Mobile Learning in Saudi Higher Education

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I declare that the research contained in this thesis, unless otherwise formally indicated within the text, is the original work of the author. The thesis has not been previously submitted to this or any other university for a degree, and does not incorporate any material already submitted for a degree.

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Abstract

This study investigated female students' practices and experiences of using mobile technology for learning in Saudi higher education during the period of 2014-2017, and built a theoretical framework for mobile learning in this context.

The rapid expansion of higher education in Saudi Arabia, coupled with the rapid increase in student numbers, is raising the need to find more effective ways to teach, reach and communicate with such a large student body. Mobile technology has been widely used in the context of Saudi higher education by both students and university teachers, but little is known about female students' experiences of using mobile technology to support their learning. A better understanding of the context of mobile use in higher education in Saudi Arabia might help in exploiting the affordances of mobile technology for learning purposes and uses.

As a contribution to innovations in Saudi higher education, this study explored mobile learning experiences of Saudi female students at one of the universities in Saudi Arabia, King Saud University. The study implemented a case study methodology and used a qualitative-led mixed methods design. A large-scale online survey of 7,865 female students provided information about the ownership and practices of mobile technology among higher education students; the extent of Internet access via mobile technology, as well as times, locations, and purposes of the use. The study also investigated the opportunities provided by mobile technology that enhance and foster learning experiences for higher education students through an in-depth investigation of 52 participants through personal diaries, group interviews and in-depth, semi-structured interviews.

The contribution to knowledge lays in the development of a theoretical framework for mobile learning to describe contemporary practices and experiences in Saudi higher education. Themes of mobile learners' ubiquitous use, mobile learners' movement, and mobile learners' strategies for achieving learning goals emerged through the analysis. One major conclusion of the research is that, as a country with a gender segregated education system and very strong cultural demands on women, mobile learning enables Saudi females to negotiate their way through the different constraints, restrictions and boundaries that prevent or hinder them in their learning process, while maintaining their own cultural values, principles and traditions. The research concluded that the mobile learning framework, in the context of Saudi females in higher education, is about active learners showing their agency through appropriating tools and resources, crossing boundaries of contexts, and personalizing their learning with and through the use of their mobile technology as a cultural resource and boundary-crossing tool to accomplish learning tasks, purposes and goals.

Acknowledgements

In the Name of Allah, the Most Beneficent, the Most Merciful

"Praise be to Allah, Lord of the worlds, The Beneficent, The Merciful, Master of the Day of Judgment, Thee (alone) we worship, Thee (alone) we ask for help, Show us the straight path, The path of those whom Thou hast favoured, Not the path of those who earn Thine anger nor of those who go astray" (1:1-7, Holy Quran).

This study could not have been completed without the support and guidance of some very special people. I wish to express my sincere gratitude to my supervisors Prof. Avril Loveless and Prof. Olfat Fodah for their continuous support, guidance and encouragement. I am also indebted to my supervisors Dr. Keith Turvey and Dr. Richard Griffiths for their insightful, professional and helpful guidance. I am grateful to all of the study participants for their time and willingness to share their experiences.

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Acronyms

ADL	Advanced Distributed Learning
GPS	Global Positioning System
GSMA	Groupe Speciale Mobile Association
HE	Higher Education
ICT	Information and Communication Technology
SA	Saudi Arabia
KSU	King Saud University
LMLG	London Mobile Learning Group
ML/ M-learning	Mobile Learning
MMS	Multimedia Message Service
MoE	Ministry of Education
MoHE	Ministry of Higher Education
MoLeNET	The Mobile Learning Network
MOOCs	Massive Open Online Courses
MoTIF	Mobile Training Implementation Framework
MSL	Mobile Seamless Learning
MT	Mobile Technology
PDA	Personal Digital Assistant
PLE	Personal Learning Environment
PLN	Personal Learning Network
SMN	Social Media Network
SMS	Short Message Service
UoB	University of Brighton
WAP	Wireless Application Protocol

CHAPTER I: Introduction

"Higher education stands on the edge of a great precipice of change – change brought about by mobile technology." (Engel et al., 2011, p.3)

As mobile devices have become more advanced and cost less, the use of this technology has grown to the extent where it can substitute for other devices to find or manipulate information. In fact, there are now 6.9 billion mobile subscriptions globally, which is about 96% of the world's population (ITU, 2015). These statistics clearly show that mobile phones have become ubiquitous.

Undoubtedly, mobile devices allow us to perform multiple tasks anytime, anywhere with just a few clicks and touches. We can browse the Internet, read newspapers, play games, access emails, shop online, check the weather forecast, take pictures, record videos, communicate and interact with others through social networking and short message service (SMS), find the nearest coffee shop by using GPS (Global Positioning System) or even check into a flight at the airport with a mobile boarding pass (Ally, 2009). In fact, people are increasingly choosing to perform a variety of tasks on their mobile phones. In 2007, in Japan, five of the year's 10 best-selling novels were originally written on cell phones (Onishi, 2008). Mobile devices have transformed from a means of communication to tools for socialization, entertainment, and work. But how might we develop critical insights into how mobile devices might change the ways we teach and learn in the early twenty first century?

Some would argue that teaching and learning today is vastly different from twenty years ago. Today's teens are part of the generational cohort known as Generation Y or Millennia's (the "millennial generation" born between 1980 and 2000) (Fleming, 2009). They have been called technology wise consumers, content creators and digital learners. As Gartner predicted in 2009, more than 80% of these students use mobile technology as a tool for learning (Pepicello, 2009). Moreover, some students have reported that media – especially mobile phones – has become an extension of themselves. Going without media made them feel as though they had lost a part of themselves (O'Neil-Dunne, 2011).

To keep students interested and motivated, universities should be innovative in their delivery of education, and adopt multiple modes of assessing progress and forging new ways to reinforce successes. Mobile learning has already had an impact on the provision of learning resources, and in the way students interact with campus facilities; and some educators assume that the use of mobile technology will increase in the future (Bridgland and Blanchard, 2005). Above all, institutions should invest in their progress and future transformation to fulfill their present promise to students of providing a life-changing education (Pepicello, 2009). Incorporating mobile learning is just one potential way to meet the needs of higher education students and universities in the twenty first century.

This thesis focuses on building a conceptual framework for mobile learning (ML) in higher education (HE) in Saudi Arabia (SA). In this thesis, a mobile technology (MT) device is any device (old or new) that can be carried around and includes the capacity for voice communication, SMS (Short Message Service), MMS (Multimedia Message Service), WAP (Wireless Application Protocol) (i.e., sending/receiving emails and surfing the web), multimedia tools (camera, video and audio recorder) as well as a variety of different applications. These devices include personal tablets, personal digital assistants, smart phones and especially mobile phones, as they are the most frequently used technology in the realm of mobile learning (Naismith et al., 2004). This study excluded tablet PCs, and laptops due to their size and weight.

The following sections provide an overview of the research, the background of the research, its significance, the purpose of the study, and finally, the research questions and context are discussed.

1.1 Overview of Mobile Learning

There is a global movement in universities to offer learning environments that meet the needs of twenty first century students. The new generation of university students is influenced by the rapid innovation in technology. They are much more comfortable using Information and Communication Technology (ICT) in everyday life as compared to students from previous generations. Universities have realized the importance of using ICT tools to enhance learning and teaching.

Theorists and researchers, with various perspectives on learning, noted that our understanding of learning has developed over the years and is influenced by changes in societies, especially technological changes. As Saljo (2010, p.56) claimed, "Technology contributes to transforming our conceptions of what learning is, our expectations of what people should master, and how human skills should be cultivated".

Undoubtedly, technology is changing the way we live, work, socialize and learn. The impact of technology in learning began a long time ago and has passed through many stages of revolutions, as described by several writers (Norton and Wiburg, 2003; Crompton, 2014; Ferran-Ferrer et al., 2014). This includes the invention of the alphabet and printing, as well as the industrial revolution, electronic technology revolution and wireless revolution. The impact of technology in learning has been categorized into three types: learning effects with technology, learning effects of technology, and learning effects through technology (Salomon and Perkins, 2005).

Using wireless mobile technology in learning has the potential to open a venue for learners to access learning and information materials regardless of their time and location (Ally, 2009). Prior to the advent of mobile technology, the concept of

learning anytime, anyplace was far more difficult to attain. However, the advent of better and cheaper mobile devices has allowed personal technology to make mobile learning (M-learning/ML) possible and "more ubiquitous" (u-learning) (Boulos et al., 2006).

Using mobile technology as a learning tool to support and enhance students' learning is referred to, or called, mobile learning and it fits within the "learning with technology" category as well as the "learning through technology" category. Various mobile learning definitions are used among researchers (see section 2.2.1, The Concept of Mobile Learning). Mobile learning is not just about learning using mobile devices, but learning across contexts.

Mobile learning has many formal and informal aspects that overlap and are hard to distinguish; it bridges formal and informal learning practices and creates mutual support between them. This could be considered a distinctive feature of mobile learning and not a threat to formal education, as supported by Sharples et al. (2007, p.23), who believe education in the era of mobile devices does not aim to change or replace established formal education, "any more than the worldwide web replaces the textbook", rather, it should be viewed as an approach that offers a means to extend everyday life activities. In fact, some scholars already argue that there is a need to establish theoretical frameworks that will provide a solid foundation for the use of mobile technology in the field of learning and teaching (Farley and Murphy, 2013).

Over the past few years, there has been considerable increase internationally in mobile learning practices and activities among institutions and universities. The different applications and features that are offered by mobile technology open up many possibilities and opportunities for learning. These activities provide several benefits as well as many challenges to educational settings. Therefore, researchers and practitioners in the field of mobile learning are attempting to theorize ML depending on the activities that can be performed with MT (Naismith et al., 2004) or by focusing on the development of a specific theoretical framework to support the design of ML (Sharples et al., 2007; Pachler et al., 2010a; Pimmer, 2016). Indeed, the field of mobile learning has been quickly developing as a research topic and, it seems, that the future of mobile learning lies in a world where technology is more accessible, affordable and connected than it is today.

This study aims to fill some of the gaps that currently exist in the research of mobile learning in Saudi Arabia, where there are still 'unknowns' about mobile use, engagement with educational structures and purposes, and implications for higher education learning environments and teaching. What is known, is that Saudi Arabia experienced a growth of around 53 million mobile subscribers with a penetration rate of 167.5% by the end of 2015 (Saudi-CITC, 2015). The figures clearly indicate that there is an average of more than one connection per person in Saudi Arabia.

This study implements a case study methodology and uses a qualitative led mixed methods design to collect data in order to investigate students' current practices and experiences of using MT for learning in Saudi higher education. The study carried out a large-scale survey to gather and analyse generalizable data. This was followed by an in-depth investigation of a smaller proportion of participants through a collection of qualitative data to look at a selection of issues more closely through diaries, group interviews and in-depth semi-structured interviews. This provided insights into how MT is currently being used; and it contributed to building a conceptual framework to support learning using mobile technology in higher education. This study bridges the gaps in our knowledge about the use of mobile technology and the implications of mobile learning for higher education in different contexts within SA.

For the purposes of this study, the definition of ML draws on the London Mobile Learning Group (LMLG) definition that describes ML as, "*the processes of coming to know and being able to operate successfully in, and across, new and changing contexts and learning spaces*" with and through the use of mobile devices (Pachler et al., 2010a, p.6).

1.2 Background of the Research

This study emerged from my experience as a lecturer at King Saud University (KSU). I noticed the widespread and extensive use of mobile technology amongst university students. An increasing number of students carried their mobile devices (e.g. mobile phones, PDAs, and tablets) to the university everyday, which directed my attention to the possibility of creating learning opportunities, and supporting students' learning, by using a tool that students already owned and were already using.

In addition, my interest in mobile learning developed from my teaching background in the Computer Education department at KSU. I read literature on ML in the context of higher education in other countries (Hussain and Adeeb, 2009; McConatha et al., 2008; Traxler and Riordan, 2003) that found ML was helping enhance the learning processes. Therefore, I felt a research study in this area would allow me to investigate and understand the experiences of higher education students with mobile learning in a Saudi context.

1.3 Significance of the Research

As the universities in Saudi Arabia grow, and the number of students increases, the need to find effective ways to teach, reach and communicate with the large number of students will rise. Mobile technology has been widely used in the context of higher

education by both students and university teachers, but little is known about how much of it is used for learning.

Today, mobile devices are ubiquitous and embedded into our daily life and social practices. As mobile devices have become more advanced and less costly, they have changed from being a luxury item to a necessity. Indeed, the use of MT has grown to the extent where it can substitute for other devices to find or manipulate information. Mobile technology could be used to reach students and communicate with them quickly and easily. It could also be used as a learning resource to support and enhance learning and teaching in higher education (Traxler and Riordan, 2003; Traxler, 2008; Hussain and Adeeb, 2009; Holme and Sharples, 2002). Presently, more learners are acquiring MT rather than computers and expect to use their MT in learning (Ally and Tsinakos, 2014). Consequently, MT might be also a useful learning tool in SA, if we understand the context of mobile use in HE in SA.

This study aims to provide information about the ownership and usage of MT among HE students, information about Internet access via MT devices as well as the times and locations MT is being used by students. The study provides information about how students use their personal MT devices for learning inside and outside classrooms and how MT can be integrated as an educational tool. Also, this study looks into the opportunities provided by MT that enhance and foster learning for HE students.

Therefore, this study provides insight into how people experience learning with and through MT to enhance learning practices, and to facilitate communication between students and teachers. Moreover, the study is expected to inform teachers and educators about students' general patterns of learning and experiences with MT; and it may help them understand how best to incorporate MT into teaching and learning at the university level. The study also investigates potential benefits and challenges that may enhance or prevent the effective use of mobile devices as educational tools inside and outside classrooms.

All in all, this study contributes to the body of knowledge in the field of ML, both theoretically and practically. Theoretically, this study builds a conceptual framework for mobile learning that describes ML practices and experiences in HE as well as provides guidance for the implementation of ML. Practically, this study provides recommendations for addressing the challenges of ML in the field of HE.

1.4 Purpose of the Research

The main purpose of this study is:

- To investigate the current state of students' ownership and practices of mobile technology in Saudi higher education.
- To explore and analyse students' experiences of using mobile technology in learning in Saudi higher education.
- To build a conceptual framework for mobile learning in Saudi higher education.

1.5 Research Questions

The research addresses the following fundamental question: **How can students' practices and experiences of mobile technology be utilized to build a conceptual framework for mobile learning that could support learning in Saudi Higher Education?**

This will be investigated through the following research questions:

1. What is the current state of mobile technology ownership and use among students in Saudi higher education?
2. How do students experience learning with mobile technology in Saudi higher education?
3. What is a conceptual framework design that could support mobile learning in Saudi higher education?

1.6 Research Context

1.6.1 The Country of Saudi Arabia

Saudi Arabia (SA) is the largest country in the Middle East, stretching between the Arabian Gulf on the east and the Red Sea on the west. It occupies almost 80 percent of the Arabian Peninsula and is similar in size to Western Europe. Saudi Arabia is approximately 2,250,000 square kilometers (868,730 square miles) (MoE, 2015) and has a population of 31,742,308 (2016 census) (GAStat, 2016). The official name of the country is the Kingdom of Saudi Arabia (KSA), and its capital city is Riyadh. The country is a monarchy headed by King Salman bin Abdul Aziz, Custodian of the Two Holy Mosques. The system of government is based on 'Majlis Al-Shura' (consultation), which has similar functions to those of the Western parliament. The official language is Arabic, although English is widely spoken and understood. The country is divided into 13 provinces (administrative regions), and each includes a number of governorates (Saudi_Embassy, 2015). Each province elects a governor who holds four-year, renewable terms. Figure 1.1 shows the provinces.

Figure 1-1 The Provinces of Saudi Arabia (Saudi_Embassy, 2015)

1.6.2 The People of Saudi Arabia

Saudis are strongly influenced by religious and cultural traditions. The Islamic doctrine, as well as Saudi culture and tradition, affect every aspect of everyday life for Saudis. Due to the fact that Saudi Arabia is the heartland of Islam, the birthplace of the Prophet Muhammad and the site of the two holy cities, Makkah and Madinah, Saudi culture and tradition are strongly influenced by Islam. Therefore, distinguishing between the religious influences and the cultural influences on Saudi people is often very difficult. Additionally, Saudi social norms or mores, the rules of behavior that are considered acceptable in a group or society, have a noticeable influence on Saudis. Figure 1.2 illustrates the complex relations between the factors that influence the lives of Saudis.

Although the traditions in Saudi Arabia are inspired by the Islamic and Arab culture, namely the culture of the Arabs in the Arab Peninsula, they differ from one province to another, especially with respect to dialect, housing patterns, clothing, cuisines, dances, and folk songs (Saudi_Tourism, 2013).

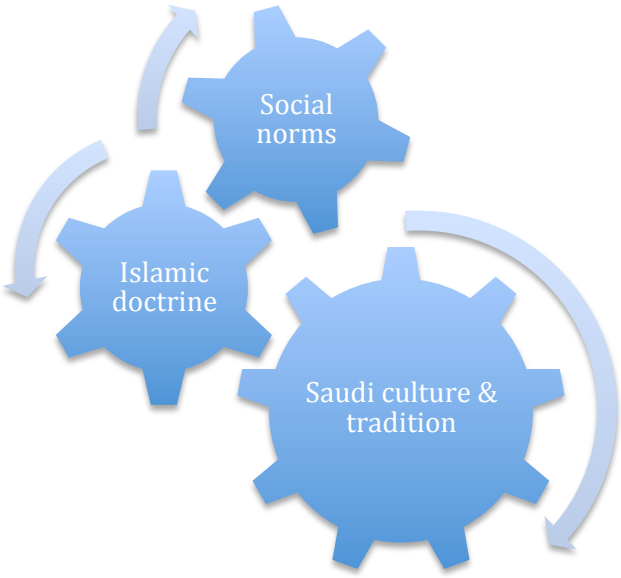

Figure 1-2 The Factors Influence Saudi People Life

As a Muslim country, the family and tribe are the basis of the social structure and are highly valued by Saudi people. The family, in Islam, is an integral part of society and represents customs and habits. Saudi males take their responsibility to their family quite seriously (Al-Hariri, 1987). A Muslim male is considered to be in command of the family and is grateful to take care of his wife, mother and sisters financially, even if they work or are rich. The male's responsibility for females in Islam stresses his role as one of leadership that has been called "*Qawamah*" (caretaking) in the Quran.

The segregation of the sexes, required by Saudi culture and societal norms, influences all aspects of life, including education. The educational environment is segregated by sex in accordance with local Islamic law, with classes for men and women in separate buildings and taught by teachers of the same sex (MoE, 2015).

As the poet John Keats (1795- 1821) said, "There is nothing stable in the world". This is true even when we talk about cultures and traditions in SA. Saudi culture and its traditions have witnessed a transformation over time. Writers have illustrated the transformation in Saudi culture differently. For example, Doumato (1996) saw that traditional and core tribal values of rural families changed as they moved to big cities. Also, Hausheer (2014) saw that scholarships and studying abroad for many young Saudis may alter their culture and traditions, as there are large numbers of them in American cities. She saw that living outside of Saudi Arabia gave Saudi students the opportunity for cross-cultural exchange and the chance to further develop their "intellectual identity". Hausheer (2014, p.2) states, "This massive influx of Saudi students is bound to have an impact when they return home. Indeed, this population is seen by many in the Kingdom as a positive force that will inevitably catalyze change in the conservative society".

Furthermore, technology has also had a noticeable impact on Saudi traditional culture since it entered the country. Elmusa (1997) argues that modern technology has profoundly changed Saudi traditional culture. He supports his argument by going back into the history of Saudi Arabia and describes how the simplest forms of modernization and technology (such as cars, clocks and modern cities) contributed to a struggle between traditions and technology. He states:

> The change is seen in the culture's response to specific technologies, clock-based time and the rise of the modern city. Conventional accounts and, especially, Saudi and other Arabian Peninsula literary works are employed to construct this argument. The argument of profound cultural changes is premised on the view that technology is a bearer of new paradigms of perception and action and that it is ambiguous, in spite of its strong deterministic features (p.345).

He also declares that the Saudi government was able to see the importance technology would have on its state, both inwardly and internationally, and were able to work around the religious and political aspects that contradicted with their way of life. Elmusa (1997, p.346) sees technology as "a cultural instrument, a mediation between the individual and the world, a way of ordering the world. It presents the Saudis with alternative modes or paradigms of perception and action that challenge their own indigenous, traditional cultural norms".

Saudis are varying in their acceptance of these cultural transformations. Some Saudis are very willing and perceive this development as progress, others view it as a threat to Islamic and cultural traditions, while others fall between the two extremes. For example, Saudi families perceive the Internet and mobile phones in different ways. When the Internet entered the country for the first time, many families rejected it and did not allow members of their families to use it because they saw it as a "threat" to their culture and traditions. This is not the case when we talk about mobile technology and mobile phones specifically. As illustrated statistically before (see section 1.1), mobile phones are widespread in the country and were automatically accepted by Saudis who saw the mobile phone as a "communication tool". Therefore, many Saudi families allowed their family members including children to use and own mobile phones.

1.6.3 Women in Saudi Arabia

A Muslim female has to follow some conditions when she wants to go outside her house. This includes wearing a "*Hijab*", a veil that covers the head and chest, and a wide dress (cloak) that covers the entire body. Females are only allowed to remove their Hijab in front of a "*Mahram*", which includes her husband and men of her immediate family such as brothers, fathers, uncles and nephews. Al-Hariri (1987, p.51) talked about the public appearance of Muslim women when they were outdoors

and how it should be one of "decency and dignity". He (1987, p.51) stated the reasons behind this is that "Islam calls on women to restrict the display of beauty and charm which make them a centre of attraction". Saudi females wear a black hijab inside Saudi Arabia and they tend to use other brighter colours when they travel outside the country.

The issue of the Hijab illustrates the reasons behind the segregation of the sexes in the country. Saudi males cannot teach females directly, so general education in Saudi is completely gender segregated. However, in higher education, males sometimes teach females through a closed circuit television network and when females have to communicate with, or contact, males for administrative and educational purposes it is mostly done by phone.

Females in SA, due to cultural and social regulations, do not drive but instead are provided with transportation by male relatives or chauffeurs (Prokop, 2003). If a male cannot fulfill his transportation obligations for the females in his family, then they must depend on drivers (chauffeurs). In the event that a male relative or driver cannot take a female to work or to school (for any reason, such as being sick), then she will be absent or miss class. Saudi females tend to not use public transportation because they are not safe enough for females to use alone. Recently, the government has been working on making transportation safer for women. There are many transportation projects under development now such as constructing the first metro in Riyadh and developing public transportation to suit the needs of Saudi society.

Additionally, direct interactions between females and males, who are not close relatives or a Mahram, is not permitted except on rare occasions; therefore, there is no room for male-female friendships. However, some workplaces, such as banks and hospitals, cannot be gender segregated. In these places, females work in a mixed environment with men. This is not in conflict with Saudi cultures and traditions if the women wear Hijabs and act formally. However, the government is trying to place cultural demands on businesses by separating all work places, if applicable.

Although Saudi women face many cultural and social restrictions, the Saudi government still encourages women to work. Recently, the late King Abdullah bin Abdul Aziz permitted women to take part at the Al-Shura council in January 2013, which was an important step for Saudi women in gaining positional power. Currently, 30 Saudi women, forming 20% of the overall council's members, have entered the Al-Shura council (Alkhchiban, 2013).

1.6.4 Education System in Saudi Arabia

Public education in Saudi Arabia is provided free of charge to all citizens at all levels. The government has invested large amounts of money in the system of public

education and works hard to encourage people to get an education (Al-Hariri, 1987). The Saudi educational system aims to ensure that students are prepared for life and work in the modern world, while meeting the country's religious, social and economic needs (Saudi_Embassy, 2015).

The education system in Saudi Arabia can be divided into two broad categories: general education and higher education. General education (see Figure 1.3) comprises schooling at the primary level, intermediate level, and secondary level (high school) (AMCML, 2014). Higher education is comprised of Diplomas, Bachelors, Masters and PhD degrees. Pre-primary education (kindergarten) is not a prerequisite for students entering primary education in Saudi Arabia.

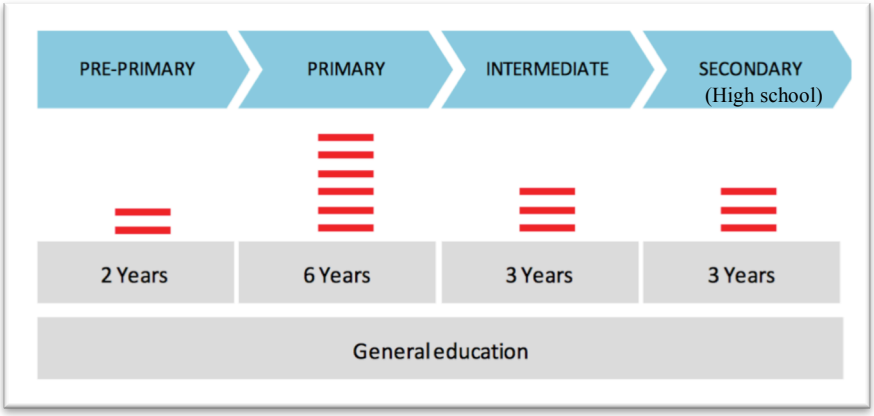

Figure 1-3 SA's General Education System (AMCML, 2014, p.7)

The Ministry of Education (MoE) is the main authority responsible for the administration and management of SA's education system. The MoE was established in 1954. It oversees all educational levels in Saudi Arabia. Unfortunately, when it was established in 1954, education was only offered to males, and there were no schools for females to get an education (Alamri, 2011). In 1957, the first university, King Saud University (KSU), was founded in Riyadh due to the need to educate Saudi students instead of sending them abroad for education. In 1959, King Saud bin Abdulaziz discussed the issue of educating women in Saudi Arabia and sought support from religious scholars to start education for girls (Alamri, 2011). In 1960, the first school for girls started in Riyadh (Al-Rawaf and Simmons, 1991). Since then, schools have separated boys and girls at all educational levels.

The first government school for girls was built in 1964, and by the end of the 1990s girl's schools had been established in every part of the Kingdom. Today, female students make up over half of the more than six million students currently enrolled in Saudi schools and universities (Saudi_Embassy, 2015).

1.6.5 Saudi Higher Education

Saudi Arabia began focusing on higher education when the country entered a new era of rapid development in the early 1970s. Currently, about one million students are enrolled at Saudi universities and colleges, compared to 7,000 in 1970 (Saudi_Embassy, 2015). The higher education system, which is based on diversification, has expanded to include (MoE, 2015):

- 25 government (public) universities (see Figure 1.4),
- 18 primary teacher's colleges for men,
- 80 primary teacher's colleges for women,
- 37 colleges and institutes for health,
- 12 technical colleges,
- 9 private universities and 36 private colleges.

Figure 1-4 Distribution of the Saudi Government Universities (25 universities)

Saudi universities and institutions offer 2-year Diplomas, Bachelors, Masters and PhD degrees in various specializations within the science and humanities programmes. English is used as the medium of instruction in technology and science fields, while all other subjects are taught in Arabic. Saudi public universities provide free education and financial support for both undergraduate and graduate students. The government grants monthly allowances of around £160 per month for all university students (MoE, 2015).

The MoE, through supervision and coordination with the universities, gives very special attention to scientific research, which is an important source for scientific and civic development, and is a fundamental function of universities. The Ministry supports specialized research institutes and centers, and conducts scientific symposiums and conferences, which enable the academic staff at the universities to

participate in specialized scientific activities, and learn about updates in their fields (MoE, 2015) .

Men and women in higher education are kept almost completely separate. This is accomplished mostly with gender-specific (all-male, all-female) colleges and universities, which make up the vast majority of higher education institutions. Segregation and female status has been specifically discussed in this section because cultural aspects can influence females' practices and experiences with regard to mobile learning.

Despite gender segregation, women still have ample educational opportunities, constituting nearly 60% of the total student population in the kingdom. Additionally, the late King Abdullah made it a point to spend government funds specifically on women's education.

1.6.6 Saudi Women in Higher Education

"When we talk about the comprehensive development that our country is witnessing, we cannot ignore the role of Saudi women and their participation in this development. The productive role of women...has been a definite result of the great investment that the country has dedicated to the field of education for all of its citizens, men and women. As a result, Saudi women have been able to earn the highest educational credentials, which has enabled them to work diligently in different fields. Saudi women have proven their ability to handle responsibilities with great success, whether through their principal duty as mothers, or as professionals. We look forward to women acquiring a major role in a way that will promote the interests of this nation on the basis of Shariíah (Islamic law)".

King Abdullah bin Abdul Aziz (1924-2015) cited in (MoHE, 2010, p.v)

Women in higher education in the Kingdom are witnessing an unprecedented development quantitatively and qualitatively in terms of development programs, initiatives, and strategies. This development provides educational opportunities for women and plays an important role in realizing equity between the two sexes in job opportunities and overseas scholarships.

As part of the objectives of the Kingdom's development plans, women in Saudi Arabia are vigorously pursuing higher education and professional careers, and seeking to become active members of society, where their roles are defined in terms of what they can offer to benefit their country's economic, as well as social and cultural, development.

Saudi Arabia has recently increased its emphasis on promoting HE for females including the establishment of Princess Nora bint Abdul-Rahman University for women that offers women new educational opportunities to enter the labor market.

Many more women are applying for, and receiving, scholarships to obtain PhDs. In 2010, there were more than 300 higher education colleges for women in the country alongside universities; and women represent more than 56% of the total number of Saudi university students and more than 20% of those benefiting from overseas scholarship program (see Figure 1.5). This percentage is expected to increase in the coming years with the establishment of a number of new universities in major cities in the Kingdom (MoHE, 2010).

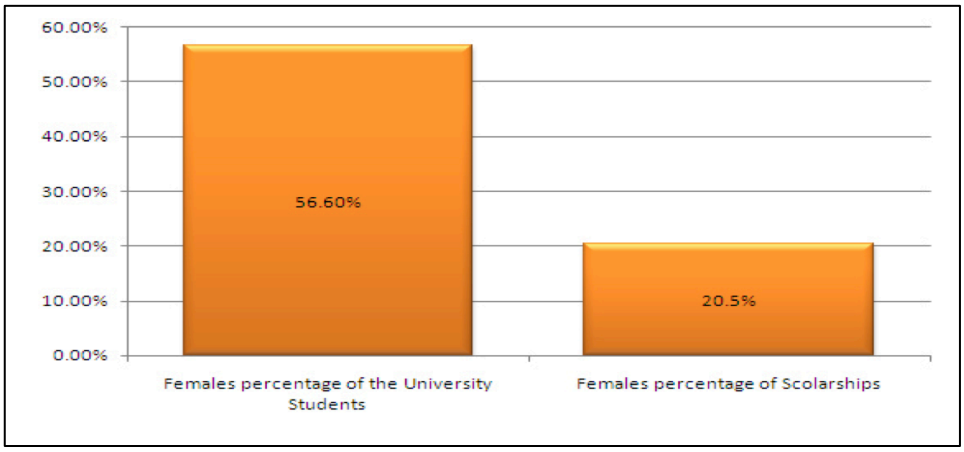

Figure 1-5 Percentage of Saudi Women in Higher Education (MoHE, 2010, p.2)

Additionally, international observers have noted that Saudi women are becoming pioneers in a variety of fields, most prominently in science and research, and by receiving international awards and earning patents (MoHE, 2010).

1.6.7 King Saud University (KSU)

The oldest university in Saudi Arabia is King Saud University in Riyadh, where this study was conducted. It was founded in 1957 as Riyadh University and renamed King Saud University in 1982. When it first opened in 1957, just nine instructors taught 21 students (Saudi_Embassy, 2015). In 2015, 61,321 students (59% males and 41% females) were pursuing degrees in art, science, commerce, engineering, agriculture, medicine, dentistry, nursing, education, computer science or information science taught by 7,391 faculty members (KSU-Statistics, 2015). Although many majors are available at KSU, not all majors are available for females. For example, there are no engineering or architecture degrees available for females yet.

King Saud University has sought to become a leader in educational and technological innovation, scientific discovery and creativity by fostering an atmosphere of intellectual inspiration and partnership for the prosperity of society (KSU, 2015).

KSU has many campuses located in different cities in Saudi Arabia, a total of 18 libraries, and two highly recognized hospitals (KSU, 2015). Each campus includes two separated sections for males and females. The female section is run by female

staff and taught by female lecturers in person, or by male lecturers via a closed circuit television network.

The main campus, where I work as a computer education lecturer and teach only female students, is located in Riyadh and situated on nine million m^2 of land. As of 2013, it houses all of the University colleges. It contains all the required facilities – everything from academic buildings, lecture halls, staff housing, student's housing, learning resources, support services, as well as recreation and sports facilities. Learning Resources is considered to be the backbone for supporting teaching and learning processes at KSU. KSU provides many learning resources and facilities for its faculty and students including:

- **Library collections and services**, such as the library web portal, financial support to purchase books, magazines, and other sources of information, and free subscriptions to world databases such as ISI database
- **The electronic learning services,** such as the university's web portal, E-register (http://ereg.ksu.edu.sa), Edugate (https://edugate.ksu.edu.sa), the Learning Management System (LMS), E-learning portal (https://lms.ksu.edu.sa), Email services (as the university provides emails for each student and member of staff and faculty), different accounts on SMNs, some mobile applications (e.g. KSU-Staff and KSU-Student), and free Wi-Fi throughout the campus.
- **Computer labs** in each college, to facilitate students using and accessing the Internet and other learning resources, other than for teaching purposes.
- **A bookstore,** where students can buy textbooks at affordable and reduced prices. KSU pays 50% of the textbook price in order to help students obtain the books.

University students are admitted based on their high school grade-point average, their grades in the MoE's comprehensive exam, and their grades in tests prepared by the National Centre for Assessment in Higher Education (NCAHE). The NCAHE attempts to establish fairness and equality in the Higher Educational system of Saudi Arabia and improve the efficiency of learning. In the first year of university, all students are enrolled in the Preparatory year to prepare them to study at university level and to enhance the quality of their learning. This program is offered to provide students with basic computer and Internet skills, English language skills, and self-development skills. Additionally, the Information and Communication Driving License (ICDL) program has been implemented in the Preparatory year at King Saud University (KSU, 2015).

1.6.8 Summary

Saudi Arabia is a country built on Islamic values and beliefs and run entirely by Islamic law. At the same time, however, it is a modern country that strives to keep up with the latest technological developments, especially with regard to education. Fifty-

five years ago, only 21 students studied at the first established University. Currently, there are 25 public universities and a number of private universities established throughout the country. The Islamic culture remains a strong influence on all aspects of life including education, and female education, specifically, has been given high priority.

Recently, many schools and universities have been constructed for females and equipped with the latest technological advancement. Almost all higher education institutions in Saudi Arabia provide their students with free access to Wi-Fi and to their university's learning management systems. Also, students are provided with a university-email and a personal-university site to facilitate access to their schedule, courses and grades.

The use of technology in HE facilitates communication and interaction between males and females, while at the same time does not conflict with Saudi culture and Islamic traditions. Mobile technology is always in a student's hand and is the easiest and fastest way for them to contact and communicate with their teacher. Therefore, the trend in HE, recently, is to integrate traditional learning (face-to-face) with other technological forms of learning such as online learning, blended learning and mobile learning.

1.7 Structure of the Thesis

This thesis is comprised of seven chapters with the following structure:

Chapter I, **Introduction**, presents the background of the study, the significance of the study, the purpose of the study, and the research questions. Additionally, it provides a review of the context of the study, including the culture and the education system.

Chapter II, the **Literature review**, provides the literature pertinent to the study. Learning generally, and mobile learning particularly are introduced. Learning opportunities, benefits and challenges of mobile learning, and mobile learning in higher education are also discussed. Finally, theoretical perspectives of mobile learning are reviewed.

Chapter III, **Research methodology**, describes the methodological approach, the sampling approach, the data analysis procedure, trustworthiness issues and ethical considerations.

Chapter IV, **Mobile technologies in higher education: ownership and practices**, presents the findings and the analyses of the research's quantitative data.

Chapter V, **The experiences of mobile learning in higher education**, presents the findings and the analyses of the research's qualitative data.

Chapter VI, **Building a conceptual framework for mobile learning in higher education**, presents discussions and interpretations of the themes that emerged from the data analysis. It also presents a theoretical contribution of a suggested mobile learning framework for higher education.

Chapter VII, **Conclusions and recommendations**, answers the research questions, presents the challenges and limitations of the research, discusses research contributions as well as the implications and recommendations for future enquiry and research, and presents the general conclusions that arose from the study.

CHAPTER II: Literature Review

The rapid advances in technology, and the expanded capabilities of new mobile devices, have created a growing interest in mobile possibilities for teaching, learning, and research. Today, mobile devices are ubiquitous and integrated into many aspects of our lives. As mobile devices have advanced technologically, and become more affordable, we have become more dependent on them. Mobile technology use has grown to the point where it is often used in place of other devices to find or manipulate information. This has led to global interest in examining the potential uses of mobile devices to support learning.

This chapter provides a literature review about learning in general, and mobile learning (M-learning/ML) in particular. The chapter begins by reviewing some of the different perspectives of learning. This is followed by a brief discussion of specific topics in the field of learning and technology. This includes the history of technology's impact in education and learning and the potential of technology in learning. Additionally, mobile technology and its use in education are addressed. After that, the concept and features of mobile learning are explained. Learning opportunities, challenges and benefits of mobile learning are also addressed. Following that, some practices of mobile learning in higher education (HE) are discussed and more light is shed on theoretical perspectives of mobile learning. Finally, the aims and the main research question of the study are presented within the chapter conclusion.

2.1 An Overview of Learning

"Learning is not compulsory; it's voluntary. Improvement is not compulsory; it's voluntary. But to survive, we must learn".

W. Edwards Deming (1900-1993) cited in (Voehl, 1995, p.125)

The use of Information and Communication Technology (ICT) tools to enhance learning and teaching requires an understanding of how ICT tools might support the learning process in general. To address this, different facets of learning and technology are considered. In this section, specific topics related to learning will be discussed. This includes discussing different perspectives of learning and describing how technology impacts our education system generally, and how ICT influences learning and teaching practices and has become part of them. Then the discussion will move on to explain the potential benefits of using technology in education and learning. After that, the categories of technology's effects on learning and learners, and their uses of technology, will be briefly discussed. Finally, the section will conclude by concentrating on MT and discuss how the previous topics relate to using MT as a learning tool, which is the focus of this study.

2.1.1 Understanding the term 'Learning' from Different Perspectives

Learning is a complex process that is not easily defined or conceptualized. So, to best understand what learning is, it is important to look at how different perspectives view learning. This will include some theories of learning, some learning metaphors, and the input of some educators on learning.

Theories of learning have several different perspectives on learning and various assumptions about how people learn. In such discussions, we often find that "dominant theories of the past continue to operate as the default framework affecting and driving current practices and perspectives" (Shepard, 2000, p.4). Therefore, it is important to consider concepts of learning from past learning theories, as well as contemporary learning theories, as a foundation for examining our understanding and assumptions about how students learn. James et al. (2007) indicated that the three main, and most frequently used, perspectives are **Behaviourist** learning theory, **Constructivist** learning theory and **Sociocultural** learning theory.

Behaviourist theory looks at learning as a developing association between stimuli and responses, and focuses on observable behaviour rather than thinking. Behaviourism is most concerned with behaviour, "not what goes on in a person's head" (Brown et al., 1999; James et al., 2007, p.17).

Constructivist theory looks differently at learning processes and aims to explain what knowledge is and how it is acquired. It assumes that all knowledge is constructed from previous knowledge and understanding, so the transformation of incoming ideas depends only on existing knowledge and understanding (Brown et al., 1999). Constructivism is mostly concerned with the mental models that a learner employs when responding to new information or problems (James et al., 2007).

Sociocultural learning theory expands on these ideas and emphasizes the importance of social interactions with others in the learning process. This approach was first systematized and applied by the Russian psychologist Lev Vygotsky in the nineteen-twenties and thirties. Vygotsky contends that learning proceeds by interactions between learners and others (teacher, peers, experts, workmates, friends and family), in a social context, mediated by tools such as language and promoted by social norms that value the search for understanding (James et al., 2007; John-Steiner and Mahn, 1996).

In addition, according to Sfard (1998), learning can be seen as a continuing process of 'participation' rather than a discrete instance of 'acquisition'. Sfard claims that the different perspectives on learning underpin two key **metaphors**: an acquisition metaphor and a participation metaphor. Learning within the acquisition metaphor involves accumulation of knowledge that is abstracted and generalised. The process may involve either reception or development by construction, but the focus is on

‘gaining ownership’ or possession of something (Sfard, 1998, p.5). Within the participation metaphor, learning involves participation within a community of others more knowledgeable to construct understanding. Participation takes place in the context of culture through social mediation. The focus within this metaphor is not on possession but on participation in various kinds of activities characteristic of a learning area as the learner gradually becomes a member of the subject community.

Sfard (1998) declared that the Behaviourist learning theory and Constructivist learning theory are concerned with the acquisition of skills, knowledge and understanding, while Socio-cultural learning theory sees learning as embodied in, and through, participation in a cultural activity. Paavola et al. (2004) added a third metaphor for learning that is “knowledge creation”, which means producing something novel or original. This metaphor is important in learning because it looks at creativity and innovation as a learning goal.

Learning theories and metaphors are useful because they allow us to look at learning from different lenses and at the same time they challenge our assumptions on learning and teaching. Sfard (1998, p.10) highlights that “each metaphor has something to offer that the other cannot provide”, and asserts the dangers of being a devotee of only one particular metaphor for learning. The same might be said of learning theories in general. Without a doubt, each learning theory has influenced some of our current educational environments (Luckin, 2010), and teachers will probably not only find a practical application at some time for Behaviourist, Constructivist, and Socio-cultural theories, but, they are likely to use mixed metaphors (James et al., 2007).

That said, **educators** look at learning from different points of view and there are actually vital differences between them when discussing learning. To illustrate, Benjamin Bloom (1956) provided a detailed description of learning in his famous ‘Taxonomy of Educational Objectives’. He argued that all learning could be described in terms of three overlapping domains: the psychomotor domain (manual and physical skills- ‘doing’ / hands), the affective domain (emotions and attitudes - ‘feeling’ / heart), and the cognitive domain (intellectual capacity and knowledge - ‘thinking’ / head). Figure 2.1 conceptualizes Bloom’s domains.

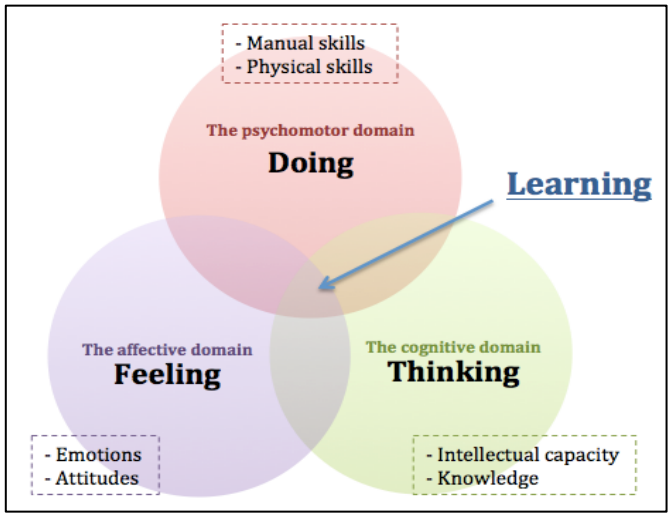

Figure 2-1 Conception of Bloom's Domains

Additionally, David Perkins (1993) raised an important question on this matter, which is, how does learning happen? Most learning theories tend to see that learning happens inside the learner's head and the result of the learning process lies in the mind of the learner. However, Perkins (1993, p.89) adopted Roy Pea's concept of "distributed intelligence," which is the idea that we should reconsider human cognition as distributed beyond the person; that it can also include other people, symbolic media, environment and artefacts. He (1993, p.89) introduces the concept of "person-solo" and "person-plus", a contrast between what we "know" in the form of what is kept in our head, as opposed to what we know in cooperation with the physical arena in which thinking and learning occur. He argued that thinking and learning involve not only the person (the person-solo), but also the surrounding resources (the person-plus); the ability to think and learn ably depends more on the "access characteristics" (knowledge, representation, retrieval, construction) of important information, as opposed to where it is stored in the person or the surroundings (i.e. in a brain or a book). Perkins considered learning a distributed process and the surrounding resources as tools that support learners in their learning environment. He emphasised the important role of the learner's environment in the learning process.

Moreover, Saljo (1999) debated that learning was related to how people appropriate tools for thinking and acting that exist in a given culture or society. He talked about learning in an interesting way and emphasised the role of the different tools that people use in learning. He also highlighted the important roles of the social and cultural aspects of learner life in learning. Saljo's view of learning is based on sociocultural theories of learning and human activity. He argued that:

> Human learning has always been a matter of mastering tools of different kinds, intellectual (such as, for instance, becoming competent in how to do a division or a multiplication by using algorithms) as well as physical (learning how to build a house or how to cultivate land). A fundamental assumption in a sociocultural understanding of human learning is precisely this: learning is always learning to do something with cultural

> tools (be they intellectual and/or theoretical). This has the important implication that when understanding learning we have to consider that the unit that we are studying is people in action using tools of some kind… The learning is not only inside the person, but in his or her ability to use a particular set of tools in productive ways and for particular purposes. (p.147)

Also, Neil Selwyn (2011) discussed how learning should be seen as a product or a process. He argued that the old learning theories saw learning as a product or outcome (such as Behaviourist theory), while contemporary learning theories saw learning as a process (such as Constructivist theory) where students can learn based on their previous experiences and, in some instances, change their behaviour as a result.

In addition to the differences between learning conceptions across theories, as Selwyn illustrated, conceptions also vary between students. Research by Roger Saljo (1979) reported by Selwyn (2011, pp.3-4) outlined five distinct conceptions of learning for students; these are:

- Learning as the increase in knowledge. Learning is acquiring information or knowing a lot;
- Learning as memorization. Learning is storing information that can be reproduced;
- Learning as the acquisition of facts, skills and methods that can be retained and used as necessary;
- Learning as making sense or abstracting meaning. Learning involves relating parts of the subject matter to each other and to the real world;
- Learning as an interpretation and understanding of reality in a different way. Learning involves comprehending the world by reinterpreting knowledge.

Saljo's findings asserted the same difference in views of learning amongst educators. Some students described their learning as a product (the first three findings) where other students described it as an on-going process (the last two findings).

Vesisenaho and Dillon (2013, p.243) discuss that people learn through experience that is "what happens when people interact with their environment". They adopted a cultural ecological view of learning which places significance on the interactions and transactions between people and their environments. Environment encompasses all the actors and resources in a given situation including the physical, psychological, social, cultural, etc. The individual is seen as an integral part of the environment and thus inseparable from elements which typically have been labeled as historical, social, cultural, economic, technological, etc. They talk about different source of interactions and transformative relationships such as 'the relational' and 'the co-constitutional'. In relational relationship, situations are defined relative to each other, behaviours may be predicted and they are diachronic. In contrast, in the co-constitutional relationship, situations are emergent, behaviours and environments co-construct each other, and things happen episodically 'in the moment'. They describe learning as a complex

process stating:

> The relational and the co-constitutional are themselves constantly reforming each other, which is why learning is a complex process. It is complex because there are predictable things that can be said about it, but at the same time there is a degree of unpredictability that comes through the emergent possibilities of the situation (p.244).

Indeed, it is essential for educators to consider the understanding they have and the assumptions they have made regarding teaching and learning. This is important because these understandings and assumptions, implicitly or explicitly, influence the educators' professional stance and their teaching and learning practices.

Furthermore, educators have realized the importance of developing an understanding of learning that is influenced by rapid changes in society. As evidence, there have been significant developments in the understanding of learning, from knowing how to read, write and calculate (basic literacy), to memorization and remembering, to understanding and taking control of learning (active learning) (James et al., 2007). Additionally, educators shifted their thinking about "how we learn" to focusing on individuals' behaviours to the social and cultural relations among people, and how their thoughts on learning are explicated "from models of training and transmission to networks of collaborative knowledge-building" (Loveless and Williamson, 2013, p.101).

Therefore, the definition of learning in this thesis draws on Norbert Pachler and Caroline Daly's (2011, p.17) definition that describes learning as, "the twin processes of 'coming to know' and 'being able to operate' successfully in and across new and ever-changing contexts and learning spaces, as a process of meaning-making through communication and as an augmentation of inner, conceptual and outer, semiotic resources".

All in all, it seems clear that over the years, educators have not found one unanimously agreed upon definition or conception of 'learning'. It is argued that "our understandings of learning are not simply acquired as knowledge that is put into practice; rather, they develop over time and in diverse contexts working with diverse students, based on ongoing experience and reflection" (Scarino and Liddicoat, 2009, p.24). That said, our understanding of the learning process as well the learning environments have developed and changed over time. Moreover, many changes occur in the elements that make up the learning process such as the learner, knowledge, required skills for learning, learning tools, context, environment, culture, and the era in which learning happens. All of these elements have changed over time and are influenced by rapid changes in society, especially technological changes. As Saljo (2010, p.56) stated, "Technology contributes to transforming our conceptions of what learning is: our expectations of what people should master, and how human skills should be cultivated".

Technology has certainly changed the way we live, work and think. It has impacted different facets of life and redefined living (Oak, 2011). It is embedded in our life and has a substantial effect on our learning, knowledge and culture (Loveless and Williamson, 2013). Whilst digital technology seems to have accelerated the pace at which we have to adapt to new learning forms and tools, technology has shaped the way we learn for many generations before us and will continue to do so.

2.1.2 Learning and Technology

"Every era of technology has, to some extent, formed education in its own image"

(Sharples et al., 2007, p.221)

This section discusses how technology impacts the education system generally, and how ICT influences learning and teaching practices and has become a part of them. Additionally, it explains the potential benefits of using technology in education and learning, the categories of technology's effects on learning, as well as shading some lights on learners and their uses of technology.

2.1.2.1 History of technology's impact on education and learning

The impact of technology in the education and learning fields is both visible and effective, and has taken many stages throughout history. Many authors have described the different stages as revolutions (Norton and Wiburg, 2003; Ferran-Ferrer et al., 2014; Crompton, 2014). Moreover, the impact of technology in education and learning has always been an intense topic of debate. It began with the ancient Greeks who debated the use of the alphabet after its invention, and their fear that using letters might lead to a decline in the capacity of humans to use their memory as well as an erosion of "truth". Eventually, the technology of the alphabet changed their oral culture into a scribal culture (Norton and Wiburg, 2003, p.2).

Later, the German inventor, Johannes Gutenberg, invented the printing press in 1452 and his invention changed the culture again, this time from a scribal into a print culture. As Marilyn Gilmore suggested, the invention of printing was "the most radical transformation in the conditions of intellectual life in the history of western civilization...It opened new horizons in education and in the communication of ideas…Its effects were sooner or later felt in every department of human activity" (as cited in Eisenstein, 1979, p.167).

In the 18th and 19th centuries, the industrial revolution accompanied by technological development brought new ways of learning and teaching (Crompton, 2014). It ushered in an era where teaching could take place remotely (e.g. through learning materials or videos), and learning could occur at different places or times rather than

through traditional face-to-face interactions. This paved the way for creating a new learning model known as Distance Learning (d-learning) (Peters, 2007).

In the 20th century, electronic technology was invented and spread widely over the world. As a result, another revolution began to occur and change the way humans know and interact with the world. According to Norton and Wiburg (2003, p.2), "The reinvention of knowledge as a result of our interaction with computer[s] is already occurring and is changing our life options and the kind of educational opportunities required for students to succeed in this knowledge environment". The electronic revolution has led to the development of computers and related programs, which has led to the creation of the Electronic Learning Model (e-learning) using the advanced technology of computers and networks.

At the end of the 20th century and beginning of the 21st century the wireless revolution occurred. Wireless devices, mobile information and communication technologies spread very quickly, and in large numbers, all over the world. To back this up, the World Bank Organization's website ('World Bank Organisation ', 2014) published statistics showing the subscriptions of mobile phones throughout the world, as showed in Figure 2.2 (see Appendix A). This figure clearly shows the widespread use of mobile phones all over the world. The information on The World Bank website is based on the International Telecommunication Union, World Telecommunication/ICT Development Report and database.

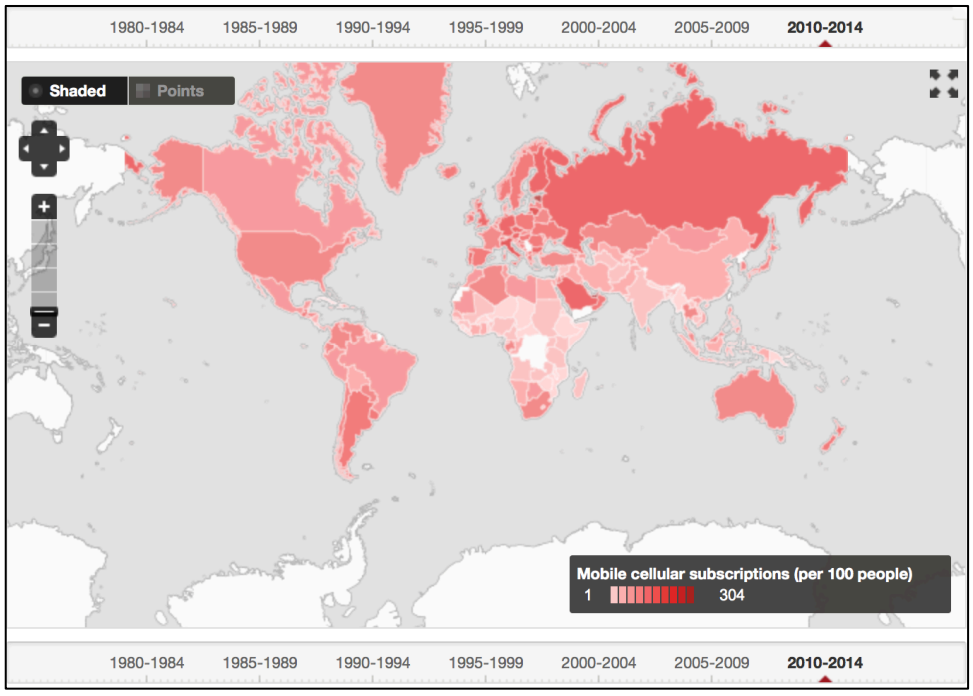

Figure 2-2 Mobile Phone Subscriptions ('World Bank Organisation', 2014)

The wireless revolution was distinctive because it allowed for fast communication, information processing, supported new social patterns (Peters, 2007) and led to the creation of a new learning model - Mobile Learning (M-learning/ML). Mobile technologies are important enablers of the new social structure as well as important in reducing dependence on fixed locations for work and study (Peters, 2007). This model of learning provides the learner with the opportunity to learn anytime and anywhere; and it provides new methods of delivery that are suited to the "just in time, just enough and just for me" demands of 21st century learners (Peters, 2007, p.113).

According to Saljo (2010), technology is significant, serves as "instructional aids", and has two implications in the production and reproduction of knowledge and skills. He argues that:

> One of the main consequences of why these technologies are so significant is that they affect the manners in which society builds up and provides access to social memory, that is, the pool of insights and experiences that people are expected to know about and to make use of. Then, my second point is that the technology does not facilitate or improve learning in a linear sense, rather it is currently changing our interpretations of what learning is and changing our expectations about what it means to know something (p.56).

Consequently, the enormous technological developments and revolutions had a significant impact on the learning process as they transformed learning in new and different ways from what we were used to, and it will likely continue to do so in the future. As Saljo (2010, p.53) stated, "Technology does not merely support learning; they transform how we learn and how we come to interpret learning". As a result, ICT is now considered an important component of education and has almost become inseparable from it, which gives technology the potential to be used in education and learning.

2.1.2.2 The potential of technology in education and learning

Kramer and Schmidt (2001, p.196) outlined the potentials and benefits of technology in education and learning as follows:

- The same content can be presented using different media types including text, two- and three-dimensional graphics, sounds, image sequences or simulations.
- Different perspectives and access to the same topic can be used to provide cognitive flexibility.
- Different media can be synchronized into multi-model presentations.
- Multimedia components can be networked to hypermedia learning applications according to logic, didactic or other meaningful relationships among components.

- Different customized "tours" can be superimposed on a web of learning components with a view to maximize re-use and adapt existing contents to new course and curricula.
- Educational software development and knowledge modelling tools facilitate authoring of multimedia educational material and technology.
- Flexible navigation control lets learners explore a networked information space at their own pace and orientation. However, it can also provide rigid guidance including conditional selection of follow-on information and progress on successful completion of given learning tasks.
- Interaction facilities provide learners with opportunities for experimentation, context-dependent feedback, and constructive problem solving.
- Asynchronous and synchronous communication and collaboration facilities help to bridge geographical distance between course providers, teachers and students.
- Virtual laboratories and environments can be used to offer near authentic work situations, opportunities for hands-on experimentation and constructive problem solving.
- Operation sequences and preferred learning paths can be recorded, evaluated and reactivated if necessary. The students can add their own reference structures and personal notes to the course material.

2.1.2.3 The impact of technology on learning categories

The impact of technology on learning has been described in three ways; learning effects with technology, learning effects of technology, and learning effects through technology (Salomon and Perkins, 2005).

Learning effects '**with**' technology describes how the use of technology often enhances our performances and supports our thinking. Technology extends a user's capabilities to perform different activities and tasks by establishing a partnership with the user. The partnership interacts and works for the user so activities and tasks are distributed between the technology and the user "without too much involvement" on the user's part (Salomon and Perkins, 2005, p.74).

Learning effects '**of**' technology describes how the use of technology might enhance performances even without the technology in hand. Effects of technology are recognized in the lasting impact that continues after using the technology and can be recalled later to enhance performance (Salomon and Perkins, 2005).

Learning effects '**through**' technology describes how the use of technology sometimes reshapes and reorganizes our performances in addition to enhancing it. Effects through technology take a longer time (than effects "with" and "of" technology) to be apparent, so the user has the opportunity to explore further

affordances of the technology, and that leads to reorganization of the task itself (Salomon and Perkins, 2005).

2.1.2.4 Learners and technology

The new generation of students entering HE institutions is inevitably influenced by the rapid innovation in technology. They are much more comfortable using ICT in everyday life as compared to previous students. Moreover, they are using their MT on a daily basis and expected to use their MT in learning (Ally and Tsinakos, 2014). Indeed, as reported by students, MT- especially mobile phones - have, figuratively speaking, become an extension of themselves. Going without media, therefore, makes it seem like they have lost part of themselves (O'Neil-Dunne, 2011). Researchers describe these students as 'generation Y', 'millennials', 'digital learners', 'net generation', 'Yers' and 'I-generation' (Prensky, 2001; Oblinger and Oblinger, 2005; Krause, 2005; Loveless and Williamson, 2013). In Saudi Arabia, the new generation of undergraduate students are expected to be more familiar with the use of ICT than current students and their lecturers. Consequently, the literature of digital learners and what distinguishes them from previous generations of students is reviewed below.

There are many authors that point out that the new digital generation, growing up in the digital age, requires a different way of learning that suits their needs and learning preferences and also matches their learning expectations (Loveless and Williamson, 2013). For example, Krause (2005, p.3), in a keynote paper, described higher education students entering for the first time in 2005 as "Generation Y, Net-genners, Millennials, Echo Boomers, or simply Yers". The Y generation has grown up with computers and prefers typing on keyboards than writing with a pen and paper. They are technoliterate, a wired and wireless generation rolled into one, fast learners, and well acquainted with discovery learning skills such as those required in computer games. Supporting this view, Hartman et al. (2005) state that 'Net Generation' learners are multitasking, always-on communication, engage with multimedia, optimistic, team orientated, diverse, and accept authority. They use technology for social networking, photo sharing, swarming, blogging, instant messaging, and text messaging. They use the Internet for research more than they do the library; and believe that Internet use has had a positive impact on their academic experience.

Moreover, "learners today are viewed very differently; students are encouraged to be active in their own learning, to be self-thinking and active consumers of knowledge" (Crompton, 2013a, p.5). Oblinger and Oblinger (2005) state that learners not only consume web-based information, but rather they are creating content, producing content, using and sharing it. Additionally, Karuse (2005) indicates that 'Yers' are a connected generation. They connect through email, mobile phones and online chat, along with face-to-face contact to build connections and a sense of belonging within their learning community. Currently, the majority of Saudi HE students are using

email, mobile phones and Internet tools to connect. Consequently, their need for innovation in learning and teaching is high. In Saudi Arabia, higher education has been under extensive development, including the establishment of new universities and support for the integration of new modes of learning. Therefore, educators need to invent new methodologies for teaching 'digital learners' that suit digital learners' expectations of using technology in learning. Hence, educators could use their students as a guide in inventing new ways of learning.

2.1.3 Mobile Technology in Education

Describing technology as "mobile" is generally understood as something that is "movable" and "portable". There are four categories of mobile technology based on the orthogonal dimensions between personal and shared, and portable and static (see Figure 2.3) (Naismith et al., 2004). The first category is **personal portable technology**. This category refers to mobile devices that support one user, and hence, are perceived to be "personal" gadgets or devices. Mobile devices in this category provide information and communication sharing applications to the user. It is also generally perceived as "portable" because it can be taken from one place to another. The second category is **personal static technology**, which are less portable compared to personal digital assistants (PDAs) and mobile devices, but allow for personal interactions in the learning experiences of the user. It is regarded as static because it cannot be taken from one place to another. However, it is still considered personal because the technology supports a single user. The third category, referred to as **shared portable technology,** offers learning experiences to users who are "on the move". In this case, "portable" focuses on the learner who can move from one place to another and not the technology being used. Because of its large size these items cannot be moved but allow for a multiple number of users. The last category is the **shared static technology**, which allows for shareable interactions especially in large populations like classrooms. It cannot be moved due to its large size; hence, it is no longer classified as mobile technology (Naismith et al., 2004).

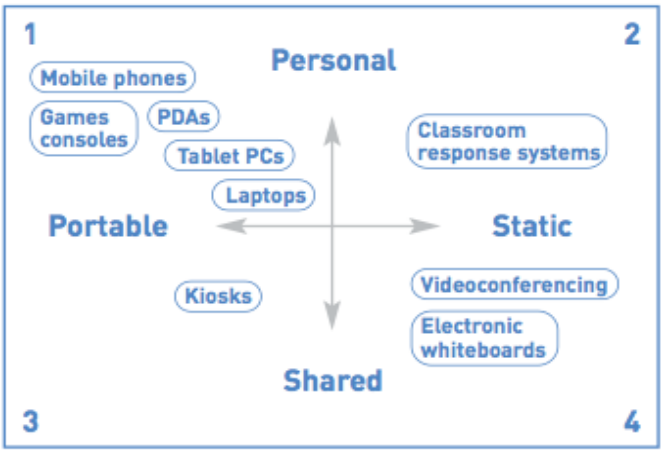

Figure 2-3 Classification of Mobile Technology (Naismith et al., 2004, p.7)

Mobile technology has the potential to be used in education as part and parcel of student learning as it has distinctive properties and advantages that provide many learning opportunities for students. For example, Rekkedal and Dye (2009) discussed that mobile technology performs two basic types of functions that can be employed for educational use, Push and Pull. Push technology sends the information directly to the user such as MMS and SMS; while Pull communication occurs when the user uses the device to access information such as WAP, HTML (Hyper Text Markup Language), and email. Also, mobile technology is "familiar, personal, universal, non-intrusive, lightweight and cheap, to be woven into every waking moment, among a myriad of other activities and in all manner of social settings and groups" (Traxler, 2008, p.18). Therefore, it could have the ability to support students' learning (Traxler, 2008). Additionally, it is now available to provide "personalized learning" and has the potential to play a significant role in learning experiences and environments in the future (BBC, 2014).

The BBC broadcast a series entitled, "My Teacher Is an App" that discussed the changes to education being brought about by technology in the United States (BBC, 2014). The series debated how technology could create "an education revolution" for the first time in history. The discussion was supported by the mention of two important examples that challenged traditional teaching methods - MOOCs (Massive Open Online Courses) and Khan Academy. MOOCs have provided the opportunity of getting a university education to people who would otherwise not get one. Khan Academy is a non-profit online educational organization (www.khanacademy.org) whose mission is to provide a free world-class education to anyone, anywhere, through the production of short lectures in the form of YouTube videos; and they currently have 10 million users logging onto their online videos every month. Though the series debated what the classroom of the future should look like, and what the university of the future would look like, it did not seem to consider the challenges mobile learning may present.

Indeed, there is global interest to exploit mobile technology in education. The growing advantages of MT allows technical developers and educators to see the potential of this technology for educational use (Naismith et al., 2004). This idea was supported by Klopfer et al. (2002), who enumerated five properties of mobile technology (PDAs and mobile devices) advancement that provide educational affordances. The first property is **portability,** which emphasizes the advantage of having a small and lightweight device that can be taken from one place to another. The second property of these devices is its **social interactivity**. This is its capability to allow learners to exchange data and collaborate face-to-face through the devices. In other words, mobile technology in this sense acts as a facilitator for learners to interact face-to-face. The third property is **context sensitivity,** which allows users to respond to simulated or real data regardless of their location, time, and environment. The fourth property is **connectivity,** which allows users to create a shared network by connecting their devices to one network. The last property is **individuality,** which allows learners to work individually, especially when the activity is difficult or

complicated. Individuality is a unique property because it gives learners the ability to customize their learning.

Given the many advantages of MT, it is not surprising that many educators support the new dimension of learning created by incorporating this technological advancement. The portable and personal characteristics of these devices provide a new mode of interaction that could make them essential in the learning processes of individuals. Thus, it may be appropriate to exploit their potential in the realm of education as they become more prevalent in our lives (Naismith et al., 2004). However, a challenge that Naismith et al. (2004) faced, is which method designers and educators should adopt to explore and understand the best use of these technological resources in supporting the learning of individuals. This study will try to meet this challenge by investigating students' practices and experiences of using mobile technology in learning, in order to describe how students use this technology to support their learning.

The focus of this study is the category of personal portable technology such as hand-held technology, which includes personal tablet devices, personal digital assistants, smart phones and especially mobile phones, as they are the most frequently used technology in the realm of mobile learning (Naismith et al., 2004). These devices include capacity for voice communication, SMS, MMS, WAP (i.e., sending/receiving emails and surfing the web), multimedia tools (camera, video and audio) and a variety of different applications. Larger mobile technology devices such as laptops and tablet PCs are not always considered as MT in the realm of ML because they are heavy and not always carried everywhere by their users. For example, Keegan (2005) argued that ML should exclude devices that can not fit in a lady's bag or a gentleman's pocket. Additionally, Crompton (2013b, p.48) considered ML as "the utilization of the electronic devices that are easily transported and used anytime and anywhere". Therefore, this study excludes tablet PCs, and laptops as it has been shown that MT is owned and used more frequently than laptops by Saudi citizens in a rapidly developing country (Ally and Tsinakos, 2014), which is where this study was conducted.

2.1.4 Learning Summary: Mobile Technology as a Learning Tool

In the previous sections, I reviewed literature that discussed learning and its meaning. It showed that learning is a large and complex topic, and it is difficult to find agreement between educators, or theories of learning, about what it is. However, almost all learning theories emphasized the important roles of active engagement and social interaction in the students' own construction of knowledge (Blumberg, 2009).

Additionally, Perkins's concept of person-plus, how learners and their surroundings work together in order to facilitate learning (Perkins, 1993), opens up an avenue for us to rethink what the appropriate tools are that we should be using. He discussed the distribution of the executive function in the person-plus environment. This

distribution happens in classrooms all the time (e.g. when a teacher makes a decision that students follow; the instructions at the top of a workbook; etc.). Therefore, I can argue that our understanding and thoughts of learning have transformed how we consider learning tools. This transformation links learning, culture, knowledge, assessment and pedagogy in a way that requires us to rethink our views of the tools (McCormick and Murphy, 2008).

Moreover, in the previous sections, I reviewed literature that discussed technology's categories and its impact on learning. Technology has opened up a whole new learning environment and method of learning and teaching. It creates new learning opportunities and serves not only as a research and learning tool but also as a metaphor for understanding what is important to know (Norton and Wiburg, 2003). Also, as Saljo (2010) stated, technology does not just support learning, but affects how we learn and even how we interpret learning.

With the use of MT, the transformation of learning continues to happen. MT is becoming more embedded, ubiquitous and networked, with enhanced capabilities for rich social interactions, context awareness and Internet connectivity (Naismith et al., 2004). Furthermore, the ubiquitous powers and functions of MT provides learners with many abilities to store, retrieve, calculate, communicate, read, write, and share messages and emails, all with one device that is readily available, with the added advantage of doing so in a "just for me" manner, any time at any location. "Transformations of this kind, which are linked to the globalized media ecology, illustrate that the school – and the teacher and the student – are operating in a new environment" (Saljo, 2010, p.59). This new environment of transforming learning (a digital learning environment) is intended to scaffold student learning, collaboration and inquiry (Saljo, 2010), and is suitable for digital age students who have unique characteristics and skills as it allows them to participate and engage more in learning.

Using MT as a learning tool draws students' interests and enthusiasm, which is important and could help in promoting student engagement to motivate students to learn (Loveless and Williamson, 2013). Motivation plays the biggest role in learning and if students are motivated then they will learn. MTs are not the only tools for learners in a digital age, but they are ever-present in a "local and global context" (Loveless and Williamson, 2013, p.101). MTs are social tools that are appealing and familiar to students; therefore, learning needs to change and incorporate the use of mobile technology that learners already own. This would not replace traditional forms of learning, but rather it would improve learning and allow it to be used in parallel with rapid technological development, as well as potentially serving to encourage and motivate learners to learn.

The aim of using MT as a learning tool in this study is to support and enhance students in their learning. The average learner does not function as a 'person solo' but overwhelmingly as a 'person plus'. So, learners with their MT work together as a system to accomplish different learning tasks and activities; and MT enables learners

to extend and augment their learning experience. Therefore, using MT as a learning tool in this study fits within the "learning with technology" category as well as the "learning through technology" category, and the learner's experience with MT is interpreted in the person-plus sense of the person with the tool as a system.

Consequently, using MT as a learning tool could underpin all learning metaphors and theories and could contribute to students' learning. For example, the three overlapped domains suggested by Bloom to describe the learning process are employed in this study. Higher education students' practices of MT in learning (doing) are investigated and also students' experiences (doing, thinking and feeling) of using MT in learning are explored. The three domains of HE students' learning experiences contributed in building the conceptual framework for mobile learning in higher education.

Drawing on the above discussion, Norbert Pachler and Caroline Daly's (2011) definition of learning (see section 2.1.1) fits the parameters of this study, and the focus of this thesis is to explore learners' experiences (practices and utilisations) of MT as a tool to support their learning, which is an important part of research in education and technology.

2.2 An Overview of Mobile Learning

Students can be engaged in mobile learning by simply using their mobile technology to learn something (Quinn, 2000). However, mobile learning has many **definitions** and many **properties,** which makes it different from other forms of learning. Mobile learning has a unique learning environment and can offer many learning opportunities for learners. The following sections discuss all of these aspects of mobile learning.

2.2.1 The Concept of Mobile Learning

In reviewing the literature, it is more difficult to get one standard definition of mobile learning than it is to get an in-depth analysis of mobile learning discourse (Traxler, 2010). Definitions of mobile learning range from a simple description of the devices to those that depict mobile learning as an extension of e-learning.

Traxler (2010) identified three approaches for defining mobile learning that have been used in past literature. The first approach that attempted to define ML tended to focus on **the technology**, referring particularly to handheld devices. This approach claimed that ML was "any educational provision where the sole or dominant technologies are handheld or palmtop devices" (Traxler, 2005, p.262). This definition only relates to devices that can be used within the context of ML. These mobile devices are limited to personal digital assistants (PDAs), tablets, smartphones, and mobile phones. It excludes iPods, laptops, game consoles, and desktops because these are not "handheld or palmtop devices", as claimed by Traxler (2005). The second approach that defines mobile learning focuses on **the mobility of the technology**. This approach described ML as "e-learning through mobile computational devices: Palms, Windows CE

machines, even your digital cell phone" (Quinn, 2000). The third approach moved away from the technology and emphasized **the mobility of the learner and the learning process**. In this approach, ML involved "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies" (O'Malley et al., 2003, p.6).

Table 2.1 presents some of the different definitions of mobile learning found in the literature. The main theme in these definitions is technology, as it is an important part of the mobile learning system.

Table 2-1 Mobile Learning Definitions

ML definition	(Author, year)	Definition approaches (according to Traxler 2010)
"Any form of learning (studying) and teaching that occurs through a mobile device, or in a mobile environment".	(Trifonova, 2003)	The third approach
"A new stage of e-learning having the ability to learn everywhere at every time through use of mobile and portable devices".	(Georgiev et al., 2004)	The third approach
"The provision of education and training on PDAs/palmtops/handhelds, smartphones and mobile devices".	(Keegan, 2005)	The second approach
"A next stage or a new form of e-learning through the use of mobile and portable devices and wireless network and communication technologies for teaching and learning".	(Doneva et al., 2006)	The second approach
"The process of using a mobile device to access and study learning materials and to communicate with fellow students, instructors or institution".	(Ally, 2009)	The second approach
"The exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance and extend the reach of teaching and learning".	MoLeNET research (Attewell et al., 2009)	The second approach

Traxler (2009b, p.2) sees many of these definitions of mobile learning as too constricting, calling them "too techno-centric and imprecise", as well as highly "unstable" owing to the transience and diversity of the devices, systems and platforms. He calls for the exploration of other definitions that focus on the learner's experience and distinguishes it from other forms of education, especially e-learning. This is because the technocentric and e-learning based definitions only seek to place mobile learning somewhere on "e-learning's spectrum of portability, ending perhaps in ubiquitous, pervasive and wearable learning" (Traxler, 2009b, p.2).

Farley et al. (2013) took a similar position to Traxler (2009b) and claimed that the definitions given above, which include descriptions of technology characteristics, are bound to become obsolete because mobile technology and its capabilities are constantly changing over time. Farley et al. (2013, p.285) further stated:

> Definitions of mobile learning get bogged down when they attempt to be inclusive enough to accommodate mobile learning in all of its variety, including a wide variety of technologies, many not yet invented, but exclusive enough to differentiate mobile learning from e-learning or informal learning for example.

Furthermore, Sharples (2007) and Sharples et al. (2007) believe that the unique characteristics of mobile learning make it very difficult to describe. Additionally, Sharples et al. (2009, p.235) agreed with Traxler (2009b) that early definitions of mobile learning were focused on technology, which did not help in "understanding the nature of the learning and overlooks the wider context of learning as part of an increasingly mobile lifestyle".

Research (Attewell et al., 2009) at MoLeNET (The Mobile Learning Network), a unique collaborative approach to encouraging, supporting, expanding and promoting mobile learning, and Keegan (2005), shared the same technology emphasis as Traxler (2005), and focused on the mobility of the technology when they defined mobile learning. Keegan (2005) asserts that the definition of ML should focus on mobility rather than functionality (like e-learning). Keegan (2005, p.3) also mentioned that one of the characteristics of ML is that it uses devices:

- Which people are used to carrying everywhere with them,
- Which they regard as friendly and personal,
- Which are cheap and easy to use,
- Which are used constantly in all walks of life and in a variety of different settings, except education.

Keegan (2005) stated that mobile learning should not include computers and laptops as they are more functional (primarily for e-learning) than mobile (M-learning/ML). This uncertainty and disagreement between those in the field of ML about whether laptop and tablet computers deliver ML illustrates the difficulty with defining ML. To tackle the problem of defining ML from a different direction, Kukulska-Hulme and Traxler (2007, pp.181-182) identified distinct emergent categories and contexts in which mobile learning can be used, which include:

- ***Technology-driven mobile learning***, a specific technological innovation is deployed to demonstrate technical feasibility and pedagogic possibility, e.g. the iPhone.
- ***Miniature but portable e-learning***, mobile, wireless and handheld technologies

are used to re-enact approaches and solutions found in 'conventional' e-learning, perhaps porting an established e-learning technology onto mobile devices.

- ***Connected classroom learning***, the same technologies are used in a classroom setting to support static collaborative learning, perhaps connected to other classroom technologies, such as personal response systems, graphing calculators, or PDAs linked to interactive whiteboards, etc.
- ***Mobile training and performance support***, the technologies are used to improve the productivity and efficiency of mobile workers by delivering information and support just-in-time and in context for their immediate priorities, roles and duties.
- ***Large-scale implementation***, the deployment of mobile technology at an institutional or departmental level to learn about organizational issues.
- ***Inclusion, assistivity and diversity***, using assorted mobile and wireless technologies to enhance wider educational access and participation, for example, personal information management for students with dyslexia.
- ***Informal, personalized, situated mobile learning***, the same core technologies are enhanced with additional unique functionality, for example, location-awareness or video-capture, and deployed to deliver educational experiences that would otherwise be difficult or impossible; for example, informal context-aware information in museum spaces
- ***Remote, rural and developmental mobile learning***, the technologies are used to address environmental and infrastructural hurdles to delivering and supporting education where 'conventional' e-learning technologies would fail.

With so many different perspectives, there is no definite definition of mobile learning (Crompton, 2013a). However, finding a definition for mobile learning continues to be a topic of interest amongst researchers. For example, the ADL's (Advanced Distributed Learning) Mobile Training Implementation Framework (MoTIF) project defines mobile learning as "leveraging ubiquitous mobile technology for the adoption or augmentation of knowledge, behaviors, or skills through education, training, or performance support while the mobility of the learner may be independent of time, location, and space" (Berking et al., 2013, p.5). Also, GSMA (Groupe Speciale Mobile Association) (2014, p.10) defined mobile learning as "the application of mobile devices and services, connected to mobile and other networks, in any education process, including teaching and learning, assessment and administration". More recently, Al-Emran et al. (2016, pp.93-94) expressed that "M-learning helps students and educators to perform their daily tasks in a short timely period using small technological devices (tablets or smartphones) in anytime anywhere".

The concept of mobile learning encompasses many different definitions and conceptions. Recently, Traxler (2016, p.394) argued that the concept of mobile learning would include many ideas if we were to do "a more comprehensive alternative look at the capacity to enhance, extend, and enrich the concept and activity

of learning itself, beyond earlier conceptions of learning and beyond the capacity of earlier technologies". According to Traxler (2016, pp.394-395), mobile learning includes ideas of:

- Contingent learning and teaching: learners and/or teachers react and respond in real-time to their environment and their changing experiences;
- Situated learning: learning takes place in surroundings that make learning relevant and meaningful;
- Authentic learning: meaningful learning tasks are related to immediate learning goals;
- Context-aware learning: learning is informed by the history, surroundings, and environment of the learner;
- Augmented reality mobile leaning: learning builds on local physical context supplemented by an appropriate audio and/or video overlay;
- Personalized learning: learning is customized for the preferences and abilities of individual learners or groups of learners;
- Collaborative learning: linking learners together meaningfully on a shared task;
- Learning support: guidance and information for learners in formal courses or institutions;
- Recommender systems: using the context, goals and preferences of mobile learners to suggest personalized learning objects;
- Pastoral support: enabling students to access non-academic services and support;
- Game-based learning: now increasingly mobile;
- Assessment: aligned to these mobile affordances;
- User-generated learning: created as well as consumed by learners and everyone else, for example, podcast - although some come from formal institutions, such as universities, broadcasters or publishers, many more come from informal groups and passionate individuals;
- Social networks, micro-blogs, blogs, and others from of Web2.0 (of which more later);
- User-generated content, for example YouTube, Flickr, Wikipedia;
- Apps.

2.2.2 Mobile Seamless Learning (MSL)

The notion of seamless learning was introduced into the mobile learning field in 2006 (Chan et al., 2006). Seamless learning can be defined as a continuity of the learning experience across contexts (Chan et al., 2006). "Seamless learning implies that a student can learn whenever they are curious in a variety of scenarios and that they can

switch from one scenario to another easily and quickly using the personal device as a mediator" (Chan et al., 2006, p.6).

Wong and Looi's (2011) analysis of literature on mobile-assisted seamless learning (MSL) identified ten features that characterize activities for MSL and provide a useful framework for seamless learning, as described below:

- Encompassing formal and informal learning.
- Encompassing personal and social learning.
- Across time.
- Across locations.
- Ubiquitous access to learning resources.
- Encompassing physical and digital worlds.
- Combined use of multiple device types (tech).
- Seamless switching between multiple learning tasks.
- Knowledge synthesis (a combination of prior knowledge, new knowledge, and multidisciplinary learning).
- Encompassing multiple pedagogical or learning-activity models (facilitated by teachers).

Mobile learning has been described as seamless since students can learn seamlessly in their everyday life regardless of their place, time, learning tasks, and the MT being used. Mobile learning has its own particular unique properties that distinguish it from other forms of learning. Many researchers claim that mobile learning should be viewed in particular settings, integrated into our lives and should represent "a seamless flow" of learning experiences (Milrad et al., 2013; Nordmark and Milrad, 2015; Sharples et al., 2007). According to Sharples et al. (2007, P.222), it begins with the assumption that students in mobile learning environments are "continually on the move", so they can: learn across **space** as they take ideas and learning resources gained in one location and apply or develop them in another; learn across **time** by revisiting knowledge that was gained earlier in a different context that then provides lifetime learning, **move from topic to topic** by managing a range of personal learning projects instead of following a single curriculum; and **move in and out of engagement with technology**. Also, the idea of learning areas and spaces was also supported by the findings of Vavoula's survey (2005, p.2) of everyday adult learning, where 49% of respondents indicated that they are engaged in learning outside of their "usual environment".

2.2.3 Mobile Learning as learning across contexts

The notion of context is considered as one of the defining contributions of ML to the wider field of technology enhanced learning (Traxler, 2011a). This is because it is "exploiting the personal and portable nature of the devices and their capacity to sense some aspects of their context, initially their location and trajectory" (Traxler, 2011a, p.2).

Dourish (2004, p.28) described context as a "slippery notion" as it "keeps to the periphery, and slips away when one attempts to define it". Dourish (2004, p.22) saw context as "a relational property that holds between objects or activities...Context arises from the activity. Context isn't just 'there', but is actively produced, maintained and enacted in the course of the activity at hand". Also, Luckin (2010) discussed the concept of context based on her work drawn from different disciplines and the different ways in which the term is used. She presented literature that defined context in diverse ways and discussed some concepts and metaphors that come alongside context such as 'space', 'place', 'knowledge', 'landscape', 'physical and digital environment', 'culture', 'that which surrounds' metaphor, and 'weaving together' metaphor. Luckin (2010, p.8) saw context as a social entity that is shaped by what people do stating:

> Clearly context matters and its significance needs recognition. It is complex and for some it is not a singular entity, but rather a multiplicity to which we are serially exposed… Context is associated with action and time, emphasizing that it is a dynamic entity and is associated with connections among people, things, locations and events in a geographic and temporally situated narrative. It is distinguished from the physical environment and described as social. It is discussed in the language of emotions and affect, as performance, and as linked to culture and to tacit knowledge.

In the field of ML, Traxler (2011a) argued that different perspectives of context attempted to make a distinction between the learner or user and the context or environment, until the notion of user-generated contexts arose and eroded these distinctions. User-generated contexts emphasise the role of learners themselves in shaping their own context. According to Cook at el. (2011, p.183), "The context within which communication takes place is augmented by users to suit the needs of the individual and/or the conversational community".

In addition, there is a significant amount of research in mobile learning that places particular emphasis on the meaning of mobile learning and contexts (Sharples et al., 2007; Sharples et al., 2009; Pachler et al., 2010a; Pachler et al., 2010b; Wali et al., 2008; Kukulska-Hulme et al., 2009; Pimmer and Grohbiel, 2013; Pimmer, 2016; Pimmer and Pachler, 2014). Learning in, and across, ever-changing contexts is considered a basic component and fundamental characteristic of the field of mobile learning (Sharples et al., 2007; Kukulska-Hulme et al., 2009; Pimmer, 2016). Pachler et al. (2010b, p.2) conducted research linking learning in formal contexts with learning in informal contexts of everyday life in the field of ML and suggested that:

> If educators recognize the learning with and around mobile devices within the context of everyday life, mobile devices could become a meaningful link between learning in formal contexts such as school and universities and learning in the informal context of everyday life.

Moreover, the role of MT for learning goes beyond bounded spaces, communities and closed domains, such as the classroom, to include learning across contexts (Pimmer, 2016). Scholars in the field of ML, see learning potential in MT crossing or bridging contexts in mobile learning. For example, Pimmer and Grohbiel (2013, pp.1-2) point out, "The convergence of social and mobile media may offer specific affordances for education by connecting different learning spaces" and bridging boundaries "between and within different professions, between 'novices' and 'experts', between people who draw from different cultural and linguistic resources, across a diversity of locations, over time as well as across formal and informal spaces".

Furthermore, the concept of 'context' is included in several definitions of ML. Many researchers in the field of ML stated that ML is about crossing or connecting different contexts. For example, the London Mobile Learning Group (LMLG) defined mobile learning as "the processes of coming to know and being able to operate successfully in, and across, new and changing contexts and learning spaces" with and through the use of mobile devices (Pachler et al., 2010a, p.6). Additionally, Pimmer and Pachler (2014) define ML in work-based education and see ML as learning using MT as well as learning across contexts; and the construction of knowledge through the use of MT. They consider that the crossing or bridging of contexts is essential to acquiring an understanding of ML.

Moreover, Sharples et al. (2009, p.237) included the concept of 'context' in their definition of mobile learning. According to them, ML is "the processes (both personal and public) of coming to know through exploration and conversation across multiple contexts amongst people and interactive technologies". Similarly, Wali et al. (2008) take context-crossing as a reference to a change of physical and/or social setting, and as the base/core for conceptualizing ML.

2.2.4 Mobile Learning Characteristics

Mobile learning has a separate identity and unique characteristics that the literature supports and which, as opposed to other learning types, is continually growing, and was described as a "revolution" (Ferran-Ferrer et al., 2014). In fact, there are already theoretical frameworks proposed by educators regarding the use of mobile learning, and there is also a development of learning initiatives and pilot studies internationally that support mobile learning (Traxler, 2009b). To back up these findings, Traxler (2009a) cited cases in the United Kingdom and other countries that use mobile learning in their workshops, conferences, and seminars.

Mobile learning offers new learning environments with mobile digital devices and supports many types of learning and learning activities. "Mobile technologies are nowadays shaping and creating innovative ways to share and construct information and knowledge in both formal and informal learning settings" (Milrad et al., 2013, p.96).

The ‘mobile’ in mobile learning can refer to many aspects of mobile learning. According to Mellow (2005, p.469), “The ‘m’ in mobile learning generally refers to mobile; the delivery of content and learning interactions via mobile devices”. Focusing on the mobility aspect of mobile learning has been a point of interest for many researchers and organizations in the mobile learning field. GSMA (2014, p.4) stated:

> Mobile learning encompasses all aspects of mobility – the mobility of learners, the mobility of connectivity and the mobility of learning environments. It brings together both the pedagogical innovation of mobile learning and the pragmatic streamlining of administration in schools through mobile data collection and management.

In addition, Sharples et al. (2009, p.235) found five “mobile” aspects of mobile learning, which include: mobility in physical space, mobility of Technology (tools and resources carried around), mobility in conceptual space (different topics and themes that compete for a learner's attention), mobility in the social space, and learning dispersed over time.

Mobile learning offers new tools and environments of learning for students and teachers. According to Kress and Pachler (2007, pp.12-14), mobile learning offers portability and flexibility, multi-functionality, multimodality, nonlinearity, and interactivity and communicative potential, as described in detail below:

- ***Portability and flexibility,*** mobile learning involves the use of wireless networked devices that are usually small in size and thus easy to carry around. This makes it possible for mobile learning to take place anywhere at anytime. Additionally, mobile learning encourages the modification of resources so that they can adapt to changing needs as well as to the people using it.
- ***Multi-functionality,*** mobile devices have multiple functions nowadays. For example, people are able to conduct research, manage appointments, listen to music, watch videos, chat, read messages and emails and make phone calls amongst other things. This makes ML more interesting as one device is enough to meet all the technology-related needs of the learner.
- ***Multimodality,*** mobile learning can offer a multimodality environment because it not only allows students to participate in their learning, but also allows them to create and interact with the rest of the world. An example of this is recording videos, which allows them to create representations of themselves.
- ***Nonlinearity***, mobile learning gives students a chance to connect and locate any information they might require right from their devices. Additionally, it provides them with relevant information and thus saves a lot of time.
- ***Interactivity and communicative potential*****,** mobile learning gives the student a chance to interact and communicate with various people, thus gaining divergent

knowledge. Additionally, learners are in a position of sharing information and getting solutions to difficult questions answered immediately.

Furthermore, mobile learning creates different learning environments from those provided by e-learning (at a desktop). According to Chen et al. (2002, p.152), mobile learning environments have many unique characteristics, including: the urgency of learning needs, the need for knowledge acquisition, the mobility of the learning setting, the interactivity of the learning process, the situating of the instructional activities and the integration of instructional content.

Also, mobile learning has many unique characteristics and various dimensions. It can suit both formal and informal learning in collaborative or individual learning methods (Berking et al., 2013). According to Winters (2006, pp.8-9), mobile learning:

- Enables knowledge building by learners to take place in different contexts;
- Enables learners to construct their own understandings;
- Changes the pattern of learning or the work activity;
- Goes beyond time and space, and "sees mobile learning as part of a greater whole in which learning tools, activities, contexts and people are distributed over time and space".

Additionally, mobile learning creates opportunities for new forms of learning environments because it changes the nature of the relationship between teachers, learners, and the objects of learning (Laurillard, 2007). It offers a wide range of learning activities and can support learning in many ways by (Laurillard, 2007, pp.157-158):

- Exploring and investigating - real physical environments linked to digital guides;
- Discussing – with peers, synchronously or asynchronously, audio or text;
- Recording, capturing data – sounds, images, videos, text, locations;
- Building, making, modeling – using captured data and digital tools;
- Sharing – captured data, digital products of building and modeling;
- Testing – the products built, against others' products, others' comments, or real physical environments;
- Adapting – the products developed, in light of feedback from tests or comments;
- Reflecting – guided by digital collaborative software, using shared products, test results, and comments.

What is more, the use of mobile technology as a learning tool could support many types of learning and learning activities. According Naismith et al. (2004), mobile technology can relate to six types of learning or learning activities, namely:

- ***Behaviourist activity***, mobile devices facilitate the quick feedback or reinforcement element.

- ***Constructivist activity***, mobile devices enable immersive experiences such as those provided by mobile investigations or games.
- ***Situated activity***, learners can take mobile devices into an authentic context, or use it while moving around a context-aware environment in a specially equipped location such as a museum.
- ***Collaborative learning***, mobile devices provide a handy additional means of communication and a portable means of electronic information sharing.
- ***Informal and lifelong learning***, mobile devices accompany users in their everyday experiences and become a convenient source of information or means of communication that assists with learning, or records it on the go for future reference.
- ***Learning and teaching support or coordination*** can be improved by the availability of mobile technology at all times for monitoring attendance or progress, checking schedules and dates, and reviewing and managing activities that teachers and learners engage in throughout the day.

2.3 Opportunities for Mobile Learning

This section reviews and classifies many learning practices and activities with MT. The aim of this section is to investigate opportunities for mobile learning that could contribute to building a conceptual framework for mobile learning in HE.

In reviewing the literature, we can find that many ML practices and activities are done with the use of MTs' applications and features. In fact, applications that run on, and features that are built-in, most MTs create many learning opportunities for learners and allow them to construct knowledge, consume, discover and produce content (Dahlstrom, 2012). Today's learners own multifunctional MT that makes learning available for them anytime and anywhere (Kukulska-Hulme, 2008). "Learners appear to be moving to a position of power with regard to their ability to influence how and where learning happens and even its content and form" (Kukulska-Hulme, 2008, p.8).

Mobile technology has developed into feature-rich miniature multimedia computers, including features such as built-in virtual or physical keyboards for easy text entry, a high resolution digital still and video camera, a GPS, high capacity memory storage, high resolution touchscreen user interfaces, and a wide variety of pre-installed and downloadable applications (Cochrane and Bateman, 2010).

2.3.1 Mobile Learning Opportunities with Mobile Technology's Applications

There are many applications that are used for ML. According to Zhang and Adipat (2005), mobile learning applications are software systems that can be operated on MT devices. And though these applications might not be designed for educational purposes, a large number of applications that are available at application stores allow users to learn about different things such as a new language, algebra, the periodic table of elements, or organize notes and homework (Apple App Store). There are, however, other applications that are specifically designed for educational use such as iStanford, Mobile Helper, Mobile Organizer, KSU-Staff, KSU-Student and English in Action.

Some researchers in the field of ML consider mobile applications as learning tools and classify them into different categories depending on the tasks that can be performed through the applications. For example, Winters (2006) views ML applications as mediating tools in the learning process that can be used in conjunction with other learning tools that are already used by students and teachers. Also, Clough et al. (2009, pp.103-104) classify mobile learning applications into seven categories (see Figure 2.4), which are:

1. ***Collaborative applications*** that encourage knowledge sharing, making use of the learner's physical location and mobility**.**
2. ***Location aware applications*** that contextualize information, allowing learners to interact directly with their environment; for example, collecting environmental data linked to geographical context or accessing contextually relevant reference material.
3. ***Data collection applications*** that use the handheld device's ability to record data in the form of text, image, video, and audio.
4. ***Referential applications*** that use dictionaries, translators and e-books to deliver content when and where it is needed.
5. ***Administrative applications*** that employ the typical scheduling, information storage, and other calendar functions available on mobile devices.
6. ***Interactive applications*** that use both the input and output capabilities of mobile devices, allowing the learner to input information and obtain some form of feedback, which aids the learning process.
7. ***Microworld applications*** model real world domains to enable learners to use practice in a constrained version of the learning scenario.

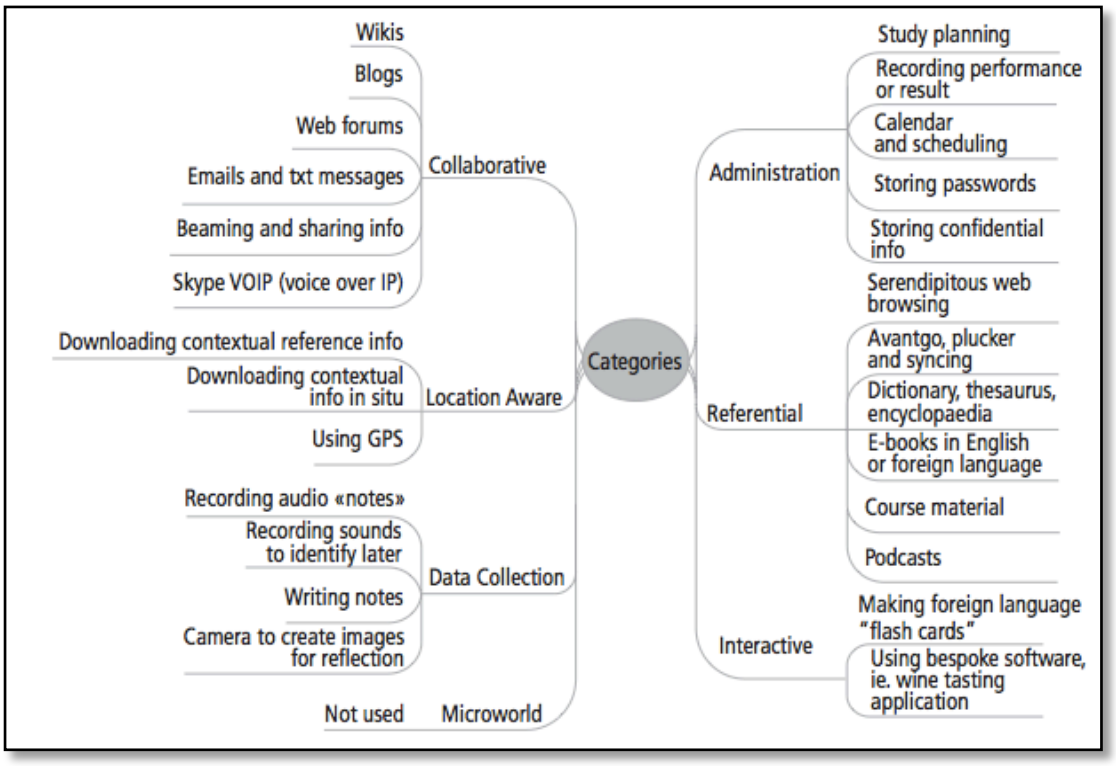

Figure 2-4 Mobile Learning Application Categories (Clough et al., 2009, p. 104)

Many universities now create mobile-optimized versions of their websites or build stand-alone applications that can be downloaded from mobile application stores (Chen and Denoyelles, 2013). The applications that run on these devices allow users to utilize, discover and produce content. As such, there are claims that they continue to transform how college students learn, as well as influence their learning preferences, both within and outside the classroom (Chen and Denoyelles, 2013). There are many examples of university applications designed by universities for educational purposes, such as "**iStanford"** which is considered the first campus mobile application (Pena, 2009), "**Mobile Helper**" from Massey University at New Zealand (Brown et al., 2006), "**Mobile Organizer**" from the University of Birmingham (Holme and Sharples, 2002; Corlett et al., 2005), and "**KSU-Staff"** and **"KSU- Student"** from King Saud University at Saudi Arabia (KSU, 2015).

Additionally, the Open University (OU) has designed many programs that depend on ML, as new learning materials are funded by the European Union. For example, the programme on teaching English, "**English in Action**" (EIA), aims to improve English language skills for 25 million people (in primary and secondary school) in Bangladesh via mobile applications. It provides both classroom activities and teaching technique videos on mobile phone's SD cards. Within the pilot, teachers' and pupils' use of English exceeded 70% and 80% respectively, and pupils' English scores increased significantly. The use of mobile devices has been shown to facilitate access to teacher learning, resulting in changes to classroom practices (Shohel and Power, 2010). There are other pioneer applications in the OU that support using mobile

devices to deliver content to encourage learners to communicate with each other or with their tutors via mobile applications (Kukulska-Hulme and Shield, 2008).

Microblogging is another mobile friendly application in the form of social media networking. "Microblogging is a cross between SMS texting, blogging, and instant messaging. Microblogging is an asynchronous, collaborative communication technology, suited to use on mobile devices" (Cochrane and Bateman, 2010, p.5). There are many applications for microblogging. For example, Twitter (https://twitter.com) is the most popular microblogging service for texting, while Instagram (http://instagram.com) and Pinterest (https://www.pinterest.com) are mainly used for pictures. Microblogs allow users to exchange small elements of content, such as short sentences, individual images and video links. Moreover, microblogs can be used in different learning activities to support HE students in their learning. For example, Ferran-Ferrer et al. (2014) use microblogs with HE students for various purposes such as to share links and information, reduce feelings of loneliness, and improve classroom environment dynamics.

2.3.2 Mobile Learning Opportunities with Mobile Technology's Features

There are many features that are used for mobile learning. According to Traxler (2009a, p.17), "Mobile learning technologies clearly support the transmission and delivery of rich multimedia content. They also support discussion and discourse, real-time, synchronous and asynchronous, using voice, text and multimedia". MT has many hi-tech features that could provide different learning opportunities and activities for HE students and allow for the delivery of different types of content. This section reviews some examples of utilizing the affordances of MT features for ML, such SMS, download ability, podcast, and mobile camera. These examples are not exhaustive but they provide an overview of the affordances of mobile technology features in learning.

For example, **SMS** (Short Message Service) has the ability to make learning more widely available and accessible anywhere and anytime, as well as provide a more flexible, mobile, convenient and seamless learning environment (Safie, 2004). Among mobile technology's features, SMS is the most used feature in mobile learning research (Trifonova, 2003; Rau et al., 2008). According to Mellow (2005, p.471), there are three models of utilizing SMS for ML:

- A 'Push' system; HE institutions push out messages to all students in a course.
- A 'Pull' system; students seek out specific information.
- An interactive model; students interact with their institution (questions are either sent out or sought, then answered, and replied to by the student to check the answers and receive feedback).

SMS has been used as a supplementary learning tool to deliver various learning activities to learners (Safie, 2004; Stone et al., 2002), as a communication tool in HE to guide, prompt and support students in their learning (Garner et al., 2002), and as a tool to manage learning activities (Rau et al., 2008). In addition, some researchers found that SMS contributed to the improvement of students' learning and served learners' needs (Moura and Carvalho, 2013), as students preferred and engaged faster with SMS than email and felt that SMS was more of a personal communication tool (Stone et al., 2002). Furthermore, a survey in Norway showed that students considered SMS as an appropriate tool to share information about lectures, classes, schedules, etc. (Divitini et al., 2002).

Moreover, **the ability to download** different format of contents and learning materials on MT such as text, audio and/or video offers the potential for students to learn anywhere at anytime (O'Neill and Loftus, 2008; Hicks et al., 2001), and enables them to personalize their devices by downloading personal contents and therefore is important for effective learning (Nikoi and Edirisingha, 2008). According to Hashemi et al. (2011), mobile learning activities can involve connectivity for downloading and uploading course materials via wireless networks to link to HE institutions systems e.g. virtual learning environments (VLEs) and management information systems (MISs).

In addition, **podcasts**, which are audio or video files that can be subscribed to and downloaded automatically from the Internet, can be used as part of a course to support students' learning (Minocha and Booth, 2008). Some HE institutions have adopted podcasting in teaching and learning environments and provide their students with audio files and podcasts for lectures to review (O'Connor, 2006; Hansen, 2006). Other institutions podcast lectures in advance and use class time for collaboration and discussion instead of lecturing (Wilen-Daugenti, 2009). Henriques (2007) uses podcasts to review and expand discussions on lecture material and to present material that was not covered in the lectures. According to Wilen-Daugenti (2009, p.16), "Notheastern University finds podcasting valuable for students who commute or may miss a class due to their work schedule. Podcasting for these students provide a convenient way to listen to lectures while mobile". Students can record themselves and produce their own podcasts and share them with peers to listen to, as well as allow peer review, discussion (Florand, 2007), reflection or report on their progress in an assignment or project (Cochrane and Bateman, 2010). By producing podcasts themselves, students are enabled to be "the generator of knowledge and [are] able to collect, display, share and analyse multiple perspectives on issues and problems" (Herrington and Herrington, 2007, p.4). HE students indicated that podcasts are efficient, effective, engaging and easily received learning tools for revision, and that they consider podcasts as a review tool rather than as a lecture replacement (Evans, 2008).

Furthermore, taking pictures and recording videos through the built-in **camera** available in most mobile technology devices can support many learning activities. For example, it can be used to record events and interviews, reflect with a visual dimension, and allow real time sharing and commenting of videos directly from MT to online websites (e.g. via YouTube) (Cochrane and Bateman, 2010). The process of using cameras for learning purposes, where students pick up their mobile device, capture what is happening around them and connect it with their learning, allows students to construct their own understanding through doing the activity themselves in a real world situation. It facilitated HE students' engagement in a variety of course contexts and created contextualized and authentic learning activities (Cochrane and Bateman, 2010). According to Kukulska-Hulme et al. (2007, p.60), " 'real world experiences' are an important motivator for the design of some of the most successful mobile learning activities".

2.4 Mobile Learning Research – Benefits and Challenges

Mobile learning research is very active and rapid. There are now many mobile learning projects and pilot studies for International Development. Many universities and colleges have integrated ML into different settings and through the use of different MT. These project and pilot studies have contributed to identifying some of the benefits and challenges facing mobile learning in educational settings. The following sections discuss some ML benefits and challenges found in the literature.

2.4.1 Potential Benefits and Technology Advantages

The findings and outcomes of many mobile learning projects and research indicate that mobile learning technology can offer various learning opportunities and can support learning in several ways. Wu et al. (2012) analysed and reviewed trends of mobile learning studies (164 studies from 2003-2010) and found that the majority of studies showed positive outcomes of mobile learning.

Some researchers claim that mobile learning improves education systems and provides opportunities to expand access to education in ways not possible before (Traxler and Vosloo, 2014). It also offers unique learning opportunities than can enrich, enhance, and challenge existing ideas of education (Traxler, 2011b), in addition to enlivening and adding variety to conventional lessons and courses (Attewell, 2005). Mobile learning provides students with individual online study and resource opportunities (Goksu and Atici, 2013). Naismith et al. (2004) state that mobile learning offers blended learning approaches that enhance and support traditional learning activities. It allows anywhere, anytime personalized learning (Hussain and Adeeb, 2009; Attewell, 2005) and offers flexible and easy access to

learning materials and resources through personalized devices (Caudill, 2007). Other studies concluded that mobile learning works as an effective tool for delivering learning materials to students (Thornton and Houser, 2004; Thornton and Houser, 2005), for communication, interaction, enhancing learning (Al-fahad, 2009; Hussain and Adeeb, 2009), and as an effective revision tool (Evans, 2008). Furthermore, mobile learning can make learning an enjoyable activity (Goksu and Atici, 2013).

Attewell (2005, pp.13-14) reported key findings of the mobile learning research and development project conducted in a few European countries, such as:

- Improves learners' literacy and numeracy skills and recognises their existing abilities.
- Encourages both independent and collaborative learning experiences.
- Helps learners to identify areas where they need assistance and support.
- Helps to combat resistance to the use of ICT and can help bridge the gap between mobile phone literacy and ICT literacy.
- Removes some of the formality from the learning experience and engages reluctant learners.
- Enables learners to remain more focused for longer periods.
- Promote self-esteem and self-confidence.

Additionally, The Groupe Speciale Mobile Association (GSMA, 2014, p.4) mentioned other advantages of ML, stating:

> Perhaps the most significant advantage of mLearning is that it leads to more authentic learning opportunities by extending the reach of education beyond the classroom, and allowing students to take a more active role in their own learning in real world contexts. Students use mobile devices, individually and collaboratively, to explore locations, collect data and create learning materials whilst maintaining contact and receiving support and feedback from tutors. mLearning allows the blurring of boundaries between school and community, to make learning more relevant, collaborative and culturally significant.

Moreover, many positive findings of mobile learning research are related directly to students' learning experiences. For example, some researchers state that the use of mobile learning can make a significant positive difference in a student's performance (McConatha et al., 2008), learning outcomes (Chompu-inwai, 2005), knowledge (Thornton and Houser, 2005), confidence, motivation and self-esteem (Safie, 2004; Attewell and Webster, 2004; Hwang and Chang, 2011). Additionally, it can decrease students' experience of pressure (Rau et al., 2008), improve learning achievements (De-Marcos et al., 2010; Hwang and Chang, 2011), promote students' learning interest and attitude, encourage students to solve problems on their own (Hwang and Chang, 2011), and improve and enhance retention among HE students by enhancing

teaching and learning practices (Al-fahad, 2009). Also, Mobile Web 2.0 e-Training for the Vocational Education Trainers project (MOBIVET2.0) highlights four advantages for learners using portable devices including spontaneity, immediacy, increased access and portability (MOBIVET, 2013, pp.15-16).

In the context of higher education, mobile learning brings many advantages to higher education students. According to Cochrane and Bateman (2010, p.2), the key benefits of ML for HE include:

- Exploring innovative teaching and learning practices.
- Enabling the embodiment of 'authentic learning' - i.e. facilitating anywhere, anytime, student centred learning.
- Engaging students with the affordances of mobile Web 2.0 technologies: connectivity, mobility, geolocation, social networking, personal podcasting and vodcasting, etc.
- Bridging the 'digital divide' by providing access to learning contexts and user content creation tools that are affordable and increasingly owned by students.
- Moving from a model of fixed, dedicated general computing to a mobile, wireless computing paradigm that turns any space into a potential learning space.

Furthermore, the increasing power and pervasiveness of mobile devices, coupled with their mass integration into the world of teaching and learning have given rise to the future potentials of ML. Parsons (2014, pp.223-225) presents how the technological progress and the imaginative approaches to teaching can bring innovation to the classroom and to learning experiences in the wider world by addressing top five future potentials of ML, which are:

1. All students in a class can use their own device for learning.
2. We capture existing technology and best practices for learning.
3. Everything we want to teach can have a mobile app.
4. We re-engage students by integrating mobile technology into the classroom.
5. We teach things in a practical way that could previously only be taught theoretically.

To sum up, mobile learning increases opportunities for learning to include learning outside the classrooms and lecture halls. It also encourages student-centred learning by offering both individual and personal learning as well as flexible, collaborative and authentic modes of learning. Moreover, it supports strong links between learning at work, in the home, at school and in the community.

2.4.2 Potential Challenges and Technology Disadvantages

Despite the many benefits and advantages offered by mobile learning discussed previously, few research studies report challenges and disadvantages of mobile learning as well. These challenges need to be addressed in order to utilize the benefits of ML to support HE students' learning. For example, Yu et al. (2015, pp.74-76) presented some challenges and issues of using MT in learning and teaching, namely:

- Design issues and principles, such as issues to consider in the design for mobile learning and the structure of what and how to deliver via mobile devices.
- Technical and usability issues, such as issues related to the manufacture of mobile devices (e.g. screen size, battery life, etc.) and how to easily use mobile devices to learn.
- Security and privacy issues, such as those that guarantee users' rights and ensure their privacy (e.g. the privacy of data stored on mobile devices).
- Ethical and legal issues, such as informed consent, anonymity, confidentiality, and participant risk issues.
- Broadband connections and infrastructure issues, such as the difficulty to develop standards for ML with several operating systems, hardware limitations and Internet connections.
- Other cost concerns, such as the cost of Internet connections, training, infrastructure, devices, content development and testing.

In addition, Messinger (2011) highlighted a number of barriers to mobile technology implementation in schools and informal learning situations, including: the distractions that mobile devices can create within a traditional classroom, the lack of empirical evidence of effective use in classrooms, the lack of effective design of ML tools, the lack of a generalizable theory of ML, the slow speed of adoption, and the lack of MT accessibility.

Other issues that have been pointed out by many other researchers are cost, compatibility, equity of access, security, privacy, ethical concerns (Traxler and Bridges, 2004), and other technical limitations of mobile devices such as small screens, poor input capabilities, and low rates of connectivity (Trifonova, 2003; Naismith et al., 2004). Also, Kukulska-Hulme (2007) summarised some of the usability issues being reported in the literature as follows:

- Physical attributes of mobile device issues, such as small screen size, inadequate memory and short battery life.
- Content and software applications issues, such as lack of built-in functions, the difficulty of adding applications, and differences between applications and circumstances of use.
- Network speed and reliability issues, such as weak signals and slow access to webpages.
- Physical environment issues, such as difficulties in using the device outdoors and

concerns about personal security.

Kant (2012) presents other challenges related to the social and educational aspects, such as how to assess learning outside the classroom; how to support learning across many contexts; how to track results, proper use of information and lack of restriction on learning timetables; as well as how to manage the disruption of students' personal and academic lives.

Another problem that could face mobile learners is the restriction on different content in mobile devices (McGreal, 2014). To illustrate, when learners need to mix and match some content on their mobile technology such as highlight, copy, paste, etc., they often find that these features are locked or restricted.

Recently, Traxler and Vosloo (2014, p.13) highlighted several sets of inherent challenges facing UNESCO and other organisations engaging in mobile learning, such as those around evidence, evaluation, and sustainability; the problematic tension between large-scale interventions, based on scale and content delivered by national governments, and the language and culture of marginal or indigenous people; the absence of appropriate ethics procedures to manage educational interventions delivered by a powerful and ubiquitous technology; and the absence of learners in the forums that address these various issues.

Different researchers saw other issues of ML from different perspectives. Some of them considered some aspects as an advantage of ML while others saw them as disadvantages. For example, using mobile devices inside the class may "hinder student concentration and interrupt class progress" (Cheon et al., 2012, p.1055), or may be seen as "a great freedom for the learners to start and stop or even interrupt [the] learning process whenever and wherever he/she wants" (Goksu and Atici, 2013, p.692). Also, the ability to learn 'anytime, anywhere' offered by mobile learning could be seen as a challenge to learning spaces (Hartman et al., 2005). This is because learning can now occur both in and out of the classroom, in both formal and informal settings, and by lone scholars or among groups.

A further important problem facing the implementation of ML is the need for teacher development so they can utilize all the affordances MT provides in their teaching practices. This problem also needs to be addressed in order to maximize access to learning opportunities with mobiles. According to Traxler and Vosloo (2014, p.16), "Mobile learning does not seem to be routinely established in the school curriculum, either as a delivery mechanism or as a subject at a national or institutional level". Naismith et al. (2004) present this problem as a vital challenge for educators and designers. This is because they need to understand and explore how best they might use mobile technology to support learning that embraces a learner-centred approach to learning; and to transform learning into a seamless part of daily life to the point where it is not recognised as learning at all.

Also, Parsons (2014, pp.225-226) raises awareness of potential negative effects to assist researchers and educators in avoiding possible pitfalls of ML innovation by addressing top five future risks of ML, which are: entrenched digital divides, digital distractions and threats, the opposite of a Green Manifesto, uncontrolled, misleading effects on outcomes, and poor return on investment.

To sum up, it seems clear that there are many challenges and disadvantages of mobile learning but HE institutions cannot afford to ignore this type of delivery method for their students due to its many benefits and advantages for learning as well as it being a part of HE students' daily lives.

2.5 Mobile Learning in Higher Education

The possibility of students and teachers adopting mobile learning is becoming a more interesting topic in the field of higher education. The "revolution" of mobile learning has entered the higher education context and has been implemented into a range of topics, which gives higher education institutions an opportunity to improve its learning and teaching practices (Ally and Tsinakos, 2014, p.176). As evidence, Hwang and Tsai (2011) investigated the development of research concerning mobile learning between the years 2001 and 2010 by consulting published articles in six Social Science Citation Index journals. What they found was that most of the studies conducted in the realm of mobile learning were in higher education and mainly focused on the investigation of perceptions, attitudes, and motivations of students towards mobile learning. Focusing on mobile learning research and projects has been described as though "a huge wave of mobile technology adoption has swept throughout the world" (Sharples and Roschelle, 2010, p.4).

In recent years (2011-2015), there have also been investigations into the adoption (Mac Callum and Jeffrey, 2013; Iqbal and Qureshi, 2012), intention (Carvalho et al., 2012), attitudes (Alzaidiyeen et al., 2011), and acceptance of mobile learning amongst students in higher education (Matha and Madarsha, 2013; Pollara and Kee Broussard, 2011; Abu-AlAish and Love, 2013). Other implications of mobile learning in higher education can be seen in learning a foreign language (Thornton and Houser, 2005; Thornton and Houser, 2004). Additionally, the implementation of mobile learning in Saudi Arabia is impacted by students' attitudes and perceptions towards mobile learning (Al-fahad, 2009; Chanchary and Islam, 2011), students' acceptance (Nassuora, 2013), Saudi women teachers' adoption of ML in HE (Alfarani, 2015), teaching and learning English as a foreign language (EFL) (Almarwani, 2011), how SMS can be used as a learning tool in higher education and students' opinions about it (Alharthi, 2008).

Supporting learning processes was another area of focus for mobile learning in higher education. Mobile learning in this area is used to promote a positive learning

environment (Hussain and Adeeb, 2009), improve student performance (McConatha et al., 2008), explore the effectiveness of podcasting for teaching (Evans, 2008), provide learning materials to students (Holme and Sharples, 2002), and support students' learning (Traxler and Riordan, 2003).

Through a wide range of mobile learning implementations, researchers are finding key issues to consider by students, educators and technology developers in order to successfully implement ML. As for students, they should be required to learn "digital literacy skills" so they can take advantage of any learning opportunities MT may afford (Chen and Denoyelles, 2013). Such skills include managing, evaluating and accessing digital resources (Chen and Denoyelles, 2013), as well as having the ability to live, learn and work in a digital society (JISC., 2012). However, as Loveless and Williamson (2013) claim, prolific use of MT does not necessarily mean sophisticated use, as many of these technological innovations are utilized as consumable goods by students and not as creators or constructors of identity and knowledge.

Moreover, "to fully appreciate the potential of mobile technologies for learning we must look beyond the use of individual devices and consider their use embedded in classroom practices, or as part of a learning experience outside the classroom" (Naismith et al., 2004, p.10). A recent survey (with 1,082 respondents) attempted to discover students' ML practices at the University of Central Florida (UCF) (Chen and Denoyelles, 2013). It showed that HE students used their mobile devices mostly for self-directed informal learning rather than in a formal academic context. The researchers believe that using mobile devices in this way makes it challenging to get an accurate picture of academic use.

As for educators and technology developers, there are five key issues to consider (Naismith et al., 2004). First is **context,** which is the possibility of compromising the privacy and anonymity of the learner in gathering and using contextual information. The second issue that needs to be considered is **mobility**. This states the possibility of students to escape the classroom since the activities concerning ML link the world outside. Moreover, there is also a possibility that these students might engage in activities outside the curriculum or teacher's agenda. The third concern is **learning over time** which states that "effective tools are needed for the recording, organization and retrieval of (mobile) learning experiences" (p. 4). The next issue is **informality,** which emphasizes the possibility of students abandoning their technology once they learn that their social networks are under attack. Lastly, the issue of **ownership** states that students have the eagerness to control their own personal technology. This might cause problems when bringing it into the classroom. In the Saudi context, Alfarani (2015) found two main factors affect the adoption and use of ML among female teachers in HE, resistance to change and perceived social culture.

In talking about examples of ML practices in HE, we can find that there are many tools that are designed for mobile learning. Many of these tools are applications that

can be downloaded on most Wi-Fi enabled mobile devices. Some applications were designed by universities to provide general information and administrative support for their students and staff. Other applications were carefully designed to supply particular purposes for a particular group of people to achieve specific goals, such as "Mobile Organizer" and "English in Action" (as discussed in section 2.3.1).

Although these designs (discussed in section 2.3.1) highlight the importance of mobile learning and show the work of some researchers at different universities, researchers have to understand how personal MT devices are being used for learning inside and outside classrooms, and how MT can be integrated as educational tools. This study investigates students' uses of their MT inside and outside classrooms. The different designs discussed earlier provided some insights and ideas that helped in building a conceptual framework for mobile learning in higher education.

2.6 Theoretical Perspectives of Mobile Learning

There are several existing learning theories used by researchers and practitioners in the field of mobile learning. Some researchers focused on a particular learning theory that was dependant on activities that could be performed with mobile technology. Other researchers focused on the development of a specific theoretical framework to support the design of mobile learning.

2.6.1 Connecting Mobile Learning to Learning Theories

By reviewing the literature, one can infer that a wide range of theories have been used in the discourse of mobile learning. To validate this, Keskin and Metcalf (2011, p.202) researched learning theories that are currently used in ML and found that there are more than a dozen including, but not limited to, "Behaviorism, Cognitivism, Constructivism, Situated Learning, Problem- Based Learning, Context Awareness Learning, Socio-Cultural Theory, Collaborative Learning, Conversational Learning, Lifelong Learning, Informal Learning, as well as Activity Theory, Connectivism, Navigationism, and Location-based learning".

Supporting this view, Naismith et al. (2004, pp.2-4) argue that mobile learning can relate to more than one theory. They identify six theory-based themes for ML based on the kind of activities that can be enabled through the use of mobile devices. These themes were based on the main learning theories and areas of learning relevant to learning with MT. The six main themes include: Behaviourist, Constructivist, Situated, Collaborative, Informal and lifelong, and Learning and teaching support.

Nie (2006) agreed with Naismith et al. (2004) that the previous themes are suitable for a mobile learning environment. According to Nie (2006, pp.1-5):

- "The use of mobile devices to present teaching materials/content specific questions (stimulus), obtain responses from learners (response), and provide appropriate feedback (reinforcement) - provides 'drill and feedback' activities" and fits within the **behaviourist**-activity theme.

- The use of mobile devices provides "a unique opportunity to have learners embedded in a realistic context at the same time as having access to supporting tools...which allows them to become part of the dynamic system they are learning about" and fits within the **constructivist**- activity theme.

- The use of mobile devices to present knowledge "in authentic contexts (settings and applications that would normally involve that knowledge)", and allows "learners to participate within a community of practice" fits within the **situated learning-** activity theme.

- The use of mobile devices "to promote, facilitate and enhance interactions and collaborations" can foster collaboration and communication in group settings and enable individuals to share files, messages and data, and fits within the **collaborative-**activity theme.

- The use of mobile devices, "with their reduced size and ease of use", to support the informal activities that enhance learning such as "acquiring information through conversations, TV and newspapers, observing the world, or even by experiencing an accident or embarrassing situation" fits within the **informal and lifelong learning-** activity theme.

Other researchers have suggested that **conversation** theory, which was developed by Gorden Pask in 1975, is suitable to mobile learning because it allows for individualized communication. Conversation theory is a theory of how knowledge is constructed. It describes learning in terms of conversations between different systems of knowledge. Researchers who follow conversation theory believe that knowledge is agreed upon through the exchange of knowledge through conversations. According to Sharples (2005), communication plays an important role in identifying a framework for ML. Learning here can be seen as a continual conversation between learner and partner (a teacher, another learner, or with communications technology). Learning will be more successful when the learners themselves control the activity in which they are testing ideas, performing experiments, asking questions, collaborating with others, seeking out new knowledge and planning new actions (Sharples, 2005). In a different research study, Sharples et al. (2009, p.5) proposed a mobile theory based on Pask's conversation theory and the writings of Dewey (1916), in which students learn "through exploration and conversation across multiple contexts, amongst people and interactive technologies". Mobile technology here acts as a system to create and share knowledge.

Additionally, Laurillard (2007, p.165) used conversation theory to create the conversational framework, in which new technologies could be assessed and utilized according to how the technology supports the different aspects of the learning process. The framework can also be used to test what MT contributes to the learning process. She described how "m-learning activity could build in more opportunities for digitally-facilitated site-specific activities, and for ownership and control over what the learners do".

Connectivism has been related to mobile learning (Siemens, 2004). This is because learning has changed over the past several decades. Currently, people are learning through a variety of ways, such as through communities of practice, through their personal networks (personal learning network PLN), environments (personal learning environment PLE), and through work-related tasks. Additionally, the emphasis of learning is not only on knowing "how" and "what" but also on knowing "where" to access knowledge (Siemens, 2004).

Navigationism has also been discussed in relation to mobile learning (Brown, 2005). Learners should not just be provided with learning contents, but also with ways that enable them "to find, identify, manipulate and evaluate information and knowledge, to integrate this knowledge in their world of work and life, to solve problems and to communicate this knowledge to others" (Brown, 2005, p.10). In this environment, the role of teachers and educators will be "the source of HOW to navigate in the ocean of available information and knowledge" (Brown, 2005, p.10).

Other researchers have suggested that the **Activity theory** by Yrjo Engestrom developed in 1987, which is understood as a cultural-historical activity system, also applies to mobile learning (Sharples et al., 2007; Uden, 2007; Petrova, 2010). Sharples et al. developed a framework called the Task Model based on Engestrom's expansive activity model. In this framework, learning can be seen as a cultural-historical activity system that is mediated by tools that support or hinder learners in their goal of transforming their knowledge and skills. This framework describes the dialectical relationship between technology and learning, which Engeström's model fails to do. The Task Model for mobile learning can describe any mobile learning project in a structured way via its factors - context, tools, control, communication, subject and object. Additionally, it provides a detailed framework to support educators and designers in creating a mobile learning environment.

2.6.2 Mobile Complex: Socio-cultural ecological approach to ML

Pachler et al. (2010a) took a slightly different perspective for mobile learning - a **socio-cultural ecology** perspective. They argue that mobile devices should be viewed as new cultural resources for learning and as a mode of meaning-making that operates

within an individualized, mobile and convergent mass communication. Mobile cultural resources emerge within, from what they call, a triangular-oriented 'mobile complex', which consists of socio-cultural structures, users' agency and cultural practices of media use and learning. Figure 2.5 illustrates the key components of Pachler et al.'s socio-cultural ecological model. Pachler et al. (2010a, p.26) summarize their notion of 'mobile complex' as follows:

> The interrelationship of these three components: agency, the user's capacity to act on the world, cultural practices, the routines users engage in their everyday lives, and the socio-cultural and technological structures that govern their being in the world, we see as an ecology, which in turn manifests itself in the form of an emerging cultural transformation.

Therefore, the mobile complex results from the interdependence of structures, agency and practices. In another work, Pachler et al. (2010b, p.2) define 'mobile complex' by stating:

> By mobile complex we mean the transformation of the world around us, which is increasingly marked by fluidity, provisionality and instability, where responsibilities for meaning-making as well as other risk-taking have been transferred from the state and its institutions to the individual, who has become a consumer of services provided by a global market.

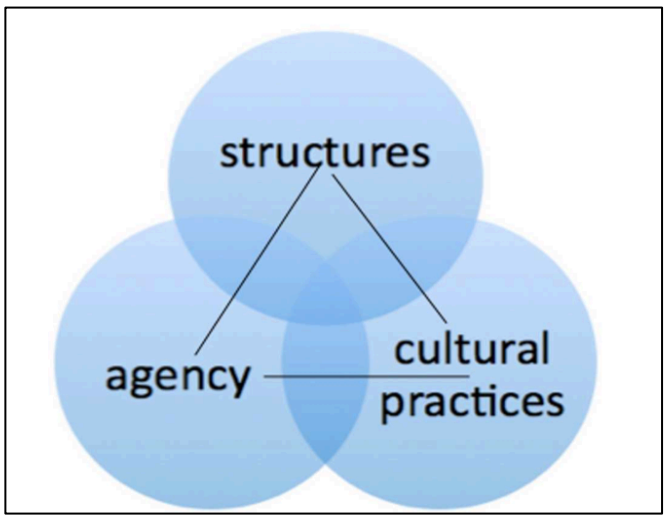

Figure 2-5 Key Components of a Socio-cultural ecology Model of ML (Pachler et al., 2010a, p.25)

Pachler et al. (2010a, 2010b) also present the notion of 'appropriation' and consider the use of MT for educational purposes as an appropriation of mobile cultural resources for learning (more details are discussed later in section 2.6.4, The appropriation of MTs as tools and resources for ML).

2.6.3 Boundary Mechanism: Boundary crossing approach to ML

A boundary is understood as a sociocultural difference that leads to discontinuity in action and interaction and can stimulate learning (Akkerman and Bakker, 2011). However, the definitions of boundary are different. On one hand, a boundary divides or separates and also connects sides of different worlds; belonging to both worlds (Kerosuo, 2001). On the other hand, a boundary reflects 'nobody's land', belonging to neither world (Akkerman and Bakker, 2011, p.141).

Two terms found in the literature that stress how boundaries carry potential for learning are: boundary crossing and boundary objects. Boundary crossing tools are different from boundary objects. Star (2010) explains boundary objects as a set of work arrangements that reside between social worlds or groups and allow them to cooperate in the absence of consensus. Akkerman and Bakker (2011) consider that people and objects can play an essential role in crossing boundaries. According to them, **boundary crossing** involves a person's transitions and interactions across different sociocultural spaces or sites, and **boundary objects** are abstracts or artefacts that cross boundaries through a bridging function (Akkerman and Bakker, 2011).

Akkerman and Bakker (2011) reviewed literature on boundary crossing and boundary objects and found that the descriptions of boundaries and of people and objects at the boundaries showed the ambiguous nature of boundaries. They stated, "The emerging body of literature on boundary crossing and boundary objects urges us to look at learning across and between multiple social worlds and thus expands education research beyond the study of learning within single domains and practices" (p.150). They discerned four potential learning mechanisms that can take place at boundaries: identification, coordination, reflection and transformation.

> (a) identification, which is about coming to know what the diverse practices are about in relation to one another; (b) coordination, which is about creating cooperative and routinized exchanges between practices; (c) reflection, which is about expanding one's perspectives on the practices; and, (d) transformation, which is about collaboration and co-development of (new) practices (Akkerman and Bakker, 2011, p.150).

In the field of ML, Pimmer and Grohbiel (2013) argue that boundaries include more than sociocultural differences that lead to discontinuity in action and interaction. They claim that many opportunities for learning would be missed if boundaries were only understood to be that. They assert that the focus of boundaries should be on the affordances of connecting different spaces offered by MT to facilitate and enhance learning in a way that was not possible before.

Recently, Pimmer (2016) connected mobile learning with the theoretical framework of boundary mechanism. He combined findings from the field of ML with Akkerman

and Bakker's (2011) theoretical framework of boundary crossing in order to explore the potential of MT for educational purposes. He discusses how these four learning mechanisms relate to ML practices. First, he discusses that the use of MT and SMNs to cross socio-cultural boundaries is related explicitly and implicitly to the negotiation and re-construction of professional identities and, therefore, meets the identification learning mechanism. Second, he illustrates how mobile phone-based multimodal representations (i.e., images, videos, texts, audio) enhance the communicative connection between the different parties/sides of group work and can take a mediating role in the learners' work across discipline boundaries; this meets the coordination learning mechanism. Third, he discusses that the use of MT encourages sharing and discussions of experiences in formal and informal settings, as well as allowing for learning cycles between formal and informal contexts. This meets the reflection learning mechanism. Finally, he argues that the use of MT starts to transcend from informal and leisure time contexts to more formal learning spaces, such as the classroom context, which can offer affordances for profound changes of practice or create new ones by means of crossing boundaries; this meets the transformation learning mechanism.

Pimmer (2016) prefers the notion of boundary crossing tools because it emphasises the active use of MT and also stresses the agency of the learner. Pimmer (2016, p.10) argues that this account is too narrow and "mobile phones are used by learners in their boundary-crossing between different socio-cultural sites, with and without consensus". He views MT as tools that are used by students to "navigate across networks" (instead of social groups), in which "each individual represents the hub of his own self-created and personalised network" (p.10).

Additionally, Pimmer (2016, p.1) argues that MT, specifically mobile phones and SMNs, have "been used to facilitate learning across more diverse and more peripheral network spaces" and are, therefore, boundary crossing tools; "tools that are used by learners to generate multimodal representations that reflect their experiences and identities, and to share them across their digital and non-digital social networks". He found that the crossing of context can facilitate learning and that ML helps to cross "contexts" of diverse sociocultural worlds.

2.6.4 The Appropriation of MTs as Tools and Resources for Mobile Learning

Many learning and teaching practices have replaced the analogue media and technologies with the use of MT (Seipold, 2014). Pachler et al. (2010b) consider that MT affords contexts for human development and learning. Also, Seipold (2014) claims that the use of the different functions of MT is widening learners' scope of action and supporting learners in constructing contexts for their learning (user-generated contexts). Moreover, Pimmer and Pachler (2014, p.200) claim that using

MT in learning is “moving the learner away from being a passive consumer to becoming an active producer and distributor as well as co-creator of multimodal designs and learning processes”.

Nowadays, MT is integrated in the lives of users and has become normalized in everyday life (Seipold and Pachler, 2011). Thus, researchers consider them to be important cultural resources, and as tools learners can use to organise their everyday lives (Pachler et al., 2010b; Seipold, 2014; Pachler et al., 2010a; Seipold and Pachler, 2011). Moreover, Pachler et al. (2010b) consider the use of MT for educational purposes as an appropriation of cultural resources for learning. In addition, Seipold (2014) considers MT to be a resource within the process of appropriation for access to and production of a variety of activities, structures, contents and knowledge. Moreover, Pimmer et al. (2012) found that both students and professionals in the context of higher education in developing countries (e.g. Nepal) appropriate mobile phones and SMNs as rich educational tools in informal learning contexts.

Appropriation is centred on the question of how people use mobile phones once they have adopted them (Wirth et al., 2008). Pachler et al. (2013, p.44), who take a socio-cultural ecological perspective to ML, define appropriation as “the processes around the development of personal practices with mobile devices concerning the internalization of, and externalization into, the pre-given world of cultural products across the breadth of learning, in educational institutions and in everyday life".

Additionally, Pachler et al. (2010b) argue that the appropriation process can overcome or bridge some of the gaps between formal and informal learning contexts. They consider that the formal sites of learning and teaching, such as school, college, and universities, are quite separate culturally from the ‘Mobile Complex’, which consists of agency of the learner, the cultural practices of MT use, and the structures that govern learners’ life (for more details, see section 2.6.2). Similarly, Burns at el. (2007, p.330) argued that MTs “enable learners to take their learning away from campus and into the world, and their experiences from outside university with them to study”. However, Pachler et al. (2010b) believe that the process of appropriation of MT can meaningfully overarch these gaps.

Pachler et al. (2010a, 2010b) claim that appropriating mobile cultural resources (Mobile Complex) for learning enables learners to develop a new habitus of media use of everyday life, to develop a new habitus of learning around mobile devices, to develop a new set of literacy practices of everyday life, to generate content and contexts for their learning, and to make meaning from the distributed content and information at the time of use, for example. All these practices with MT function as resources for learning. Figure 2.6 shows more learning practices resulting from the appropriation of MT for learning. The following paragraphs discuss some of these learning practices that result from appropriating mobile cultural resources for learning in more detail.

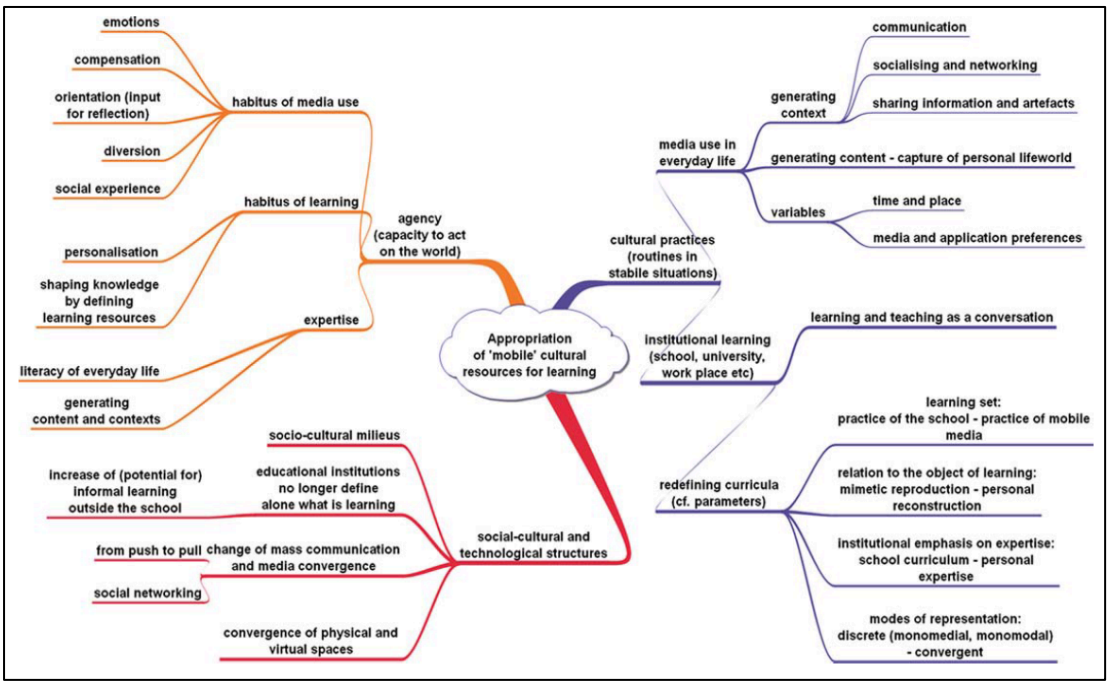

Figure 2-6 Appropriation of Mobile Cultural Resources for Learning (Pachler et al., 2010a, p.217)

For example, Mobile Complex enables learners to **develop new habitus of media use of everyday life** due to the ownership of MT and the ability to personalize it. Ownership of MT device enables owners or learners to put their own personal stamp on it, and that in turn helps in developing new habitus of media use such as seeking, capturing, storing, organising and/or categorising information. Pachler et al. (2010b, p.11) stated:

> One's mobile phone is an inherently personal device, and this can be enhanced by personalisation or accessorising a phone to put one's own personal stamp on it. This is mainly achieved by adding skins or covers and accessories, and by personalising ring tones, operating systems and menus as well as by adding wallpaper and, importantly, applications. In short, users can be said to be developing a new habitus of media use.

Similarly, Mobile Complex enables learners to **develop new habitus of learning around mobile devices** by interacting and experiencing the world in which they live differently and in new ways even if learners are at the same place. Pachler et al. (2010b, p.11) used 'life world' to describe this stating:

> The molding, defining characteristic for this new habitus of learning emerges from individualized life-worlds as a frame for what is real and valid. It relates to who produces knowledge and how, and it describes the move from a world in which the text is an authoritative source of knowledge to one in which it is treated as a resource for the production of knowledge.

In addition, Mobile Complex enables learners to **develop a new set of literacy practices** by maximising the use of mobile phones. Pachler et al. (2010b, p.11) stated:

> It is necessary for users to develop a new set of literacy practices including, among other things, the ability to locate, evaluate and install applications that augment the basic functionality of phones and enable not just entertainment through games such as Sudoku, or information access, storage and retrieval such as service location (banks, coffee shops, cinemas etc. in the vicinity), RSS feed readers, audio recorders, news channels etc., but also communication tools such as social networking applications (e.g. Facebook, Twitter, blog tools, Wikipedia clients) as well as cloud computing tools (e.g. Google docs).

Additionally, Mobile Complex enables learners to **generate content and contexts for their learning** due to the unique properties of MT. Pachler et al. (2010b, pp.11-12) stated:

> Ownership allows for qualitatively and emotionally very different kinds of relationships with technologies and devices, and their multi-functionality, portability and ubiquitous connectivity allows for the generation of content by capturing users' personal life-worlds as well as the generation of contexts for learning through socialising and networking, communicating and the sharing of information and artefacts across time and place.

Pachler at el. (2010a, 2010b) consider learner-generated content and learner-generated contexts as key features of appropriation. Learner-generated content and learner-generated contexts vary depending on place, time, the availability of cultural resources and the aims of the appropriation processes. Those contents and contexts that are created by learners are considered resources for learning (Pachler et al., 2010b; Seipold, 2014).

Pachler et al. (2010a, 2010b) also present the notion of user-generated contexts as a means of integrating meaning-making from the world outside of formal institutions such as universities, colleges, schools and its curriculum. Mobile device users in user-generated contexts are being 'afforded' synergies of knowledge distributed across people, communities, locations, time, social contexts and sites of practice (such as socio-cultural milieus) and structures.

Many researchers have discussed the notion of user-generated content. For example, Bruns (2006, p.282) called learner-generated content as 'user-led content' and discussed how the emergence of new information technology has "shifted away from mostly passive, mass reception to more interactive, individualised modes of active engagement" and therefore facilitates information access, knowledge exchange, and content production. He argued that those using technology were also producers as they use technology as well as produce content especially in online environments, such as wikis, multi-user online games, online publishing and blogs.

Bruns (2006) and Bruns at el. (2007) argue that the use of MT in learning is necessary, especially in higher education environments, because it prepare learners

for the future. Bruns (2006) stated that by discussing how the use of MT enables learners to collaborate and engage with their teachers and with other learners, as well as provides opportunities for them to work in groups and on ongoing projects. Therefore, it helps "to prepare learners for a future where they may be required to work in heterarchical, self-determined, and collaborative teams of content producers" (Bruns, 2006, p.282). Moreover, Bruns at el. (2007, p.331) consider MT a tool that encourages progress towards user-led education, as they allow learners to be active participants in the design and development of courses by being 'co-creators of content', "through access and contribution to the increasing number of sharable and reusable learning objects and communication and content generation tools, such as wikis and blogs".

Also, many researchers have discussed the notion of user-generated contexts. For example, Seipold (2014, p.41) mentioned several reasons behind why the concept of user or learner generated contexts has relevance and gains importance, including:

- The context concept moves the focus away from user-generated contents, which are produced within contexts, and thus away from the idea that learning tools or preset learning contents would be central for the learning process.

- Learning materials such as school books are not the only resource providing learning contents; also agency of learners, technologies, structures, networks, contents and so on gain importance, whether they are from the learners' everyday life or from school and learning contexts.

- On the way towards the development of a mobile learning theory, it appears to be important to put a focus on contexts because, as new cultural products, they are constructed by learners. In these self-produced contexts, the learners' agency, cultural practices, as well as their expertise, aesthetics, concepts of learning, aspects of identity, become apparent.

- The context concept provides links to current developments in mass communication as well as a contemporary understanding of learning as meaning-making in formalised and informal structures, because both move away from the idea of users/learners being consumers of pre-given contents towards an idea of users/learners as producers of self-chosen and self-created contents.

- Because contexts can be situationally constructed anytime, anyplace, school and classrooms lose their central position as the only place for learning in the formalised learning process; other places or spaces – be it a swimming pool or a chat room – become relevant places for learning.

- Therefore, the context concept reveals the learners' everyday life to informal learning and allows researchers to construct links between informal and formal contexts and activities, and to frame them systematically.

- Within contexts, users/learners act in a flexible manner and are able to adjust resources (including structures, agency and cultural practices) to the demands and conditions of contexts.

2.6.5 Personalized learning through mobile technology

Personal ownership of MT is a defining characteristic of ML. It means that the learner has developed the necessary skills to use MT's hardware and software in an effective way. In this sense, Pachler et al. (2013, p.42) discuss how the personal ownership of MT "enables users to develop qualitatively and emotionally strong relationships with the devices and the services available through them". They claim that ownership of MT, therefore, fosters a process of user generated content and user generated context for learning through MT (for more details, see section 2.6.4). Also, ownership "allows for personal media and applications preferences" (Pachler et al., 2010b, p.18). Cochrane (2013) holds a similar view, and emphasises in her 'summary and critique of ML research and practice', that ownership of MT enables students to generate content and contexts for their learning. She considers mobile devices as 'ubiquitously connected communication devices' due to two characteristics of MT: the 'ubiquitous ownership' of them and their primary functionality. Moreover, she claims that the ownership of MT and the multi-functionality of them could lead to a pedagogical change, stating:

> These two characteristics of wireless mobile devices enable their use as disruptive devices to act as catalysts for pedagogical change by mediating student-generated learning contexts and sharing student-generated content as key elements of social-constructivist learning, or Pedagogy…We must become more critically reflective and look towards sustainable approaches, such as focusing upon student-owned devices for enabling student-generated content and student-generated learning contexts (Cochrane , 2013, p.30).

Similarly, Moura and Carvalho (2013) suggest that ownership of MT allows learners to explore MT's services and features and to develop skills for studying and learning. They carried out a project on ML, called 'Mobile Generation', regarding the appropriation of mobile phones as a learning tool for learning foreign languages. The project used different multimedia services and functions offered by MT such as SMS, digital pictures, videos, and podcasts. The students engaged in different activities for language learning such as using a podcast to learn pronunciations and new content, and receiving SMS to improve vocabulary. Moura and Carvalho proposed that students explore different services and features available in their personal MT to develop and improve their learning skills. They also concluded that their students recognized MT as learning tools and used MT as a tool for reading and writing, for

recording and listening to podcasts, and for receiving and sending SMS for educational purposes.

Additionally, ownership of MT offers students the chance to personalize their MT devices as well as their learning. Personalization in learning, with the use of technology and digital tools, can be approached as "the recognition and design of learning contexts which offer choices in the people and resources that are available to support skills, knowledge and feedback in learning as 'Person-Plus'" (Loveless and Williamson, 2013, p.112).

Moreover, ownership enables students to customize their device's preferences such as ringtones, background and theme colours, and to downloaded different applications. They can also add accessories to their MT such as covers and cases to make it more personal. Moreover, ownership offers students the chance to personalize their learning by choosing to use applications and features that they want, not what their teacher or school want. Pachler et al. (2013, p.42) discuss how personal ownership of MT enables students "to adopt personalized media and application preferences" by making "their own choices rather than having to rely on those made by schools or teachers". According to Loveless and Williamson (2013, p.112), being an active learner and having the ability to personalize learning with the use of MT enables learners to create personal learning environments (PLE) "for managing, collecting, curating and planning learning activities", as well as to design personal learning networks (PLN) of information and people to share and construct links and ideas.

2.6.6 Developing a Theory for Mobile Learning

In developing a theory of mobile learning, researchers and educators need to follow some standards that could guide them in postulating a theory of ML. Sharples, Taylor and Vavoula (2007, pp.222-223) determined four criteria for a theory of ML, which are:

1. Differentiate it from other types of learning, in terms of students being continually on the move, learning across space and time, moving from topic to topic and in and out of interactions with technology. There is mobility in learners and the learning process. Thus, "placing mobility of learning as the object of analysis we may understand better how knowledge and skills can be transferred across contexts such as home and school".
2. Consider that learning "occurs outside offices, classrooms and lecture halls". This is due to the fact that there is no consistent and standard relationship between locations and the topic of learning. Furthermore, there is a need to understand how individuals engage with their environment and how this environment becomes their location of learning.

3. “Be based on contemporary accounts of practices that enable successful learning”. In other words, there is a need for the educator to consider the age and the subject areas to be taught. They can use, for example, research about effective learning conducted by the US National Research Council. According to this institution, effective learning is learner centered, knowledge centered, assessment centered and community centered.
4. “Take account of the ubiquitous use of personal and shared technology”. This criterion is due to the fact that there is a large disparity of technology access across the globe. Developing countries have more access to various technologies while underdeveloped countries have less.

Traxler (2009a) had a similar idea as Sharples et al. (2007), and wished to examine the differences between ML and conventional tethered e-learning in regard to the underlying learning experience. Additionally, Farley and Murphy (2013) agreed with Sharples et al. (2007), and asserted the importance of understanding how learning differs between using mobile technology and other electronic technology in theorizing mobile learning. The ability for anyone to learn anytime and anyplace that is offered by mobile learning supports a variety of different learning activities. However, one researcher described mobile learning as a “noisy phenomenon where context is everything and confounding variables abound” (Traxler, 2009b, p.5). This makes developing or specifying a theory of mobile learning particularly problematic as it might led to an oversimplification of mobile learning (Traxler, 2009b). Traxler (2009b, p.6) argues that in looking for a theory for mobile learning, the mobile learning community will be faced with three different options and dilemmas:

1. “Import theory from ‘conventional’ e-learning and worry about transferability” (e.g. Conversation theory);
2. “Develop theory *ab initio* locally and worry about validity” (e.g. Connectivism and Navigationism theories);
3. “Subscribe to some much more general and abstract theory and worry about specificity and granularity” (e.g. Activity theory).

Despite the different concepts of learning theories and how it supports mobile learning, it is worth noting that there is no definitive theory for how we learn, rather we exhibit different characteristics depending on the objective and circumstance.

Indeed, mobile technology has transformed how we learn, and the theories of mobile learning are considered extensions of the old learning theories with a move from static places (classrooms) to open-walled places (anywhere, anytime). Learning theories, together with mobile learning affordances, can create “a unique environment for learning that allows learners to use their knowledge and skills by thinking critically, applying knowledge to new situations, analyzing information, comprehending new ideas, communicating, collaborating, solving problems, and making decisions” (Yu et al., 2015, p.67).

2.7 Summary

This review of literature has considered understandings of learning generally and mobile learning particularly. In this study, I take the position that learning is *a complex process that takes place in many contexts, which involve learners being actively engaged in using different mediating tools*. The focus of this thesis is to explore Saudi HE female students' practices and experiences of using mobile technology as a tool to support their learning. Thus, the review of literature has helped to describe current theories and research in the field.

In this chapter, I reviewed literature that discussed mobile learning definitions. It would appear that there is no consensus when defining mobile learning, which fits with Winters' (2006, p.6) statement that, "a precise definition of mobile learning is unattainable". However, all the definitions have directly or indirectly highlighted the same idea that mobile devices play an important role in learning activities regardless of whether the activities are conducted in the field or in the classroom. Also, it has been noted that the unique nature of mobile learning makes it difficult to reach a definition that encompasses a wide variety of learning opportunities with the multi-functionality offered by mobile technology. This has led researchers in mobile learning to further investigate specific areas, such as the different features of mobile learning, the types of learning and learning activities that can be supported by the use of mobile technology, the unique characteristics of the mobile learning environment, and the different contexts in which mobile learning can take place. These activities, characteristics and categories of mobile learning could address the limitations in defining mobile learning; and it might help towards overcoming the difficulty in reaching an agreement on the definition.

All in all, mobile learning can encompass e-learning through mobile devices, although this current study distinguishes mobile learning from e-learning and posits that ML stands on its own because of the unique nature and dimensions of mobility. ML is mediated learning through mobile technology and promotes formal and informal learning. Learning can take place in any location, and anytime, including traditional learning environments, such as classrooms and lecture halls, as well as non-traditional learning environments, such as the workplace, home, community locations or in transit.

Mobile learning is not intended to replace or challenge established forms of teaching and learning, or point out a specific kind of learning; rather it shows that the environment and different conditions should be taken into consideration. In short, mobile learning is considered to be about "understanding and knowing how to utilize our everyday life-worlds as [a] learning process" (Seipold and Pachler, 2011). Due to cultural limitations and segregation of males and females within the learning environment in Saudi Arabia, mobile learning could be used as a supplementary method that might support, enrich and enhance students' learning experiences, especially for females. Females in higher education are sometimes taught by males, so

mobile learning might be an optimal tool to facilitate communication and interaction between the students and their instructor.

Additionally, in this chapter, I review literature that discusses the possible mobile learning opportunities through the use of different applications and features of mobile technology. It seems that mobile technology can deliver different types of learning activities through the use of various applications and features.

The previous mobile learning opportunities (discussed in section 2.3) highlight the importance of ML and illustrate the work of a few pioneer researchers at different universities and organizations. As discussed earlier, MT could be used for different types of ML activities including communication, administration, interaction, information broadcasting, collaboration, and reflection for many learning purposes. Moreover, the Clough et al. categorization of ML applications is incorporated into this study to determine whether Saudi HE students' practices with mobile devices falls into the same categories of mobile learning applications designed by educators. Additionally, the study will delve further than case studies, as there are no known studies regarding whether these learning opportunities would be suitable for Saudi HE students.

This study investigates, in detail, how HE female students in SA use MT applications and features in learning. One of the aims of this study is to investigate how the different applications and features of MT could be used to support and enhance students' learning in HE; and therefore will help in building a conceptual framework for ML in HE.

In conclusion, while there has been considerable research on mobile learning globally, there is plenty of space for further research in the Middle East, and especially in Saudi Arabia where mobile learning is now being introduced. The most likely explanation is that mobile learning is relatively new and under-researched. And though there are a few studies that look into mobile learning in the Saudi context, we still do not know how females in Saudi Arabia use MT in education. This study addresses this gap and explores the experiences of HE female students with using their mobile technology in learning. It is hoped that the study will determine a way of thinking about how to utilize the affordances of MT in learning based on students' practices and experiences.

Therefore, this study aims to investigate the current state of students' ownership and practices of mobile technology in Saudi higher education, to explore and analyse students' experiences of using mobile technology in learning in Saudi higher education and to build a conceptual framework for mobile learning in Saudi higher education. As a result, the main research question underpinning this study is: **How can students' practices and experiences of mobile technology be utilized to build a conceptual framework for mobile learning that could support learning in**

Saudi Higher Education? This is investigated through the three research questions mentioned earlier in section 1.5.

CHAPTER III: Research Methodology

This chapter presents a detailed description of the decisions followed to conduct this study. The research design and the theoretical assumptions of the study are followed by the strategy of enquiry. Then, a detailed description of the data collection methods, the sampling and the data analysis are demonstrated. Finally, issues of trustworthiness and issues of ethics are provided.

3.1 Research Design

The research design is a framework for conducting a study that includes the intersection of three important elements: philosophical assumptions, strategy of enquiry and specific research methods (Creswell, 2009). Therefore, when structuring the design of this study these three elements must be addressed.

3.2 Philosophical Assumptions

Addressing philosophical assumptions, or worldviews, is the first step to structuring the design of the study (Creswell, 2009). To do this, four key questions in ontology, epistemology, methodology and methods need to be answered sequentially and will inform one another, as depicted in Figure 3.1 (Waring, 2012).

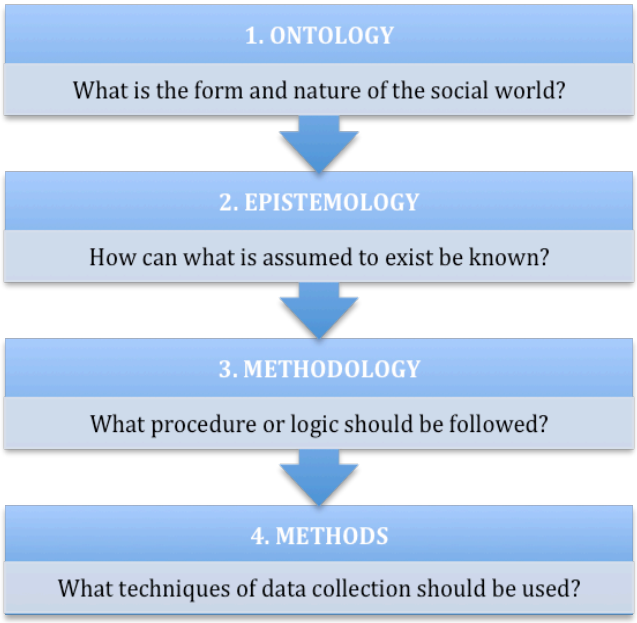

Figure 3-1 The Relationship between Ontology, Epistemology, Methodology and Methods (Waring, 2012, p.16)

These questions will be answered based on my understanding of the main research paradigms, namely positivism and interpretivism. I have primarily focused on these two areas as they are considered the major paradigms and perspectives (Wisker, 2008; Basit, 2010) informing educational research.

First, "ontology is the starting point of all research" and epistemological and methodological positions follow it logically (Grix, 2002, p.177). The **ontological** question asks, "What is the nature or form of the social world?" (Waring, 2012, p.16). The objective of this study is to explore the experiences of students with mobile learning, with the expectation of eliciting multiple interpretations from participants. The answer, therefore, is that reality (social world) is not an objective phenomenon, but is socially constructed by individuals through interactions with others and through historical and cultural rules that drive their world (their experiences within a particular context) (Creswell, 2009). They construct multiple realities, which the researcher needs to interpret in order to understand their experiences and to provide a meaningful explanation of the phenomena within the participants' context.

Second, the **epistemological** question asks, "How can what is assumed to exist be known?" (Waring, 2012, p.16). The epistemological position is concerned with the theory of knowledge and "the possible ways of gaining knowledge of social reality" (Grix, 2002, p.177). The reality is known through understanding it. This can be achieved by getting access to the participants to interact with them and gain a deeper understanding of their world; to make sense of their constructed meanings and interpret their views. Coming to know their social reality involves listening, observing, interacting, analysing and interpreting the participants' accounts of their experiences and understandings of mobile learning.

Third, the **methodological** question asks, "What procedures or logic should be followed?" (Waring, 2012, p.16). The methodology position is concerned with the logic, potentialities and limitations of research methods (Grix, 2002). Therefore, methodological assumptions are important in identifying research data collection strategies. According to Yin (2009), case studies offer the opportunity to explore and describe a specific phenomenon in a real-life context using a variety of data sources. To that end, the question is answered in this study through **a case study** methodology, as it helped me answer the research questions (see section 1.5) regarding the investigation of how higher education female students' use their mobile technology in learning, and their experiences regarding how this technology enhances learning (a specific phenomenon) in Saudi Arabia (real-life context). In addition, case study methodology has the ability to deal with the multiple sources of data collection (Yin, 2009) that are utilized in this study.

Lastly, the **methods** question asks, "What techniques of data collection should be used?" (Waring, 2012, p.16). The data collection methods take various forms depending on the research questions. Therefore, the answer is that the study conducts

a mixed methods study where qualitative methods drive the shape of the study, while statistical evidence is used to support it. Four methods are used to gather data: questionnaire, diaries, group interviews and semi-structured, in-depth interviews.

The answers to the philosophical questions detailed above, disclose that my research interest is mainly subjective and qualitative in nature. Additionally, the qualitative method is dominant in this study. Designing a mixed methodology with "one dominant methodology tend[s] to adhere to the traditional guidelines of that methodology" (Greene et al., 2005, p.276). Consequently, I can identify myself as an interpretive researcher and aim to follow the **interpretative paradigm** to understand and interpret the practices and experiences of Saudi HE students with mobile learning as a means to support their learning.

3.3 Strategy of Enquiry

3.3.1 Mixed Method Strategy

The study employs a mixed method strategy to gather, analyse, and present data, which involves the use of both qualitative and quantitative methods. The study is designed as a dominantly qualitative, sequential design and can be indicated by using the following procedural notation **quan ➔ QUAL** as described by Creswell (2009), or as a **qualitative led mixed methods** design as described by Tashakkori and Teddlie (1998). That is, quantitative and qualitative data are collected in sequential order, and they complement each other.

The nature of my research questions led me to utilise the sequential exploratory design as it appeared to be the most appropriate to explore and present a detailed view of the mobile learning experiences of Saudi higher education students; and to utilise it to build a conceptual framework designed for learning using MT in HE. However, the lack of Saudi statistical databases concerning the use and ownership of mobile technology among students in higher education required the application of a survey strategy first, which provided baseline information that helped in designing the other methods and in interpreting the collected data. Therefore, I utilised **the sequential exploratory design** of the mixed methods strategy (Creswell et al., 2003), and changed the sequential order of applying the methods to suit the purpose of the study. Figure 3.2 illustrates the sequential exploratory mixed methods design of the study.

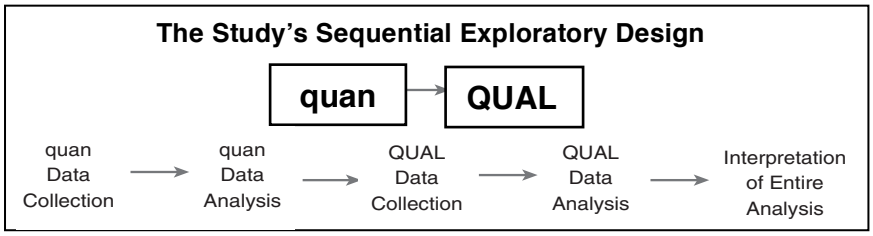

Figure 3-2 The Sequential Exploratory Mixed Methods Design of The Study

To best understand the research problem, I conducted the four methods in sequential order (see Figure 3.3) so data collected from one method could help generate the following methods' questions. Also, it gave the participants a chance to think about the topic, which helped enrich the discussions in the following methods. Moreover, this contributed to the development of a conceptual framework that required the collection of rich in-depth data and analyses to inform the framework.

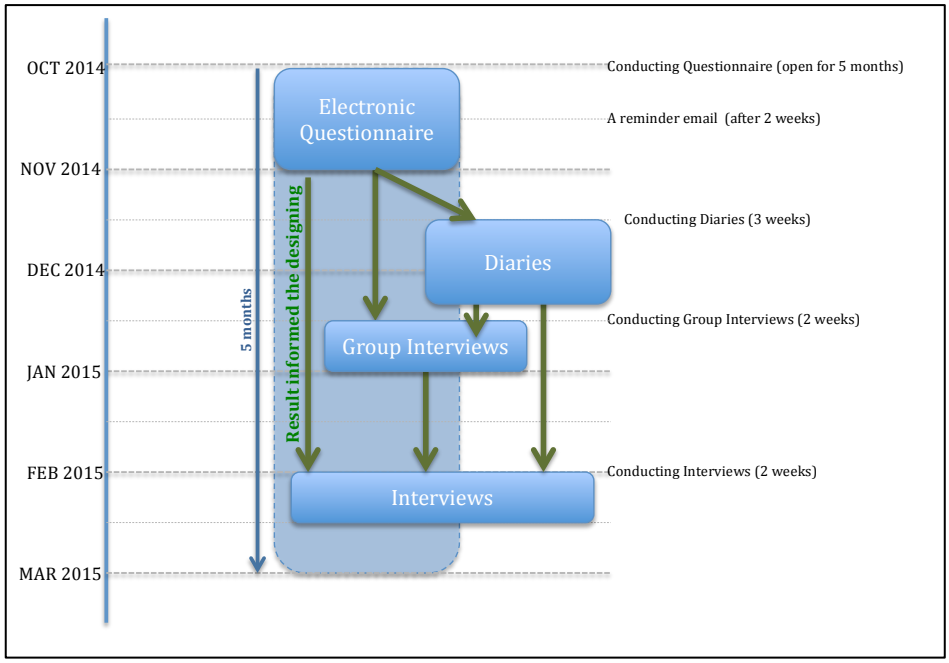

Figure 3-3 The Sequential Implementation of The Data Collection Methods

The design of this study followed the three important dimensions of the mixed methods design exactly (Greene et al., 2005). These were, firstly, to determine if the methods would be integrated during the study in which data, from various methods, informs the design, or the sample, of other methods; or if they would be kept separate until the end. Secondly, to determine the importance of the different methods – whether they were considered of relatively equal importance or if one of them was dominant. Thirdly, to determine the implementation timing of different methods (concurrently/sequentially) (Greene et al., 2005).

3.3.2 Case Study Methodology

Case study research involves the study of a contemporary phenomenon in-depth and within a real-life context or setting (Yin, 2009). Stake (1995, p.xi) defined case study as "the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances". Stake states that case study research is not a methodology but a choice of what is to be studied (e.g. a case within a bounded system, bounded by time and place). Others present case study as a strategy of inquiry (Denzin and Lincoln, 2003), a methodology (Creswell, 2013), or a

comprehensive research strategy (Yin, 2009).

In the context of this study, Creswell's (2013, p.97) definition of case study research as "a qualitative approach in which the investigator explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information (e.g., observations, interviews, audiovisual material, and documents and reports), and reports a case description and case themes", was considered to be the most appropriately focused, although this study did not use policy documents as data to inform the context and background of this study.

Case study methodology has the ability to deal with the multiple sources of data collection (Yin, 2009). According to Stake (1995, p.85), case study is undertaken to make the case 'understandable'. It can emphasise the 'uniqueness' of the case itself and can provide 'particularization', knowing the particularity of the case (Stake, 1995, p.8). However, it seems a poor basis for generalization (Stake, 1995).

Yin (2009) and Stake (1995) use different terms to describe different types of case studies. Yin categorizes case studies as explanatory, exploratory, or descriptive. He also differentiates between two designs of case studies, single-case study and multiple-case study. Stake distinguishes three types of case studies: intrinsic, instrumental, or collective. Creswell (2013) argued that the different types of case studies have been categorized depending on the size of the bounded case (e.g. the case may involve one individual, several individuals, a group, an activity, or an entire program), or depending on the intent of the case analysis (such as Stake's categorizations). The different types of case studies and when to use each one are provided in Table 3.1. Stake (1995, p.4) illustrated that the point of making these distinctions is "not because it will be useful to sort case studies into these three categories but because the methods we will use will be different, depending on intrinsic and instrumental interests".

Table 3-1 The Different Types of Case Studies

Case Study Type	When to use it
Explanatory	This type of case study would be used if a researcher wished "to explain the presumed causal links in real-life interventions that are too complex for the survey or experimental strategies" (Yin, 2009, p.19).
Exploratory	This type of case study is used to explore and "to enlighten those situations in which the intervention being evaluated has no clear, single set of outcomes" (Yin, 2009, p.20).
Descriptive	This type of case study is used "to describe an intervention and the real-life context in which it occurred" (Yin, 2009, p.20).
Intrinsic	This type of case study is undertaken for the intrinsic interest in the case itself and would be used if a researcher wished to gain in-depth understanding of the case (Stake, 1995).
Instrumental	This type of case study would be used if a researcher wished to accomplish something other than understanding a particular situation, and here the case is of secondary interest (Stake, 1995). This means that the case is chosen to gain

	insight or understanding into something else, in which a researcher focuses on an issue or concern, and then selects one bounded case to illustrate this issue.
Collective	This type of case study would be used if a researcher has an interest in multiple cases. Here, the researcher focuses on an issue or concern, and then selects multiple case studies to illustrate and understand the issue or question (Stake, 1995).

The table below (Table 3.2) presents the most defining features of case studies that were identified by Creswell (2013, pp.98-99) (he relies on Stake (1995) and Yin (2009) to form these distinctive features), and depicts how each is demonstrated within this study.

Table 3-2 The Characteristics of Case Study Research

Case study characteristics	How to demonstrated the characteristics within this study
Case study research begins with the identification of a specific case that can be bounded or described within certain parameters, such as a specific place and time.	This study involved the investigation of a "specific" and "real-life" case (Saudi higher education students' experiences of mobile learning) that were bounded by a specific place (a single campus, namely KSU in Riyadh) and time (five months of collecting data).
Case study research's intent is important. The intent may be to illustrate a unique case that has unusual interest and needs to be described and detailed (Intrinsic case); or the intent may be to understand a specific issue, problem, or concern (Instrumental case).	This study intends to illustrate the phenomenon of ML in a unique case (KSU) and accomplishes that by selecting **an intrinsic case study** (a single case namely female at KSU). This case is unique due to the unique circumstances that surrounded females' life in Saudi (e.g. gender segregation in education, the role of religion, culture, and overall policy in Saudi Arabia).
A good case study research presents an in-depth understanding of the case by collecting data from multiple sources.	This study achieved this by using multiple sources of information in data collection (a mixed-methods strategy) that presents a more coherent picture of the unique situation. This ensured that the case was explored through a variety of lenses, which allowed for multiple facets of the case to be revealed and understood.
The data analysis in a case study will differ. It may involve the analysis of multiple units within the case, or the analysis of a single case.	This study involved the analysis of multiple units within the case (many females at KSU) for understanding the complexity of the case. The study analysed a variety of participants' experiences that were collected from questionnaires, diaries, group interviews and in-depth interviews.
A good case study research involves a description of the case through identifying themes or issues of the case or specific situations uncovered by the researcher.	The researcher focused on an analysis of themes by identifying issues within each participant and then looking for common themes that transcend the case (Yin, 2009).
The themes or issues might be organized (by the researcher) into a chronology, analyzed across cases for similarities and differences among the cases, or presented as a theoretical model.	The result of the case study contributed to building a conceptual framework for mobile learning in HE.
Case study research ends with a conclusion formed by the researcher about the overall meaning derived from the case(s).	The researcher concluded the study by providing conclusions, recommendations, and suggestions for further research.

3.4 Data Collection Methods

The study gathered both quantitative and qualitative data. The data gathered was largely experience based, and involved gathering students' practices and experiences of mobile learning. There were several tools for data collection; questionnaires, diaries, group interviews, and semi-structured interviews.

Quantitative data for this study was collected through an electronic survey questionnaire sent via KSU email to all female students. Qualitative data was collected through diaries, group interviews, and semi-structured interviews with selected participants who gave their consent on the survey to be contacted to participate in other stages of data collection for this study. All data collection methods were piloted before implementing them for the main study (see section 3.8.3, Pilot Study).

I received 11,246 questionnaire responses, of which 3,381 were not relevant. These responses were eliminated because 1,072 responses were from male students, 1,867 were from female students outside KSU, and 442 responses did not specify their gender or their university. As a result, the study used the responses obtained from the remaining 7,865 questionnaires from KSU female students. Table 3.3 presents the questionnaire responses.

The high responses rate may indicate that Saudi females in higher education are active and enthusiastic and welcome the opportunity to participate in research (see section 1.6.6, Saudi Women in Higher Education). Additionally, the high response rate came from the different methods used to ensure the questionnaire would reach all KSU female students, or at least a large number of them. The methods included sending emails, SMS, posting advertisements, distributing piece of papers containing the questionnaire's link, and placing the questionnaire's link on some colleagues Twitter account; a detailed information of these ways are discussed later in section 3.4.1.1.

Table 3-3 Questionnaire Responses

	Male	Female			Skipped	Total
Gender	1,072	9,842			332	11,246
		↓				
University		KSU		Not KSU	Skipped	
		7,865		1,867	110	
		4,652 (Complete responses)	3,213			

Eliminated responses

Used responses

Also, a total of 52 students participated in the qualitative data collection methods for this study, and some of them participated in two or more methods of data collection. I collected diaries from 39 students, each of them provided me with two-day diaries (one weekday and one weekend day). In addition, I conducted four group interviews,

each consisting of three to five students, and 12 in-depth individual interviews. A summary of the data collection methods is showed in Table 3.4 and a summary of the participants' distribution in different methods is showed in Table 3.5.

Table 3-4 Summary of the Data Collection Methods

Methods		Research Question	Purposes	Method's focuses	Participants
Quantitative	Questionnaire	Question 1	-To provide baseline statistical information. -To reveal broad patterns/trends across populations.	General information about owning and using mobile technology among higher education students.	7,865 participants (representing 31.41% of the female population)
Qualitative	Diary	Question 1+2	-To obtain rich descriptive data in order to facilitate the exploration of the phenomena. -To produce a deeper understanding and insight.	Students' daily practices	39 participants (2-day diaries (a weekday & a weekend day) for each participant)
	Group interviews	Question 2		Students' experiences	4 group interview of 3-5 participants in each 30-40 minutes each
	In-depth interview			Students' experiences	12 participants 30-60 minutes each

Table 3-5 Distribution of the Participants

Method	Participants	Participants Distribution		
Questionnaire (Q)	7,865 students	7,865		
		↓	↓	
Diary (D)	39 students	↓	39	
		↓	↓	↓
Group Interview (GI)	16 students	13	3	↓
		↓	↓	↓
In-depth Interview (II)	12 students	4	3	5
		4 students participate in Q + GI +II	**3 students participate in Q + D + GI + II**	**5 students participate in Q + D + II**

3.4.1 Quantitative Data

The quantitative data for this study was collected through an electronic survey questionnaire using an online survey software, Survey Monkey, (http://www.surveymonkey.com). The survey questionnaire was sought to identify general information about students' practices using mobile technology in higher education in Saudi Arabia. Therefore, it enabled me to infer the general pattern of use to answer **research question 1**.

3.4.1.1 Questionnaire

Survey questionnaires are appropriate when the sample size being studied is relatively large, and the variables being studied are measureable. A questionnaire is a valuable method to gather data from participants who cannot be accessed in any other way (Basit, 2010). What is also advantageous about questionnaires is the relatively short time needed to obtain a great deal of information. Additionally, researchers may feel that the research is ethical because of the distance from the participants. Moreover, the findings could be generalizable, which could enable researchers to make inferences about the wider population with some degree of confidence. However, the findings are largely "superficial" because it is not designed to look at issues in-depth, so it is not appropriate to gather in-depth data about perceptions, feelings and viewpoints (Basit, 2010). Walker (1985, p.91) points out the advantages and disadvantages of questionnaires by stating:

> The questionnaire is like interviewing-by-numbers; and like painting-by-numbers, it suffers from some of the same problems of mass production and lack of interpretive opportunity. On the other hand, it offers considerable advantages in administration. It presents an even stimulus, potentially to large numbers of people simultaneously, and provides the investigator with an easy accumulation of data.

In this study, the questionnaire sought to obtain **general information** such as:

- The percentage of students who have mobile phones and other mobile devices.
- The percentage of students who have access to the Internet regularly.
- The different uses of MT by HE students that can be assigned to two levels: use related to a student's personal life, and use related to a student's study.
- Types of applications used by HE students.
- The amount of time students spent with mobile devices each day.
- The different places in which students often use their mobiles.

The questionnaire (see Appendix D-1) was divided into seven sections to make it manageable and to give participants a break and encourage them to complete it. At the beginning of the questionnaire, clear instructions were given with the typical time to complete it; and the language used was simple with sophisticated terminology avoided. It contained 50 questions that were a combination of different types of

closed-ended questions (Basit, 2010), such as:

- Dichotomous questions that simply required a student to tick one of the two options, such as yes or no questions.
- Multiple choices, single response questions that asked students to choose one of the responses, such as determining age or college of participant.
- Multiple choices, multiple response questions that asked students to choose as many responses as applied.
- Ranking questions that asked students to prioritize their responses in order of importance, such as ranking the most used features in mobile devices.
- Matrix questions that included a number of statements relating to the same question.

At the end of the questionnaire, the participants were asked to participate voluntarily in keeping a diary, group and individual interviews. To do so, they could either provide their contact details or contact the researcher via a provided email (see Chapter IV for more information about the questionnaire).

In order to conduct the survey, I sought permission from KSU administration to send the questionnaire via the KSU email system (as all students are provided with a KSU email) and an SMS to all KSU female students. The KSU administration agreed to circulate an email to all female students (see Appendix C), inviting them to participate in the questionnaire. The email explained the purpose of the study, requested participation and contained a link to the survey, which directed students to the site where the survey was being hosted, at SurveyMonkey. The email was sent to all KSU female students over a period of three weeks during the first semester of the academic year 2014/2015. After two weeks, a reminder email was sent in order to persuade non-respondents to participate. A total of 7,865 responses were returned from female KSU students, with 4,652 responses completing all questions without omission.

In addition, to maximize the responses, I placed advertisements throughout the university campus (see Appendix D-5), and distributed a piece of paper containing the questionnaire's link to students randomly and asked them to voluntary complete it. I received welcoming responses from students so I continued distributing the pieces of paper for three days in different areas of the KSU female campus. Additionally, I had colleagues place the questionnaire's link on their Twitter account as well as send it to their students via SMS and email.

3.4.2 Qualitative Data

Qualitative data for this study was gathered through the use of three types of methods: diaries, group interviews and in-depth interviews. The qualitative methods were sought to obtain **deeper information** from the participants to answer **research questions 1 and 2**.

3.4.2.1 Diary

Diaries were used in the research to obtain detailed information about students' daily practices of mobile technology and where and how they used their mobiles in formal and informal learning. Diaries helped provide a pattern of how students used their mobiles during the day. Diaries can often be better than other methods in obtaining "an accurate daily or even hourly record of the participants' activities" and are especially suited to those who write better than they speak (Basit, 2010, p.146). Ideally, diaries are not used alone, but rather as a supplemental method to quantitative data, providing a rich complement to interviews and a valuable source for triangulating data (Basit, 2010). Initially, the diaries were used in the study to offer an opportunity for participants to record their experiences and to disclose issues for further discussion and investigation in group or individual interviews. Additionally, they were helpful in developing the main questions, as well as the probing questions, for the group and individual interviews.

A distinctive advantage of diaries, among other methods, is the ability to overcome the shortcomings associated with accessing data due to memory problems (Basit, 2010). This means that participants can immediately record their activity; and the time between the occurrence of the sequence of activity and the recording of data is relatively short. Diaries can offer rich depictions of the participants' experiences. Alaszewski (2006, p.33) maintains:

> Diaries provide a rich source of data for researchers who wish to explore the development of an individual life, and the activities and relationships of particular groups in society. The utility of diaries may be restricted by their availability, but it may be possible to minimise such limitations by seeing an individual diarist or group of diarists as typical or representative of wider group. Diaries can be used to access information within a specific society or social group and to explore the relationships between groups and even between cultures.

However, obtaining and analyzing diaries can be time-consuming and, sometimes, it is difficult to obtain as some people might be unwilling to share them (Basit, 2010).

I designed a diary template (see Appendix D-2) to help participants in recording their daily practices and to enhance the quality of the recorded data. The template was divided into two parts to enable participants to record their daily use (day and night). In addition, I informed them that they could provide their contact details, or contact the researcher via a provided email, if they were willing to participate in both the group and individual interviews.

Diaries were collected from 39 female students, who provided their email on the survey and agreed to participate in recording their diary. In addition, they owned and used mobile technology for educational purposes (based on their responses on the questionnaire). Participants were asked to record their daily practices of using mobile

technology for two days - a weekday and a weekend day, after which they submitted their responses electronically by email or by hand, depending on their preference. Having information about students' practices on different days gave insight into their formal and informal practices and also provided information about their experiences that was further investigated in the following methods.

Eight of the participating students in the diary method agreed to be part of the group and in-depth individual interviews. A summary of the participants' distribution is illustrated in Table 3.5.

3.4.2.2 Group Interview

Group interviews were used to explore students' experiences of mobile learning and what they understood about the concept of mobile learning. It was helpful for providing insights into how Saudi higher education students perceive mobile learning.

Group interviews can be used as "an initial stage" for other qualitative methods to raise and explore relevant issues that can be discussed further through in-depth interviews (Ritchie, 2003, p.38). Moreover, it provides participants with a chance to start thinking about the topic to further the discussion in one-to-one interviews. Additionally, it creates an opportunity for participants to discuss their differences and opinions directly and explicitly (Finch and Lewis, 2003). For example, one of the group interviews included students with distinct views; a student with a negative view of mobile learning and other students with a positive view towards mobile learning, which made the discussion rich and led to further information being shared.

The group interview questions (see Appendix D-3) were general questions about the concept of mobile learning. I was focused on the participants' understandings of mobile learning. Probing questions were used to encourage and facilitate the discussion.

I conducted four group interviews with three to five students in each. The participants were from different majors and academic levels. Three group interviews were held with undergraduate students and one group interview with postgraduate students. The group interviews ranged in time between 30 to 40 minutes each. Group interviews were held in a convenient and informal environment on-campus, and refreshments were provided. In addition, I used a digital recorder to review the data and for transcribing the information later, though I took notes to clarify any ambiguity in the transcription, because "using [a] recorder does not eliminate the need for taking notes" (Fraenkel and Wallen, 2009, p.452). The discussions were in Arabic so I translated them to English and a colleague who is fluent in both languages checked the accuracy of my translations.

Seven of the participating students from the group interview method agreed to be part

of the in-depth individual interviews. A summary of the participants' distribution is illustrated in Table 3.5.

3.4.2.3 Interview

Interviews were used to provide in-depth information about topics that had not been clearly identified in other methods. Specifically, the researcher focused on students' personal experiences of mobile learning to enhance the learning process. Additionally, I sought out their opinions of any advantages they experienced and any challenges they encountered in the mobile learning environment. Gaining in-depth information from students facilitated the interpretation of participants' views and helped in analyzing their experiences of mobile learning.

Semi-structured, in-depth interviews were employed as the main method in this study. This type of interview required me to formulate various questions in advance to ask, and to pose some supplementary questions (related to the participants' answers) that were devised during the interview to elicit in-depth responses (Basit, 2010).

Interviews allow the interviewer to ask key questions and do some probing to gain "a deeper and fuller understanding of the participant's meaning" as well as fully explore "all the factors that underpin participants' answers: reasons, feelings, opinions and beliefs" (Legard et al., 2003, p.141). Interviews enable the interviewer to explain questions if the participants have not understood them the first time and allow participants to give detailed descriptions about their own experience in their own words with more time (Basit, 2010). Additionally, it provides a way to gather data from participants who may be poor writers (Basit, 2010).

The interview questions (see Appendix D-4) were open-ended questions and were dependent on the collected data from previous methods. Probing questions were used to encourage the discussion and to cover the research objectives. Some of the questions were similar to the group interviews' questions to allow participants to provide more in-depth explanations.

I conducted 12 one-to-one interviews with Saudi higher education students. The interviews ranged in time between 30 to 60 minutes. I realized that conducting the interview during the middle of the semester might affect the students' studying requirements (such as exams, projects and homework), so I conducted further interviews at the end of the semester.

Similar to the group interview procedure, interviews were held in a convenient and informal environment on-campus and refreshments were provided. Additionally, a digital recorder was used to capture the data accurately and for later transcription, though I took notes to clarify any ambiguity in the transcription. I translated the transcriptions from Arabic to English and a colleague who is fluent in both languages

checked the accuracy of my translations. I shared the Arabic transcription with students to validate their own experiences.

As illustrated in Table 3.5, four of the students that participated in the individual interviews also participated in the questionnaire and group interviews. Three participated in all data collection methods, and five participated in the questionnaire, diary and individual interviews.

3.5 Population and Samples

The population for this study is higher education female students from King Saud University. According to the 2015 statistics from KSU, there are 61,321 students enrolled at KSU of which 36,288 are males and 25,033 are females (KSU-Statistics, 2015). For the quantitative data, a census survey approach was adopted for the survey questionnaire as it was sent to all female students at KSU and I received 7,865 responses representing 31.41% of the female population. For the qualitative data, diaries, group interviews and interviews were collected using purposive (criterion-based) sampling.

On one hand, census approach includes every member of the population in the study and the findings are seen as generalizable. On the other hand, purposive sampling involves choosing sample units with particular features based on discretion, knowledge and experience, in order to enable detailed exploration and understanding of the central themes that will be studied (Ritchie et al., 2003). That means that each member of the population does not have an equal chance of being selected. It is believed that this type of sampling is selective and does not seek to represent the wider population or claim generalization (Basit, 2010).

According to Ritchie et al. (2003, p.97), choosing criteria for a purposive selection of the sample is important and "is influenced by a review of the aims of the study". Given that the population is females at KSU, the purposive sampling had criteria, such as: having and using a mobile technology (based on questionnaire results); and willingness to participate in other methods by giving their email at the end of questionnaire. Also the participants were from different majors and levels of study (undergraduate and postgraduate). This was to ensure that the obtained sample was information-rich and suited the purpose of the study, especially since the sample sizes for diaries, group and individual interviews were much smaller.

3.6 The Role of the Researcher

According to Radnor (2002, p.30), "The researcher is the research instrument who engages in a transactional process, recognizing that the process is ethics-in-action". This is also reflected by the declaration by Legard et al. (2003, p.142) that "qualitative research interviewers are, themselves, research instruments". Accordingly, the

principle of the researcher as a research instrument has a significant implication for the researcher's roles and responsibilities in this study.

In this study, I recognized my role as a qualitative researcher who was responsible for selecting the appropriate methodology for the research questions, designing the data collection tools, collecting and analyzing data, and interpreting findings. In addition, I was aware that as a researcher I needed to adopt different roles at different stages of the research process. For example, the role of interviewer, in group interviews and in-depth interviews, requires a diverse and challenging range of qualities, such as:

- Being **an active listener**; the ability to listen and to hear from the participants during interviews. To illustrate, a researcher should try to "digest and comprehend the participant's answers in order to decide how to probe further" (Legard et al., 2003, p.142).
- Being **a facilitator**, the ability to enable the interviewee to talk about their thoughts, feelings, views and experiences. According to Legard et al. (2003, p.147), the facilitator's role is an active role and not passive as "it does not mean sitting back and just letting the interviewee talk. On the contrary, it means managing the interview process to ensure that the required subjects are covered to the required depth, without influencing the actual views articulated".
- Being **a moderator**, the ability to control the discussion or the argument between the interviewees and bring everyone in. To illustrate, a researcher should "ensure that every participant gets a chance to contribute to the debate. While it is unlikely that each individual will contribute equally, there will at times be a need to exert a degree of restraint or of encouragement, and to [an] extent to 'orchestrate' the flow of contributions" (Finch and Lewis, 2003, p.182).

Additionally, I am considered an 'insider' since I am a lecturer at KSU where this study was conducted and that there are issues of power because of my position as a lecturer at KSU. This position provides me with both advantages and challenges in conducting my study. For instance, some of the advantages of being a lecturer at KSU are:

- A greater chance of support from KSU administration to obtain permission to conduct the study with KSU students.
- An awareness of key locations around campus (where students often meet) to place the advertisements.
- A familiarity with higher education students and with the KSU female campus.
- Easier to arrange for a room on campus to conduct individual and group interviews.

Furthermore, my experiences as a Computer Education lecturer and recent graduate have provided me with an understanding of the student-teacher relationship as well as a familiarity of what higher education students experience and some of their likes and

dislikes. I only teach undergraduate female students from the education department who represent a small group of KSU students. KSU students are used to participating in various studies; and as they receive many emails and papers asking for their participation, they will not fear any repercussions if they decline to participate in this study.

A potential challenge may be conducting a research study with only females as men in higher education may not utilize mobile technology in higher education the same way females do. However, I do not foresee any issues and am comfortable conducting the research with only females.

Another challenge that I may face as a researcher is that, due to my role as a lecturer, I have a familiarity with the material, which may contribute to biases or assumptions while analysing the data. This has been referred to as "researcher reflexivity". According to Radnor (2002, p.30),

> The researcher is bringing to the research and is influenced by informal, personal and tacit theory about education. This has to be recognized and when recognized enhances the whole process of engaging in interpretive research. It becomes a positive aspect in research where the researcher is the research instrument ultimately in control of the research design she/he constructed.

Reflexivity is related to the researcher's effects on the research process and on participants. It was difficult to separate these influences, but I worked towards becoming aware of and understanding them.

Therefore, I recognized my role as an insider and a research instrument and I had regular and detailed discussions with my supervisors as I analysed the data so they could challenge any biases or assumptions in my interpretations.

3.7 Data Analysis

Data Analysis is the process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and recap, and evaluate all the data in a study. Basit (2010, p.160) stated:

> Both quantitative and qualitative data need to be analysed to make sense of the information that they are conveying to us. Quantitative data are seen as offering precision whereas qualitative data are viewed as presenting depth. Both kinds of data are ultimately expected to fulfill our objective of searching for the truth and addressing our research questions.

In this study, quantitative data, collected using questionnaire, were in numeric form

and were analysed by employing descriptive statistics such as percentages, means, and standard deviations in order to describe the participants and provide a summary regarding the percentage of mobile devices' use or those who have access to the internet all the time. To enhance the analysis's accuracy, the SPSS program was used to calculate the frequencies and percentages for each question/statement. The survey data was downloaded from Survey Monkey in an Excel format and then transferred and reformatted into SPSS (sample in Appendix D-8).

Qualitative data collected using diaries, group and individual interviews were organised and analysed using **thematic content analysis**, which involves going through the transcriptions and content line by line, identifying patterns and meanings, and categorizing them into themes that are then given codes to make subsequent analysis easier (Creswell, 2009). According to Boeije (2010, p.76):

> Qualitative analysis is the segmenting of data into relevant categories and the naming of these categories with codes while simultaneously generating the categories from the data. In the reassembling phase the categories are related to one another to generate theoretical understanding of the social phenomenon under study in terms of the research questions.

This method is in-depth, as themes are derived internally from the data and are informed by the key concepts identified in the design of the research aims and questions as well as through a review of the literature. These then are used to develop the conceptual framework for mobile learning.

In this study, to complete the thematic content analysis, I **transcribed** all of the recorded data of the group and individual interviews, translated them from Arabic to English, and sorted them into different files. Then, I **segmented data** into relevant and meaningful parts. This activity included breaking up, separating, and disassembling data into pieces then organizing these pieces into categories or groups depending on their similarities and differences. Categories or groups are then named or coded. Next, I **reassembled** the parts again in order to make sense of the data theoretically. This activity included putting together, recombining and modelling parts by looking for patterns, searching for relationships between parts, and finding explanations for what was observed. Categories or themes were then defined and labelled.

Due to the significant amount of research data compiled, I used a computer-assisted data analysis software. I was eager to utilize computer technology to analyze my research data due to my background in Computer Science. Supporting this method, Barry (1998) stated that using any software can benefit and enrich the analysis process. He indicated that computer-assisted qualitative data analysis software (CAQDAS) might be helpful in assisting automaton and "thus speed up and liven up the coding process"; offering "a formal structure for writing and storing memos to

develop the analysis"; and supporting "more conceptual and theoretical thinking about the data".

I selected the Atlas program to analyze the data (sample in Appendix D-9). It is a multifunctional software system for the development, support, and management of qualitative data analysis projects. I transcribed the group and individual interviews in order to import them into Atlas. However, the software was not used as a replacement for the intellectual role of the researcher. Supporting this view, Spencer et al. (2003, p.127) point out that:

> There are a number of different 'tools' available for analysing qualitative data. Originally these were manual methods but the latter part of the twentieth century saw a rapid growth in computer assisted qualitative data analysis software (CAQDAS). These offer a variety of functions. There is strong advice that these should be seen only as an 'analytic support' to aid the process of analysis and not as a replacement for the intellectual role that is required of the researcher.

Next, I interpreted the data and drew conclusions. I triangulated the methods by using both quantitative and qualitative data. The theme and categories were then used to develop the conceptual framework.

The mobile learning conceptual framework in Saudi higher education passed through many levels of data collection and analysis before being built. **The first level** aimed to explore mobile technology ownership and current uses and practices among students in order to use this information as a base or main foundation for building claims in Chapter V. The detailed results are reported in Chapter IV. Then, **the second level** aimed to explore and analyse mobile learning experiences among students in the Saudi HE context in order to understand and interpret these experiences and to use these understanding and interpretations as rock-solid base for building ML framework in chapter VI. The detailed results are reported in Chapter V. And, **the third level** aimed to build a conceptual framework for mobile learning in Saudi higher education. The findings of the multiple data collection methods that were reported in Chapters IV and V were used and discussed together then analyzed in light of the reviewed literature; they were also compared with the different ML frameworks and models that were discussed in the literature review chapter. Analysing and discussing results from the multiple methods generated three themes that were found useful and used to describe the findings of the study. These themes were then used to formulate a framework for mobile learning in higher education in Saudi context. The detailed results are reported in Chapter VI.

3.8 Issue of Trustworthiness

Educational researchers need to test and assess the quality and rigor of their research. In a research study, there are many issues that need to be taken into consideration.

These include the credibility of the research, triangulation and pilot study. All of these issues were considered in this study.

3.8.1 Credibility: Validity and Reliability

The researcher needs to test and assess the credibility of the research. There are two central concepts used in any discussion of the credibility of scientific research: the reliability of the research's data and methods, and the validity of the research findings (Silverman, 2006). However, Basit (2010) pointed out that these two terms can be ensured in different ways in quantitative and qualitative research.

Validity is concerned with having the appropriate methods, approaches and techniques to measure or describe the phenomena that are being researched (Silverman, 2006; Wisker, 2008; Basit, 2010). Validity in quantitative research could be addressed through "paying meticulous attention to sampling, development of instruments and statistical analyses" (Basit, 2010, p.64). Validity in qualitative research could be addressed through "the honesty, depth, richness and scope of the data achieved [through] the participants approached, and the use of triangulation" (Basit, 2010, p.64).

Reliability deals with replicability, which means that the findings of the research could be replicated if another researcher carried out the same research process with similar participants in a similar context (Silverman, 2006; Basit, 2010; Wisker, 2008). Reliability in quantitative research could be addressed through "the standardization of research instruments, by crosschecking the data, and by using different instruments to examine the same thing" (Basit, 2010, p.69). However, reliability in qualitative research does not seek to duplicate, rather it includes "trustworthiness, honesty, distinctiveness of context, authenticity, comprehensive, detail and depth of response, and significance of the research to the participants" (Basit, 2010, p.70).

In this study, a rigorous data collection procedure was used through multiple data collections methods to increase the credibility of the study. As a primary data collection method, in-depth interviews were used following questionnaires, diaries, and group interviews to allow for deeper investigation of the phenomena. Also, many procedures were taken into account in order to bring credibility to this study. This included:

- Constructing questionnaire questions based on prior literature and the advice of some experts in the field (see Appendix B).
- Describing research strategy and data analysis methods in a detailed manner (Basit, 2010).
- Taking care in designing data collection methods to avoid leading or ambiguous questions, using simple language, and keeping questions succinct. These were done in order to elicit clear responses from participants.

- Using a triangulation technique to collect data. More detailed information about triangulation is presented in section 3.8.2.
- Conducting a pilot study. Reliability and validity were primarily addressed during the pilot study to ensure that data collections methods' questions were appropriate. More detailed information about the pilot study is presented in section 3.8.3.

3.8.2 Triangulation

In this study, triangulation of sources, which means "using a variety of instruments to collect data" (Fraenkel and Wallen, 2009, p.453), were used to enhance both the validity and the reliability of the research (Basit, 2010), as the limitations of one method were complemented by the strengths of the second method (Greene et al., 2005; Biesta, 2012). The results collected using one method could also be illustrated and validated using those obtained through the other method. This ensured that accurate and reliable data was collected to strengthen the validity of the research findings (Biesta, 2012).

In this study, a triangulation technique is applied by gathering data from a large number of participants (through questionnaire) and by supplementing and supporting this data with data gathered from other sources and via other means. For example, if a questionnaire's results indicated the most used applications among students, I would compare that with the other data collection methods (diaries, group interviews and in-depth interviews) and see if these methods revealed the same results.

3.8.3 Pilot Study

The pilot study was undertaken prior to the main study to review the research design and amend the methods as needed in order to enhance the research reliability and validity (Basit, 2010). The pilot study was conducted from August through December 2014.

The pilot study participants were female undergraduate students from the Education College at KSU. They were representative of the research population but did not take part in the main study. The pilot study took 17 weeks and included 13 "stages" of activity as shown in Table 3.6. I initiated the main study before completing all stages of the pilot study (see Figure 3.4).

Table 3-6 Pilot Study Stages

	Stage	Period of time	Activity
Questionnaire		2 months	Design the first draft questionnaire
	1	2 weeks	Judge questionnaire by experts
	2	1 week	Make changes
	3	2 weeks	Pilot questionnaire on students
	4	1 week	Make changes
	Apply questionnaire for main study		
Diary	5	1 week	Design a first draft diary template
	6	2 weeks	Pilot diary (1st draft) on students
	7	1 week	Design a second draft diary template
	8	2 weeks	Pilot diary (2nd draft) on students
	Apply Diary for main study		
Group interview	9	1 week	Prepare group interview questions
	10	1 week	Pilot group interview
	Conduct group interview for main study		
In-depth interview	11	1 week	Prepare in-depth interview questions
	12	1 week	Pilot in-depth interview
	13	1 week	Make changes
	Conduct in-depth interview for main study		

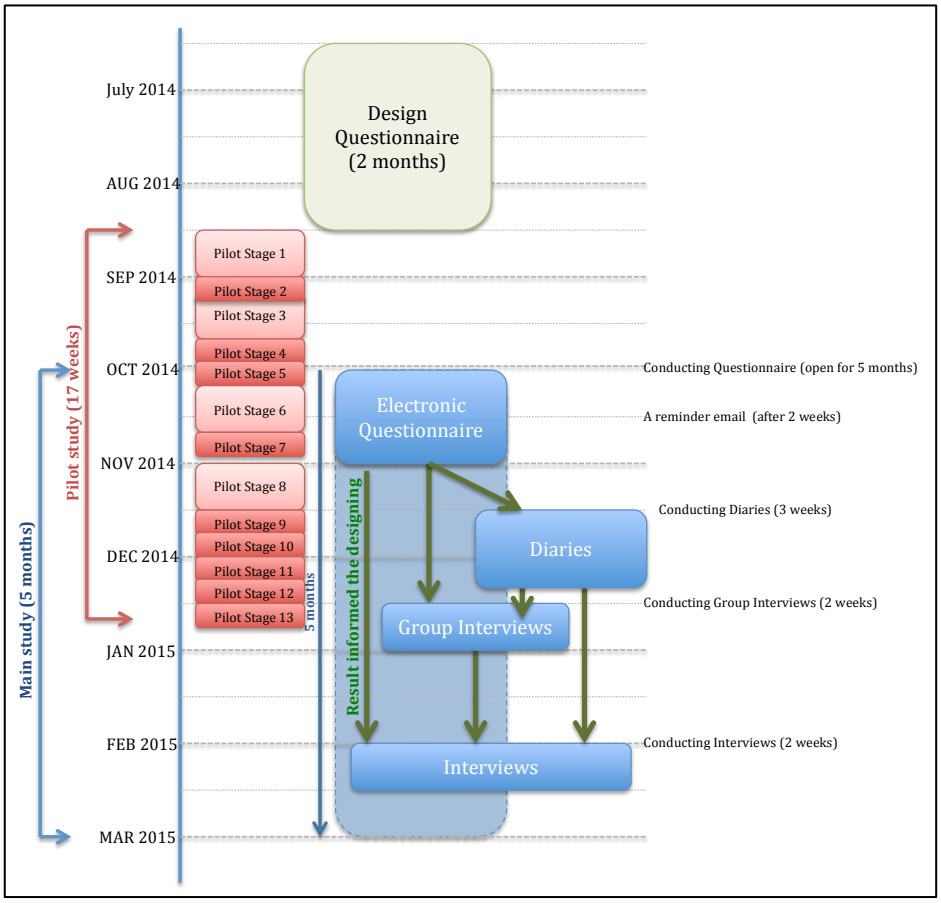

Figure 3-4 The Process of Conducting the Pilot Study and the Main Study Stages

First, I designed the first draft of the questionnaire with the help of research supervisors. In order to determine the validity of the questionnaire, it was E-mailed to twenty faculty members from KSU to assess the questions' relevancy and the survey's design, and to determine if the items would yield the type of information needed. Ten faculty members replied (see Appendix B) and examined the instrument and provided comments and feedback. The research supervisors also reviewed faculty members' comments and provided additional comments. Based on these comments, I made some changes to the questionnaire such as combining two sections, deleting some questions that were not related to the aim of the study, rearranging some questions, and adding some common vocabulary to a few of the questions.

In order to determine the reliability of the questionnaire, a paper questionnaire was piloted twice prior to the distribution of the final questionnaire. There were twelve students in the first pilot, and ten students in the second. The students were representatives of the population. The purpose of the pilot was to check if students had any difficulty responding and to ensure that they understood the instructions, questions and choice of responses. Depending on the students' responses, minor changes were made (such as rewording some questions for clarity and adding more choices to some questions). After that, the final electronic questionnaire was employed for the main study (see Appendix D-1).

Second, I designed a first draft diary template based on the questionnaire's initial results. The template was divided into several parts depending on the mobile devices' features and time of day (morning, afternoon, evening, night). Seven students agreed to contribute their diary records, but only three participants submitted their diaries. I think that the design of the template was too specific because many students' responses were only yes or no, though that was not the goal of using the diary as a data collection method for this study. As a result, I designed another diary template that was more general and open and was simply divided into two parts according to the time of day (day, night). In this stage, ten students agreed to contribute their diary records though only five of submitted their diaries. The second diary template was better than the first one and gave the participants a chance to record their daily uses. After being satisfied with the responses in the diaries, the diary templates were distributed for the main study (see Appendix D-2).

Third, while distributing the diary templates for the main study, I prepared group interview questions based on the literature review, discussions with supervisors and the initial results of the previous methods. Three students agreed to participate in a group interview and in the in-depth interviews. All of the students attended the group interview. I piloted the group interview to check if there were any ambiguities or misleading, inappropriate or redundant questions, as well as to test if the questions were appropriate and achieved the aim of conducting the group interview. The group interview's questions were clear and easily understood by the students. Therefore, I began to conduct the group interviews for the main study before piloting the in-depth

interviews (see Appendix D-3).

Finally, like the group interview questions, the in-depth interview questions were prepared based on a review of the literature, discussions with supervisors and the initial results of the previous methods. The in-depth interviews were held with the same three students who participated in the pilot group interview. A minor change was made to the in-depth interview questions before conducting the in-depth interview for the main study (see Appendix D-4).

Conducting the pilot study afforded me the opportunity to redesign the data collection methods and make appropriate changes to them. In addition, conducting group interviews and in-depth interviews during the pilot study, provided me with the experience needed to conduct the main study. I learned to be an interviewer and an active listener at the same time. I knew how to take the role of the moderator during the group interview and how to encourage the interviewees to talk freely.

In regard to the data collection methods, I examined the four proposed methods: questionnaire, diaries, group interviews and in-depth individual interview. The pilot study enabled me to develop reliable methods for the main study and the pilot results were not considered in the results and discussions.

3.9 Issue of Ethics

This research adhered to the *British Educational Research Association* (BERA) guidelines for educational research (2011) and the University of Brighton's *Guidance and Good Practice in Research Ethics and Governance* (2010).

I received the Ethical Research Approval from the University of Brighton as well as permission to conduct the study from King Saud University (see Appendix C). The School of Education Tier 1 Ethics Scrutiny recommended that the proposal be scrutinized at the Tier 2 Faculty Ethics and Governance Committee, which recommended some minor changes that have been made (see Appendix F).

In a research study, there are many ethical issues that need to be taken into consideration. There are ethical issues concerning research participants, such as gaining access to them, issues of consent, privacy, anonymity, and confidentiality (Basit, 2010), and also the possibility of causing harm or risk. All of these issues were considered in this study.

3.9.1 Access

This involves how to gain access to the sample that is required for the research (Basit, 2010). Being a lecturer at KSU made it easier to garner support from KSU administration to obtain permission to conduct the study with KSU students. This

study was conducted with only female students, because we are in a gender-segregated environment, and as a female, I am able to gain access to any female student willing to voluntarily participate in the study.

3.9.2 Informed Consent

This involves ensuring that participants are aware of the nature and objectives of the research and its consequences, as well as their role in it. They are informed:

- That the research is only for academic purposes and they will be able to see its findings if they wish.
- That their participation is absolutely voluntary and they have the right to withdraw at any time without giving a reason.
- Of the expected time frame to participate in each method.

They were provided with two forms before taking part in this study: A Participant Information Sheet (see Appendix E-1), which provided the participants with information that helped them decide whether they wanted to be involved or not; and a Participant Consent Form (see Appendix E-2) to sign, which included the aim of the study and assured the anonymity and confidentiality of the data.

3.9.3 Privacy, Anonymity and Confidentiality

Respecting participants' privacy, maintaining the confidentiality of their supplied information, and ensuring their anonymity are major issues in research ethics (Basit, 2010; Wisker, 2008; Lewis, 2003). Privacy involves keeping obtained data separate from the participants' name or any other identifiers (Basit, 2010). Anonymity means "the identity of those taking part not being known outside the research team''; and confidentiality means "avoiding the attribution of comments, in reports or presentations, to identified participants" (Lewis, 2003, p.67).

The researcher must consider these issues for data collection and storage. Thus, to maintain anonymity, confidentiality and shield participants' identities I used pseudonyms or numbers to represent the students. Moreover, I obtained their permission to record the discussion of group interviews and interviews on a digital recorder and confirmed that the recording will be kept secure and will only be transcribed by myself. I also reassured them that data will be stored in a password-protected computer and will be destroyed after completion of the study.

However, the data collection methods that are used for this study capture general information about students' uses of mobile technology. Therefore, I am aware that some of the questions could reveal some personal details (number of mobile devices owned, the types, applications used, etc.). Thus, all efforts will be made to anonymize

data.

3.9.4 Harm and Risk

The researcher guaranteed that all efforts would be made so that no participant will be placed in a situation where they might be harmed, physically or psychologically, as a result of their participation. Participants were provided with a contact number that they could use if they felt there were problems.

3.10 Summary

This chapter demonstrates the methodological approach and methods in order to address the research questions and the analyses of data reported in the next chapters.

CHAPTER IV: Mobile Technologies in Higher Education: Ownership and Practices

This study has three main aims (see 1.4 Purpose of the Research), and this chapter explores the first aim, which is about investigating the current ownership and practices of mobile technology by higher education female students in Saudi Arabia.

This chapter presents the results of analysing the quantitative data. The quantitative method of data collection in this study was designed to provide baseline statistical information about students' current ownership and practices of MT and to reveal broad patterns across the population with regard to students' experiences of mobile learning in higher education in Saudi Arabia.

The questionnaire was developed by the researcher and consists of seven sections. The first section asks respondents demographic questions. The second section aims to identify the ownership of mobile phones among university students. Students were then directed to two different sections depending on whether they had or did not have a mobile phone. Students who did not have mobile phone were directed to section 2, part A, which was aimed at determining the reasons behind not having a mobile phone. Students who had a mobile phone were directed to section 2, part B through section 7. These sections asked students about their mobile phone and other mobile devices as well as their current uses of mobile technology, in general. The questionnaire contained a total of 50 questions, however, not all questions were required to be answered. That was because it was designed systematically, so different answers to some questions directed participants to different sections or to different questions in the same section (those questions are in sections 1, 2, 3, and 7). The survey questionnaire instrument can be found in Appendix D-1. Figure 4.1 shows the different sections of the survey questionnaire. Then, the following sections of this chapter report the results of the quantitative method in detail.

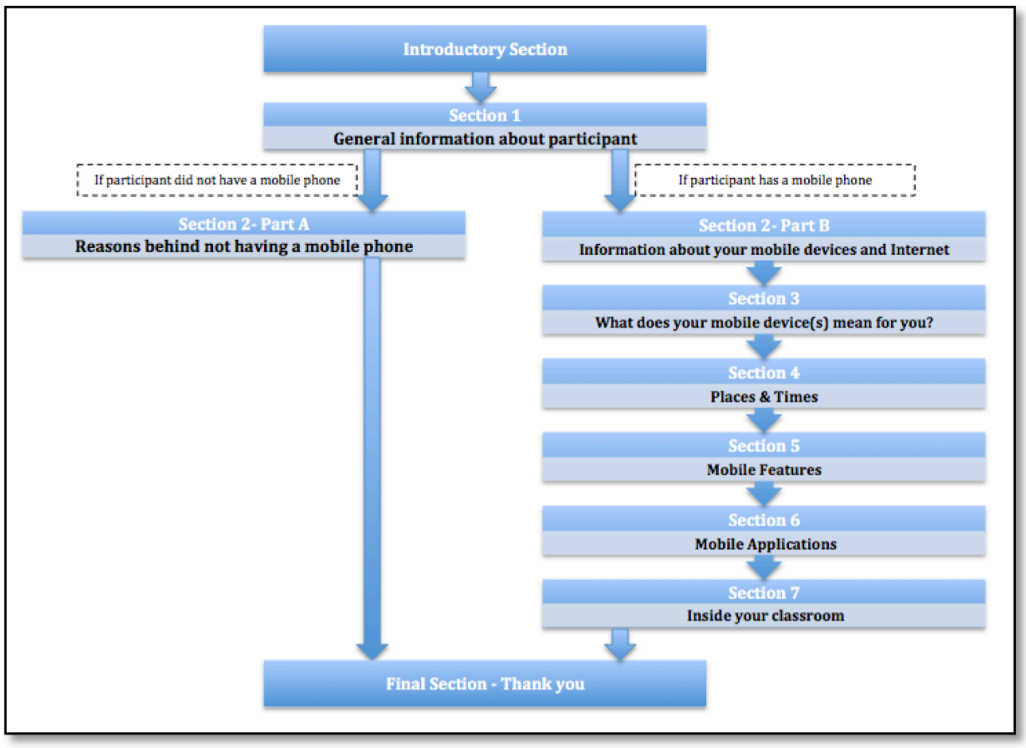

Figure 4-1 The Different Sections of the Survey Questionnaire

4.1 Descriptive Characteristics of HE students

The number of female students at KSU is 25,033 (KSU-Statistics, 2015) and the number of questionnaire respondents was 11,246. But, 3,381 of the responses were eliminated because they were not relevant to the scope of the study since they were male (1,072 responses), females not studying at KSU (1,867 responses), or they did not specify their gender or university (442 responses). Table 4.1 illustrates the questionnaire responses.

Table 4-1 Questionnaire's Responses

	Male	Female			Skipped	Total
Gender	1,072	9,842			332	11,246
		↓				
University		KSU		Not KSU	Skipped	
		7,865		1,867	110	
		4,652 (Complete responses)	3,213			
						Eliminated responses
						Used responses

Thus, the overall responses that were analysed for this study were taken from 7,865 female students at KSU. The overall response rate was approximately 31.41% of the population. The majority of respondents ranged in age from 17 to 24. The mean age was within the age group 17-20, and the median age was within the age group 21-24. Figure 4.2 shows the distribution of respondents by age.

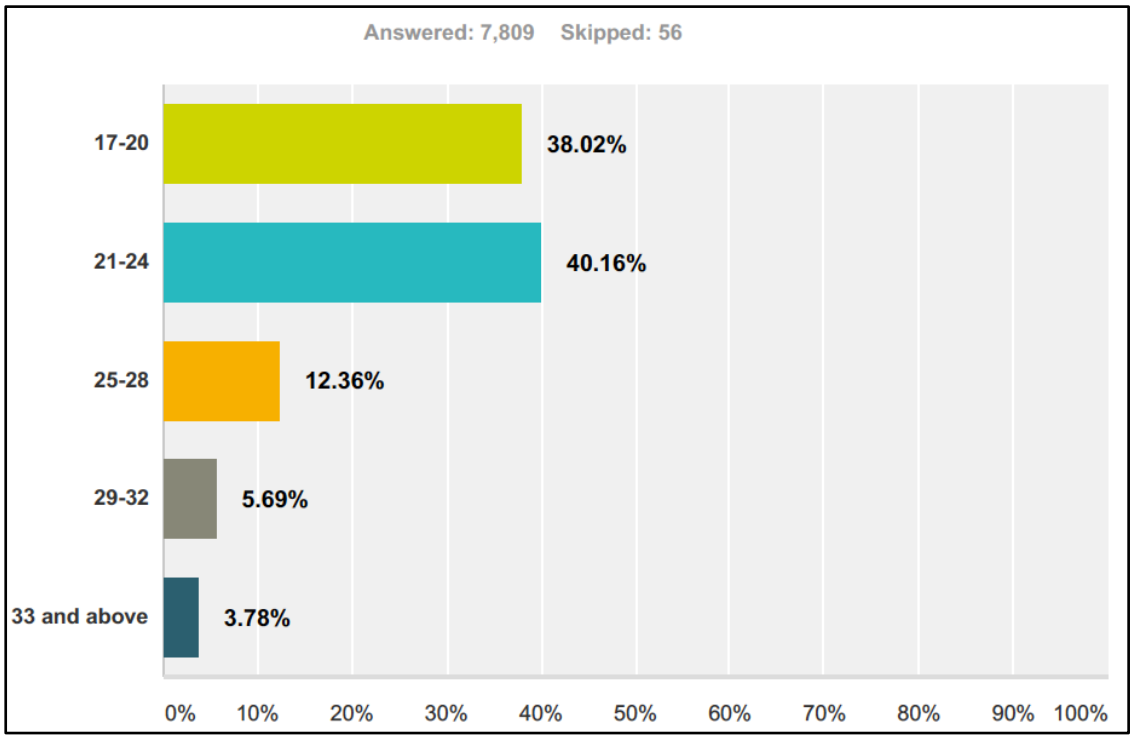

Figure 4-2 Respondents by Age (N=7,865)

As is clear from the above figure, the highest percentage of questionnaire respondents were aged between 21- 24 years old with a percentage of 40.16%, followed by the age group between 17-20 years old with a percentage of 38.02%. The group between 25-28 years old had a 12.36% participation rate. Students aged 33 and above had the least participation with a very low percentage of 3.78%.

Respondents were affiliated with a variety of colleges (major/subject) within KSU and were from different academic levels. The table below (Table 4.2) reports the number of respondents from each college and the current number of female students in each college (the size of college) according to a KSU 2015 statistics report (KSU-Statistics, 2015).

Table 4-2 Respondents by College (N=7,865)

College Type	College	Current number of female students (2015)	Number of respondents	
			Frequency	Percentage
Humanity colleges	Education	**4,114**	1,466	19.56%
	Arts	**4,155**	1,102	14.71%
	Tourism & Antiquities	**98**	15	0.20%
	Sport Science	**0**	0	0 %
	Arabic Language Institute	**38**	9	0.12%
	Teachers Colleges	**0**	0	0 %
	Language & Translation	**1,463**	410	5.47%
	Law & Political Science	**881**	274	3.66%
	Humanity college's total	**10,749**	**3,276**	**43.72%**
Sciences colleges	Business Administration	**2,818**	1,032	13.77%
	Computer & Information Sciences	**1,048**	461	6.15%
	Sciences	**1,738**	637	8.50%
	Food & Agricultural Sciences	**39**	36	0.48%
	Architecture & Planning	**0**	0	0 %
	Engineering	**0**	0	0 %
	Sciences college's total	**5,643**	**2,166**	**28.90%**
Health colleges	College of Medicine	**872**	255	3.40%
	Prince Sultan College for Emergency Medical Services	**0**	0	0 %
	Applied Medical Science	**1,253**	538	7.18%
	Nursing	**294**	84	1.12%
	Dentistry	**277**	122	1.63%
	Pharmacy	**562**	285	3.80%
	Health college's total	**3,258**	**1,284**	**17.13%**
Community colleges	College of Applied Studies and Community Service	**1,889**	135	1.80%
	Riyadh Community College	**0**	0	0 %
	Community college's total	**1,889**	**135**	**1.80%**
Preparatory year		3,494	632	8.43%
Total		**25,033**	7,493	
Skipped		-	372	

The table above reveals that most of the questionnaire respondents were studying in the College of Education with a percentage of 19.56%, while the least number of respondents came from the Arabic Language Institute College with a percentage of 0.12%. The following table (Table 4.3) describes the respondents by their academic levels and the current number of female students in each academic level according to a KSU 2015 statistics report (KSU-Statistics, 2015).

Table 4-3 Respondents by Academic Level (N=7,865)

Academic level	Current number of female students (2015)	Number of respondents	
		Frequency	Percentage
Preparatory year (1st year)	**3,494**	1,004	12.88%
Undergraduate (Bachelor)	**15,616**	5,382	69.07%
Master	**4,005**	1,154	14.81%
PhD	**658**	125	1.60 %
Other (Diploma, High Diploma, Fellowship)	**1,260**	127	1.62%
Total	**25,033**	7,792	
Skipped	**-**	73	

The above table indicates that undergraduate students had the highest percentage of participation in the questionnaire with a percentage of 69.07%, while PhD students had the lowest participation in the questionnaire with a percentage of 1.60%. This might simply be reflective of the number of students enrolled in each academic level, as there are more students enrolled at the undergraduate level then there are PhD students.

A closer look at Table 4.2 and Table 4.3 shows that the questionnaire's respondents were from different colleges and academic levels at KSU. Overall, the questionnaire had a good range/percentage of respondents from the different colleges and academic levels at KSU when we compare the number of respondents from each college and academic level with the current number of female students in each college (the size of college) and in each academic level.

4.2 Mobile Phone Ownership vs. Laptop Ownership

After students answered the demographic questions, they were asked whether or not they owned a laptop and/or mobile phone. Figure 4.3 presents the results.

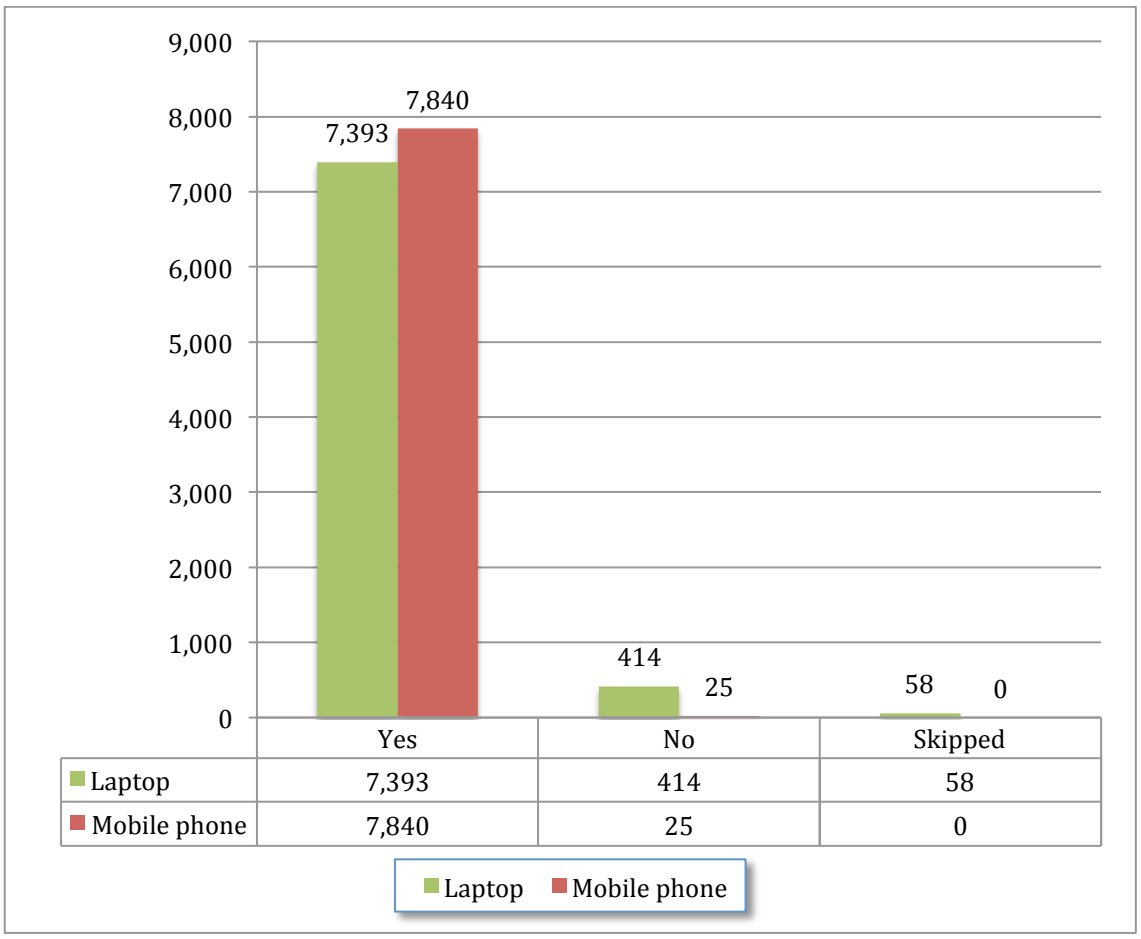

Figure 4-3 Owing Laptop and Mobile Phone

The figure above indicates that most of the respondents have a laptop and mobile phone, with a high percentage of 94.70% that own a laptop and 99.68% that own a mobile phone.

Students who did not have a mobile phone were asked to report reasons why and their answers are reported in section 4.2.1 (reasons behind not having a mobile phone). Students who had a mobile phone were asked more questions about their mobile phone and their current uses of mobile technology in general. Their answers are reported in sections 4.3, 4.4, and 4.5.

4.2.1 Reasons behind not having a mobile phone

Although almost all HE students who responded to the questionnaire had mobile phones, there was a minority of 25 students out of 7,865 students (representing 0.32% of the respondents) that did not have a mobile phone. Students who did not have a mobile phone were given five questions to determine the reasons behind not having a mobile phone and what they do if they need to use a mobile/electronic device. Table 4.4 presents the results.

Table 4-4 Reasons behind not Having a Mobile Phone (N=25)

Questions	Number of respondents	
1- Why you don't have a mobile phone?		
▪ Unnecessary	5	
▪ I can't afford it	1	
▪ I think line phone is enough	2	
▪ I think it is a kind of time waste	1	
▪ I have one but it does not work	2	
▪ Other (specify)	1	
▪ Total respondents	12	
▪ Skipped	13	
2- If you would like to make a voice call, what devices do you use?		
▪ Landline phone	2	
▪ Family mobile phone	7	
▪ Friend's mobile phone	3	
▪ Other (specify)	1	
▪ Total respondents	13	
▪ Skipped	12	
3- If you want to use the Internet (send emails, browse, etc.) for personal purpose, what device do you use? **4- If your courses have homework assignments or study requirements, or you need to contact the university, what device do you use?**		
	Q3	**Q4**
▪ Personal PC	11	11
▪ University Computer pool	1	0
▪ Friend or family mobile phone	1	2
▪ Friend or family mobile device	0	0
▪ I rarely use Internet	0	1
▪ Other (specify)	0	0
▪ Total respondents	13	14
▪ Skipped	12	11
5- To receive regular messages from KSU, what mobile number did you provide them with?		
▪ Friend mobile phone number	4	
▪ Family mobile phone number	4	

▪ None	2
▪ Other (specify)	4
▪ Total respondents	14
▪ Skipped	11

Descriptive analyses in Table 4.4 show that the respondents' reasons behind not having a mobile phone covered all the possibilities mentioned in the questionnaire. Only one respondent had other reasons not mentioned in the questionnaire. That respondent stated that some personal reasons prevented her from having a mobile phone.

For reasons unknown, only half of the students who did not have a mobile phone answered these questions. From these, 13 students reported what they used if they wanted to make a voice call. According to them, they either used a mobile from someone in their family (7 respondents), a friend's mobile phone (3 respondents), a landline phone (2 respondents), or another device (1 respondent). The remaining 12 respondents skipped this question.

Additionally, most of the respondents (11 respondents) who did not have a mobile phone used their personal PC to access the Internet and perform personal tasks (e.g. sending emails, browsing, etc.), as well as to perform educational tasks (e.g. sending homework, other study requirements or to contact the university). Other respondents either used the University computer pool or a family/friend's mobile phone to access the Internet for personal or educational reasons. What is more, none of the respondents picked the choice, "I rarely use the Internet" when asked about what they use if they want to access the Internet for personal purposes.

In the case of students needing to provide the university with a mobile number to receive regular messages from KSU, respondents reported that they provided the university with the mobile number of someone from their family (4 respondents), a friend's mobile number (4 respondents), did not provide any number (2 respondents), or another answer, such as a neighbor's mobile number (4 respondents).

4.3 Information About Students' Mobile Devices and Internet Connectivity

HE students who had a mobile phone were given ten questions about their mobile devices and Internet connectivity. The survey questionnaire showed that 68.02% of the respondents had only one mobile phone (N= 5,159). However, other respondents reported that they owned more than one mobile phone. Figure 4.4 shows a detailed breakdown of the number of mobile phone(s) owned by HE students.

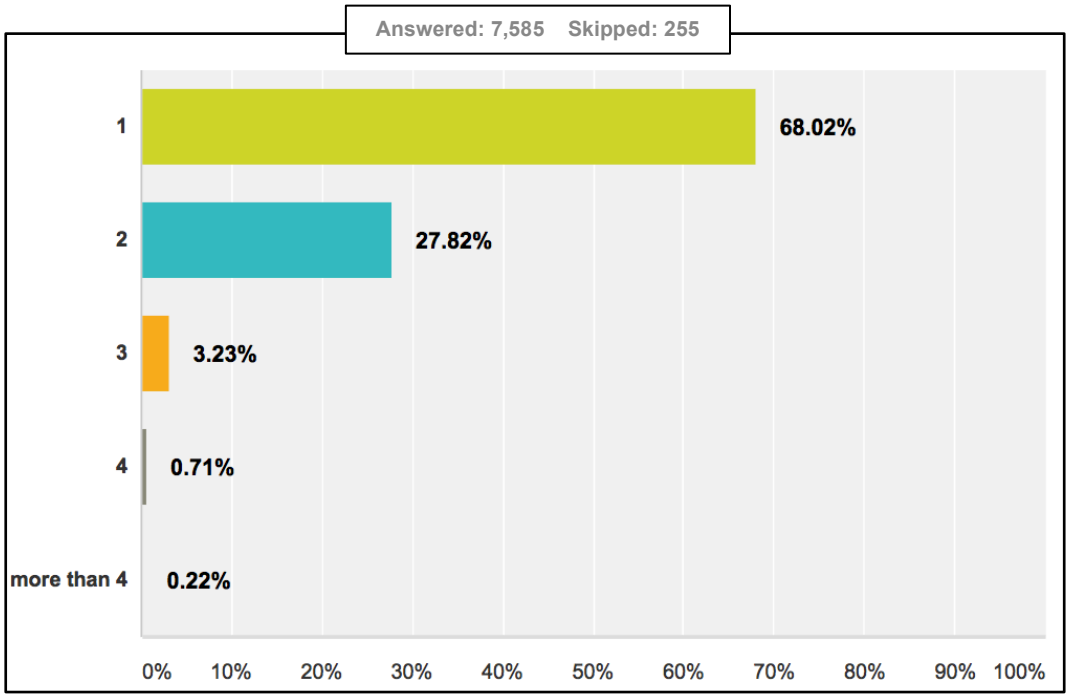

Figure 4-4 Number of Mobile Phone(s) Owned by Students (N=7,840)

Additionally, 68.90% of HE students (N= 5,209) had other mobile devices (one or more) such as tablets (e.g. iPad), PDAs (Personal Digital assistant), E-readers, or iPods; and 31.10% of HE students (N=2,351) did not have any other mobile device. Figure 4.5 shows a detailed breakdown of other mobile devices owned by HE students.

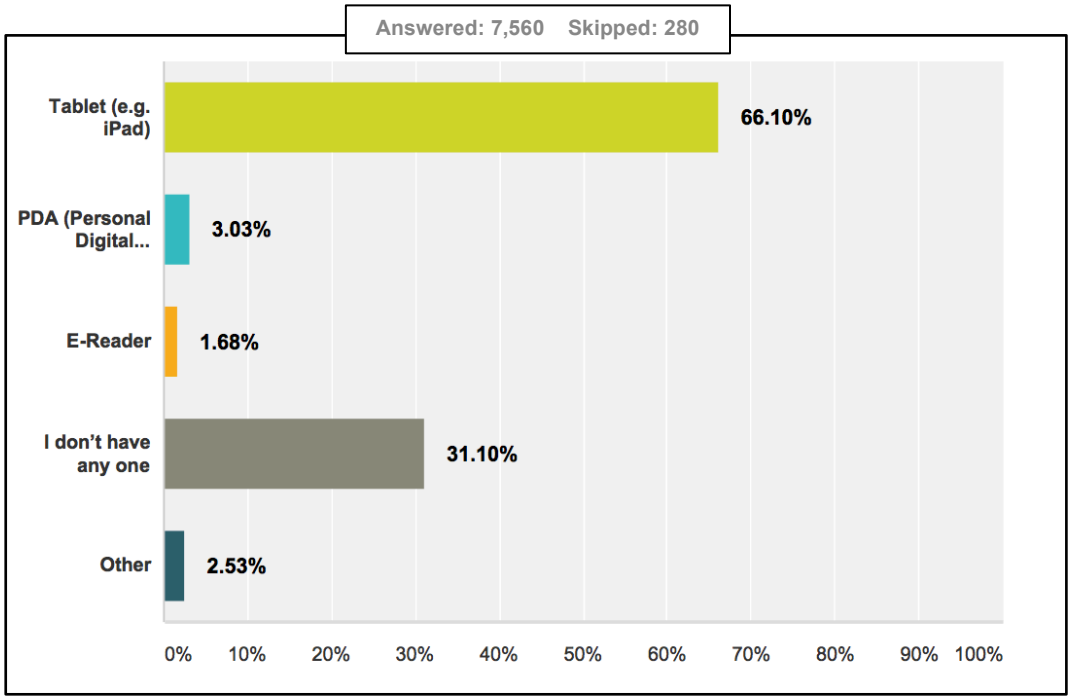

Figure 4-5 Type of Other Mobile Device Owned by Students (N=7,840)

Students were asked about what age they were when they owned their first mobile phone. It was found that 7.19% of respondents got their first mobile phone in elementary school (N=545), 29.66% got one in middle school (N=2,249), 37.39% got

one in high school (N=2,835), 25.76% got one at university (N=1,953), and 258 respondents skipped this question.

The next seven questions of the survey asked HE students about Internet availability and connectivity via mobile phones and devices. The following table presents the results.

Table 4-5 Internet Availability and Connectivity (N=7,840)

Questions	Number of respondents			
	Frequency		Percentage	
1- Do you connect to the Internet via your mobile phone or other mobile devices?				
▪ Yes	7,420		98.21%	
▪ No	135		1.79%	
▪ Total respondents	7,555			
▪ Skipped	285			
2- How often is your mobile phone connected to the Internet?				
3- How often is your other mobile device(s) connected to the Internet?				
	Q2	**Q3**	**Q2**	**Q3**
▪ Always	4,818	3,051	65.86%	42.18%
▪ Most times	2,417	3,009	33.04%	41.60%
▪ Rarely	75	846	1.03%	11.69%
▪ Never	5	328	0.07%	4.53%
▪ Total respondents	7,315	7,234		
▪ Skipped	525	606		
4- What kind of Internet connection do you use?				
▪ WI-FI	5,634		77.02%	
▪ 3G	1,184		16.19%	
▪ Modem (dial-up (cable, DSL, etc.))	287		3.92%	
▪ Broadband	138		1.89%	
▪ I do not know	72		0.98%	
▪ Total respondents	7,315			
▪ Skipped	525			
5- How often do you connect to the Internet?				
▪ Everyday	6,056		83.22%	
▪ Once a day	34		0.47%	
▪ Whenever I need to	1,187		16.31%	
▪ Total respondents	7,277			
▪ Skipped	563			
6- Do you connect to the Internet for free or do you have to pay?				
▪ Free	489		6.69%	
▪ Pay	4,572		62.51%	
▪ Both	2,134		29.18%	
▪ I do not know	119		1.63%	
▪ Total respondents	7,314			
▪ Skipped	526			
7- What kind of Internet connection do you use when you are at university?				
▪ University Wi-Fi	3,117		42.63%	
▪ My own connection	1,727		23.62%	
▪ Both	2,376		32.50%	
▪ I do not know	92		1.26%	
▪ Total respondents	7,311			
▪ Skipped	529			

The survey shows that the majority of respondents, 98.21%, connect to the Internet via a mobile phone or other mobile devices. Only 1.79% of respondents did not connect to the Internet from their mobile phones or other devices. Also, the majority of the questionnaire's respondents used Wi-Fi to connect to the Internet with a

percentage of 77.02%. Other respondents used 3G or broadband to connect to the Internet with percentages of 16.19% and 1.89%, respectively.

In addition, the above percentages reveal that a high percentage, 65.86%, of respondents always connect their mobile phone to the Internet, and 42.18% of respondents always connect their other mobile devices to the Internet. Also, respondents who reported that they rarely connect to the Internet from mobile phones or other mobile devices represented 1.03% and 11.69%, respectively. Only a very low percentage of participants never connected to the Internet from a mobile phone (0.07%) or other mobile device (4.53%).

Table 4.5 also shows that the majority, which represents 83.22% of respondents connect to the Internet everyday, whereas 16.31% of respondents connect to the Internet when they need it. Out of 7,840 respondents, only 34 respondents connect to the Internet one time per day.

What's more, 62.51% of respondents used a paid Internet connection, 6.69% of respondents used a free Internet connection, 29.18% of respondents used both paid and free Internet connections, and 1.63% of respondents did not know what kind of Internet connection they used, whether it was a free or paid connection.

When HE students are inside the university campus, 42.63% of them use the university Wi-Fi Internet connection, while 23.62% of students use their own Internet connection. 32.50% of students used both the university Wi-Fi Internet connection and their own Internet connection. Only 1.26% of students did not know what kind of Internet connection they used while on campus.

4.4 What Do Mobile Phones Means to HE Students

In order to understand what mobile phones mean or represent to HE students, students were asked to indicate all the statements that describe their mobile phone. The results are presented below.

Table 4-6 What Mobile Phone Means for HE Students (N=7,840) (Please tick all that apply)

Statements	Frequency	Percent
Communication device	3,791	52.62%
A window to my Identity (private pictures/ passwords/private info)	3,219	44.68%
Game device	1,347	18.70%
A web browsing device & searching for information	3,878	53.83%
Social media device	4,438	61.60%
Part of my fashion	1,038	14.41%
Essential part of my daily life	5,157	71.59%
Other (specify)	101	1.40%
Total respondents	7,204	
Skipped	636	

The percentages in the above table express what mobile phones mean or represent to students. From these percentages, it can be concluded that, to the majority of respondents', mobile phones are an essential part of their daily life and a social media device. Also, approximately half of the respondents reported that mobile phones represent a communication and web-browsing device. In addition, 101 students, from the 7,840 respondents, described their mobile phones with different statements than those mentioned in the survey. Some examples of statements respondents used to describe their mobile phone included: "a scientific reference", "all my life", "my heart", "my personal assistant: translator, calculator, appointments organizer etc.", "it is like the need for water", "a device to perform the different work that requires the Internet", "my outside brain" and so on.

The next items in this section asked students to report on the kind of information they save on their mobile and what they do if they lose their mobiles or forget them at home. The results are presented in the table below.

Table 4-7 The Kind of Information Saved on HE Students' Mobile Phone and What to do if Forget/Lose Mobile Phone (N=7,840)

Questions	Number of respondents	
	Frequency	Percentage
1- What kind of information do you save on your mobile? (Please tick all that apply)		
▪ Personal information	4,179	58.15%
▪ Personal pictures and videos	4,857	67.58%
▪ Other important information	4,177	58.12%
▪ Non-important information	2,214	30.81%
▪ Non-personal information	2,467	34.33%
▪ Other (specify)	149	2.07%
▪ Total respondents	7,187	
▪ Skipped	653	
2- What do you do if you forget your mobile at home?		
▪ It doesn't matter	722	10.04%
▪ I'll struggle without it	3,694	51.37%
▪ I'll return home to pick it up	2,684	37.32%
▪ Other (specify)	91	1.27%
▪ Total respondents	7,191	
▪ Skipped	649	
3- What would you do if you lose your mobile?		
▪ It doesn't matter (I have another/ I'll buy a new one)	482	6.71%
▪ It will negatively affect me (I don't have another / I can't afford another one)	1,105	15.39%
▪ It doesn't matter (I have a backup of the information/ the information is not important)	690	9.61%
▪ It will negatively affect me (I don't have a backup / the information is important)	4,671	65.05%
▪ Other (specify)	233	3.24%
▪ Total respondents	7,181	
▪ Skipped	659	

Results in the table above, reveal that 58.15% of respondents use their mobiles to save their personal information; 67.58% use them to save personal pictures and videos, and 58.12% use them to save other important information. Additionally, 30.81% of respondents use their mobile phones to save unimportant information, while 34.33% state non-personal information is saved on their mobiles. 2.07% of respondents

reported that they saved different information and materials. They provide a range of items and examples, such as “files for university lectures, educational information, books’ name, homework, papers and articles related to a research, deadlines and exams dates, diaries, poetry, etc.”.

This shows that the most common type of information saved on students' mobile phones are personal pictures and videos followed by personal and other important information. Also, HE students used their mobiles to save different things and materials related to their learning or hobbies.

Additionally, 51.37% of respondents reported that they would struggle without their mobile if they forgot it at home, while 37.32% of respondents reported that they would return home to pick up their mobile if they forgot it. Only 10.04% of respondents who forgot their mobile stated it did not matter for them. 1.27% of respondents gave alternatives for what they would do if they forget their mobile phone at home. Some ways mentioned by respondents included, “I never forgot my mobile”, “It depends on where I am going and when I will be back home”, “It does not matter if I am going out with my family”.

Moreover, Table 4.7 indicates that 65.05% of HE students would be negatively affected if they lost their mobile phone, specifically those who did not have a backup and/or the information was important. 15.39% of students would be negatively affected because they did not have another mobile phone and/or they could not afford a new one. The loss of a mobile phone did not matter to other students because they had another mobile and/or they could buy a new one. This type of student is represented by a percentage of 6.71% of students. The loss of a mobile did not matter for other students, represented by a percentage of 9.61%, because they had a backup of the information and/or the information was not important to them. 3.24% of respondents mentioned other choices such as “I will keep searching for my mobile”, “I will contact the carrier to stop my SIM card”, “I will miss my mobile”, “I really do not know!”, “It is a disaster”, “I will die”, “I will cry all day”, “I will feel completely frustrated”.

HE students were asked about the tendency to replace or not replace their mobile phone and the reasons behind that. It was found that out of 7,840 students, 45.70% replace their mobile phone every three years or more, while 39.04% replace their mobile phones every two years. Only 15.26% of the students replace their mobiles every year and 624 respondents skipped this question.

Students who changed their mobile phone every year or every two years were asked about their reasons for changing their phone. Also, students who kept their mobile phone for three years or more were asked about their reasons behind not changing their phones. The following table presents students’ reasons behind changing or not changing their mobile phone regularly.

Table 4-8 Reason behind Changing or not Mobile Phone Regularly (N=7,840)

Questions	Number of respondents	
	Frequency	Percentage
*** Why do you replace your mobile every year or every two years? (Please tick all that apply)**		
▪ A problem with the old device (damaged/doesn't work/ screen broken, etc.)	2,278	59.05%
▪ New features	2,207	57.21%
▪ Faster	1,022	26.49%
▪ Larger storage capacity	1,132	29.34%
▪ Lighter weight	712	18.46%
▪ A new design	1,595	41.34%
▪ More fashionable	1,081	28.02%
▪ I got it as a present	900	23.33%
▪ Other (specify)	31	0.80%
▪ Total respondents	3,858	
▪ Skipped	3,982	
*** Why don't you replace your mobile every year or every two years? (Please tick all that apply)**		
▪ My mobile is still working	2,516	77.13%
▪ I got used to my mobile	1,615	49.51%
▪ No need for new features	944	28.94%
▪ Out of my budget	704	21.58%
▪ I don't know how to transfer the information and number to a new device	160	4.90%
▪ Other (specify)	57	1.75%
▪ Total respondents	3,262	
▪ Skipped	4,578	

A large percentage of HE students (2,516 respondents) kept the same mobile phone device with them for three years or more, as long as the device was still working. Additionally, a large percentage of students (2,278 respondents) replaced their mobile phones every year or two because of a problem with the old device. Some of the students (57 respondents) stated that they did not want to replace their phones for superficial reasons, but only when necessary.

However, a large percentage of respondents stated that they replaced their mobile device every year or two for different reasons. Some of these reasons could be considered superficial, such as wanting a new design (1,595 respondents), a lighter weight phone (712 respondents), received it as a present (900 respondents), or wanted a more fashionable mobile phone (1,081 respondents).

Other reasons provided could be related more to necessity, such as reasons that emerged through the extensive use of mobile devices and subsequently the need to change the mobile phone device to search for new features (2,207 respondents), larger storage capacity (1,132 respondents), or even to have a faster mobile phone (1,022 respondents). It is obvious that the increased use of mobile phones by HE students makes them more dependent on the devices and increases their need to have more storage and additional features to perform different tasks and activities. Consequently, there has been a transition from mobile phones being replaced for superficial reasons to ones of necessity.

Moreover, Table 4.8 indicates that 49.51% of respondents did not change their mobile every year or two years because they got used to the mobile they had, while 28.94% of respondents thought that there was no need for new features and therefore did not change their mobiles. Money is another reason that students cited for not changing

their mobiles. Budget reasons were represented by a percentage of 21.58%. Only 4.90% of students did not change their mobile phone because they did not know how to transfer the information and numbers to a new device. Other respondents, 1.75% of students, mentioned other reasons behind not changing their mobile every year or two years, such as "I am busy with other important things", "I think it is a waste of money".

Out of these percentages, it was noticed that more than 50% of respondents skipped the question that asked about the reasons behind changing or not changing their mobile phone.

4.5 Current Uses of Mobile Devices

4.5.1 Places and times of use

Respondents were given two questions regarding which places they most often used their mobile devices. The first question asked respondents about the five places they most used their mobile devices. Figure 4.6 presents the results. The second question asked respondents about the places where they are connected to the Internet. Figure 4.7 presents the results.

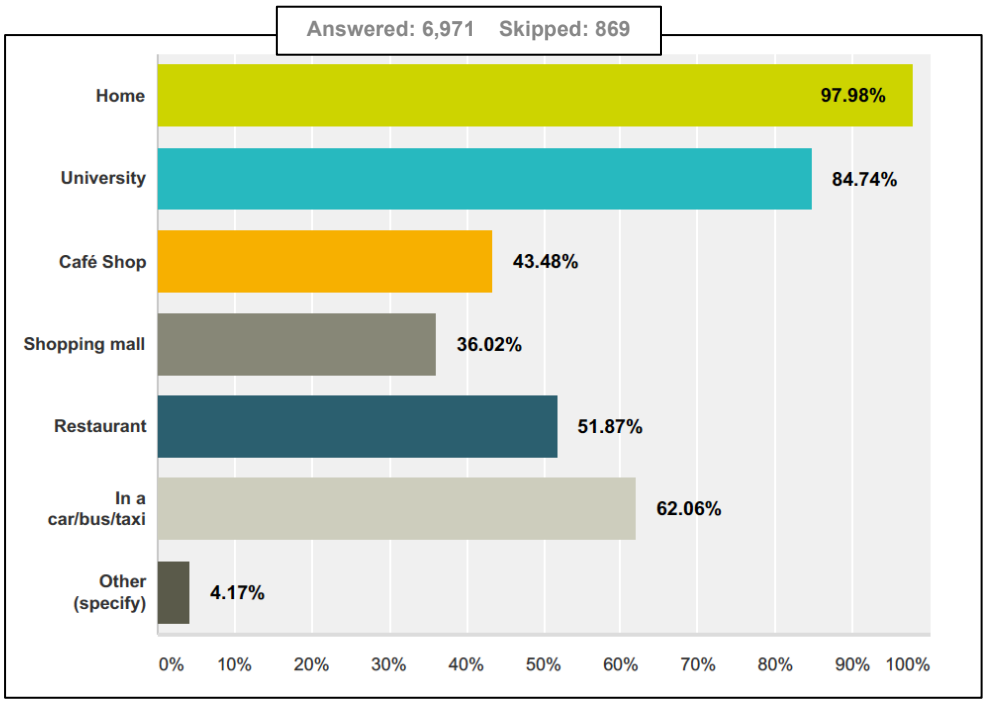

Figure 4-6 Places of Highest Mobile Device Use (N=7,840)

The above figure shows that the five places students most used their mobile devices, sequenced in order, were the following: home (with a percentage of 97.98%), university (with a percentage of 84.74%), car/ bus/taxi (with a percentage of 62.06%), restaurants (with a percentage of 51.87%) and café shops (with a percentage of 43.48%). 36.02% of respondents used their mobile devices in shopping malls. 4.17%

of respondents mentioned other places where they used their mobile device such as the workplace, hospital, etc. 869 respondents skipped this question.

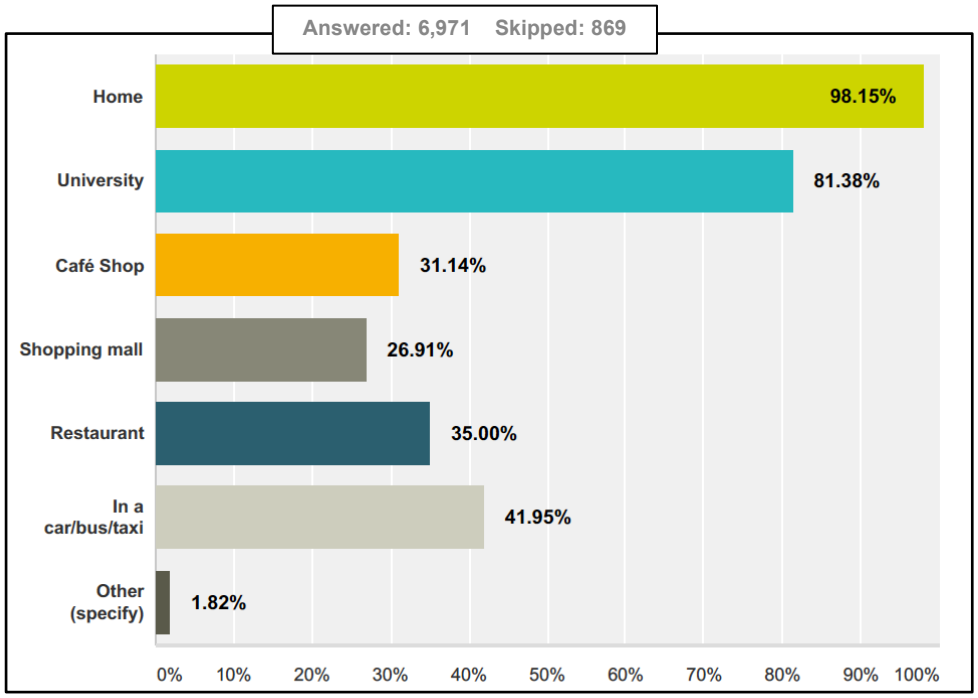

Figure 4-7 Places Most Connected to the Internet (N=7,840)

The percentages in Figure 4.7 show that respondents connect to the Internet from all the places mentioned in the survey. Connecting to the Internet from home represents the highest percentage of 98.15%, whereas connecting to the Internet from a shopping mall represents the lowest percentage of 26.91%. 1.82% of respondents mentioned other places in which they are connected to Internet, such as a friend's house, workplace, hospital, hotel or library. 869 respondents skipped this question.

Out of these percentages, it can be safely concluded that home and university are the most common places to use MT and to connect to the Internet for respondents from King Saud University.

Also, respondents were given three questions about the times in which they use their mobile devices. The following table presents the results.

Table 4-9 Times of Using Mobile Devices (N=7,840)

Questions	Number of respondents	
	Frequency	Percentage
1-When do you use your mobile device the most? (through the day)		
▪ Morning	247	3.55%
▪ Afternoon	121	1.74%
▪ Evening	1,583	22.74%
▪ When I am not busy	3,035	43.60%
▪ All the time	1,975	28.37%
▪ Total respondents	6,961	
▪ Skipped	879	
2-When do you use your mobile device the most? (through the week)		
▪ On the weekdays	1,034	14.95%

▪ On the weekends	1,735	25.08%
▪ Everyday	4,148	59.97%
▪ Total respondents	6,917	
▪ Skipped	923	
3-How long do you think you spend daily on your mobile?		
▪ Less than an hour	114	1.64%
▪ 2-3 hours	1,271	18.31%
▪ 4-6 hours	1,618	23.31%
▪ More than 6 hours	2,612	37.64%
▪ I do not know	1,325	19.09%
▪ Total respondents	6,940	
▪ Skipped	900	

Table 4.9 shows the different times MT is used through the day and week by HE students. The majority of respondents used mobile devices through the day when they were not busy, with a percentage of 43.60%; 28.37% used their mobile all the time; 22.74% used their mobile mostly in the evening; 1.74% used their mobile in the afternoon, and 3.55% used their mobile in the morning. Also, the majority of respondents, 59.97%, used their mobile every day throughout the week, while 25.08% used their mobile on a weekend day, and 14.95% only used their mobile during a weekday.

The above table also shows that respondents spent a large amount of time on their mobile. 37.64% of students used their mobile for more than 6 hours a day. 23.31% of respondents spent 4 - 6 hours a day, whereas 18.31% of students spent 2-3 hours per day on their mobile. Only 1.64% of respondents spent less than one hour on their mobile, while 19.09% of them did not know how many hours they spent on their phone.

Out of these percentages, it can be concluded that a high percentage of respondents used their mobile when they were not busy throughout the day and the majority use their mobile every day of the week. In general, HE students use their mobile phones in different places and at different times throughout the day. Instructors could benefit from the flexibility provided by their students using mobiles to keep in touch with them (e.g. sending SMS, emails, etc.) anytime and anywhere without committing to a specific time or place.

4.5.2 Mobile features' uses

This section asked students to report their use of the different features on their mobile phone and other mobile devices. Students were asked to rank the features from the most used to the least used. Table 4.10 presents the number of respondents who ranked each feature and the percentage of the sample that those respondents represented.

Table 4-10 Ranking Different Features on Mobile Phones and Other Mobile Devices (N=7,840)

Features	Mobile Phone			Other mobile devices		
	Score (9)	Number of respondents	Percentage of respondents	Score (7)	Number of respondents	Percentage of respondents
Voice call	5.53	4,985	99.03%	---	---	---
SMS	3.50	5,002	99.36%	---	---	---
Multimedia	5.41	5,003	99.38%	4.14	4,399	99.48%
Web browser	6.39	5,001	99.34%	6.14	4,402	99.55%
Apps and games	3.10	5,006	99.44%	3.63	4,403	99.57%
Email	3.91	5,007	99.46%	4.09	4,405	99.62%
Work-Organizing tools	3.67	5,016	99.64%	1.72	4,410	99.73%
Location Services	1.70	5,018	99.68%	1.28	4,412	99.77%
Downloading ability	1.86	5,024	99.80%	2.52	4,415	99.84%
Total respondents		5,034			4,422	
Skipped		2,806			3,418	

The table above shows the different mobile features and students' use of these features from the most to the least used one. A closer look at the table indicates that the web browser feature is the most used feature on students' mobile phone, while the location services feature is the least used feature. These features are sequenced according to the following scores: web browser with a score of (6.39), voice calls (5.53), multimedia (5.41), email (3.91), work organization tools (3.67), SMS (3.50), Apps and games (3.10), downloading ability (1.86) and location services (1.70).

Additionally, a closer look to Table 4.10 indicates that the web browser feature is also the most used feature on students' other mobile devices, while the location services feature is also the least used feature. These features are sequenced according to the following scores: web browser with a score of (6.14), multimedia (4.14), email (4.09), Apps and games (3.63), downloading (2.52), work organization tools (1.72) and location services (1.28).

It is clear that HE students use many features on their mobile phones and devices consistently. The most used features among HE students are web browser, email, and multimedia.

The next items on the survey asked students to report their use of mobile phone features for personal or educational reasons. Students were able to respond to the features they believed applied to their prior use of a mobile device (i.e. answer of "yes"). The results indicate that HE students use the different features of their mobile phones and devices for both personal and educational purposes. The web browser feature was the most used feature for both personal and educational purposes (93.73% and 97.51% respectively); while the second most used feature for personal purposes was voice calls (91.48%), and email (96.22%) for educational purposes. Table 4.11 summarizes the percentage of students' use of different mobile features for personal and educational reasons.

Table 4-11 The Percentage of Students' Use of Mobile Features (N=7,840)

Features	Personal uses	Educational uses
Voice call	91.48%	63.19%
SMS	76.11%	56.62%
Multimedia	88.32%	73.11%
Web browser	93.73%	97.51%
Apps and games	64.01%	41.42%
Email	82.01%	96.22%
Work-Organizing tools	81.17%	78.87%
Location Services	68.98%	32.17%
Downloading ability	80.31%	75.89%
Total respondents	4,773	
Skipped	3,067	

4.5.3 Mobile applications' uses

This section asked students about applications that are typically not sold with the mobile device and can be downloaded. Students were asked four questions about the types of applications they had on their mobiles. The table below presents the results.

Table 4-12 Type of Applications on HE Students Mobiles (N=7,840)

Questions	Number of respondents	
	Frequency	Percentage
1- How often do you download an app?		
▪ Many times a day	145	2.94%
▪ Daily	168	3.40%
▪ Weekly	1,318	26.70%
▪ Monthly	1,630	33.02%
▪ Every two months or more	1,597	32.35%
▪ Never	78	1.58%
▪ Total respondents	4,936	
▪ Skipped	2,904	
2- How many apps do you have on your mobile phone?		
▪ Less than 10 apps	1,174	23.89%
▪ 10-20 apps	2,491	50.68%
▪ More than 20	1,250	25.43%
▪ Total respondents	4,915	
▪ Skipped	2,925	
3- Do you have Arabic apps on your mobile phone?		
▪ Yes	4,428	90.55%
▪ No	462	9.45%
▪ Total respondents	4,890	
▪ Skipped	2,950	
4- How many apps on your mobile phone support the Arabic language (written)?		
▪ All	1,308	26.75%
▪ Some	3,384	69.20%
▪ None	198	4.05%
▪ Total respondents	4,890	
▪ Skipped	2,950	

Results in the above table reveal that the majority of the respondents download applications on a monthly basis (33.02%) or every two months or more (32.35%). 26.70% download an app on a weekly basis, while 3.40% of students download an app on a daily basis. Only 1.58% never download any applications. Additionally,

50.68% of the respondents had between 10-20 applications on their mobile phone, while 25.43% of them had more than 20 applications.

The majority of respondents had Arabic applications on their mobile phone; this was represented by a percentage of 90.55%. Only 9.45% of students did not have Arabic applications on their mobile phone. Also, 26.75% of respondents reported that all applications on their mobile support Arabic language, while 69.20% reported that only some of applications on their mobile support the Arabic language. 4.05% of respondents reported that they did not have any applications that support the Arabic language.

The next items on the survey asked students to report whether or not they used some communication applications. The results indicated that students used different communication apps, and the most used applications among students were social media applications, such as Twitter, Snapchat, and Instagram and indirect communication applications, such as WhatsApp. Table 4.13 shows the percentage of usage of different applications by HE students.

Table 4-13 The Level of the Frequent Used Application by HE Students (N=7,840)

Application	Used	Not used
1. Twitter	99.88 %	0.12%
2. WhatsApp	99.86 %	0.14 %
3. Snapchat	78.60 %	21.40 %
4. Skype	38.44 %	61.56 %
5. Instagram	94.92 %	5.08 %
6. Tango	28.19%	71.82 %
7. Facetime	9.48 %	90.52 %
8. Foursquare	16.13 %	83.87 %
9. Kik	39.48 %	60.52 %
10. Keek	16.24 %	83.76 %
11. Path	38.52 %	61.48 %
12. Pinterest	9.63 %	90.37 %
13. Ask.fm	25.79 %	74.21 %
Total respondents	4,982	
Skipped	2,858	

It is clear from these percentages that students are familiar with certain communication applications such as Twitter, WhatsApp, Instagram and Snapchat more than any other application.

4.5.4 Inside classroom uses

This section asked students about their uses of mobile phones and/or other mobile devices inside the classroom.

Firstly, students were asked to report the tools and resources that they used to support their learning (at home, or at university or elsewhere). Students were able to respond to as many of the choices they believed applied to their prior use of tools and resources. Figure 4.8 represents the different tools and resources that students used to support their learning.

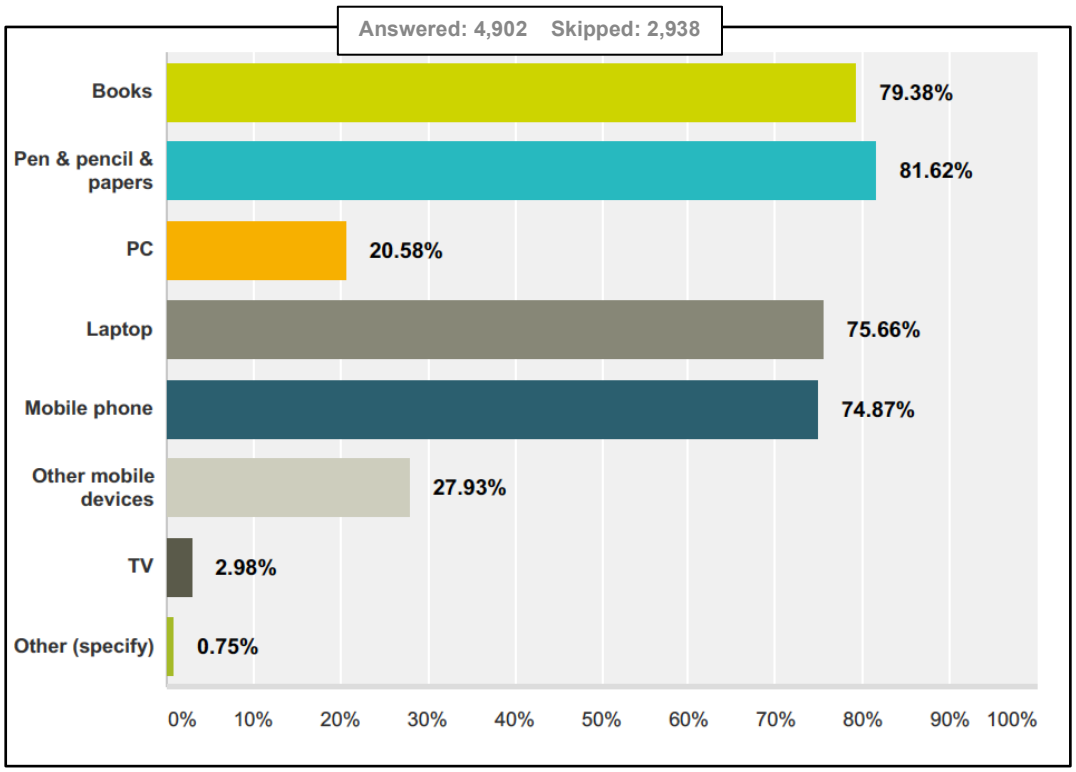

Figure 4-8 The Different Tools and Resources that Students Use to Support their Learning (N=7,840)

It is clear from the above figure that students support their own learning through different resources. For example, they use books, PCs, laptops, mobile phones, other mobile devices, etc. Figure 4.8 shows that students depend on certain resources to support their own learning more than other resources. These resources will be mentioned in sequence according to the percentage of students dependent on it: pen, pencil and paper with a percentage of 81.62%, books (79.38%), laptops (75.66%), mobile phones (74.87%), other mobile devices (27.93%), PCs (20.58%), TVs (2.98%), and other sources mentioned by students (such as friends, white boards, radio, articles and papers, scientific research, etc.) with a percentage of 0.75%.

Students were then given two separate questions about whether instructors allowed, or did not allow, the use of laptops and mobile phone inside the classroom and for what

purpose. Next, students were asked about whether or not they use their mobile phones regardless of the instructors' instructions. Table 4.14 presents the results.

Table 4-14 Students Use of Mobile Technology Inside the Classroom (N=7,840)

Questions	Number of respondents	
	Frequency	Percentage
1- Do your teachers allow you to use your laptop inside the classroom?		
▪ Yes	1,627	33.44%
▪ No	1,005	20.65%
▪ Don't say anything	2,234	45.91%
▪ Total respondents	4,866	
▪ Skipped	2,974	
- If Yes, for what?		
▪ In-class activity	882	22.78%
▪ Searching for class-related information	1,697	43.83%
▪ Looking for something related to the course	648	16.74%
▪ Homework	302	7.80%
▪ Other (specify)	343	8.86%
▪ Total respondents	3,872	
▪ Skipped	3,986	
2- Do your teachers allow you to use your mobile phone inside the classroom?		
▪ Yes	450	9.33%
▪ No	2,357	48.86%
▪ Don't say anything	2,017	41.81%
▪ Total respondents	4,824	
▪ Skipped	3,016	
- If Yes, for what?		
▪ In-class activity	324	13.01%
▪ Searching for class-related information	1,179	47.33%
▪ Looking for something related to the course	719	28.86%
▪ Homework	98	3.93%
▪ Other (specify)	171	6.86%
▪ Total respondents	2,491	
▪ Skipped	5,349	
3- Do you use your mobile phone inside the classroom, regardless of your teacher's instructions?		
▪ Yes	968	20.35%
▪ No	1,794	37.71%
▪ Sometimes	1,995	41.94%
▪ Total respondents	4,757	
▪ Skipped	3,083	
- If Yes or sometimes, for what?		
▪ Voice call	49	1.60%
▪ Texting	214	7.01%
▪ Socializing	1,694	55.47%
▪ Searching for non-class information	296	9.69%
▪ Checking/looking for something	671	21.97%
▪ Other (specify)	130	4.26%
▪ Total respondents	3,054	
▪ Skipped	4,786	

According to respondents, instructors allowed their students to use laptops more than mobile phones inside the classroom. Table 4.14 shows that 33.44% of respondents reported that their instructors allowed them to use laptops inside the classroom, while just 9.33% of respondents reported that their instructors allowed them to use mobile phones inside the classroom. Similarly, 20.65% of respondents reported that their instructors did not allow them to use laptops inside the classroom, while 48.86% of respondents reported that their instructors did not allow them to use mobile phones inside the classroom.

Furthermore, there was no difference between what respondents reported when they were asked if their instructors did not say anything regarding the use of laptops (45.91%) or mobile phone (41.81%) inside the classroom. However, a large percentage of respondents skipped these two questions.

Finally, students were asked to report the ways in which the university could help them in using their mobile in learning. Students were able to respond to as many of the choices as they believed. Students reported that the university could help them in using mobile devices in learning by: recording and watching lectures on mobile devices (64.72%), downloading courses materials on mobile devices (60.28%), integrating mobile learning with traditional learning (45.82%), providing a blackboard on mobiles (44.97%), supporting and encouraging the use of mobile devices for courses (44.34%), providing educational sessions on mobile learning (30.20%), and providing training courses and tutorials about the uses of mobile devices on learning (28.11%). 3,115 respondents skipped this question.

4.6 Summary

This chapter presented the current ownership and practices of mobile technology by higher education students in Saudi Arabia; and, therefore, aimed to answer the first question of this research which was: “What is the current state of mobile technology ownership and use among students in Saudi higher education?”. It also attempted to review the reality, and extent, of using mobile phones in learning in higher education in Saudi Arabia.

The chapter’s results determined that King Saudi university, where this study was conducted, has already largely adopted the new technologies that were considered the backbone of mobile learning. The analysis of quantitative data showed that almost all HE students had mobile phones and it was rare to find a HE student who did not have a mobile phone. Moreover, almost all the HE students who responded to the survey had new models of mobile phones that were equipped with the latest features and were capable of downloading many applications. In addition, a large percentage of students (68.90%) own another MT device such as a PDA, tablet, E-reader, or iPod.

HE students at KSU already use their MT to perform a variety of activities and tasks related to their learning both inside and outside of class, with some instructors allowing, and even encouraging, them to use their MT inside the class. For instance, they used their mobile phones and other mobile devices equipped with an Internet connection to search for information on 'web browsers', find places through 'location services’, download different applications, files and/or other materials, and to access emails and social media networks accounts. In addition, they used their mobiles as a calculator or organizer, and as a place to save personal and non-personal information, for example.

Mobiles and the Internet are essential parts of HE students' lives. Almost all respondents stated they use their mobile everyday of the week and at all times. Moreover, they were dependent on being connected to the Internet to perform their daily practices with MT; therefore, the use of the Internet became a necessity for them. As evidence of this, none of the respondents picked the choice, "I rarely use the Internet" when asked what they use if they want to access the Internet. Also, according to the survey questionnaire's results, a very low percentage of HE students (135 respondents) did not connect to the Internet on their MT devices whereas the majority of students (7,420 respondents) did connect to the Internet on their MT devices.

Most HE students use their MT devices regularly to perform general and educational tasks and activities. In fact, performing general tasks tends to help students gain confidence to use their mobiles for learning. Therefore, MT help students merge the different uses, making it difficult, at times, to distinguish between the purposes of using MT.

HE students use many features on their mobile phones and devices consistently. The most used features among HE students, were the web browser, email, and multimedia, which could be used to serve the practices of mobile learning in HE, especially when they are used for learning purposes. Additionally, a large percentage of HE students are familiar with certain communication applications such as Twitter, WhatsApp, Instagram and Snapchat more than any other application. Therefore, these applications, familiar to most HE students, could be used to support ML practices in HE. However, as patterns of use of particular applications change over time, instructors need to be aware of the purposes and affordances of the applications, in order to adapt to any changing use or fashion in the future.

To conclude, the survey questionnaire results show the widespread use and the ease of use of mobile phones among Saudi students, especially in their learning environments. Therefore, I claimed that the ownership and current uses of MT shows the ubiquitous use of MT generally that makes HE students easily available anywhere anytime, and always connected to the Internet through their MT. Overall, having established statistical data provides me with a clearer picture of the ownership and current uses of MT among the sample population, in general, which in turn creates a chance to explore their ML experiences in more details. The following chapter presents the analysis of ML experiences in Saudi higher education.

CHAPTER V: The Experiences of Mobile Learning in Higher Education

This chapter focuses on exploring and analysing students' experiences of using MT in learning in Saudi higher education, and therefore explores the second aim of this study (see section 1.4).

This chapter presents the results of analysing the three qualitative methods of data collection that were employed; diaries (D), group interviews (GI) and semi-structured in-depth interviews (II). The qualitative methods of data collection in this study were designed to obtain rich descriptive data about students' experiences of using MT in learning, to facilitate the exploration of this practice and to produce a deeper understanding and insight from students with regard to their experiences of mobile learning in higher education in Saudi Arabia.

For the purposes of this study, I collected diaries (D) from 39 students; each of them provided me with a two-day diary (one weekday and one weekend day). In addition, I conducted four group interviews, each consisting of three to five students, and 12 in-depth individual interviews. Table 5.1 presents the pseudonyms of all participating students in the group interviews (GI) and the individual interviews (II) and also illustrates their academic levels and backgrounds. Then, the following sections report the results of the qualitative methods in detail.

Table 5-1 Summary of Participating Students in GI and II and their Backgrounds

Data Collection Methods	Pseudonym	Majors	Academic level
GI1	Samar	Business	Undergraduate
	Manal	Education	Undergraduate
	Ameera	Education	Undergraduate
	Salma (II4)	Education	Undergraduate
GI2	Reem (II6)	Chemistry	Undergraduate
	Abeer (II8)	Chemistry	Undergraduate
	Hanan	Biochemistry	Undergraduate
	Marwa	Sciences	Undergraduate
	Adwa	Biochemistry	Undergraduate
GI3	Mona	Education	Postgraduate
	Nouf	Education	Postgraduate
	Soha	Business	Postgraduate
GI4	Sara (II2)	Physics	Undergraduate
	Wafa (II10)	Physics	Undergraduate
	Farah (II12)	Physics	Undergraduate
	Asma (II11)	Sciences	Undergraduate
II1	Noha	Education	Undergraduate
II2	Sara (GI4)	Physics	Undergraduate
II3	Maha	Pharmacy	Undergraduate
II4	Salma (GI1)	Education	Undergraduate
II5	Halah	Education	Postgraduate
II6	Reem (GI2)	Chemistry	Undergraduate
II7	Amal	Law	Undergraduate

II8	Abeer (GI2)	Chemistry	Undergraduate
II9	Ghada	Business	Undergraduate
II10	Wafa (GI4)	Physics	Undergraduate
II11	Asma (GI4)	Sciences	Undergraduate
II12	Farah (GI4)	Physics	Undergraduate

5.1 Approach to the analysis

The rich amount of data, gathered from participating students, is analysed in this chapter and shows that students' experience of using MT in learning meets the four criteria of Sharples et al. (2007) for developing a theory for mobile learning. Therefore, the four criteria of Sharples et al. (2007) are used in this chapter as initial categories to classify, present and organize data. As discussed in Chapter II, the criteria show the unique properties of ML. Sharples et al. (2007, pp.222-223) state:

> A first step in postulating a theory of mobile learning is to distinguish what is special about mobile learning compared to other types of learning activity. The obvious, yet essential, difference is that it starts from the assumption that learners are continually on the move. We learn across space as we take ideas and learning resources gained in one location and apply or develop them in another. We learn across time, by revisiting knowledge that was gained earlier in a different context, and more broadly, through ideas and strategies gained in early years providing a framework for a lifetime of learning. We move from topic to topic, managing a range of personal learning projects, rather than following a single curriculum. We also move in and out of engagement with technology, for example as we enter and leave cell (mobile) phone coverage… Second, a theory of mobile learning must therefore embrace the considerable learning that occurs outside offices, classrooms and lecture halls… Third, to be of value, a theory of learning must be based on contemporary accounts of practices that enable successful learning. The US National Research Council produced a synthesis of research into educational effectiveness across ages and subject areas (National Research Council, 1999). It concluded that effective learning is: learner centred: it builds on the skills and knowledge of students, enabling them to reason from their own experience; knowledge centred: the curriculum is built from sound foundation of validated knowledge, taught efficiently and with inventive use of concepts and methods; assessment centred: assessment is matched to the ability of the learners, offering diagnosis and formative guidance that builds on success; community centred: successful learners form a mutually promotive community, sharing knowledge and supporting less able students… Lastly, a theory of mobile learning must take account of the ubiquitous use of personal and shared technology.

In the first two criteria, Sharples et al. (2007) consider the factors that distinguish ML from other learning activities, such as learning on the move, learning across spaces, times, topics and technology. They also consider the large amount of learning taking place outside formal learning environments, such as in friends' houses, places of leisure, at home and in cars. Sharples et al. emphasise that learning happens while we are on the move and in informal environments; and that the use of MT generally enables students to shift between physical and virtual spaces, time, formal and informal modes of learning, and cultures. These criteria are a very important category as it describes learners' movements across space, time, culture and modes of learning while using MT. Moreover, the boundaries of these four aspects become permeable. Therefore, I merged the two criteria from Sharples et al. into one large category that describes "mobile learners' movement".

For the third criterion, Sharples et al. (2007) considered that learning was based on practices that have been thought to be successful (in the context of the 21st century). They presented a National Research Council's ideal situation of a contemporary account of learning practices focused on learners, knowledge, assessments, and the community. In this chapter, the third criterion is linked to the real and current experiences of ML in Saudi HE and describes what I observed from students and then presented in the "mobile learners' strategies" category. Therefore, mobile learners' strategies do not necessarily match the ideal contemporary accounts of practices stated by Sharples et al.

In the fourth criterion, Sharples et al. (2007) focus on the ubiquitous use of personal technology. This includes the various personal technologies students have, the personalized services the devices afford, and the ubiquity of using them. This criterion most aptly describes a wide-range of students' uses. Therefore, the category was renamed to "mobile learners' ubiquitous use" and rearranged to be the first category in this chapter.

Presenting the findings within the criteria helped in building the ML conceptual framework later in Chapter VI, though the categories are renamed and their orders are rearranged. Additionally, two criteria are merged together and linked into one category, and the meaning of each category is updated to suit students' current experiences of ML. The following table (Table 5.2) presents the three main categories and the criteria from Sharples et al. that are linked to them. The three categories each branch to include other sub-categories in order to leave space for additional explanations and classifications of collected data, as shown in Table 5.3. Several sub-categories emerged through the use of more than one data collection method, which showed the triangulation of methods as well as the depth of these categories, such as connectivity, personalization, movement across mobile learners' spaces, movement across mobile learners' times, strategies for skills in HE and strategies for building disciplinary knowledge.

Table 5-2 The Main Categories and Sharples et al.'s Criteria

Category	Sharples et al.'s criteria
Mobile learners' ubiquitous use	Criterion 4
Mobile learners' movement: crossing borders of spaces, times, modes of learning, and culture	Criteria 1 & 2
Mobile learners' strategies for achieving learning purposes and goals	Criterion 3

Table 5-3 Categories Developed from Students' Experiences

Category	Data Collection Methods		
	Diaries	Group Interview	Interview
Mobile learners' ubiquitous use			
Connectivity	✓	✓	✓
Personalization	✓	✓	✓
Mobile learners' movement: crossing borders of spaces, times, modes of learning, and cultures			
Movement across mobile learners' spaces	✓	✓	✓
Movement across mobile learners' times	✓	✓	✓
Movement across mobile learners' learning modes	–	✓	✓
Movement between mobile learners' cultural boundaries	–	✓	✓
Mobile learners' strategies for achieving learning purposes and goals			
Strategies for skills in HE	✓	✓	✓
Strategies for building disciplinary knowledge	✓	✓	✓
Strategies for wider learning goals	–	✓	✓

The three main categories of analysis of students' experiences of ML overlap and are connected, so it is difficult at times to distinguish between them. Although they influence each other, they are separated into three different categories to describe in more detail students' experiences of ML as much as possible and to give a clear picture of ML experiences of females in Saudi HE. The following sections present the three main categories in detail.

5.2 Mobile Learners' Ubiquitous Use

"Mobile learners' ubiquitous use" category in this thesis describes the variety of ways HE female students use their personal MT to allow them to always be available and connected (physically, as they move with Internet connected MT, and virtually, as they connect to social media networks (SMN) and the Internet), as well as allow them to personalize their preferences through MT's settings and uses. Ubiquitous use refers to students' ability to be anywhere, anytime, easily available, always connected to the Internet, "always on" with MT, and adjustable for their personal use.

Students in their ubiquitous uses and experiences of ML discovered affordances as well as limitations of their MT that enabled or hindered them in their uses. The following sections discuss the "mobile learners' ubiquitous use" category within two subcategories of connectivity and personalization.

5.2.1 Connectivity

The survey questionnaire (Chapter IV) reveals that almost all of the students who participated in the questionnaire were connected to the Internet through their MT with a percentage of 98.21% representing 7,420 respondents (see Table 4.5 for more information regarding Internet availability and connectivity among participants). Additionally, the survey questionnaire also showed that almost all participants were using SMN sites or applications. To support this, section 4.5.3 reveals that the most used applications among students are SMN applications such as Twitter with a percentage of 99.88% of questionnaire respondents, WhatsApp (99.86%), Instagram (94.92), and Snapchat (78.60%).

Therefore, based on the results from the survey questionnaire, students were asked additional questions in the group and individual interviews to understand why students connect to the Internet and SMNs extensively.

The results are then classified and reported under a 'connectivity' subcategory, where "connectivity" describes learners as always being connected to the Internet and their interaction within their uses. Connectivity enables learners to perform different tasks and use different applications (apps) that require an Internet connection. Learners can connect to the web (general connectivity) or to a learning partner through SMNs (social connectivity). The following sections discuss these two kinds of connectivity: general connectivity and social connectivity.

5.2.1.1 General connectivity

General connectivity describes learners being connected to the Internet in their everyday life. According to the survey questionnaire (Chapter IV), many students' uses and practices of MT relies on being connected to the Internet. For example, section 4.5.2 shows that the most used feature on both students' mobile phones and devices is the 'web browser' feature (see Table 4.10), and it is also the most used feature for personal and educational purposes (see Table 4.11). In addition, section 4.5.2 shows that students use other MT's features that require Internet such as 'email', 'downloading ability' and 'location services'.

Students were then asked deeper questions in the group and individual interviews in order to gather additional details about what they really do when they are connected to the Internet through MT. What was found was that connecting to the Internet meant

a lot to participating students as it made them **feel confident** and enabled them to perform **everyday tasks** and activities to **achieve different purposes**.

Feeling confident

Connecting to the Internet made the students felt confident as it allowed them to do what they want, be available everywhere, feel that they had not missed anything, and that their mobile phone was useful as long as it was connected to the Internet.

Many examples from the collected data show how general connectivity allows students to do what they want and connects them to the world around them, which make them feel confident. For example, Halah (II5) described herself feeling "*self-assured*" when she had an Internet connection on her mobile phone. She stated, "*If I go out without my phone then I either go back to get it or I regret it because I will feel cut off from the world.*" She depends on her mobile to do everything and feels like she could not do anything without her mobile. She mentioned, as an example, that she does not memorize any number, so if she needs to call someone, "*How can I call my mother or the driver? I need to call the driver to ask him to bring the car and to know where the car is exactly*." Similarly, Soha and Mona (GI3) depend on their mobile phones to do everything. Soha reported that in the event she forgets her mobile at home she will return to pick it up; and Mona described her dependence on her mobile phone as "*indispensable*".

Some participating students reported that the Internet connection through MT enables them to be everywhere and available all the time and that make them feel confident. For example, Samar (GI1) felt that the Internet connectivity on her mobile phone allowed her to always be connected and available "*everywhere*" through SMNs. In the same way, Reem (II6) stated, "*I am 'always on' and I use my mobile without intending to.*" What is more, connecting to the Internet through MT makes students feel confident because they feel that nothing has been missed or lost and that their mobile phone is a useful and valuable device. One student felt like something was missing when she was disconnected from the Internet. This was stated clearly by Sara (II2) who said, "*My mobile is useless without an Internet connection*". Reem (GI2) shared similar feelings by describing her mobile phone without Internet as "*totally useless*".

Performing everyday tasks

Connecting to the Internet enables students to perform their daily routines of using MT, such as checking emails and updates on different SMNs accounts, searching for information instantly, checking the weather, downloading and updating applications, communicating with family and friends, listening to music, reading books or articles, or sharing their location.

Checking emails and updates on different SMN accounts was one of the most common daily uses of MT reported by participating students. For example, Halah

(II5) reported that she depends on her mobile to check her email and use SMNs every day. She mentioned the reason behind using MT is because, "*it is faster than doing it with my laptop*", and she needs to check them regularly, especially if she is expecting to receive something related to her learning, such as course requirements from an instructor or to follow up on the progress of a project with group members. Additionally, many other students mentioned in their diaries (D1, D5, D6, D8, D9, D15, D21, 22, D32, D33, D35, D36) that they check their emails from MT many times a day and also send and reply to emails from peers and instructors.

Using SMNs is considered a daily routine of MT use for students as, interestingly, all students who participated in writing in their diaries (N=39 students) reported an extensive use of different SMNs through their MT. Some examples of SMNs used by students include: Instagram, Snapchat, Twitter, Tango, YouTube, FoxTube, Telegram, Facebook, Skype, Tumbler, Path, BBM, Ask, and Keek. They reported many different uses of SMNs such as changing and updating account pictures or status, posting comments, liking posts, following new accounts, checking the latest updates on fashion, keeping up to date with world news, browsing pictures, watching videos, communicating with followers, reading important hash tags, checking Twitter timelines and uploading pictures and videos.

Moreover, diaries gave a picture of the extensive use of MT by participating students and revealed a lot of information about students' daily routines of using MT. Participating students reported in their diaries (on both weekday and weekend diaries) that they use MT to perform sets of everyday tasks on a daily basis or based on their interests, such as searching for information instantly (D9, D15, D35); checking the weather (D3, D8); using, downloading and updating different applications (D5, D8, D15, D16, D32, D36, D39) (e.g. 'Polaris office', 'NumberBook', 'Free-app'); communicating with family and friends through voice calls, SMS, and/or WhatsApp (D1, D4, D6, D9, D10, D11, D13, D14, D15, D16, D21, D22, D23, D25, D26, D27, D28, D30, D31, D32, D33, D34, D36, D37); listening to music (D6, D8, D38); reading books, articles or stories (D4, D15, D17, D30, D34, D39); and sharing their location (D32).

However, some of the students' daily routines of using MT, as reported in their diaries, did not need or depend on being connected to the Internet, such as setting mobile reminders and alarms (D1, D3, D4, D6, D8, D9, D10, D13, D16, D21, D22, D23, D24, D25, D28, D32, D33, D34, D36, D38); checking the time (D4, D8, D11, D15, D16, D21, D38); browsing stored pictures and videos (D4, D11, D25, D28, D36); taking pictures and recording videos (D6, D11, D15, D22, D24, D32, D36); taking notes (D6, D15, D32); and saving new contacts (D15).

Furthermore, some interesting examples that were linked to the use of MT for performing everyday tasks were given by Reem (GI2), Halah (II5) and another student (D24). Reem mentioned the importance of being connected to the Internet to her as a university student and how the Internet is necessary to use the different

applications on her mobile and to do everyday jobs. Reem described her situation without the Internet in an interesting way. She stated, "*Disconnecting from the Internet means disconnecting me from life, and my mobile will be totally useless*". Additionally, Halah and another student (D24) both described themselves as "*addicted*" to using their connected mobile phone.

Achieving different purposes

Connecting to the Internet enables the students to do things they are interested in, or do things that are related to their learning and studying at the university.

On one hand, many participating students reported examples of **MT use that are related to their interests,** such as watching videos on YouTube, listening to music, using SMN for entertainment, looking up information, writing, editing and designing pictures and videos, playing games, and doing things related to their religion.

For example, Wafa (GI4) reported that she used her mobile a lot for entertainment by watching videos on YouTube and listening to music. Amal (II7) also liked to listen to music through her mobile while exercising. She claimed that owning a mobile phone allowed her to dispense with her other devices, such as a watch, camera, DVD, and music player. Additionally, Mona (GI3) uses her iPad for learning and entertainment at the same time. She stated, "*I like to watch historical and documentary films on my iPad, and consider that as learning because I benefit from it and it is also entertaining because I love it*". She uses SMNs for entertainment too, and added:

> *Approximately all the students I know use SMNs as a means of entertainment as I do; and I use Twitter and Instagram the most to learn the latest news about the world around me, but I am not active on SMN as I just browse sites without leaving comments.*

Salma, who participated in both types of interviews (II4, GI1), uses her mobile to do many things that interest her such as cooking. She stated, in her II4, "*I always search for recipes on my mobile and instructions to make some specific dishes through the Google search engine or the 'Cheflr' app*"; ('Cheflr' is an application in the Apple store that allow users to share ingredients, preparation, meals and recipes with others). Another student, (D32), who is also interested in cooking, uses her mobile to search for recipes on Google. Sara (II2) likes writing for pleasure and does that on her mobile, usually between lectures on the university campus. She wrote her diaries and other topics using the 'Notes' application and sometimes sends them to her email (through her mobile) to save them.

Some of the other students (D29, D32 and D35) wrote in their diaries using a set of applications on their mobile phone to edit and design pictures and videos such as the 'PhotoEditor' app. Additionally, Asma (II11) reported that she has many designing applications on her mobile phone and uses YouTube channels to learn how to produce short video clips. In addition, other participating students (D11, D12, D17, D21, D27,

D32, D33, D34, D36) played games on their MT as a means of entertainment. They mentioned some examples of gaming applications such as 'FunRun', 'Farm', 'PAC-Man', 'CandyCrush', 'Minecraft' and 'Minion Rush'. However, Nouf (GI3) linked using MT for entertainment directly with having gaming applications on her MT. She stated, "*I do not use my mobile for entertainment at all. I do not have any games on it because I feel that games are a waste of time*".

Another use of MT that was related to students' personal interests was linked to their religion of Islam. Participating students wrote many uses in their dairies related to their religion, such as: reading, rehearsing, and listening to the Quran (D5, D6, D9, D13, D19, D21, D22, D28, D32, D33, D34, D36, D38, D39) through some apps such as 'Electronic-Quran' app, 'Khitmah' app, 'Mushaf' app, and 'Quran' app; reading daily prayers (day and night prayers) (D15, D24, D32, D33, D34, D38) through some apps such as 'I.adkar' app, and 'Athkar' app; and placing reminders for prayer times (D4, D22) through apps like 'Islamic Finder'.

On the other hand, many participating students reported examples of **using MT for purposes related to their learning and studying at university**, such as searching for information related to their classes, browsing instructor's web sites, communicating with instructors and peers, browsing KSU websites and accounts on SMNs, using MT as a calculator and a translator, and taking pictures for learning purposes.

Diaries revealed a lot of information regarding the use of MT for learning purposes. Participating students reported in their diaries that they used MT to perform sets of tasks that were related to their learning and studying at university such as:

- Searching for information related to university courses on Google (D1, D6);
- Browsing instructors' web sites to download learning materials and lecture slides (D14, D25), to check any announcements about the course (D21, D35, D38), and to review for quizzes and exams (D5, D21);
- Communicating with instructors and peers through email, WhatsApp groups, and/or voice call for different learning purposes. For example, to discuss course requirements and homework (D5, D21, D27, D33, D36), to check the progress of the projects (D1, D6, D8, D14, D21, D26), to receive PowerPoint slides from teachers (D9, D34, D39), and/or to send homework and course requirements (D25, D35, D37, D39);
- Browsing KSU websites and accounts on SMNs, and checking their university email to check grades, updates, announcements about the course and the available workshops at the university (D5, D19, D25, D26, D32, D34);
- Use of MT's calculator to calculate formulas inside the class or while studying at home (D3, D5, D28);

- Use of dictionary and translation apps or sites to look up vocabulary and translate new words while studying (D8, D9, D11, D24, D27, D38);
- Taking pictures for learning purposes, such as taking pictures to add to a university report (D1), taking pictures for instructor's notes on the smart board, rather that writing them down (D6), taking pictures of students' work and projects in 'Zoology lab' (D27), or for homework (D32) to share with family or peers.

Although connectivity through MT allows students to complete their daily routines and many other tasks, students reported some situations in which connectivity was a concern. This is especially true for Salma (II4), who depends on the university Wi-Fi to complete homework and other study requirements. She mentioned that sometimes the university Wi-Fi disconnects suddenly and prevents her from completing her work. Salma stated, as an example, "*My friend and I were deeply engaged in doing our project by following some steps on YouTube, when the university Wi-Fi suddenly disconnected. We were really disappointed*." Also, Amal (II7) was displeased about the Internet disconnecting in general. She stated, "*One of the disadvantages of being connected to the Internet is when you are sending important files and the Internet disconnects without warning and you don't know if the files were sent.*"

5.2.1.2 Social connectivity

Social connectivity describes social interactions with others within the use of MT. Interactions here, occur virtually through different SMNs. The survey questionnaire (Table 4.13) and the previous section of this chapter (section 5.2.1.1) show that using SMNs is very common among HE students at KSU as they use SMNs extensively for different purposes through their MT at different times throughout the day and on different days throughout the week.

Hence, in order to gather more details about what students really do when they use SMNs, they were asked some questions in the group and individual interviews. What was found was that connecting to SMN enables learners to be **connected to the world** around them (e.g. family, friends, knowledge), to be **updated about the news**, and also to be **available all the time**.

Being connected to the world

The collected data shows that Saudi students are connected to the world around them through the use of different SMNs locally, nationally, and internationally for a variety of purposes, such as to gain knowledge and stay connected to family.

Saudi students are connected **locally** because they use SMNs to contact others at a local level, such as their peers, instructors, and university staff. For example, Soha (GI3) stated that she uses her Twitter account to contact instructors and peers. She

mentioned that they always pose questions and discuss them together in an active way. Also, Hanan (GI2) mentioned that she used her Snapchat account sometimes to review for exams with her friend by sharing and exchanging diagrams and pictures while they are each in their own home.

Saudi students are connected **nationally** because they use SMNs to contact people in different cities all over the country. For example, Halah (II5) reported that SMN helped her contact a professor (from Taybah University in the city of Almadinah) that she met at a conference. She stated:

> *Professor Noura has the same research interest as I do and I came across one of her papers that I found related very much to my thesis. I searched many times trying to find the full paper on the Internet but I could not find it. I was disappointed. Then, I searched for her on SMNs, and when I contacted her she replied immediately. That was great! SMNs can help us do anything!*

Saudi students are connected **internationally** because they use SMNs to contact others overseas. For example, one student (D9) wrote in her dairies that she always contacts and connects with her brother, who is studying in America, through Skype on her mobile phone.

Being updated about the news

Many examples from the collected data show that social connectivity enables students to be updated and informed about news that is of interest to them, such as the news of the world, the university, and/or their friends and family.

For example, Reem (II6), Mona (GI3), and another student (D34) reported that they use Twitter on their mobile phones every day as the main way to browse news. According to Reem, "*Twitter summarizes all the news I need to know, and I am an active person on Twitter*", as she posts pictures and videos and comments on others' tweets. Similarly, Mona uses Twitter and Instagram as well to be informed about the latest news worldwide, and a student with (D34) uses Twitter to be updated about the different news she needs, whether it is about her studies or the world in general.

Also, Noha (II1) reported that SMN enables her to stay up to date on university news. She always browses the KSU account on Twitter because it is, in her words, "*very useful*" and benefits her a lot. She mentioned, as an example, that the KSU Twitter account always informs her of different workshops and courses that KSU offers to students and provides links to register for them.

Additionally, Nouf (GI3) mostly uses her SMN accounts to keep up with news of her family members. She reported that she uses SMNs to contact and communicate with her family, and to share personal news, pictures and videos. She considers SMNs as the fastest way to reach her family and for them to keep each other informed about what they are all doing.

Being available all the time

Many of the students who participated in the qualitative methods use SMNs throughout the day and feel that social connectivity makes them available all the time. Moreover, some of them consider their MT to be mainly for socializing. For example, Samar (GI1) stated, "*You will find me everywhere on social media; and if you ask me to describe my mobile I will tell you that my mobile is a tool for social media*". Similarly, Reem and Abeer (GI2) use SMNs extensively and describe their personal MT as a "*social media device*."

Although social connectivity through MT allows students to be connected to the world around them, to be updated about the news, and also to be available all the time, students reported some situations in which connectivity was a concern. This is especially true for Noha (II1), who found that the extensive use of MT led to a loss of face-to-face interactions. Noha stated, "*We lose real interactions as human. When I enter the first lecture of each course everyone is busy using their personal mobiles and there is no place to make new relationships. They are addicted to using mobile devices*."

5.2.2 Personalization

MT devices represent and mean a lot to HE students and that was clear from the results of the survey questionnaire. For example, Table 4.6 presents different statements that participants choose in order to describe their mobile phone. Several other participants (101 from the 7,840 respondents) described their mobile phone by using other personal statements and phrases such as 'all my life', 'my heart', 'my personal assistant: translator, calculator, appointments organizer etc.', 'my outside brain' and so on (see section 4.4). They also typically save personal and important information on their MT (see Table 4.7).

Additionally, the survey questionnaire (Chapter IV) provides me with many insights about students' ability to customize their MT devices as well as their uses. It shows that students customize their MT by using MT at different times (see Table 4.9) and locations (see Figure 4.6) as well as using the different features for different purposes and reasons, depending on their desires and needs (Table 4.11). For example, participating students use their MT almost all the time (28.37%), everyday (59.97%), more than six hours a day (37.64%), and at many different places including home (97.98%), university (84.74%), cafés (43.48%), shopping malls (36.02%), restaurants (51.87%), while commuting (62.06%), and at other places such as hospitals and workplaces (4.17%). Moreover, section 4.5.2 provides more details about the different features and applications of MT that were used by the students, revealing that 5,034 of the participants use several features of MT (Table 4.10). Also, section 4.5.3 provides more details about the numbers and types of applications students downloaded on their MT (Table 4.12).

Therefore, to learn more about how students benefit from their ability to customize and personalize their MT devices, they were asked additional questions in the group and individual interviews. Then, the results were classified and reported under the 'personalization' subcategory. "Personalization" describes learners' ability to customize and personalize their mobile technology devices and their use of these devices to the individual's unique path, interests and needs. Personalization enables learners to perform different tasks and use different applications (apps) depending on their choices and needs. Learners can personalize their profiles and MT devices (personalize the identity), or personalize where, when, why and how they use MT (personalize the use). The following sections discuss these two kinds of personalization: personalize the identity and personalize the use.

5.2.2.1 Personalize the identity

Personalizing the identity describes the ability of learners to make adjustments to their mobile technology **device** and their **profiles** as users, while also being aware of issues of connectivity in the wider society and culture.

Personalizing the device

Personalizing the mobile technology device itself includes, for example, changing the ringtone, mobile theme, background, or using accessories such as covers and headphones to make their MT their own and more personal. For example, Maha (II3) mentioned in her interview that she always carries headphones and cannot use her iPad without them. Additionally, from my own observation during the interviews, many participating students customized their mobile phones by using colorful cases and covers, wired and wireless headphones or earphones, and changed their mobile settings such as ringtones and backgrounds.

Personalizing profiles

Personalizing a profile includes, for example, personalizing personal account settings such as SMN accounts and an email account by using a nickname, following people on social media, adding friends, changing statuses, posting pictures, etc.

The collected data revealed that the students used SMNs throughout the day through their MT. They reported many practices of personalizing their SMN accounts in a way that reflects their identity and suits their needs by, for example, using their real names or nicknames (Manal (GI1)), extending their social networks through following new people, friends, and family in SMNs (D26, D33), making their account private in order to share personal pictures only with family and friends (Nouf, Mona, and Soha (GI3)), changing their account picture (D18, D19, D32), updating their status regularly (D19, D27), changing their bio (D27, D36), or sharing pictures and videos with others by uploading them into an SMN account (D26, D32, D34).

Manal (G11) reported an interesting finding related to personalizing identity. She stated that she likes SMN generally and enjoys communicating with unrelated people while using a fake name. Manal claims that she likes to communicate with unknown people specifically and she uses the 'Catfiz' application because it is not popular and not well-known within her community.

5.2.2.2 Personalize MT use

Personalizing MT use includes affording the learner the choice of **where** (anywhere), **when** (anytime), **why** (for different purposes), and **how** to use MT (individually or within a group to use MT's applications and/or features).

Where & When: Using MT anywhere & anytime

Students have a choice about where and when to use MT. Similar to the survey questionnaire's findings (Chapter IV), the collected data from the qualitative methods shows that the students use MT at different times and locations.

Some of the students use their MT every day of the week at the same level of use, while other students reduce their use at specific times or certain days. For example, one student (D39) reported that she likes doing a quick check on her mobile phone for any updates on SMN accounts, emails, SMS and/or missed calls in the evening every day when she is in her bed, before going to sleep. Similarly, Halah (II5) reported that she checks everything on her mobile before sleeping and when waking up, as a daily routine, because this makes her feel confident and sure that she did not miss anything. In contrast, Salma (II4) reported that she does not use her mobile phone as much at home in the evening or on weekends, as she is busy doing housework like cooking, cleaning the house, washing and ironing clothes.

Also, students use their MT in different locations. For example, one student (D34) reported that she liked to read electronic newspapers in the car on her way back home. Other students, Sara, Wafa, Farah and Asma, four students from GI4, mentioned that they usually use their MT at university, in-between lectures.

Why: Using MT for different purposes

Students choose to use MT for a variety of reasons. Many participating students mentioned that they use MT to perform tasks related to their learning and university studies as well as tasks related to their personal needs.

An example of using MT to perform learning tasks was from Mona (GI3). She uses her mobile phone a lot for learning. She stated, "*I use my mobile in learning, and I use it inside and outside class too. Actually I access the teacher site from my mobile to see homework, projects, lecture slides, and any other announcements from the teacher*." Additionally, Wafa, a science student (II10 and GI4), needs to complete many mathematical formulas so she uses her mobile's calculator a lot.

Abeer (GI2) provided an example of using MT to perform personal tasks. She described how she spent a lot of her time teaching and reviewing with her younger sister. She downloaded an application on her iPad that contained the school's chants, that her sister needed to memorize, and gave it to her sister to practice as much as she wanted. Abeer stated, "*This really saved me some time and also made my sister have fun while memorizing*". Also, Soha (GI3) uses her iPad to make all her travel reservations including airline tickets and hotels via the 'Booking.com' application.

Many other examples of using MT to achieve different purposes and goals are reported in section 5.2.1.1 of this chapter.

How: Using MT's applications and/or features, individually or with a group

Students can choose how to use MT, such as using it alone or within a group, or by choosing a learning resource such as performing different tasks by using MT's applications and/or features.

Many participating students mentioned that they prefer to complete some tasks collaboratively within a group through MT. For example, Farah (GI4 and II12) found that the use of MT generally facilitates group work such as a learning project with peers, as it is difficult at times to find a time that suits all members of the project. She stated, "*We meet and discuss together in WhatsApp groups. We ask questions and answer each other's questions*." Other students prefer to do some tasks and activities by themselves. For example, Soha (G13), a postgraduate student, wants to improve her English language skills. She prefers to do that individually by downloading applications that teach English skills on her mobile phone. She stated, "*I download many apps to learn English as I have a scholarship to the United States next year. I use these apps every day and have noticed some improvements*."

Moreover, many of the students who participated mentioned that they use different features and applications on their MT to perform different tasks and activities. Students reported preferring to use a particular feature and/or application on their MT to perform some everyday tasks. For example, Wafa and Asma, (GI4), reported using their mobile phones a lot to check emails from instructors and peers, as they state it is the fastest and easiest way to do that. Also, Noha (II1) likes to use both SMN applications and the voice call feature as a means of entertainment. She stated, "*I need to take breaks when I study for a long time so I usually use SMNs or call friends to get away from studying*."

Additionally, students varied in their preferences regarding using different features and/or applications on MT to communicate with others. For example, Ameera (GI1) prefers to communicate with family and friends through voice calls and SMS features as well as through the WhatsApp application. She also reported that she prefers to use the WhatsApp application to communicate with peers, but email to communicate with instructors. Salma (GI1) reported that she usually uses the WhatsApp application as the main way to communicate with peers, whereas she prefers to communicate with

her instructors by email, voice call, and/or WhatsApp. Abeer (GI2) also reported that she mainly prefers to use email on her mobile to communicate with instructors and peers rather than sharing her personal mobile number with them because, as she reported, "*My mobile is with me all the time and all the emails are saved on it*". Also, Reem (GI2) reported that she likes to use Twitter for everything, and to use WhatsApp mostly to communicate for learning purposes. She stated, "*I have many university groups on WhatsApp. I have a group for every course this semester and I consider it the main way to communicate with peers and instructors*".

The ability to personalize the use of MT is considered a feature of ML. This was stated clearly by Wafa (GI4):

> *It is fantastic to be able to pick the application that I prefer to do the task that I want. I remember that one time our instructor asked us to draw a mind map for a particular part of the class and we did the same tasks but used different applications on our mobiles.*

To sum up the "mobile learners' ubiquitous use" category, this category disclosed that most of the uses and practices of MT by the HE female students relied on being connected to the Internet and on using SMNs extensively. Also, this category discusses how each student has her own preferences while using MT that differ from other students regarding the time, place, purpose, and even the way of using MT. Therefore, this category describes a wide range of students' ubiquitous uses and practices of their personal MT and so concurs with the fourth criterion of Sharples et al. (2007), as discussed in section 5.1.

The different examples reported under the 'connectivity' and 'personalization' subcategories demonstrate that HE female students benefit from and exploit the affordances of using connected MT to perform and accomplish many different tasks, as well as to facilitate and enhance their learning. Likewise, these examples show that the use of MT in learning helps students to: feel confident, perform everyday tasks, achieve a variety of purposes, be connected to the world (locally, nationally, internationally), be updated about the news, be available all the time, customize the MT's settings and uses, use MT anywhere and anytime, and have different choices of using MT's apps and/or features, alone or within a group.

5.3 Mobile Learners' Movement: Crossing Borders of Space, Time, Modes of Learning, and Culture

The survey questionnaire (Chapter IV) reveals some information about the different places (Figure 4.6) and times (Table 4.9) in which HE students use their MT as well as some tasks and activities students engaged in inside and outside the classroom. For example, section 4.5.4 shows that students use their mobile phones at formal times of learning inside the class to perform both class tasks and non-class tasks (see Table

4.14), including in-class activities (13.01%), searching for class-related information (47.33%), looking for something related to the course (28.86%), and homework (3.93%), as well as for voice calls (1.60%), texting (7.01%), socializing (55.47%), searching for non-class information (9.69%), and checking/looking for something (21.97%).

Based on these general and broad results gathered from the survey questionnaire, students were asked more detailed questions in the group and individual interviews in order to gather more details about the different times, places and learning tasks (formal and informal) students use their MT for.

The information gathered from these interviews revealed that MT enables students to move and cross borders of space, time, modes of learning and culture in order to accomplish their learning needs. The results were then classified and reported under 'mobile learners' movement' category.

The "mobile learners' movement" category in this thesis describes the variety of ways in which HE female students use their MT anytime and anywhere, performing formal and informal learning tasks (different modes of learning), and often crossing cultural boundaries. Students, in their movement and experiences of ML, found some affordances and limitations of their MT that enabled or hindered them in their ubiquitous uses.

The following sections discuss this category within four subcategories of movement across mobile learners' spaces; movement across mobile learners' times; movement across mobile learners' learning modes; and movement between mobile learners' cultures boundaries. These four subcategories are connected and influence each other.

5.3.1 Movement across mobile learners' spaces

"Movement across mobile learners' spaces" describes how the use of MT enables students to be connected and available anywhere: in physical spaces, such as the classroom, home, or car; in virtual spaces, such as SMN sites and apps; or in both, by moving across spaces.

5.3.1.1 Physical spaces

Students reported different physical spaces in which they used their MT, such as **while commuting**, or **inside** and **outside the classroom,** to accomplish learning tasks.

Students use their MT **inside their car**, as they try to benefit from the time they spend commuting to the university campus, since it typically takes a long time to reach the university campus in Riyadh because the city is large and crowded. Additionally,

since women in Saudi Arabia are not permitted to drive and depend on drivers (chauffeured) or male relatives to take them to the university (see section 1.6.3 for more information about Saudi women), they can use their MT for the majority of the drive. For example, Abeer (II8) reported that she always uses her mobile phone on her way to the university. She stated, "*It usually takes an hour to reach my university, so I have gotten used to reviewing for exams on my mobile on my way to the university. I usually access lecture slides from my teacher's site and read them*." Also, Wafa (II10) mentioned that her instructor asked the students to make a mind map for each lesson and she always did her mind maps while commuting by using the 'Simple Mind' app on her mobile phone.

Additionally, students are using their MT **inside the class** to access course materials and information from the web, access the learning management system (LMS) on their mobile devices, look up something they do not know or understand during class, look up information pertinent to the class, look up vocabulary in a dictionary, translate foreign words, or audio record the lecture. For example, Ghada (II9) reported that she uses her mobile phone inside the class to access lecture slides from the instructor's website. She also reported that the instructors themselves sometimes ask students to access a website that is relevant to the class topic from their mobiles. Maha (II3) also uses her mobile phone to access the learning management system (LMS). She stated, "*One of our instructors asked the class to download the 'LMS Mobile' app as we always need to use LMS inside her lectures*". Marwa and Hanan (GI2) reported that they use their mobiles during class to look up something they do not know or understand, such as the definition of a word, so they can keep up with the instructor. Amal (II7) also uses her mobile phone inside the class to do a quick search on Google about information related to the class topic. Mona (GI3) uses her mobile inside the classroom as well, and states, "*I usually use my mobile during a lecture to search for the meaning of difficult vocabulary that I come across; and this helps me to memorize and remember them*". Also, Reem (II6) reported that she uses her mobile phone a lot during class to translate new words as well as to audio record a difficult lecture.

Moreover, students are using their MT **outside the class** as well, such as at home, or inside the university campus to perform some learning tasks that are similar to in-class activities.

For example, Noha (II1) and Sara (II2) reported that they use their mobile while studying and like to study for exams and do homework in a quiet space at their or their family's home. Noha said, "*I keep my mobile close to me while I am studying at home to ask peers and enquire about anything I did not understand*." Sara reported that she keeps her mobile close to her to translate words and to communicate with peers through WhatsApp groups. Also, Wafa (II10) uses her mobile at the university. She described how she and her friends use MT while studying together inside the university campus. She stated, "*We always open educational channels on YouTube on one of the iPads and then discuss it together*."

More examples of the different physical spaces that students use their MT in are discussed in Chapter IV, section 4.5.1 and section 5.2.2.2 of this chapter.

Policies regarding the use of MTs in university formal learning places

According to the survey questionnaire (Chapter IV), participating students reported different responses regarding whether university instructors ban or allow the use of mobile phone and laptops inside their classrooms. Section 4.5.4 shows that respondents reported that instructors allowed them to use their laptops (33.44%) more than mobile phones (9.33%) inside the class, and similarly, that instructors ban students from using their laptops (20.65%) less than they ban mobile phones (48.86%) inside the class. Additionally, most respondents reported that their instructors did not say anything about using or not using laptops (45.91%) or mobile phone (41.81%) inside the classroom (see Table 4.14).

Based on the variety and inconsistency of these results, the results were discussed further in the group and individual interviews in order to determine why the university's instructors vary between allowing and banning the use of MT inside their classes and what the formal policies are of using MT at the university.

The 12 participating students who were interviewed individually were asked about the policies regarding the use of MT on the university campus, in general, and inside the class specifically.

Some of the students who participated, reported that they did not see any formal written policies in place regarding the use of MT on the university campus, but that it is common knowledge among students that taking pictures inside the campus is completely prohibited because there is concern about pictures being taken of other female students, which is not accepted culturally. Noha (II1) said, "*If the security staff see you taking pictures then they might take your mobile away and ask you to sign an agreement with your commitment not to repeat this again*". Sara (II2) stated, "*I think all students respect the rule of not taking picture inside the university and they trust each other not to take picture of others without their permission*."

Students were also asked about the policies regarding the use of MT inside the class. Students stated that each instructor set their own policies regarding the use of MT in the classroom. According to most of the students who participated, instructors vary between allowing students to use MT and even asking them to use it, to not allowing their students use MT at all, or just not saying anything at all about using MT.

On one hand, students reported that they believed that instructors who allowed the use of MT in class thought their students needed to use MT as a study tool. For example, Maha (II3) reported that she always accesses course materials by using 'LMS Mobile' app inside the class through her mobile phone. Ameera and Manal (GI1) reported using their mobile phone inside the class to open a specific video on YouTube that did

not work on the PowerPoint slides prepared by their instructor. Manal (GI1) reported that she uses her mobile phone during the lecture because the instructor sometimes asks them to search instantly for information related to the class. Sara (II2) reported that using MT is a necessity in some classes. She stated:

> *We use our mobile a lot during Chemistry lab to retrieve elements' properties from the 'Periodic table' app. Some instructors ask us to use our phone to retrieve information or to access the E-book, as we do not bring the textbook with us because it is heavy.*

On the other hand, students reported that they believed that instructors who do not allow the use of MT in class thought their students are engaging in other activities unrelated to the class. For example, Noha (II1) thought that some of her class peers used their mobiles inappropriately inside the class and engaged in activities unrelated to the class. She stated, *"I usually put my mobile inside my bag and do not use it, but I notice other students who use their mobiles during some lectures to socialize and text each other."* She added, *"One of our lecturers told us at our first meeting that using mobile devices is totally prohibited. I remember she said she will take off two marks from students who use their mobiles in her class"*. The same point of view was presented by Sara (II2) who said, "*I notice some girls who use SMN during some class*es". Also, Abeer (II8) stated, *"Most instructors who ban the use of mobile phones inside their class think that mobile phones are either not useful inside the class or students will engage in non-class activity so they ask students not to use them"*.

However, other students reported that their instructors do not say anything about using MT inside the class and usually do not mind if they see students use MT. For example, Maha (II3) stated, "*Our instructors generally do not mind if we do or don't use our MTs inside the class*." Sara (II2) stated:

> *I noticed that students' use of MT varied depending on the instructors; if an instructor taught well then students usually focused on her and left their mobiles, but if the opposite, and the instructor cannot explain things clearly or speaks a lot then students tend to use their mobiles.*

Halah (II5) added, "*I cannot function without my mobile. I use it inside the class and check for updates, messages, or emails every ten minutes and that is okay with my instructor*." Furthermore, Amal (II7) stated, "*Our instructors vary between allowing and banning the use of mobile phones inside the class… and even if they ban mobile phones they are not strict in their ban but very lenient*".

5.3.1.2 Virtual spaces

Other than learning in different physical spaces, students also accomplish many learning tasks within virtual spaces. Some of these **virtual spaces are available**

(ready) to use through some applications and websites, while other **virtual spaces are created by students** themselves.

Many of the participating students reported using virtual spaces that are available in some applications and websites to learn something that is of interest to them, such as a new language or something related to their studies. For example, Ameera (GI1) reported that she has an application to learn English that offers virtual rooms for chatting, texting and listening with others. Likewise, Adwa (GI2) develops her English skills by following English people on SMNs and by participating in chat rooms (virtual spaces) on a website that aims to teach English to people from all over the world. She reported that she saved the website address on her mobile phone to access the site in her spare time. Mona (GI3) uses YouTube as a virtual space for studying and learning. She discussed watching videos and following many educational channels for the purpose of learning. Moreover, Maha (I13) reported that she frequently uses 'Khan Academy' website as a virtual learning environment to find videos that explain and clarify specific parts of her courses that she does not understand, as well as find videos that explain other things in different subject areas of interest such as Computer science and Physics.

Furthermore, students create virtual spaces for themselves to keep in touch with family and friends, and do things related to their learning. Some of these virtual spaces are teacher-led spaces and others are student-led spaces.

Some teachers ask students to create a virtual space like a WhatsApp group, for example, for all students in the class to virtually meet and discuss issues related to that class (teacher-led spaces). Halah (II5) reported that her teacher asked them to create a group on 'WhatsApp' and the teacher is a member of the group too. She stated, "*We use the group for educational purposes such as swapping course news, reviewing for an exam, sending deadline reminders, and telling each other what happened if someone is absent or misses class*". Other virtual spaces are student-led spaces as students choose to create them to be in touch with other students in the same course or to be in touch with their family and friends. For example, Sara (II2) reported that they have become used to the university groups and benefit from them a lot, so they always create them even if the instructor does not ask for them.

Generally, students create groups on 'WhatsApp', but, if the app is not available for all, then they use 'Keek', 'BBM', or 'Telegram' (as stated by Sara (II2), Maha (II3), and Adwa (GI2)). Almost all the students who participated mentioned that they benefit from using WhatsApp groups in their learning so they create a group for each course whether the instructor asks for it or not. They use these groups to discuss issues related to the course. For instance, Nouf (GI3) said, "*Currently, we use WhatsApp for everything and we always exchange useful stuff; for example, I sent some research links to my friends through WhatsApp*." In the same way, Noha (II1) reported:

> *We exchange pictures and homework, and have discussions in our WhatsApp group. I always take a picture of the homework that is written on the smart board and then share it with my peers through the group… Almost all group members interact and participate in the discussions, but there are a few students who just browse and take their needs without participating.*

Most students care about being a member in these groups. For example, Reem (II6) stated, "*My mobile was damaged for awhile so I used BBM to communicate with peers but I missed a lot from our WhatsApp group*."

Moreover, many students reported in their diaries (D2, D3, D5, D6, D8, D9, D10, D11, D12, D14, D15, D17, D19, D20, D21, D22, D23, D26, D27, D30, D32, D33, D34, D35, D36, D37) that they have a group on WhatsApp to communicate with family and friends by texting, sending voice recordings, sharing personal pictures and videos, and keeping up with each other's news.

5.3.1.3 Shifting between spaces

In addition to the different physical and virtual spaces that students use their MT in to accomplish learning tasks, MT enables students to shift between physical and virtual spaces.

Students can be in the same physical space (e.g. class) while at the same time in different and multiple virtual spaces, such as being on different SMN apps through their MT, or they can be in different physical spaces (students' homes) but in one virtual space (e.g., WhatsApp group). For example, Sara, Wafa, Farah and Asma, four students from GI4, mentioned an example of how they were in the same physical space but at the same time in different virtual spaces. They reported that they sit together in-between lectures and usually use their mobile phones. Sometimes, unintentionally, the time will pass without them talking to each other as they are busy checking SMNs, browsing university groups, searching for references on Google, or reading a story from MT. Sara and her peers were in the same physical space sitting together in the university campus, but in different virtual spaces on their MT.

Another example of being in different physical spaces, but in one virtual space, was from Hanan (GI2). She mentioned how she studied with her friend for an exam at midnight. Hanan and her friend were in different physical spaces, as each of them was in their own home, but in the same virtual space (Snapchat). She continued, "*It was difficult for us to meet at midnight, so we used Snapchat to share pictures of some diagrams with data on them. We always study and review for exams together by using WhatsApp*".

5.3.2 Movement across mobile learners' times

"Movement across mobile learners' times" describes how the use of MT enables students to be connected and available anytime; at formal learning times, at a time not traditionally used for learning, or at any time they choose throughout the day or week.

5.3.2.1 Formal times of learning

Formal times of learning include using MT for learning during university hours, such as during and between lectures. Some examples of using MT at formal times of learning, during or between lectures, are discussed earlier in section 4.5.4 and section 5.3.1.1.

Also, students reported performing other learning tasks during formal times of learning (classes) such as translation. For example, Marwa, an undergraduate Science student (GI2), reported that she used her mobile phone a lot during classes to translate scientific vocabulary. She continued, *"I translate any new words right away and quickly, and my use of my mobile does not distract me but instead helps me understand what the teacher is talking about to keep up with her while she teaches"*.

5.3.2.2 Informal times of learning

Informal times of learning include using MT for learning on weekday evenings or on weekends, and the pattern of use varies between students. Some examples of using MT at informal times of learning are discussed earlier in section 4.5.1 and section 5.2.2.2

Also, participating students reported many examples of using MT for learning at informal times of learning. For example, Soha (GI3) describes how she uses MT for formal learning, but at a time not traditionally used for learning. She reported that her male instructor wanted to give them an online exam at a time not formally used for learning. She stated:

> *Last week we took an online exam on Blackboard in the evening. I did it from my iPad at my home. And after finishing the exam we discussed it immediately with our male professor on the Blackboard's discussion forums. It was great for me and I liked doing the exam online, but one of the students had a problem with her Internet connection so she did not do well.*

Moreover, Marwa (GI2) reported that she uses her MT to learn new languages on the weekends and weekday evenings. She stated the she is interested in learning other languages and does that by using some applications on her mobile phone such as the 'Duolingo' app. Also, some students reported that they have gotten used to using MT

at specific times through the day, such as every evening before sleep (D39 and Halah (II5)), or while traveling in the car (D34, Wafa (II10), and Asma (II11)).

Furthermore, students' diaries revealed information about MT uses at informal times of learning. Diaries showed that there was an overall reduction in the use of MT over the weekends for some students for a variety of reasons, including being busy with housework (D25), visiting family or going to parties, or shopping (D13, D14, D24, D25, D37); or because the Internet connection at home is limited (D5, D24). Diaries revealed that some students did not use MT a lot on weekday evenings for similar reasons, like helping with housework such as cooking and cleaning (D34), or lack of an Internet connection at home (D16). A few other students reported the opposite, and mentioned many examples of extensive use of MT during the weekends in their diaries, such as using SMN, watching videos, and communicating by voice calls and messages with friends and family (D39, D7).

However, students' diaries were expected to provide a clear picture of students' pattern of use of MT on different days of the week and at different times of the day, in general, but, they did not provide a picture of the pattern of use as expected. Diaries provided a picture of the widespread use of MT generally, and SMNs specifically, by participating students as they used MT extensively throughout the day: day and night, and every day: weekends and weekdays to complete both personal and learning tasks and purposes.

5.3.3 Movement across mobile learners' learning modes

"Movement across mobile learners' learning modes" describes how the use of MT enables students to be able to work individually or within a group, and to perform formal and informal learning tasks and activities. The border between formal and informal modes of learning is permeable and it is difficult at times to distinguish between formal and informal uses of MT.

5.3.3.1 Formal mode of learning

"Formal mode of learning" includes all the tasks that students accomplish with their MT that are facilitated or requested by their instructors, such as downloading a requested application, completing an online exam within a group inside the class, searching and retrieving requested information and videos, and confirming receipt of emails during class.

For example, Hanan (GI2) mentioned an example of a formal learning task requested by her instructor. She stated:

> *Our instructor in the 'Health and Body' course asked us to download an app that measures the distance walked and the number of calories*

burned and she promised to give full marks to the student with the highest averages. So all the students were enthusiastic to get the marks and we all walked a lot and enjoyed that course.

Abeer (II8) reported that her instructor asked them to use their mobile to accomplish an online exam during class time. She stated, "*An instructor divided the students into five groups to do a mock exam online. Each group had to cooperate together and use one device to answer the questions. We enjoyed that and got our marks immediately*."

Salma (GI1) reported that the students in her class always use MT to verify the validity of information as that is requested by their instructor. In the same way, Manal (GI1) reported that her peers always use MT as a learning tool inside the classrooms to complete tasks or retrieve videos. She explained:

One of the instructors asked us to search for information related to the class and also to verify the validity of the information. We worked in groups and used our phones or tablets. And another instructor prepared a video for us but it did not open in her slides so she asked us to open the video from YouTube on our mobiles to see it and then we discussed it together.

Also, Halah (II5) reported that her male instructor asked them to open their emails through their mobile to confirm receiving some important emails during class. She stated, *"The professor sent us an email with homework and papers during his lecture and then he asked us to be sure and confirm that everyone received the email so we checked that on our mobiles [during class]."*

5.3.3.2 Informal mode of learning

"Informal mode of learning" includes all the tasks that students accomplish with their MT that are selected by the students and not requested by the instructor, such as using MT to learn something related to their university studies or based on their interests.

Some of the students who participated reported that they use their MT to accomplish different learning tasks and activities related to their university studies, and that the use of MT is the student's choice. For example, Marwa (GI2) states that she needs to translate many words in order to understand the course and study for it. She stated:

I use my mobile during class for translation. I translate the words that I do not understand immediately during class and I benefit from this because I understand the lecture and know what the teacher is talking about, and at the same time I save time later at home, as translation takes a lot of my time.

Other students reported how they used their MT to accomplish different learning tasks and activities related to their interests, such as learning a new language, learning how to cook or learning how to design video clips.

Learning languages was an interest of many students. For example, Ameera (GI1) reported that her mobile offered her a virtual environment to study what she wanted. She said:

> *I have apps to learn a language. One of them offers virtual rooms to learn the different skills of a language; for example, a room for chatting, a room for texting, and a room for grammar. It is wonderful and I use it a lot.*

Adwa and Marwa (GI2) have an interest in learning languages and depend on applications on their mobiles to learn these languages. Nouf (GI3) also uses applications and SMN to learn a new language. She said, "*I follow many accounts on SMN, especially on Twitter and Instagram, to develop my English language skills*".

Cooking and photography are also of interest to many students. Wafa (GI4) reported that she is responsible for cooking at her home and she enjoys it. She stated:

> *I like cooking and I download many apps to help me cook better and provide the food in good way. I use the 'Cheflr' app a lot, as it provides me with many international recipes and good ideas for catering.*

Also, Sara (GI4) mentioned that she uses her MT device to learn cooking and photography through applications and by browsing websites. Moreover, Asma (II11 and GI4) reported that she likes creating and designing short video clips and she usually uses many applications and watches tutorials on YouTube in order to learn how to do that.

5.3.3.3 Shifting between learning modes

While using MT alone or within a group, students' attentions shift and flow based on personal interest and curiosity, or a commitment to their educational tasks. As a result, it is sometimes difficult to differentiate between formal and informal uses of MT and modes of learning.

Asma (GI4) mentioned an example of moving between formal learning and informal learning with the use of MT and the flow of attention between learning and interests. She mentioned that she usually uses her mobile phone during class for one of her university courses to read from an e-book and also to follow the instructor while she is teaching them (formal mode of learning); at the same time she shifts to using a translation application to translate some English words (informal mode of learning). Moreover, she reported that she reads the e-book at home through her mobile while

studying and doing homework; she also checks her SMN accounts and WhatApp groups for any updates and to communicate with others from time to time while she is reading the e-book (shifting attention from learning to interests).

Another example of moving between formal and informal modes of learning is reported by Soha (GI3). She stated that her instructor asked them to use mobiles to search instantly for information and terminology related to the class topic during class (formal mode of learning). She sometimes audio records the lectures by using her mobile (informal mode of learning) and then listens to them again to take notes for the topics discussed during the class. In this way, Soha moves between learning modes when she uses her MT during class.

5.3.4 Movement between mobile learners' cultural boundaries

"Movement between mobile learners' cultural boundaries" describes how students use MT in a way that enables them to cross cultural boundaries. The movement between cultures draws upon movement between space, time and modes of learning.

Cultural and social regulations in Saudi Arabia create a unique environment for Saudi females to live in and communicate with the world around them. For example, they cannot drive and rely on male relatives or chauffeurs for transportation. They live in a gender-segregated society, so direct interactions between females and males, who are not close relatives or a Mahram (guardian), is not permitted. Moreover, students who are wives and mothers face even more demands on their time with the added responsibility of looking after their house and children (for more details see section 1.6.3).

However, the collected data shows that the use of MT in learning offers females many learning opportunities previously unavailable or culturally unacceptable before, such as communicating with other non-relative males for learning in a way that is accepted culturally. It also offers them a convenient learning environment to save time, although some students raised the issue of privacy and concerns about losing their privacy. These issues are discussed in the following sections.

5.3.4.1 Gender gap

Since using MT in learning offers many learning opportunities for females that were previously unavailable or culturally unacceptable before, it could bridge the gap between females and males in a gender-segregated society. For example, many students reported that MT enables them to discuss and communicate with other non-relative males for purposes related to their learning. This interaction between males and females is seen by others in the community as fine and does not conflict with culture, as communication is virtual and for learning purposes.

Moreover, many students reported that using MT in learning offered suitable and easier ways for them to communicate with their male instructors. Nouf, (GI3) a postgraduate student, stated, "*As a Masters student, many of our instructors are males. So I communicate and contact them through my mobile by calling, emailing, SMS, and WhatsApp messages. It is easy and suits both of us*." Also, Sara (II2), Amal, (II7), and Halah (II5) were all pleased about being able to use their mobiles to communicate with their male supervisor anytime, as it is considered impolite in Saudi to call someone very early or very late. For instance, Halah stated:

> *Using mobiles in learning offers me many services and I mainly communicate with my male supervisor by my mobile either through a phone call, if the time is early enough on the weekdays or by a WhatsApp message if at night or weekends and my supervisor always responds.*

Soha (GI3) also appreciates the ease of communication with male instructors through MT at different times of the day. She added:

> *Not just calling or sending texts. I remember a professor who sent us a video about how to calculate a very complex math formula. He recorded himself while he did it step by step. And he always sends us audio messages through email or WhatsApp to explain things to us. Also, we always have discussions with him on his Twitter account.*

The example above shows that although students and their instructors are in different physical spaces, they are in the same virtual space through the use of applications like WhatsApp (movement across spaces), for example. They also communicate with each other for learning purposes informally (movement across learning modes), and at times not traditionally used for learning (movement across times). They communicate with their male instructor in a way that is culturally accepted (movement between cultural boundaries). Soha's experience of using MT is an example of movement between space, time, modes of learning and cultural boundaries.

5.3.4.2 Females' role

Saudi females who are wives and mothers have the added responsibility of looking after their house and children, so they face more demands on their time.

Participating students found that using MT in learning saves time for females and offers a convenient learning environment for Saudi females who have limited access to transportation; it also facilitates group work, as it is sometimes difficult for group members to meet outside of campus. For example, Mona (GI3) appreciated the time and location flexibility offered by using MT in learning. She stated:

> *WhatsApp groups relieve some of the load of the course's requirements and assists us in doing, for example, work related to our project. As*

> *members of the project, we do not need face-to-face meetings anymore, and now we meet and discuss the progress of our project on WhatsApp and then share the work when it's done through email. So we do not need to be in the university for a long time and that suits me as a mother and saves my time and effort.*

However, Salma (II4) reported that she has many responsibilities and obligations that prevent her from using MT a lot. She stated, "*I am always busy looking after my house, cooking and cleaning so I do not like to use my mobile a lot*."

5.3.4.3 Females' privacy

Saudi females generally care about their privacy and are concerned about exposing their personal picture and information to the public. Sara (GI4) raised these issues and concerns about loss of privacy or information without her consent. She explained, "*I usually do not download or use new applications unless my friends have used it for a long time and the app is generally well-known. This is because I am afraid of losing my personal pictures and information*."

The examples provided above fit the "mobile learners' movement" category and show that HE female students cross different borders and boundaries by using their MT to accomplish and achieve their learning requirements and goals. They use MT anytime and anywhere, moving and shifting between physical and virtual spaces as well as moving across formal learning times, times not traditionally used for learning, and at any time they choose throughout the day or week. They also use their MT individually or within a group in order to perform formal and informal learning tasks and activities, in which the borders between formal and informal learning are permeable and it is difficult to distinguish between formal and informal uses of MT. Moreover, they often move between cultural boundaries, while maintaining their own values and principles, in order to accomplish some learning tasks and overcome any strict boundaries or constrains they come across in their learning. Therefore, this category describes a large amount of formal and informal learning activities and tasks that students perform with their MT while they are on the move and fit the first two criteria of Sharples et al. (2007), as discussed in section 5.1.

The different examples that were reported in this category demonstrate that HE students benefit from and exploit the affordances of MT to perform and accomplish many different tasks as well as to facilitate and enhance their learning. Likewise, these examples show that the use of MT in learning enables students to move across space, time, learning modes and cultural boundaries.

5.4 Mobile Learners' Strategies for Achieving Learning Purposes and Goals

The "mobile learners' strategies" category in this thesis describes the variety of ways HE students use their MT devices to enable them to take control of their learning. Students recognize and use the affordances of MT to achieve their learning purposes and goals. These goals are related to the skills needed to accomplish and succeed in HE, in general, as well as in different subject areas, and in other aspects of their life.

Students, in their experiences of using MT to achieve learning purposes and goals, found some affordances and limitations of their MT that enabled or hindered them in their ubiquitous uses. The following sections discuss the "mobile learners' strategies" category within three subcategories of strategies for acquiring skills in HE; strategies for building disciplinary knowledge; and strategies for wider learning goals.

5.4.1 Strategies for acquiring skills in HE

"Strategies for acquiring skills in HE" include different strategies students use their MT for, in order to accomplish the skills needed to succeed in HE, in general. For example, students need to be able to communicate with other people within the university. They need to be able to work in groups and collaborate seamlessly in both physical and virtual spaces, with real and virtual partners. Also, they are expected to possess the ability to manage and organize their time and various tasks. Additionally, they need to be aware of effective ways to gather information on timetables for their courses, lecture locations and times from an app or from a website, for example.

Students benefit from the different characteristics, features and applications of their mobiles and use them in a way that puts them in control of the different tasks and activities **that serve their needs with regard to studying at university**, such as communication skills, group work skills, organization and management skills, and general study skills required in HE.

5.4.1.1 Communication skills in HE

Communication skills include using the affordances of MT to communicate and contact others within the university such as staff, instructors, and peers. The data collected shows that participating students already have these skills as they reported different ways of using MT to communicate with others within their university.

Many students reported using SMS, voice calls, email, and other virtual spaces (SMNs and/or messenger applications such as WhatsApp and Telegram) to communicate and contact others for different purposes related to their learning in HE. Moreover, they described using their MT for communication as easy and fast. For example, Noha (II1) stated, "*Having my mobile with me all the time makes it the*

easiest way to contact and communicate with others for reasons related to my studies". Similarly, Abeer (GI2) reported that she uses her MT to communicate with peers and instructors by using email and WhatsApp because it is the fastest way to do so and it is with her all the time and all the contacts details are saved on it.

In addition, participating students used email to check on updates from the university about news and announcements, and to communicate with each other and with instructors. For example, Soha (GI3) reported that she checks her email many times a day for any updates from peers or instructors about workshops, grades, exams dates, and/or timetable, for example. She stated, "*Having my email on my mobile allow me to check it continuously throughout the day*". Additionally, participating students varied in their preferences of using MT's features or applications to communicate with others and with instructors for learning purposes (as discussed earlier in section 5.2.2.2).

Furthermore, participating students formed virtual spaces for themselves to exchange news and other updates related to their courses, and to communicate with each other and with their instructors. These spaces might be teacher-led spaces or student-led spaces and they usually form 'university groups' by using some messenger applications such as 'WhatsApp' and 'Telegram', or by using SMN applications such as 'Keek' and 'BBM' (as discussed in section 5.3.1.2).

Most students use WhatsApp to communicate with each other and with their instructors. For example, Noha (II1) stated, "*I use the WhatsApp university group to communicate and contact peers. We usually tell each other about any changes in the lecture's location or time. It is the easiest and fastest way to know*". Also, Wafa (II10), Reem (GI2), Ameera and Salma (GI1), reported that they use WhatsApp to communicate with peers. Reem added that she uses WhatsApp primarily to communicate with others for learning purposes and has many university groups on WhatsApp, a group for each course. In the event not all students in the same course have 'WhatsApp', then students form a university group by using 'Telegram', 'Keek' or 'BBM' as stated by Sara (II2), Maha (II3), and Adwa (GI2).

Moreover, section 5.2.1.1 of this chapter reveals many examples from students' dairies regarding the use of different features and applications of their MT, such as email, SMN apps, voice calls, SMS and/or WhatsApp, to communicate with staff, instructors and peers for learning purposes.

5.4.1.2 Group work skills in HE

Group work skills include using the affordances of MT to complete the requirements of working within a group such as writing, talking, discussing, and collaborating with other group members to complete the group work.

Working within a group is one of the course requirements at KSU. Students are often required to work with each other in order to complete a project, homework, or write a report. For example, Adwa (GI2) reported that she engaged in group-work in all the courses she had in the previous terms. She stated:

> *We usually use WhatsApp to communicate with the project members because it supports the group work and involves all members in the same discussion; sometimes we used Keek, Telgram, or BBM if not all members have WhatsApp on their mobiles.*

Mona (GI3) also reported that she engaged in a lot of group work and used email and WhatsApp to accomplish the work. She reported that the group members usually create a shared drive (like on Google) where all members have access to the same files and information. Mona liked using her MT for learning purposes as it facilitated group work and offered an alternative choice for members to meet and discuss their work.

Moreover, many students reported in their dairies (D1, D5, D6, D14, D17, D20, D21, D22, D25, D26, D33, D35) using their MT to complete group work. For example, they used their MT to check the progress of their university project with project members, to divide the work between members, to share ideas, to set roles and to discuss things related to their project through WhatsApp and email.

5.4.1.3 Organization and management skills in HE

Organization and management skills include using the affordances of MT to manage, organize and accomplish different learning tasks and requirements.

The survey questionnaire (Chapter IV) reveals that 5,016 questionnaire respondents used work-organization tools such as Clock, Calendar, Note, and Calculator on their mobile phones; and 4,410 of them used work-organization tools on other mobile devices they have (see Table 4.10). Moreover, students gave the use of 'work-organization tools' as a feature, a 'rank 5' out of the nine features available on mobile phones, and a 'rank 6' out of the seven features available on other mobile devices.

Moreover, section 5.2.1.1 of this chapter reveals that many students reported in their dairies using the work-organization tools on their MT as a daily routine to perform everyday tasks and to achieve different purposes, such as setting mobile reminders and alarms, taking notes and using the calculator to calculate formulas inside the class or while studying at home.

Furthermore, students who participated in the interviews reported different ways of using their MT to organize and arrange their learning tasks such as deadlines, exams and projects. For example, Soha and Mona, postgraduate students (GI3), reported that MT helped them organize their learning requirements and they used the 'Calendar'

app to record project deadlines and meeting times. Nouf (GI3) also reported using different apps in order to arrange her ideas and thoughts, and writing and setting reminders for important appointments, exam dates, and homework deadlines in the 'Note' app on her phone. Although some students were pleased about using their mobile to arrange their tasks, Noha (II1) was frustrated that MT wasted her time. She stated, " *I come across things that I cannot leave, such as messages and updates on social media applications and these things take a lot of my time without me noticing".*

5.4.1.4 General study skills in HE

General study skills include using and being aware of the affordances MT provides to students in order to check and gather important data for their studies at the university, such as using MT to find required information as well as information about different useful applications for studying in HE, being aware of the university's applications and accounts on SMNs (for more details see section 1.6.7), and using MT to complete different learning requirements.

Participating students use the affordances of MT to check and retrieve information they need, such as their timetable, grades, and lecture locations. For example, Wafa (II10) and Ghada (II9) reported they used their mobile a lot to retrieve different information related to their studies, such as their timetable, academic record, grades, and their courses' names and codes (e.g. CI 250), from the KSU electronic gate (edugate.ksu.edu.sa) or 'KSU-student' application.

In addition, students were aware of the different useful applications for studying in HE, as well as the university's applications and accounts on SMNs. For instance, Ghada (II9) reported that she downloaded and used different apps that she considered important to her university studies. She stated:

> *I use 'WordPress' and 'GoodNote' apps to open and download lecture slides and PDF files. These apps allow me to write notes on the slides and PDF files. I also have a 'King of Math' app to solve mathematical operations and formulas.*

Moreover, some of the students follow the university accounts on SMNs and consider that important for all the university's students as the best way to be aware of the university's announcement and news. For example, Halah (II5) reported that she follows many accounts related to KSU on Twitter and Instagram such as King Saud University accounts (@_KSU, KING_SAUD_UNIVERSITY), skills' development dean's account (@ksu_dsd, DSD.KSU), and postgraduate students' account (@ksudgssa). Halah stated:

> *I benefit from KSU accounts on Twitter. I have become more knowledgeable and familiar with students' rights and I immediately know about any workshops for students. I think following KSU accounts is*

> *important for all students who want to be updated about any news or announcements from the university.*

She added that sometimes she prefers the Instagram account rather than the Twitter account because, "*it is easier and faster for [her] to search among pictures on Instagram than search between tweets on Twitter especially when [she looks] for available and current workshops in the 'skills development dean's account*". Halah claimed that Twitter's hash-tags are useful for her as a postgraduate student as well, because she "*found many valuable references and resources related to [her] research through these hash-tags*". Reem (II6) and Noha (II1) also found these accounts helpful and follow other accounts related to KSU on Twitter, such as–university manager (@RO_KSU), university reading club (@rc_ksu), and university news (@media4ksu).

Additionally, some of the students used the affordances of MT to complete different learning requirements such as homework and projects, and to find suitable resources for learning in HE such as educational YouTube channels. Soha (GI3) reported that she uses her iPad to submit some of her learning requirements through email. She mentioned, as an example, that her instructor asked them to find and submit five articles about a specific topic to use in the next lecture. Soha stated, "*I searched for the articles on my iPad and when I found them I sent an email to my instructor containing the articles' titles and links*". Additionally, Wafa (II10) reported that she and most of her peers in Physics use educational channels on YouTube and consider them valuable resources for their learning, stating:

> *I subscribe to some Physics channels on YouTube and rely on them to understand and gain more information about similar in-class topics; and I think all my peers do the same thing as I notice many times students are watching or discussing the same videos together inside the university.*

5.4.2 Strategies for building disciplinary knowledge

"Strategies for building disciplinary knowledge" includes the different strategies students use their MT for, in order to gain a deeper knowledge to succeed in that discipline.

Students benefit from the different characteristics, features and applications of their mobile and use them in a way that puts them in control of the different tasks and activities **that serve their need with regard to achieve a deeper knowledge of the discipline** and graduate from the university, such as translation, researching, recording, creating and constructing, reviewing and revising, downloading, accessing and retrieving, and multi-tasking.

5.4.2.1 Building knowledge through Translation

Building knowledge through translation includes using the affordances of MT to translate foreign words or vocabulary that students come across in their courses in order to build course knowledge and achieve a deeper understanding of the discipline.

Section 5.2.1.1 of this chapter reveals that many of the students reported in their dairies that they use dictionary and translation apps or websites to look up vocabulary or translate words while studying (D8, D9, D11, D24, D27, D38).

Furthermore, the collected data from interviews shows that translation is a common occurrence for many of the participating students from the different Sciences departments such as Biochemistry, Chemistry, Physics and Sciences. They reported different ways of using MT for translation such as using translation apps, dictionary apps, and web translation sites. They also completed the translations at different times and locations, such as inside the classroom or in the evening in their homes.

Participating students from the different Sciences departments explained the reason for their extensive use of MT for translation is because most of their courses are taught in English and their textbooks are in English as well. As a result, they need to translate some words into Arabic to understand them as well as get their definitions from English-to-English dictionaries, especially if the words are specific terms or scientific vocabulary and the Arabic meaning does not help.

For example, **Biochemistry** students reported using MT for translation a lot. Hanan (GI2) who is an undergraduate Biochemistry student, stated:

> *The Zoology lecture was long with a lot of new vocabulary that I needed to understand to keep up with the teacher. I usually use the English translation app to translate them to Arabic and also use the English-to-English dictionary app as sometimes the Arabic meaning is not very helpful and does not illustrate the meaning of the vocabulary for me.*

Hanan also mentioned that she does more translation at the beginning of the course because the vocabulary is typically repeated throughout the course and she has already translated most of the words and now knows their meaning. Another example is from Adwa (GI2), who is an undergraduate Biochemistry student. She reported that she depends on her mobile to translate English words that she comes across in her studies. She mentioned using an app that can translate the words by taking pictures of the words without needing to type them. Adwa was pleased to have this app because it saved her time as she translates a lot of words every day at home and at university.

Similarly, some of the **Chemistry** students like to translate and it helps them study. For example, Abeer (GI2), an undergraduate student in Chemistry, uses her mobile extensively at home for translation in order to study and do her homework. But she was annoyed about the time waste that MT caused. She stated, "*When I use my mobile to translate words while studying and doing my homework, I receive some snaps from*

friends so I watch them and reply and this takes a lot from my time without me noticing". Reem (II6) also reported that she always uses her mobile phone for translation because it always with her and all of her courses are taught in English.

Moreover, **Physics** students use MT to translate English vocabulary and words in order to gain a deeper understanding of the topics being taught. For example, Sara and Wafa (GI4), who are undergraduate students in Physics, reported that they use their mobiles a lot for translation. Wafa was pleased to find the 'CamDictionary' app for translation because it saves her time. She stated:

> *I use 'CamDictionary' for translation. I scan words or even sentences by the mobile's camera and then the app translates them without the need to type them. This app is really helping me and saves my time and effort while studying.*

Furthermore, some **Sciences** students also indicated that translation helps them study better. For example, Marwa, an undergraduate Science student (GI2), reported that she uses her mobile phone a lot during class to translate scientific vocabulary (as reported in section 5.3.2.1). Asma (II11) also reported that she cannot do anything without her mobile phone and that she depends on it to translate work related to her studies inside the class and at home.

5.4.2.2 Building knowledge by Searching

Building knowledge by searching includes using the affordances of MT to search for different things with the purpose of learning, such as information, references, learning materials and videos in order to build course knowledge and achieve a deeper understanding of the discipline.

The collected data shows that almost all of the students reported using a searching strategy through their MT and they often found what they searched for. For example, section 5.2.1.1 of this chapter reveals that many of the students reported in their dairies using their MT to search instantly for information inside the class, to search for information related to the university's courses on Google generally, and/or to search for explanations for specific courses on YouTube.

Moreover, many participating students from different disciplines, such as Physics, Education, Pharmacy, Biochemistry, Business, Chemistry, and Law, reported in their interviews using MT for searching. For instant, **Physics** students use MT to complete a lot of searching. For example, Wafa (GI4) reported that she uses her mobile to search for explanations and clarifications on her course's topics. She mentioned as an example that she had to do a presentation to the class about a specific topic of the course and she used her MT to prepare for the presentation. She stated:

> *I had to prepare a presentation about 'quantum field theory'. The*

> *problem is that I did not understand this topic from the textbook. So I used my mobile to search the web about relative information and more explanations. Then I found an educational channel on YouTube that discussed my topic in more detail. So I downloaded all the videos I needed and watched them many times between my lectures. I, also, opened parts of them before my presentation to do a last review.*

Another example of searching on MT was reported from Sara (II2), who completed searches on her phone by using Google and saw many advantages of doing searches through MT. She stated, "*Searching on my phone helps me do a quick search and gives me ideas about the topics I am searching about*". Sara also mentioned that she not only searches on Google but also uses her mobile to search on scientific databases such as the ISI database (Institute of Science Index) for scientific papers and research, and that she depends on the university's Wi-Fi to do that. She continued, "*Students can access the ISI database only if they are connected to the university Wi-Fi as the university is subscribed to it; so I search the ISI database a lot when I am on campus*". Also, Farah, an undergraduate Physics student (GI4), reported using MT to search for information on a 'Java' program, as one of her instructor asked the class to do a five-minute presentation on it because they will use it in the course. Farah did not have any background in Java and did not know anything about it at all. She reported that she depended on Google and YouTube and completed a lot of searches on them and found comprehensive and adequate information about the program.

Moreover, many of the students from **Education** reported using their MT to complete searches. For example, Mona, a postgraduate Education student (GI3), reported that she uses her mobile to do initial searches for references for her research while commuting to and from the university. She stated:

> *I use my phone to search for papers and articles in databases for my research, and when I find them I save their titles in the 'Note' app to open later at home on my laptop. And because my phone is always with me, I benefit from it and from my time inside the car to complete some searches.*

Ameera (GI1) also reported that she always searches for specific information on her mobile phone but sometimes search engines might not give her the results she wants. She stated, "*I searched for how to apply a 'Behavior Support Plan' like the one I missed because of my absence, but I never found anything similar or even close to it*". However, Salma (II4) saw many advantages from doing search tasks on her MT. She stated, "*Searching for information on your MT saves your time and helps you in finding what you want quickly as the mobile is always with you*".

Many of the other students from Education reported using MT to complete different searches on the Google engine, specifically, such as how to install an "SPSS" program on a laptop (Mona (GI3)); information about the 'Acadox' website and 'Prezi' program (Noha (II1)); learning resources, references, and forms such as

interview forms and previous exams forms (Manal (GI1)); to check the validity of some information related to the class and search for more information about a requested research (Nouf (GI3)); to find different information, facts, ideas related to the courses (Salma (II4)); and conduct instant and quick searches about some new concepts and terms during the class (Halah (II5)).

Additionally, some of the **Pharmacy** students search the Internet to increase their knowledge through the use of MT. For example, Maha, an undergraduate Pharmacy student (II3), reported that she uses her tablet to search for educational videos related to her courses in order to gain a deeper understanding of the topic and to clarify the parts that she did not understand during class. She stated that recently she began watching videos on the 'Khan Academy' site. She watches these through her MT to learn more about her courses and other topics of interest. She mentioned as an example, "*I use the 'Khan Academy' site to gain a deeper understanding about 'Breathing Basics', which was the topic of our lecture this week*". She explained that Khan Academy's videos are great, short and '*not boring'* like other educational videos she has used; and they are free as well. All of these things encourage Maha to search for and explore more videos on Khan Academy; and now she watches many videos on other topics based on her interests, as she likes the site and is used to it. She stated:

> *I like watching Khan Academy videos when I have free time between lectures or while commuting. I really like the way in which they present the topics and now I watch many videos in other subjects such as Computer Science and Astronomy, and I wish that our instructors could benefit from this great site and use it by giving us exercises, activities and tasks.*

Other examples of using MT to complete searches were reported from the **Biochemistry** students. For example, Hanan and Adwa (GI2) reported that they use their mobile phone to search for different information, facts and ideas related to their courses during class. Adwa added that she used her mobile to search for clarification on similar course topics that she did not understand during the lecture, either because they were difficult or the lecturer did not explain them clearly.

Furthermore, students from **Business, Chemistry, and Law** mentioned using MT to conduct searches as well. For example, Samar, a Business student (GI1), and Reem, a Chemistry student (II6), reported that they search Google for more information and explanations for similar course topics that were not clearly understood. Soha, a Business student (GI3), also reported that she uses her phone to search instantly for information and terminology related to the class topic during class. Abeer, a Chemistry student (II8), reported that she uses her mobile phone to search for educational videos on YouTube. And, Amal, a Law student (II7), reported that she always uses her mobile phone to do quick searches on Google both inside and outside of class.

5.4.2.3 Building knowledge by recording

Building knowledge by recording includes using the affordances of MT to capture moments from users' everyday life in the form of photos, videos or audio in order to build course knowledge and achieve a deeper understanding of their discipline.

Section 5.2.1.1 of this chapter reveals that many of the students reported in their dairies using their MT to take pictures for learning purposes, such as to add them to a university report, for instructor's notes on the smart board, for students' work and projects in "Zoology lab", for homework to share with peers, or to take pictures and record videos in general.

Students from other disciplines including Business, Law, Chemistry, Biochemistry, Education, and Physics reported in their interviews that they also use MT for recording. For example, Soha, a **Business** student (GI3), reported that she made audio recording of some of the lectures to take notes for the topics discussed during class and to make sure she did not miss anything. Similarly, Amal, a **Law** student (II7), reported using MT to audio record some lectures to re-listen to them later.

Additionally, **Chemistry** students used their MT to take pictures and videos for their lab works and to record audio notes of the lectures in order to gain a deeper understanding and share their experiences with others. For example, Reem (II6) reported that she audio recorded a lecture because she did not understand the teacher. She stated:

> *Our teacher was sick and we got a substitute teacher for just one lecture. But she was unclear in her teaching or we were not used to her teaching style so I audio recorded the lecture to listen to it again, hoping to understand the lecture.*

She also reported that she became accustomed to taking pictures of papers with her mobile camera instead of photocopying them. She stated, "*I always take pictures of worksheets and homework I don't have, which is easier and faster than going to the student center to copy them*". Abeer (II8) also reported that students typically take pictures and videos of their work and achievements in Chemistry lab and share it through SMNs with friends, family, instructors and peers. She stated, "*We often comment and discuss each other's videos and pictures on our SMN accounts*".

Also, some **Biochemistry** students use MT to record to build up their knowledge. For example, Hanan (GI2) reported that she always audio recorded some lectures for the following reason:

> *I use the audio recorder on my mobile to record lectures either because the course is hard, so I need to listen to the lecture again, or because the teacher moves quickly and I cannot follow her and take notes.*

Many of the students from **Education** reported recording through MT to complete other tasks. For example, Noha (II1) reported that she photographs the textbook cover and shares it with peers through a WhatsApp group. "*It is faster to take a picture of the book than write its title, writer, published date and version required,*" Noha said. Also, Halah (II5) reported that she always uses the 'screen capture' feature for references and books that she finds useful while browsing the web from her mobile, stating, "*When I look for references to read for my research, I always browse my 'Photos' app as I have gotten used to taking 'screen captures' of books and papers that I think are useful*".

Moreover, **Physics** students use MT to record in order to save time or out of interest. For example, Sara (II2) uses her MT camera to take and record pictures of homework in order to save time during class, stating:

> *I use my phone to take a picture of the homework questions or the project requirements that are presented on Smart board rather than writing them down. It is easier and faster, and sometimes the instructors ask us to do that, especially when the lecture time is nearing the end".*

5.4.2.4 Building knowledge by creating and constructing

Building knowledge by creating and constructing includes using the affordances of MT to make and produce new content and context for learning in order to build course knowledge and achieve a deeper understanding of the discipline.

Many of the students from different disciplines, including Physics, Education, Biochemistry, Chemistry and Pharmacy, reported in their interviews that they use MT for creating and constructing content (e.g. presentations and mind maps), and contexts (e.g. university groups) for their learning.

Almost all of the participating students from the different disciplines mentioned that they always create virtual spaces for students in the same course or project to meet and discuss issues related to their learning. They reported using a messenger application such as WhatsApp and Telegram to create theses virtual spaces and call them 'university groups'. Section 5.3.1.2 and section 5.4.1.1 show that many students are always creating university groups, depending on their interest or their instructor's desire to communicate and discuss issues with the class.

Moreover, Sara, a **Physics** student (II2), reported that she was accustomed to the university groups and benefited from them a lot, so she always creates them even if the instructor does not ask for them. Wafa (GI4) also reported that she uses her mobile to create learning content such as a mind map and presentations. She mentioned that she used an application to create a mind map required by one of her instructors and did that while commuting to the university. She also used her tablet to create and present a presentation to her class.

Additionally, **Education** students create university groups to work, collaborate, review and communicate with other students in the same course. For example, Ameera (GI1) and Noha (II1) mentioned that they use these groups extensively to review together before exams (see the next section 5.4.2.5). Mona and Nouf (GI3) also reported that they are members of many university groups on WhatsApp. Section 5.3.4.2 provides Mona's opinion regarding university groups and how these groups facilitate group work and offer females time and location flexibility. Section 5.3.1.2 reveals Nouf's different uses of the university groups including discussing issues related to the course and exchanging useful learning resources such as research links.

Furthermore, students from **Biochemistry, Chemistry,** and **Pharmacy** mentioned using MT to create context for their learning as well. For example, Adwa, a Biochemistry student (GI2), Reem, a Chemistry student (II6), and Maha, a Pharmacy student (II3), reported that they are members of many university groups. Maha said these groups are very useful as they offer a joint environment for students from different departments in Pharmacy to communicate, meet, discuss, exchange their experiences and work together. She stated:

> *We have one big group on 'Telegram' with approximately one hundred girls from the different departments in Pharmacy. We have some common courses so we discuss issues related to our courses together, pose questions, give answers, exchange files, such as forms for previous exams, videos, audio notes, and tell each other about any updates such as when the instructor has downloaded new lecture slides or homework on her website.*

5.4.2.5 Building knowledge by reviewing and revising

Building knowledge by reviewing and revising includes using the affordances of MT to study and review individually or with a group for quizzes and/or exams in order to build course knowledge and achieve a deeper understanding of the discipline.

Many of the students from the different disciplines, including Business, Education, Chemistry, Pharmacy, Biochemistry, Physics and Education, reported in their interviews using MT for reviewing and revising tasks.

Furthermore, almost all participating students reported using university groups on 'WhatsApp' to review and revise with their peers before exams. They mentioned different strategies for reviewing through WhatsApp, such as: pose questions and receive answers from group members (Adwa and Reem (GI2), Samar (GI1), Farah (II12), Noha (II1)); receive alerts from group members about any updates about the course's exam such as "*newly uploaded questions for review on the teacher's site*" (Ameera (GI1)); swap forms from previous exams with peers (Noha (II1), Maha (II3), Sara (II2)); and exchange solutions for equations and answers for homework (Sara (II2), Wafa (II10)).

Moreover, Samar, an undergraduate **Business** student (GI1), reported that she always uses the WhatsApp groups to stay in touch with her peers while studying for exams at home. She finds that these educational groups are quite useful for reviewing and revising before exams. Discussing her experience in reviewing with peers for one of her exams, she stated:

> *I was so grateful to review with the girls because they discussed a question that I had not come across while I studied since it was not from our textbook, but the teacher had talked about it in a lecture that I did not attend. And then the same question came up in the exam and I answered it correctly".*

Noha, an undergraduate **Education** student (II1), reported that she always keeps her mobile with her while studying for exams because, as she stated, "*I might need to ask my peers about something and wait for their responses. Also I always receive useful web links and old exam forms that help me a lot*". Abeer, an undergraduate **Chemistry** student (II8), also reported that she uses her mobile phone to review for exams from her instructor's site. She stated, "*Sometimes I like to review for exams from the instructors' sites, especially if the instructor uploaded all the lecture slides on her site*". And, Maha, a **Pharmacy** student (II3), reported that Pharmacy students usually exchange explanation videos and audio notes through a university group as a way to review before quizzes and exams.

Many students from **Biochemistry** (Adwa (GI2)), **Physics** (Sara (II2)), **Business** (Samar (GI1)), and **Education** (Noha (II1)) were pleased about reviewing for exams on WhatsApp groups and considered it to be a significant advantage of these groups. Sara stated, "*The WhatsApp group allows us to work together and to review and study together*". Noha added, "*The WhatsApp groups are so important generally, and benefit all of us a lot, such as in doing homework and discussing exams with peers*."

5.4.2.6 Building knowledge by downloading

Building knowledge by downloading includes using the affordances of MT to download applications or files in order to build course knowledge and achieve a deeper understanding of the discipline.

Section 5.2.1.1 of this chapter reveals that many of the students reported in their dairies using their MT to download and update different applications, and to download learning materials and lecture slides from email or from the instructors' website.

Many of the students from the different disciplines, including Pharmacy, Sciences, Education, Physics, Law and Business, reported in their interviews using MT for downloading. For example, **Pharmacy** students downloaded different applications and files on their MT to use during class in order to take notes and follow the

instructor. Maha, an undergraduate student in her fourth year (II3), reported that she downloaded a lot of learning materials and files, such as e-books, lecture slides and PDF files on her iPad. She also downloaded the 'Polares Office' app and uses it to open and access downloaded e-books and learning slides during class. She stated:

> *I use the 'Polares Office' app to access many learning materials during class because it allows me to open different types of files such PowerPoint files, Word files and PDF files, and also it allows me to write notes on these files".*

In addition, **Sciences** students reported downloading e-books in MT for learning purposes. For example, Marwa (GI2) and Asma (II11 and GI4) reported that they download the e-book format of the courses' textbook and other learning materials in PDF formats on their MT. Asma stated, "*I usually open the e-books during and between classes. The e-books are wonderful books as I can search for specific parts and contents and access them immediately*".

Moreover, **Education** students reported downloading different applications on MT for learning purposes. For example, Nouf (GI3) mentioned that she likes using different applications so she always downloads applications and after using them for a while deletes them and downloads a new application. She claims that if she benefits from some of these applications in her university studies she keeps them. However, she was annoyed about the limited capacity of her MT that did not allow her to keep a lot of applications.

Physics students reported downloading different files on MT for learning purposes. For example, Sara (II2) reported that she downloads PDF files of articles and research and uses them during her 'Research Skills' class. Similarly, **Law** and **Business** students reported downloading different files on MT for learning purposes. For example, Amal, an undergraduate **Law** student (II7), reported that she always downloads lecture slides on her mobile phone to access later in class. She also mentioned that she downloads references for her research to read them in her free time. Ghada, an undergraduate **Business** student (II9), also reported that she downloaded many applications on her mobile phone and found them useful for students in HE, in general. She mentioned some applications, such as 'GoodNote' that allows her to write on lecture slides, 'WordPress' that allows her to download different formats of files, and 'King of Math' that helps her solve operations and formulas in mathematics.

5.4.2.7 Building knowledge by accessing and retrieving

Building knowledge by accessing and retrieving includes using the affordances of MT to reach, access and find the required content and information that is saved on the

device or to search for them on the web in order to build course knowledge and achieve a deeper understanding of the discipline.

Many of the students from the different disciplines, such as Pharmacy, Law, Sciences, Chemistry and Education, reported in their interviews that they use MT for accessing and retrieving. For example, Maha, a **Pharmacy** student (II3), uses her iPad to access and retrieve different formats of learning files such as e-books, PowerPoint, Word, and PDFs during class. She also accessed many videos on Khan Academy that explain and clarify specific parts of her course through her iPad. Amal, a **Law** student (II7), also uses her mobile phone to access and retrieve learning slides during the class.

Moreover, **Sciences** students reported using MT to access and retrieve information related to their courses. For example, Asma (II11) reported that she always uses downloaded e-books on her phone to search for specific parts and contents and access them immediately during class. Also, Marwa (GI2) reported that she uses her iPad to open the lecture slides. She stated:

> *I open the same slides presented on the Smart board on my iPad because I usually sit in the back and cannot read from the board clearly. And it is very important to me to follow the teacher slide by slide to take notes and understand the lecture. And the instructor doesn't mind.*

Chemistry students also reported using MT to access and retrieve information related to their learning. For example, Abeer and Reem (GI2) reported that they use MT to look up and retrieve information from the 'Periodic Table' app. They mentioned that they use the 'Periodic Table' app a lot during Chemistry lab and while doing homework at home to retrieve and find an element's properties, such as its melting point.

In addition, **Education** students reported using MT to access and retrieve educational videos, lecture slides and timetables. For example, Ameera and Manal (GI1) reported using their mobile phone to access a specific video on YouTube that did not work on the instructor's slide and at times their instructor asks them to do that. Also, Noha (II1) reported that she uses her phone to access her timetable from the KSU electronic gate (https://edugate.ksu.edu.sa) and to open lecture slides.

5.4.2.8 Building knowledge by multi-tasking

Building knowledge by multi-tasking includes using the affordances of MT to complete strategies in order to build course knowledge and achieve a deeper understanding of the discipline.

Many of the students from the different disciplines, including Chemistry, Physics, and Education, reported in their interviews completing many tasks with their MT such as

translation, searches, downloads, access to course's materials and reviewing for exams in order to learn more about their subject. For example, **Chemistry** students reported doing more than just translation with their MT. For example, Reem, an undergraduate student in Chemistry (II6), translates, searches, downloads and accesses the course's materials with her MT in order to understand lectures in Biology. She stated,

> *I always use my mobile to translate English words during class. I remembered that I could not understand the 'the cell cycles' even after translating many words, so I searched on the web for videos that could explain the topic easily. I found some and downloaded them and watched them during the week. Also, I sent the videos links to peers on the WhatsApp group to use as I found them very useful".*

Abeer (II8) also reported that she uses the instructor's site as a learning resource because it contains all the lecture slides and worksheet. She stated, "*I got used to reviewing and studying from my teacher's website while travelling. I access her site and retrieve lecture slides that I need and review from them*".

Additionally, **Physics** students reported downloading, presenting and retrieving information with their MT. For example, Sara (II2) uses her MT to download PDF files and to access them in class. She also used her MT to present her work at the college fair, stating:

> *I participated in the fair being held at our college and I was responsible for showing and presenting the videos and diagrams on how household appliances work. So, I used my iPad to explain and show them using the videos and diagrams I had downloaded and prepared earlier.*

Moreover, **Education** students reported using MT to complete many educational tasks. For example, Salma (II4) uses her mobile to complete several simple tasks that she needs in order to keep up with her studies, such as writing notes using the 'Notes' application, searching quickly on 'Safari' for different information, sending and receiving messages on 'WhatsApp', and communicating with instructors and peers. Salma stated, "*My phone is small, quick, and always on, and that allows me to do what I want. Also, I already know how to use it so it is useful and easy to use for educational purposes*."

Students from different disciplines were pleased about performing multi-learning tasks on their MT. For example, Noha (II1, Education), Reem (II6, Chemistry), and Amal (II7, Law) saw many advantages of using MT for learning. They reported that MT is faster than using a laptop; it is easy to use, and always with them and charged, which makes them use it a lot.

5.4.3 Strategies for wider learning goals

"Strategies for wider learning goals" includes the different strategies students use their MT for, in order to accomplish the skills needed to succeed in their everyday life and improve themselves.

Students benefit from the different characteristics, features and applications of their MT and use them in a way that puts them in control of the different tasks and activities **that serve their needs with regard to develop themselves**. They use MT to acquire specific skills in order to achieve their goals, such as learning to knit (to set up a business), learning a new language (to explore other cultures or to study abroad), attending online workshops and courses (to develop personal skills), or being a member in a specific online association or society (to acquire knowledge and get a good job).

For example, Abeer (II8) reported in her interview that she uses her mobile phone a lot to watch videos on YouTube channels she is following to learn how to **knit wool**; she then set up a business to sell her textiles. She reported:

> *My sister and I learned knitting from YouTube videos. Now we know how to crochet many things such as baby hats, blankets, cloths, socks and some other pieces. Then we opened an account on Instagram to sell our products.*

Moreover, **learning a new language** was of interest to many of the students. They sought to reach goals beyond learning a new language, such as identifying and exploring other cultures, or developing the language to study aboard. For example, Marwa (GI2) reported that she is enthusiastic to learn about the Korean culture so she downloaded many applications on her mobile to learn Korean. She also reported that she listens to Korean songs and watches Korean shows in order to develop her Korean language skills. Similarly, Reem (GI2) is interested in exploring other cultures such as the Turkish culture. She claims that watching TV shows is the fastest and easiest way to know about people's cultures. She stated, "*I use my mobile a lot to watch Turkish TV shows on YouTube and consider that as a way to learn about Turkish culture*". Adwa (GI2) is also interested in learning about other cultures such as Italian and British cultures. She reported that she downloaded many applications that help her learn English and Italian. She also follows many Italian and British people on SMNs in order to know more about their lives, customs and traditions. Moreover, Soha (GI3) reported that she wants to learn English because she wants to study for her doctoral degree abroad in the United States. She reported that she downloaded many applications that teach English skills and uses them on a daily basis.

Additionally, some of the students were aware of the importance of developing their **personal skills** by attending online workshops and courses through MT. For example, Noha (II1) reported that she used her mobile to attend a course on personal development. She stated:

> *I joined a course by watching a series of videos and doing many quizzes through my mobile. It was about 'How to be a trainer in the future' and I was accredited with a Canadian certificate after completing all the videos and quizzes. This course was very long in the numbers of hours, [but it] helped me develop my personal skills.*

In the same way, Samar (GI1) attended a course about 'Big Data Analysis' by watching videos and doing exams through her MT. She reported that she watched the videos in her free time, and after completing the course she got a certificate from 'Microsoft' with her name, starting and ending dates, and the number of hours spent to complete the course.

Furthermore, some participating students cared about being a member in specific online associations and societies to **master their knowledge and get a good job**. For instance, Physics students were aware of the importance of mastering their Physics skills by being members in specific online associations and societies. They were keen to be members in the Saudi Physical Society (SPS) to develop their skills and knowledge and to be aware of job opportunities available for Physicists in the future. This was stated clearly by Sara (II2) and Wafa (II10), who thought that joining SPS was very important for all Saudi Physicists and especially those students still looking for a good job after graduation.

All in all, the "mobile learners' strategies" category disclosed that HE female students take control of their learning by using their MT in order to accomplish and achieve their learning requirements and goals. They use the different strategies on their MT in order to acquire the skills they need to accomplish and succeed in HE, as well as in different subject areas and in other aspects of their life. Therefore, this category describes a different range of students' uses and practices of their personal MT that focuses on learners' studying skills, gaining knowledge and building deeper knowledge of disciplines, and so concurs with the third criterion of Sharples et al. (2007), as discussed in section 5.1. However, the assessment and feedback that was discussed by Sharples et al. (2007) in this criterion, doesn't emerge from the collected data as participating students did not talk about these issues at all.

The different examples reported in this category demonstrate that HE students benefit from and exploit the affordances of MT to perform and accomplish many different tasks, as well as to facilitate and enhance their learning. Likewise, these examples show that the use of MT in learning allows students to acquire different skills required in HE, such as communication skills, group work skills, organization and management skills, and general study skills. The use of MT allows them to achieve a deeper knowledge of the discipline as well, by translating vocabulary, researching articles, recording lectures, creating and constructing study groups, reviewing and revising for exams, downloading applications and files, accessing and retrieving

learning materials, and multi-tasking; as well as allowing them to succeed in their everyday lives and improve themselves.

Overall, the three previous sections (5.2, 5.3, and 5.4) present the students' experiences of using MT within the criteria put forth by Sharples et al. for a mobile learning theory (Sharples et al., 2007). Consequently, the students' experiences demonstrate the characteristics of ML and represent mobile learning experiences.

5.5 Mobile Learners' Understandings of Mobile Learning

Despite evidence of the widespread use of MT for learning among HE students through 'mobile learners' ubiquitous use', 'mobile learners' movement', and 'mobile learners' strategies for achieving learning goals' (as shown in the previous sections), HE students had not heard the term 'Mobile Learning'.

The collected data shows that participating students' experiences with ML, through the use of their MT in learning, was broad, however, they had never been introduced to the term "Mobile Learning". Almost all students reported that the first time they heard it was through their participation in the questionnaire. Only one student, in one of the group interviews (Samar (GI1)), stated she knew the term because one of her instructor talked about it in a lecture. Moreover, Reem (II6) and Abeer (II8) reported that they already used and applied ML in many learning tasks and activities but did not know it was considered ML and did not give it a name or call it 'Mobile Learning'.

When students were asked in the interviews, "What was your initial expectation of Mobile Learning?" they provided different answers. Hanan (GI2) and Sara (GI4) expected the learning to be completely online and only through mobile phones. Reem and Adwa (GI2) reported that they thought it was using different applications that could support traditional learning. Wafa and Asma (GI4) expected ML to be about downloading e-books and files on MT to use them in learning. And Ghada (II9) stated, "*I thought it was about how MT helps in learning and I think its applications help and support students in learning*".

The collected data shows that HE students use their personal MT to accomplish a wide range of tasks and activities, which led to students adopting them for learning use as well. Additionally, the collected data shows that students' uses and practices with MT are shaped by, and also shape, their experiences of ML. Students' experiences of ML vary between students or even with the same students, from time to time. Gaining experience using MT or having changes in a student's personal life (e.g. additional family responsibilities, owning more than one MT device, and Internet availability) may affect a student's use of MT in learning in the future. As a result, student's experiences of ML may change. Sara (II2) discussed an excellent example of this. Sara reported that her use of her mobile phone '*completely changed'* after acquiring a new smart phone. She stated:

> *My old mobile did not support doing different tasks or downloading SMN applications or any other application. Two years ago, I changed it and bought an iPhone. I felt that I was disconnected from the world around me. But now I feel that communication and everything I do through my new mobile is faster and easier. I have many SMN applications and I use them to communicate with peers and friends more than before. For example, I always use Twitter, Instagram, and WhatsApp to check things related to my studies at university. I use Twitter and Facebook to be in touch with friends, and my use of mobiles completely changed and I became more dependent on my mobile to do different tasks in my daily life.*

This example shows that owning a new mobile device enabled Sara to be more available and connected than she was before. Sara also adopted the use of her new phone for learning as it allowed her to do more things and perform tasks related to her studies easily and quickly.

Furthermore, the collected data shows that all the students in the individual interviews reported that they did not need training on how to use MT, in general, but that they welcomed attending workshops or training about how to use MT in learning. This indicates that students have the ability to benefit from the different capabilities and features of their MT while also welcoming the opportunity to use them for learning purposes and tasks.

Students, in their practices and experiences of using MT to achieve learning purposes and goals, found some affordances and limitations of their MT that could enable or hinder their use. These experiences were recognized as affordances and limitations of ML in HE from the students' point of view, and therefore represent part of students' experiences of ML in general. Some of ML's affordances and limitations were reported directly by students, and some were derived from students' experiences of using MT in learning, which were discussed earlier in the previous sections of this chapter (5.2, 5.3, 5.4). The following sections elaborate in more detail on the affordances and limitations students encountered with ML.

5.5.1 ML's affordances from the students' point of view

HE students have generally expressed positive views about their experience with using MT in learning. They enjoy the familiarity of their own MT for learning and the ability to self-select and plan learning opportunities based on their needs or interest. Additionally, students considered the flexibility and availability of MT use anywhere and anytime as the most important benefit of using MT in learning. The following sections discussed these issues in more detail.

5.5.1.1 Flexibility, mobility, and accessibility

Flexibility and accessibility of MT allows for anytime, anywhere access. The previous sections of this chapter show that multiple students appreciate the flexibility of time and place provided through the use of MT. Many students reported that they could read course materials, retrieve timetables, or download lecture slides at their convenience anywhere and anytime. Also, they were pleased that they could access so much information that was available, and choose from several applications that were developed for various subjects and areas from their MT (see section 5.2.2.2, for example).

5.5.1.2 Self-controlled/planed learning

Students can personalize their use of MT and can self-select learning opportunities based on their needs or interest. Students can use MT, for example, to communicate, to organize, to search, to translate, to review, to retrieve, to create, and/or to download things related to their learning. Some students, including Noha (II1), Reem (II6), and Amal (II7), appreciated the ability to perform multi-learning tasks on one device (as discussed in section 5.4.2.8).

Students reported that they could seek out information online when they needed to, such as looking up a concept they were unfamiliar with on the web (as discussed in section 5.2.1.1), or seeking out information from peers, such as asking a classmate for help on specific course content through the WhatsApp university group, or seeking out information from an application such as retrieving element proprieties from the 'Periodic table' app, for example (as discussed in section 5.3.1.1).

5.5.1.3 Skills development

Multiple students indicated that using MT helped them practice and develop some essential skills such as personal skills, communication and collaborative skills. They declared that ML helped them develop a set of skills and abilities related to living and working in a world of mobile digital devices. Students reported that their experiences of using MT involved sharing and exchanging different kinds of files with peers as well as working collaboratively within a group. They used different applications and features of MT to send and receive images, videos, texts, PDFs and audio files.

Moreover, students recognize that using MT typically assists them in developing specific personal skills such as cooking, knitting, learning or improving language skills (as discussed in section 5.4.3). Some other students feel that using MT is beneficial, in general. For example, Hanan (GI2) claimed that using any application benefited her, and helped her learn something new. Noha (II1) also stated, "*I feel like I was developing myself and benefiting from using new things on my mobile*".

5.5.1.4 Engagement in classroom activity

Using MT inside the classroom offers students an opportunity to be active participants and to be involved in classroom activities. Students use their MT inside the class to search quickly for vocabulary meanings, translate foreign words, access course materials and information from the web, look up information pertinent to the class, or look up something they do not know or understand during class. Students reported that these different tasks assisted them in keeping up with the instructor (as reported by Marwa and Hanan in section 5.3.1.1) and made them feel confident and active participants during class (as discussed in section 5.2.1.1).

5.5.1.5 Ease of use

Almost all students interviewed appreciated the quick access and the ease of use of their MT to perform what they wanted. They enjoyed the familiarity of their own MT for learning. Indeed, the familiarity of using a personal device for a learning purpose was considered to be a key advantage for many students. Moreover, multiple students believed that their familiarity with MT allowed them to use it for educational purposes, as well as save them effort and time.

Additionally, some students, including Mona (GI3), Marwa (GI2), and Hanan (GI2), believed that using personal MT in learning made ML suitable for all people of different ages and in different subjects. Also, Soha (GI3) and Abeer (II8) thought that using personal MT devices in learning made ML "*fun*" and "*enjoyable*".

5.5.1.6 Quick to know, fast to respond

Most of the interviewed students were pleased by the quick access their MT provided to accomplish different tasks and to respond to learning demands. MT offered flexibility for students to check their news, emails, and/or SMNs at their convenience as they have their mobiles with them all the time. Students can immediately be informed of, and access, news, updates, and announcements through email, SMNs, or messages from instructors, the university, peers or project members. They can also immediately respond and communicate with instructors and peers through MT.

Also, many of the interviewed students reported that MT is faster and makes it easier to do many things such as checking email and SMNs compared with computers and laptops, as MT is always reachable and charged (as reported by Halah (II5) in section 5.2.1.1, Wafa and Asma (GI4) in section 5.2.2.2, Noha (II1), Reem (II6), and Amal (II7) in section 5.4.2.8).

5.5.1.7 Appropriate for culture demands

ML can save female students' time and offers them many learning opportunities that are appropriate for their culture. Many of the students, including Nouf (GI3), Sara (II2), Amal (II7), Halah (II5), and Soha (GI3) were all pleased about using their mobiles to communicate with their male instructors as that suits both the students and the instructors. They reported that ML offered suitable and easy ways for them to communicate with male instructors. They also found that ML offered a convenient learning environment for Saudi females who have limited access to transportation. They see that ML facilitates group work, as it is sometimes difficult for group members to meet outside campus. Saudi female students who are wives and mothers have the added responsibility of looking after their house and children so they face more demands on their time. They also appreciate the time and place flexibility that is offered by ML. These affordances, therefore, can be considered unique advantages for Saudi culture.

5.5.2 ML's Limitations from students' point of view

Although the majority of the interviewed students expressed enthusiasm about engaging in ML activities, they also experienced some challenges. These challenges were recognized as limitations of ML and resulted in some students having some negative views of ML. These challenges included a lack of Internet connectivity and availability for some of the students, ML being a distraction or waste of time, the abilities of MT devices, and some social concerns. These issues are discussed in more detail in the following sections.

5.5.2.1 Internet connectivity and availability

Although Internet connectivity and availability was not considered a limitation of using MT in learning for most students, a small number of students raised this issue.

The availability of the Internet was considered a challenge facing a few of the HE students. The survey questionnaire (Chapter IV) revealed that 1.79% of the questionnaire respondents (representing 135 respondents) did not connect to the Internet from their MT. Additionally, the collected data from qualitative methods showed that only three students talked about the issue of Internet availability as they reported in their diaries that they do not have Internet access at home (D16) or it is limited (D5, D24), so they depend on the university Wi-Fi to complete and submit their assignments. One of them (D16) depends completely on the university Wi-Fi. She stated, "*I will be in a real trouble if the university Wi-Fi disconnects and the deadline is tomorrow*." Also, two students, Salma (II4) and Amal (II7), raised the issue of Internet availability as sometimes the Internet disconnects suddenly which interrupts them and prevents them from completing their tasks.

5.5.2.2 Distraction

Although students were able to come up with ways that ML could be implemented, some of them seemed to be concerned with the distraction MT could cause in the classroom. For instance, Abeer (II8) and Halah (II5) reported that they are not paying attention to what the instructor is saying when they use their MT during class so they usually put their mobiles on silent mode inside the class as well as while studying at home because MT does not allow them to focus and is often a distraction. Also, Amal (II7) claimed that she felt distracted when the girl next to her uses her MT in class.

5.5.2.3 Time consuming

According to some of the interviewed students, using MT becomes time consuming. For example, Noha (II1) and Abeer (GI2) were disappointed that sometimes using MT for learning wasted their time while studying as they were distracted by messages and updates on SMNs and it would take up their time without them even noticing.

5.5.2.4 Device abilities

Although students enjoyed the familiarity of their own MT for learning, they also presented some challenges, such as battery life, screen size, and limited storage capacity.

For example, Nouf (GI3) and Salma (II4) were unsatisfied with the limited storage capacities of their MT. Nouf reported that she cannot save a lot of applications on her mobile so she deletes some of them even though they are useful. The following excerpt is from Salma's Interview:

> *Some learning resources and materials require a large storage capacity and you need at times to read a large amount of information carefully and not quickly so mobile phone here is not helpful and I think a computer is better for these tasks.*

Also, Ghada (II9) claimed that the small screen size affected her eyes stating, "*The small screen size does not allow me to write a research report*". Other students (D9 and D24) were worried about their mobile device's battery. They reported that their mobile batteries died quickly because they use MT a lot. One student (D24) was frustrated by her mobile battery. She wrote in her dairy, "*I cannot use my mobile phone on my way back home because the battery is usually dead*".

5.5.2.5 Social concerns

One of the participating students (Noha (II1)) was annoyed and concerned about losing social and face-to-face interactions as a result of the extensive use of MT by her peers. Noha described the students who use their MT a lot as 'addicted' to MT. She supports her concerns by mentioning, as an example, how students act on the first lecture of each course; how they are all busy with their MT and no one attempts to talk or establish new relationships with other students (as discussed in section 5.2.1.2). Additionally, two students, (Halah (II5) and another student (D24)), described themselves as '*addicted*' to using their mobile phone, which helps support Noha's claims.

Although some students found at least some limitations of ML, Wafa (II10) claimed that ML does not have any limitations stating "*I think that there are no disadvantages of ML*".

5.6 Summary

This chapter analyses and presents a clear picture of the experiences of female students using MT for learning in higher education in Saudi Arabia, with the aim of answering the second question of this research which is: "How do students experience learning with mobile technology in Saudi higher education?".

This chapter describes how these experiences are linked to the four criteria of Sharples et al. that were vital to developing a theory for mobile learning (Sharples et al., 2007). Therefore, I propose that the different uses and practices of MT by Saudi females in HE fit the characteristics of ML and represent mobile learning practices and experiences. However, the 'assessment and feedback', that Sharples et al. talk about in the third criterion, doesn't emerge from the analysis of the students' experiences at all.

Moreover, the four criteria of Sharples et al. have been useful and enabled me to rework them into a framework that helped in sorting the collected data into three main categories of 'mobile learners' ubiquitous use', 'mobile learners' movement', and 'mobile learners' strategies for achieving learning purposes and goals', that describe and explain the current mobile learning experiences of female students in HE in SA. These three main categories of students' experience of ML overlap and are connected, so it is difficult, at times, to distinguish between them.

The previous sections (5.2, 5.3, 5.4) show many examples of using MT as a tool that has the affordances of the criteria presented by Sharples et al. (2007) within the three emerging categories and subcategories. Some of the examples run through all the main categories. For example, Soha's experiences of using MT to complete an online exam, mentioned in section 5.3.2.2 of this chapter, shows the convergence of the three

main categories of ML experiences. To elaborate, this example shows the **mobile learners' ubiquitous use** of MT because Soha was available and connected virtually through her personal iPad.

Additionally, this example shows **mobile learners' movement across** space, time, learning modes and cultures. Soha and her peers took the exam in different physical spaces in their homes, yet in the same virtual space on Blackboard through MT, which shows movement across **space**. They completed an online exam in the evening at a time not traditionally used for learning, which shows movement across **time**. It was Soha's choice to perform the online exam (formal mode) by using her MT rather than laptop or PC and she did it at home (informal mode) and discussed it immediately with their professor (informal mode), which shows the movement across learning **modes**. Soha used her personal iPad to communicate with her male professor through the Blackboard's discussion forums, which shows movement between **cultural** boundaries.

Moreover, this example shows the **mobile learners' strategies needed for achieving learning goals** because Soha takes control of her learning and uses her iPad to build course knowledge and achieve a deeper understanding of the discipline. She downloaded the 'Blackboard' app on her iPad, opened the app at exam time, accomplished the exam, got her grade immediately and communicated with her instructor through it.

Furthermore, the previous sections (5.2, 5.3, 5.4) show the extensive use of some particular applications of MT by HE students, such as WhatsApp and Twitter, which make these applications ubiquitous tools for students. WhatsApp has become a powerful tool for Saudis, in general, and HE students, specifically, in the Saudi context as it offers a tool and vehicle to communicate between students, between students and university instructors, and between people in general. Also, Twitter has become an effective tool to keep students up to date on news and information, which seems to indicate that HE female students are following the world trend of using Twitter for news. These two applications, for example, show how technology provides affordances to HE students of using MT anywhere and anytime.

All in all, mobile learning in Saudi higher education already exists. Almost all higher education students in Saudi Arabia engage in ML activities and typically use their mobile devices for informal self-directed learning activities rather than formal learning activities. Additionally, there is emerging evidence in this study of shifts and changes in the experiences of students in a mobile learning environment, though most students have not heard the term 'Mobile Learning'.

CHAPTER VI: Building a Conceptual Framework for Mobile Learning in Higher Education

This chapter focuses on building a conceptual framework for mobile learning in Saudi higher education, and therefore explores the third aim of this study (see section 1.4).

This chapter presents a discussion of mobile learning in Saudi HE based on higher education students' practices and experiences with mobile learning (that are reported in Chapters IV and V), and introduces a conceptual framework for mobile learning in Saudi higher education.

6.1 Overview of Mobile Learning Experiences in Saudi HE

The two previous chapters present a clear picture of mobile learning practices and experiences of female students at King Saud University (KSU), a Saudi higher education institution. Chapter IV presents some statistical data about HE female students' ownership and current uses and practices of MT. The data reveals that almost all students have at least one mobile technology device. It also shows the ubiquitous use of MT among students, who use them throughout the day and in different locations to connect to the Internet and SMN accounts. Therefore, Chapter IV demonstrates the background and the wider context of ownership and use of MT in HE in Saudi and shows that MT allows HE students to be easily available anywhere anytime, and always connected to the Internet through their MT.

Chapter V completes the picture drawn by Chapter IV by analyzing and describing, in more detail, the various uses and practices of MT by female students in Saudi HE. It presents the different utilizations of MT in three large categories of 'mobile learners' ubiquitous use', 'mobile learners' movement', and 'mobile learners' strategies'. Chapter V describes how these three categories are linked to the criteria that were vital for developing a theory for mobile learning (Sharples et al., 2007). Therefore, Chapter V demonstrates that the different utilizations and uses of MT by Saudi females in HE represent mobile learning practices and experiences.

Following that, this chapter presents a discussion of ML in Saudi HE based on higher education students' practices and experiences with mobile learning, drawing upon and developing research and theoretical literature. The analysis in Chapters IV and V enabled me to understand the participants' practices and experiences and link them to the wider context of mobile learning in Saudi Higher Education, and more broadly to the context of social cultural views of mobile learning. Three main comprehensive themes of 'appropriating tools and resources for learning', 'crossing boundaries of contexts', and 'personalizing learning' emerged from the theoretical analysis of the

study findings and were used in formulating a framework for mobile learning in Saudi HE. The following sections discuss the three main themes and the framework in more detail. The following figure (Figure 6.1) shows the relationships between the study's chapters and illustrates how Chapters IV and V informed the discussion in this chapter, Chapter VI.

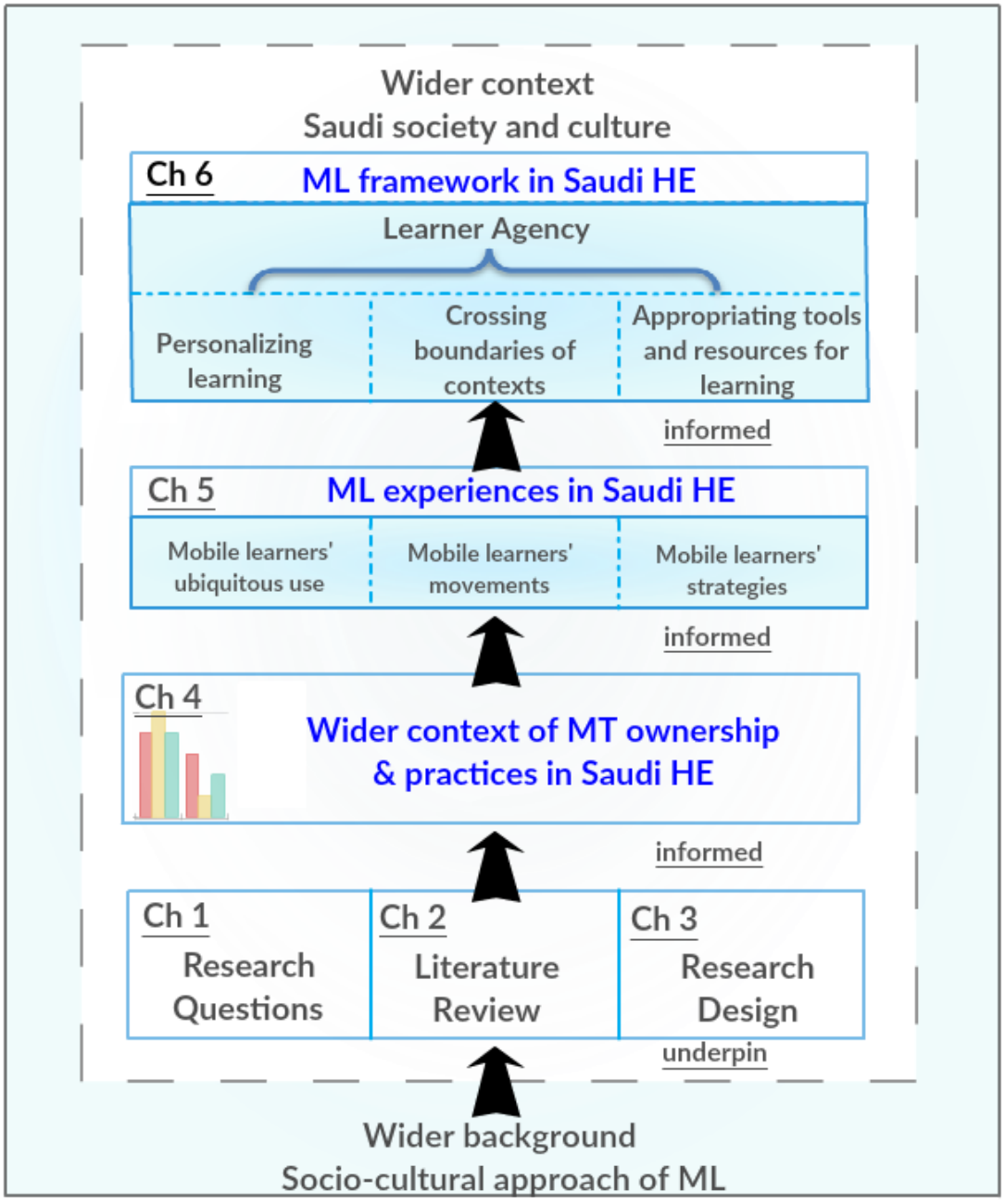

Figure 6-1 The Relationship between the Study's Chapters

Figure 6.1 illustrates how the socio-cultural approach underpins this research study, beginning with how I have asked the research questions and approached the literature to how I designed the research methodology and methods. Additionally, Figure 6.1 shows that the statistical data (discussed in Chapter IV) informs the three categories of students' experiences of ML (discussed in Chapter V), which in turn inform the

theoretical themes that emerged from analyzing the findings of the study (as discussed in this chapter). The dotted lines between the themes in Chapters V and VI indicate that the boundaries between them are permeable. The figure also shows how the data findings and analyses converge and show that ML in the Saudi context is about active learners showing their agency by appropriating tools and resources for learning, crossing boundaries of contexts, and personalizing their learning with and through the use of MT as a learning tool and resource. These themes overlap and run through all the examples of students' practices and experiences of ML.

6.2 Analysis of Mobile Learning Practices and Experiences in Saudi HE

In the field of mobile learning, many of the researchers that I have focused on in this study and that have talked about ML in depth, have drawn upon a socio-cultural background. For example, Sharples et al. (2007) and Dillon (2013), as well as researchers from LMLG (London Mobile Learning Group), such as Pachler, Bachmair, and Cook (2010a, 2010b), Seipold (2014), Traxler (2011a), and Pimmer (2016) have all drawn upon a socio-cultural approach.

The socio-cultural approach offers useful ways of looking at ML and useful tools for thinking about a case study of ML in context. It has many concepts and ideas of interaction in the environment, neutral relationships, contexts (Vesisenaho and Dillon, 2013), perturbations, adaptations, appropriation, tools (Pachler et al., 2010b), crossing boundaries (Pimmer, 2016), agency, cultural practices, and structures (Pachler et al., 2010a; Pachler et al., 2010b), as discussed in the literature review chapter, sections 2.1.1, 2.6.4, 2.6.3, and 2.6.2. All of those ideas of socio-cultural approach are helpful as a background for organizing and analysing the data. Therefore, I submit that the socio-cultural approach might be helpful for this study as well, as this research is a case study that looks specifically at learners' practices and experiences of ML in a very particular and special context, that of females in HE in Saudi Arabia.

Within the socio-cultural approach, many concepts and ideas are appropriate and suitable to describe and explain the study findings. Consequently, I developed three main comprehensive themes of 'appropriating tools and resources for learning', 'crossing boundaries of contexts', and 'personalizing learning' based on the data collected from the participants and the reviewed literature. I drew upon, and used, some theoretical views (discussed earlier in the literature review chapter) in the discussion of the themes to help in explaining these ideas of appropriation, crossing boundaries, contexts and agency in the context of this study, and to allow for a deeper interpretation of the issues that affect the students' practice and experience. Then, the three main themes were used to formulate a framework for mobile learning in Saudi HE. The following sections discuss the three themes that emerged from analyzing the findings of the study.

6.3 Appropriating Tools and Resources for Learning

Pachler et al.'s (2010b) notion of appropriation of mobile technology as cultural resources for learning, is useful in describing and explaining the findings of this study. This is because the term 'appropriation' covers 'learning across the breadth of learning' in formal contexts, such as educational institutions, and learning in the informal settings of everyday life (Pachler et al., 2010b, p.2). It also gives emphasis to the active role of learners in using MT to set up specific learning contexts for themselves (Pachler et al., 2010a). Appropriation of MT by students encompasses the adoption of MT for their own learning needs, purposes and choices.

6.3.1 Categories of mobile learning practices and activities

The findings show that the different learning tasks, goals and purposes of HE students through the use of their MT seems to fall into the same categories of ML applications designed by educators such as Clough et al. (2009) (section 2.3.1). For example, the different ML practices and activities can be categorized depending on the type of activity performed on the MT, including: **collaborative activities** (e.g. working on a project with a group of peers); **location aware activities** (e.g. searching for references on the ISI database on campus by connecting to the university Wi-Fi); **data collection activities** (e.g. recording pictures and videos inside the lab, or audio recording the lecture); **referential activities** (e.g. using dictionaries, translators and e-books to deliver content when and where it is needed); **administrative activities** (e.g. using university applications and sites to access timetables, deadlines, and grades); and **interactive activities** (e.g. interacting with others through SMNs and other applications and features of MT).

6.3.2 Educational purposes activities

The findings show that HE students recognize the affordances of MT in their learning, and benefit from the different characteristics and multi-functionality of their MT to achieve and accomplish different learning tasks, goals and purposes. To illustrate, there are several instances in the findings of explicit forms of educational content, and associated learning practices embedded in students' daily uses and practices with MT. For example:

- The engagement and participation with peers in university groups in different discussions, collaborating with members to accomplish group work (see section 5.4.1.2), reviewing for exams, posting and answering each other's questions, and receiving updates and alerts from each other (see section 5.4.2.5);
- The exchange of multimedia learning resources and materials, e.g., lecture slides, audio notes, PDF files, links to research and articles, pictures of homework and

book covers, and other useful videos (as reported by Noha in sections 5.4.2.3 and 5.4.2.5, Reem in section 5.4.2.8, (D27) and (D32) in section 5.2.1.1);

- The use of MT inside classrooms to, for example, retrieve lecture slides, search for relevant information, use LMS on their mobiles, look up vocabulary in a dictionary, translate foreign words or audio record the lecture (as reported by Ghada, Maha, Marwa, Hanan, Mona, and Reem in section 5.3.1.1);

- The dependency on MT to perform everyday tasks and use MT as a SMN tool, as well as to check email, search, browse the web, communicate, read, check the weather-podcaster, and use the alarm, music player, clock, navigator, camera, note, calculator and translator (see section 5.2.1.1); this functionality causes some students to dispense with other devices such as watches, cameras, DVDs and music players (as reported by Amal in section 5.2.1.1);

- The dependency on MT to accomplish different learning purposes and tasks such as translating, researching, recording, creating, constructing, reviewing and revising, downloading, accessing, retrieving and multitasking (see section 5.4.2).

Furthermore, in the context of higher education, appropriating the use of MT for learning uses and purposes is not limited to students. The literature review chapter presents some examples of utilizing ML by both students and professionals in HE. For example, Pimmer et al. (2012) pointed out that both students and professionals in HE appropriate MT and SMNs as rich educational tools in informal learning contexts (as discussed in section 2.6.4). Also, section 2.3.1 and section 2.5 discuss some practices of ML in HE by using a variety of applications that were designed specifically to supply a particular purpose, or to provide general information and support for both students and instructors.

The findings of this study align with these literature reviews and show that university instructors also appropriate the use of MT for learning and teaching purposes. Many participating students reported that their instructors:

- Ask them to use MT inside the classroom to access sites relevant to the class topic, use applications such as 'LMS Mobile', or open a specific video on YouTube (as reported by Ghada, Maha, Ameera, Manal and Sara in section 5.3.1.1);

- Allow them to use MT inside the classroom for a variety of things such as in-class activities, searching for class-related information, looking for something related to the course, or checking homework (as revealed by the survey questionnaire findings reported in section 4.5.4, and as reported by Maha, Marwa, Hanan, Amal, Mona and Reem in section 5.3.1.1);

- Are members in university groups created by their students (mostly on 'WhatsApp' and sometimes on 'Telegram', 'Keek' or 'BBM'), and participate in the group discussions generally (as reported by Halah in section 5.3.1.2);
- Use their SMN accounts as virtual spaces to discuss some course issues with their students (as reported by Soha in section 5.2.1.2).
- Communicate with their students by email, SMS, phone call, and/or WhatsApp about course requirements and other learning issues (see section 5.4.1.1).

6.3.3 Personal purposes activities

I examine the theme of personalisation in more depth in section 6.5 but it is clear that this theme overlapped significantly with the ways in which participants appropriated MT for learning.

The findings show that students appropriate the use of MT for their own purposes and needs. For example, students use connected MT to gain confidence as MT allows students flexibility to do what they want, in ways that were previously inaccessible before MT; as well as be available (virtually) everywhere without feeling they have missed out on anything (see section 5.2.1.1). They also use Wi-Fi connected MT to feel connected to the world around them locally, nationally and internationally through the use of SMN to connect with peers, friends, instructors and/or family in their own city or other cities or countries, for example (see section 5.2.1.2).

Moreover, the findings (presented in Chapters IV and V) show that students appropriate time, place and available resources to create a learning environment that suits them and serves their needs to accomplish different learning tasks. For example, they use their MT as learning tools and resources on different days throughout the week and various hours throughout the day (see sections 4.5.1 and 5.3.2), and at different locations such as the classroom, home, café, or while commuting (see sections 4.5.1 and 5.3.1); as well as using MT alone or in conjunction with other learning resources such as books, pen and pencils to accomplish different learning tasks (see section 4.5.4).

6.3.4 Mobile complex activities

Additionally, the discussion in Chapter II, section 2.6.4, *The appropriation of MT as tools and resources for ML*, drew attention to the wider arena in which the educational uses of MT are considered an appropriation of cultural resources for learning. Pachler et al. (2010a; 2010b) claimed that the mobile complex (the agency of the learner, cultural practices of MT use, and the structures that govern learners' lives) enable learners to appropriate the use of MT (use them for their own needs,

purposes and choices) to perform a number of day-to-day functions, such as generating new content and contexts for learning; developing new sets of literacy practices of everyday life; developing new habits of learning with MT; and making-meaning from the distributed content and information.

The evidence from this study indicates that the mobile complex enables students to appropriate the use of their MT for their learning. The different learning uses and utilizations of MT by HE female students at KSU show that they create learning content with a self-defined learning goal from the distributed content and information through the use of their MT. For example, creating mind maps and presentation slides on MT (see section 5.4.2.4); creating and recording video, photo and audio files and share in university groups (see section 5.4.2.3); and editing pictures and videos to produce new video clips and pictures (see section 5.2.1.1). This concurs with the **'user generated content'** discussed by Pachler at el. (2010b; 2010a) as well as the 'user-led content' discussed by Bruns (2006) and Bruns et al. (2007) (see section 2.6.4).

Students also create virtual learning environments and spaces through the use of MT to meet and interact together with a common, self-defined or negotiated learning goal. For example, they create WhatsApp groups for all students in the same course or for project members to discuss issues related to their course or project together (see section 5.4.2.4); or create a shared drive (like on Google) where all members have access to the same files and information (as reported by Mona in section 5.4.1.2). This concurs with the **'user generated context'** discussed by Pachler et al. (2010b; 2010a).

Most of the students know how to make use of the basic functionality of MT that enables them to benefit from MT's features and capabilities to accomplish their needs. This is shown by, for example, their ability to locate, update, delete and use different applications and file formats on MT (see section 5.4.2.6); their ability to access, store and retrieve distributed content and information on MT (see section 5.4.2.7); their ability to use different features and applications of MT for communication purposes (see section 5.4.1.1); their ability to personalize and change MT settings such as background, ringtone, etc. (see section 5.2.2.1); and their ability to use MT for entertainment (see section 5.2.1.1). Moreover, section 5.5 shows that all participating students in the individual interviews reported that they do not need any training regarding how to use MT generally. This concurs with the **'literacy practices'** discussed by Pachler et al. (2010b; 2010a).

Additionally, they are able to decide what different features and/or applications of MT they want to use that could benefit them and serve their learning needs for communicating, collaborating, translating, seeking, capturing, reviewing, organising information, and/or multitasking, for example. Searching the web; browsing instructors' and university websites; communicating with instructors and peers; using SMNs for learning purposes; capturing media as a means for learning in the form of

photographs, videos and voice recordings; using their mobile's calculator; downloading dictionary and translation apps; seeking and gathering information such as timetables, grades, and lecture locations; and following educational channels on YouTube (see sections 5.4.1 and 5.4.2), all by using their mobile's features and/or applications individually or with a group, for example (see section 5.2.2.2). That concurs with the **'develop new habits of learning with MT'** discussed by Pachler et al. (2010b; 2010a).

Furthermore, student use the distributed content and information (through the use of MT) to construct meaning for their world by accomplishing both learning tasks and everyday tasks (daily routine). For example, they review and retrieve information and access learning materials and resources from MT to revisit and reflect on their understanding (see section 5.4). They create and construct their own learning resources, materials and environments on MT to perform learning tasks (see section 5.3.3). They also take advantage of MT's features and capabilities to perform everyday tasks around searching for information instantly, using the calendar, setting reminders and alarms, keeping contact details, playing music and games, watching videos, capturing media and calling someone (see section 5.2.1.1). Additionally, they capture media in classes in the form of photographs, videos and audio recordings, as well as watch videos on YouTube and Khan Academy to develop their understanding of the courses and extend their knowledge of the course's topics. They use dictionaries and translation applications and sites inside and outside the classroom to understand the lecture and to keep up with their instructors. This concurs with the idea of **'meaning-making'** discussed by Pachler et al. (2010b; 2010a).

Therefore, the different uses and utilizations of MT by HE female students showed that they appropriated their MT as learning tools and resources in both formal and informal learning contexts.

All in all, the previous examples of appropriating tools and resources for learning illustrate how HE female students exploit the affordances of mobile technology to appropriate time, place, and available resources in order to create a learning environment that suits them and serves their own needs, purposes and choices to accomplish both learning and everyday tasks. The previous discussions about this theme demonstrate that Saudi females are appropriating their MTs as tools and resources for learning.

6.4 Crossing Boundaries of Contexts

Pimmer's (2016) concept of boundary crossing tools is useful in describing and explaining the findings of this study. This is because the 'tool' concept highlights the active use of MT (Pimmer, 2016) and also emphasises the active role of the learner in using MT.

The data analysis shows that HE students are crossing different contexts and site boundaries in a variety of ways by using their MT and SMNs in order to facilitate and enhance their learning. Several examples of these findings were reported in the two previous chapters showing that practices and experiences of HE female students with ML, involve a lot of boundary crossing practices, which concurs with Akkerman and Bakker's (2011) potential learning mechanisms of identification, coordination, reflection and transformation (that were discussed in the field of ML by Pimmer (2016) in section 2.6.3). Also, HE female students use their MT as a tool to cross boundaries of space, people, time, learning modes and culture. The following sections discuss all of these in more detail.

6.4.1 Potential learning mechanisms of boundary crossing

Many students majoring in Chemistry use their mobile phones to document important work achievements in their labs in the form of photos, videos, voice recordings and texts (as reported by Abeer in section 5.4.2.3), for example, as these represent evidence of their growing and maturing skills as Chemists. They share these representations that relate to their professional identity on various SMNs and on WhatsApp university groups with other students, peers and teachers, as well as friends and family. In this study, MT gave students the opportunity to showcase their work to a wider community; and the students use MT, specifically SMNs, to cross boundaries between their studies and private spaces in ways that were not possible before. This practice supports the **identification** mechanism of boundary crossing.

HE students accomplish many learning tasks and projects within a group of their peers, as working in a group is a required skill in HE (see sections 5.4.1.2 and 5.4.2.4). Students use many features of their MT, such as portability and multimedia features, to support group work and to generate and share mobile-based multimodal representations (i.e., images, videos, texts, or audio) with other members in the group (see section 5.3.1.2). This practice supports the coordination of distributed work in different physical and virtual settings between members with different levels of expertise. In other words, it supports the **coordination** mechanism of boundary crossing.

HE students form mobile "WhatsApp" groups, where they report and contrast different practices of their learning such as completing homework, reviewing together for exams, discussing project work and sharing resources. Thus, they extend their perspectives by learning something new about their own and their peers' practices (see, for example, Noha's excerpt in section 5.3.1.2). This practice supports the **reflection** mechanism of boundary crossing.

Forming "WhatsApp" groups represents a new form of engagement in virtual spaces created through the students' boundary crossing. Also, while HE students were using

their mobile phones to document images and videos in their leisure time, this practice, which was initially prohibited inside the university campus, began to transform inside the classroom. For example, students were allowed to use their phones for documentation, to take pictures of different things such lecture slides, homework on smart boards, or a peer's work and projects at 'Zoology lab' (see sections 5.2.1.1 and 5.4.2.3). This practice supports the **transformation** mechanism of boundary crossing.

6.4.2 Crossing boundaries of space

The findings show that HE female students at KSU cross boundaries of space by using their MT. They cross boundaries between physical and virtual spaces when they use MT inside the classroom (physical space) to access course materials and search for information that is relevant to their class topic (virtual space) (as reported by Ghada in section 5.3.1.1), and also when they use WhatsApp or Snapchat (virtual spaces) to review and communicate with each other while they are studying in their homes (physical space) (as reported by Hanan in section 5.3.1.3). Moreover, they cross boundaries between informal, familiar and personal spaces, and the more formal and authoritative settings of the classroom. For example, some students use MT to socialize and check updates, messages, or emails (informal personal spaces) inside the classroom (formal space) (as reported by Halah in section 5.3.1.1). Also they create private spaces to write their ideas and thoughts (e.g. on a Notes app, an informal, personal and virtual space) while they are inside the university campus (formal physical space) (as reported by Sara and Nouf in sections 5.2.1.1 and 5.4.1.3, respectively). Students cross boundaries between virtual spaces as they shift between using different applications and features of MT such as SMS, SMNs, web browser and email to search for information, look for news, and explore updates on their accounts (see section 5.2.2.2). Furthermore, students also cross boundaries between physical spaces as they use MT anywhere, moving between home, university, cafés, shopping malls, restaurants or even while commuting, to achieve different learning goals and purposes (see section 4.5.1).

6.4.3 Crossing boundaries of people

The findings of this study show that MT enables HE female students at KSU to cross boundaries between people with different cultures, languages, professions and expertise. Students follow and communicate with many people from foreign countries through SMNs and chat, and communicate or message them through mobile applications in order to learn new languages (as reported by Ameera and Adwa in section 5.3.1.2, and Nouf in section 5.3.3.2), as well as to explore other cultures such as Korean, Turkish, Italian or British cultures (see section 5.4.3). They also cross boundaries between themselves, as novices, and the experts in their field as they can communicate with these experts through, SMNs, for example (as reported by Halah in section 5.2.1.2).

6.4.4 Crossing boundaries of time

Additionally, the findings of this study show that HE female students at KSU cross boundaries of time by using their MT. They use MT anytime they choose, at formal learning times to perform both class and non-class tasks (see section 5.3.2.1), at a time not traditionally used for learning such as completing an online exam on their MT on a weekday evening (as reported by Soha in section 5.3.2.2), and at different times throughout the day or week as reported in the students' diaries (see section 5.3.2.2). They made use of spare time throughout the day, such as time while travelling and time between lectures, to complete learning requirements by using their MT (as reported by Maha in section 5.4.2.2, for example). The findings also show that MT allows for time to contact and communicate with peers and instructors that were not possible, or not socially acceptable, before, such as late in the evening or early in the morning (see section 5.3.4.1).

6.4.5 Crossing boundaries of learning mode

The findings of this study also show that HE female students at KSU cross boundaries of learning modes by using MT. They complete formal and informal learning activities at the same time, such as following along with the instructor inside the class by reading an e-book on MT (formal mode of learning) and switching to use a translation application (informal mode of learning) to keep up with the instructor (as reported by Asma in section 5.3.3.3). They also cross boundaries of learning tasks as they do more than one task at the same time, such as translation, searches, downloads, and reviews, in order to learn more about their subject (see section 5.4.2.8). They additionally cross boundaries between studying and entertaining as they use MT for entertainment while studying for long periods of time (as reported by Noha in section 5.2.2.2). Moreover, there are some interesting findings about using MT for entertainment and gaming as many students linked that directly with having, or not having, gaming applications on their MT (see Nouf's excerpt in section 5.2.1.1).

6.4.6 Crossing boundaries of culture

The impact of technology on Saudi culture and traditions began a long time ago (as discussed in section 1.6.2). As evidence of this, the findings of this study show that MT has become a part of the Saudi context and many Saudis depend on MT for everyday tasks. MT has had an influence on some Saudi norms and traditions by making some culturally unacceptable practices culturally acceptable through the use of MT. The prevalent and widespread ownership and use of MT among Saudi citizens in general (see section 1.1), and among HE students specifically (see section 4.2) are evidence of the adoption of this technology for a variety of purposes in Saudi society. Therefore, MT has created or enabled change in Saudi society and Saudis have readily adopted these changes.

Furthermore, the findings show that MT enables HE female students at KSU to cross boundaries of Saudi **culture**, while at the same time maintain their own values and principles. For example, many female students reported using MT to communicate and contact males within their gender-segregated environment in a way that is culturally acceptable. They reported following some male researchers, instructors and experts in their field on SMNs to communicate and discuss issues with them related to their learning (see Soha's excerpt in section 5.3.4.1). They also communicated with their male instructors for learning purposes by using WhatsApp, SMS, email, and/or phone calls (see sections 5.3.4.1 and 5.4.1.1).

These findings also show that both technology and culture have an influence on each other in the Saudi context. Technology influences Saudi culture and traditions and broadens them to accommodate for several technology uses and practices that were culturally unacceptable before, such as communicating with other males. Other examples of students crossing boundaries of their culture and the culture stretching to adopt these new uses includes crossing social boundaries, such as using MT to communicate with other unrelated people or people with different languages and traditions (as discussed by Manal in section 5.2.2.1 and Adwa in section 5.4.3); or to communicate with others very early or very late in the day (as discussed in section 5.3.4.1), and/or share personal pictures with friends and family through private accounts on SMN (see Nouf, Mona, and Soha in section 5.2.2.1).

In addition, the findings showed that some students' practices and uses of MT did not represent 'crossing a boundary of culture' but instead showed how Saudi culture and technology shaped each other. Evidence of that appeared clearly in the way they influence the policies of using MT inside the KSU female campus, for example. To illustrate, taking pictures or videos is prohibited inside the female campus (as discussed in section 5.3.1.1) because Saudi females are concerned with losing their privacy and having their personal pictures shared without wearing their "Hijab", which is not culturally acceptable in Saudi Arabia (see section 1.6.3 for more details about Saudi women). However, almost all of the students who participated used their mobile camera to take pictures and videos inside the classrooms for learning purposes. They took pictures and recorded videos of the instructor's notes, homework on smart board, the textbook cover, lecture slides, a peer's work or notes, their own work, experiments and projects in Chemistry or Zoology lab, for example (see sections 5.2.1.1 and 5.4.2.3). They did not take pictures of other females as "*they trust each other not to take picture of others without their permission*" (as reported by Sara in section 5.3.1.1). However, some students reported sharing their personal pictures with friends and family through their private SMN accounts and that it was okay for them and was seen as an acceptable use of MT for their family (see section 5.2.2.1). This example shows how culture and technology influence and shape each other in this context.

Additionally, the study findings show other different modes of crossing boundaries by using MT. For example, Manal (as discussed in section 5.2.2.1) seems to be crossing

quite a few boundaries when she uses her mobile and SMNs to communicate with other people. Manal crosses space, time, culture, individual and social boundaries when she communicates virtually with other people in different places at a time convenient for her. She uses a fake name, and unknown and unpopular applications within her community, and prefers to communicate with unrelated people; this may indicate that she wants to hide her real identity from the public. Here, Manal's agency through using MT enables Manal to cross boundaries and do things that are of interest to her and that would have been difficult or impossible to do in a way that is accepted within her society without the use of a connected MT.

The previous discussions about how students cross different boundaries are similar to Pimmer and Grohbiel's (2013) discussions and examples (see section 2.2.3) about how MT can cross boundaries through SMNs in many ways between and within different professions; between 'novices' and 'experts'; between people with different cultural and linguistic resources; across a diversity of locations; and over time, as well as across formal and informal spaces. Also, the previous discussions about how students cross individual and social boundaries, and bridge gaps between formal and informal learning as well as between males and females, aligns with Pimmer and Pachler's (2014) definition of ML in work-based education that was discussed in section 2.2.3. However, the findings of this study are inconsistent with Alfarani's (2015) findings where culture is perceived as a factor that affects the adoption of ML among female teachers in HE (see section 2.5). The findings of this study show that HE students, in their experiences of ML, already adopt the use of their MT for learning and they cross and shape limiting cultural boundaries while preserving their own values and principles. They perceive cultural constrains as barriers and overcome them by using their MT in order to facilitate their learning.

All in all, the 'crossing boundaries of context' theme presents many examples of MT uses and practices that involve Akkerman and Bakker's (2011) and Pimmer (2016) boundary crossing mechanisms. Therefore, this theme illustrates that HE female students exploit the affordances of MT to cross and shape limited contexts and site boundaries in order to manoeuvre around constraints and restrictions that prevent or hinder them in their learning process. The previous discussions about this theme demonstrate that Saudi females are crossing boundaries of space, people, time, learning modes and culture by using their MT as a boundary-crossing tool.

6.5 Personalizing Learning

The concept of personalizing learning is helpful in analyzing and explaining the findings of the study. It describes learners as active learners who take control of their learning by using their personal MT for learning, and by having their choices of how, why, when and where learning takes place. Therefore, it highlights the role of **ownership** of MT and the ability to **make learning choices** in giving learners the

chance to personalize their learning and explore and exploit the affordances of MT for learning. The following sections discuss this in greater detail.

6.5.1 Ownership of MT

Ownership of MT gives students the chance to take control of their learning by using their personal MT devices for learning. Personal ownership of MT enables students to develop their skills to use MT's hardware and software in an effective way (see section 2.6.5).

The findings of the study show that HE students use their personal MT to create a learning environment that suits their needs and mode of learning, and to achieve different learning purposes and goals that are related to the skills needed to accomplish and succeed in HE generally, as well as in different subject areas and in other aspects of their life.

Section 5.4.1 shows that students use their personal MT to accomplish the different skills needed to succeed in HE such as communication skills, group work skills, organization and management skills, and general study skills required in HE. By developing and acquiring these skills, students are able to design personal learning networks (PLN) of information and people to share and construct links and ideas with. Also, section 5.4.2 shows that students use their personal MT to build up their knowledge and achieve a deeper understanding of the discipline by engaging, for example, in different tasks and activities, such as translating, searching, recording, creating, constructing, reviewing, downloading, accessing, retrieving and multi-tasking. By doing these tasks and activities, students are able to create personal learning environments (PLE) to manage, collect and plan for different learning activities. Moreover, section 5.4.3 shows that students use their personal MT to accomplish the skills needed to succeed in their everyday life and improve themselves by learning to knit, learning a new language, attending online workshops and courses, or being a member in an online association or society, for example. By developing and acquiring these skills, students are able to set up businesses, explore other cultures, study abroad, develop personal skills, acquire knowledge and get a good job.

Therefore, HE students are able to take responsibility for their learning. This finding backs up Loveless and Williamson's (2013) discussion about how active learners are able to create PLE and PLN by using their personal MT for learning purposes (discussed in section 2.6.5).

Furthermore, the findings are aligned with the findings of other studies that were discussed in section 2.6.5. For example, Pachler et al. (2013) discuss how the personal ownership of MT allows users to develop emotionally strong relationship with their devices. The questionnaire survey findings (section 4.4) support this and show some examples of how students express some emotions when they described their MT such

as “all my life”, “my heart”, and “it is like the need for water”, etc. Also, the findings of the study are aligned with the findings of Cochrane (2013) and Moura and Carvalho (2013), where the ownership of MT facilitates the use of MT for learning, as the students already know how to use the device, in general. This was also stated explicitly by Salma, who considered that a feature of ML (see section 5.4.2.8).

In addition, the findings show that ownership of MT enabled HE students to develop different skills for using MT as a learning tool. HE students use their personal MT as a search tool, weather-podcaster, communication tool, alarm, music player, reading tool, clock, navigator, camera, note, social media device, web browser, calculator, appointment organizer, and translator (see sections 4.4 and 5.2.1.1). One student claimed that the ownership of MT caused her to dispense of her other devices such as a watch, camera, and music player that were very important to her before (as reported by Amal in section 5.2.1.1).

Furthermore, the findings show that ownership of MT allows students to personalize their learning by creating content for their learning (e.g. mind maps, pictures and videos) and context on their MT (e.g. use SMNs and WhatsApp groups as sites to discuss and exchange information and multimedia with others); by appropriating social and cultural norms as well as physical and virtual resources to make them fit their needs; and by creating and designing their own PLE (e.g. by generating personal content and context for learning and by using MT as learning tool and resource) and PLN (e.g. by extending their friends and peers network through SMNs).

6.5.2 Making learning choices

The ability to make learning choices gives students the chance to take control of their learning by making decisions about how, why, when and where learning takes place as well as deciding between the choices of resources for their required news and information (as discussed by Pachler et al. (2013) and Loveless and Williamson’s (2013) in section 2.6.5).

Students have their choice of choosing the **learning partners and resources** that suit them (how). Some students depend on themselves to learn something such as a new language or how to cook through different sources like mobile applications, YouTube channels, or by searching on the web (see sections 5.2.2.2 and 5.3.3.2). Other students prefer to work within a group to achieve their goals, such as being a member in a WhatsApp group that discusses and exchanges information and experiences with other members (see section 5.2.2.2).

They have their choice of choosing the **purpose** behind using MT (why), such as for learning and/or personal purposes. For example, Mona reported using her mobile phone inside and outside the classroom to access and retrieve different learning

requirements such as homework, lecture slides and project. Soha reported that she usually used her iPad to make travel reservations such as airline tickets and hotel reservations (see section 5.2.2.2).

They have their choice of choosing the **time** and the **place** to use MT (when and where). For example, section 4.5.1 reveals different physical places of using MT by HE students and section 5.3.2 reveals the different times of use through the day. For instance, one student (D39) reported using her mobile phone every day in the evening to check for any updates on her SMN accounts, emails, SMS and/or missed calls. In contrast, Salma reported not using her mobile phone as much in the evening as she was busy doing housework (see section 5.2.2.2). Wafa, meanwhile, preferred to use her mobile early in the morning while commuting to accomplish some learning requirements, such as making a mind map for some courses (see section 5.3.1.1).

Additionally, the findings show that students can choose the resources they need for **news and information**. They use different MT applications and features to get the news and information they need such as SMNs, Google, and/or different sites. For example, Reem, Mona, and another student (D34) reported using Twitter as the main way to stay updated about the different news they need to know (see section 5.2.1.2). Using Twitter generally is very popular among HE female students at KSU. Section 4.5.3 reveals that 99.88% of questionnaire respondents use Twitter and also almost all the students that participated in the qualitative methods use it too.

6.6 Learner Agency

Learner agency, their capacity to act on the world by appropriating mobile technology as a cultural resource (Pachler et al., 2010a), is considered the central and most suitable concept in describing and explaining the findings of this study. This is because the agency of learners and the affordances of MT all interact dynamically and enable learners to appropriate the use of MT as a learning tool and resource, to cross boundaries of contexts and to personalize learning. Therefore, the learner agency concept combines and brings the three previous themes of 'appropriating tools and resources for learning', 'crossing boundaries of contexts', and 'personalizing learning', together.

In the field of mobile learning, the appropriation of MT as learning tools and resources (Pachler et al., 2010b) and as boundary crossing tools (Pimmer, 2016) is linked to the 'agency' of the user or learner. **Learner agency** is central to a discussion of ML (see Chapter II section 2.6.4) and it is a component of the socio-cultural ecological model of ML, the 'mobile complex' model (Pachler et al., 2010a, Pachler et al., 2010b) (see section 2.6.2). This model (Figure 6.2) is useful in describing the findings of the study; however, I place the agency component of the model in the foreground and use other components of cultural practices and structures in the

background. This is because the findings of the study demonstrated in many ways that the agency has influenced the student's experiences of ML in the Saudi context. For instance, although Saudi females might be in a situation that constrains them in some way, on the university campus, at home or in society, their agency enables them to negotiate their way through by using the affordances of their MT, such as appropriation, crossing boundaries and personalization. The previous sections (6.3, 6.4 and 6.5) show that the ML experiences of HE female students involve many modes of appropriation, crossing boundaries and personalization with and through the use of MT in learning.

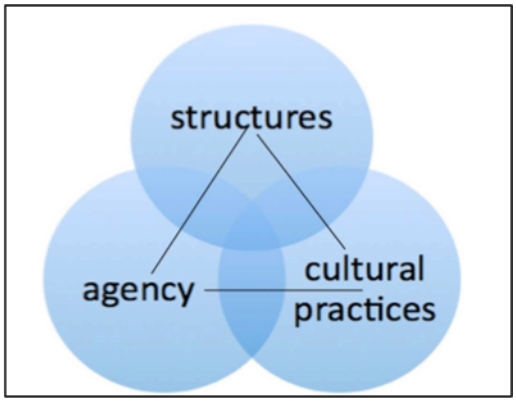

Figure 6-2 Mobile Complex Model (Pachler et al., 2010a, p.25)

Additionally, learners in the 21st century have been described by researchers in terms linked to their use of technology, such as 'generation Y', 'millennial', 'digital learner', 'net generation', 'Yers' and 'I-generation' (see section 2.1.2.4). The findings show that HE female students have rich digital lives with ever-evolving digital practices that change according to their needs. Therefore, they take control of their learning by using technology. They use MT as a tool to support and enhance their learning environment. For instance, they appropriate the use of MT as a learning tool and resource and as a boundary-crossing tool to accomplish different goals and purposes. Also, they use MT to choose the appropriate learning partners and resources as well as suitable resources for news and information. Moreover, the findings show that HE female students are taking control of their learning activity as well by establishing a partnership between them and their MT, and they work together to accomplish learning tasks and activities.

Therefore, using MT in this study enhances and extends students' capabilities to perform different learning tasks and activities, and enables them to extend and augment their learning experiences. HE students take control of their learning and function as Perkins's concept of 'person plus' rather than 'person-solo', as they work together with their MT to enhance and facilitate their learning and to accomplish and complete different learning tasks and goals. Therefore, using MT here met Perkins's "access characteristics" framework (1993), where MT has provided students with the opportunity to **access** knowledge (see sections 5.4.2.2, 5.4.2.5, and 5.4.2.7) as well as

build deeper subject knowledge by **representing** (see sections 5.4.2.1, 5.4.2.6, and 5.4.2.8), **retrieving** (see sections 5.4.2.2, 5.4.2.5, and 5.4.2.7), and **constructing** (see sections 5.4.2.3 and 5.4.2.4) the required data and information (as discussed by Perkins (1993) in section 2.1.1)..

Thus, using MT as a learning tool in this study is consistent with the view of the impact of technology on learning in this study, which is seen as 'learning with technology', as well as 'learning through technology'; the findings of this study demonstrate that learners are learning 'through' technology as MTs here are shaping learning, in addition to enhancing it (as discussed by Salomon and Perkins (2005) in section 2.1.2.3).

All in all, the 'learner agency' concept illustrates how HE female students exploit the affordances of mobile technology and take responsibility for their learning. The previous discussions about this theme demonstrate that the agency of the learner is expressed by the students as active learners with the power to take control of their learning. They do this by appropriating MT as a learning tool and resource, by crossing boundaries of contexts, and by personalizing their learning. Moreover, agency of learners enables them to negotiate their way through the different constraints and limitations that prevent or hinder their learning in different ways.

6.7 Theoretical Contribution: A Framework for Mobile Learning

Implementing mobile learning in an educational environment that has relied on a traditional didactic system for a long period requires a careful strategy. This study explored the practices and experiences of mobile learning in Saudi universities and found three theoretical themes that were derived from HE female students' practices and experiences of mobile learning. These themes are key factors in formulating a mobile learning framework that can be used in Saudi universities. The ultimate aim of the framework is to describe and explain the mobile learning experiences in the context of females in Saudi HE.

Figure 6.3 presents the mobile learning conceptual framework in the Saudi HE context that was developed from this study. The figure illustrates that I adopted the socio-cultural ecological model from Pachler et al. as a background for the framework by applying it to the Saudi context for female HE students.

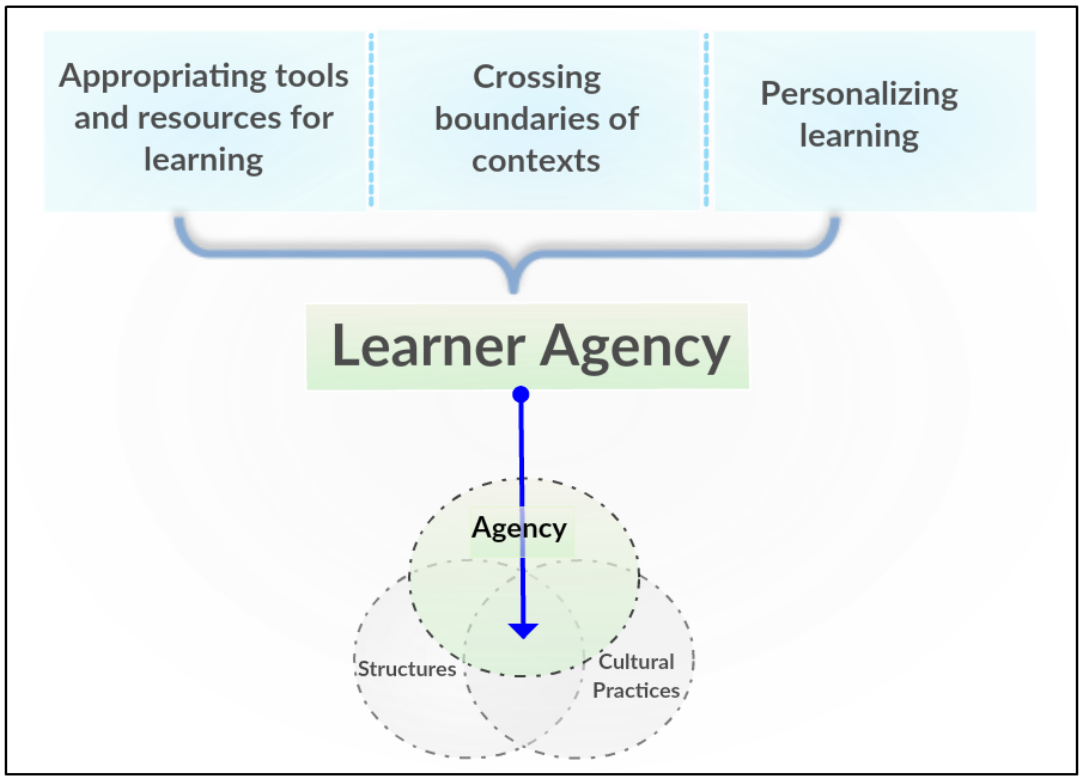

Figure 6-3 Framework for Mobile Learning in Higher Education

Figure 6.3 clarifies how the three themes that emerged from the analysis helped in formulating the framework and the relationship between them. These three themes are associated with each other and mutually influence one another.

The themes of 'appropriating tools and resources for learning', 'crossing boundaries of contexts', and 'personalizing learning', are situated at the center of the socio-cultural ecological model at the intersection of structures, cultural practices and agency. However, 'learner agency' underpins and combines all these themes. Learner agency is the most salient component emerging from the data analysis in this study, and is therefore foregrounded in this model.

Therefore, the mobile learning framework, in the context of Saudi females in HE, is about active learners showing their agency through the appropriation of tools and resources, crossing boundaries of contexts, and personalizing their learning by using their MT as a cultural resource and boundary-crossing tool to accomplish learning tasks, purposes and goals. Bringing learner agency into the foreground has enabled a more detailed insight into the rich digital lives of these women as well as how new digital literacy practices are evolving according to their needs and concerns.

The framework shows that the three components of the model by Pachler et al. work together and how the 'agency' of learners allows them to take control of their learning. For example, in order to appropriate the tools and resources for learning, there needs to be an interaction between the learner's agency, the cultural context, and the structural conditions of HE and university systems. Wafa's agency, for example,

enabled her to appropriate time and place for her own needs when she used her MT to create mind maps while commuting to the university in the back of the car (see section 5.3.1.1). Similarly, for crossing boundaries, there are clear interactions between learners' agency, cultural and structural systems. For example, Manal's agency enabled her to cross different cultural boundaries in order to communicate with strangers by using fake name and less-known applications within her community (see section 5.2.2.1). And again, in personalizing learning, there is an interaction between agency, culture and structure. For example, the agency of Physics students, for example, enabled them to personalize their learning by following some educational channels on YouTube and watching them regularly to understand hard topics in their courses within the structures of the university curriculum and assessments (see section 5.4.2.2).

Therefore, my argument is that the socio-cultural approach has something to offer in the field of ML. Researchers in the field of ML (see section 6.2) have used it to gain insight into ML and they have talked about similar ideas and concepts of the study framework. But, this study looks particularly at learners' practices and experiences; and the strong themes that emerged from the data findings of 'mobile learners' ubiquitous use', 'mobile learners' movement', and 'mobile learners' strategies for achieving learning goals' has led me to consider some socio-cultural approach concepts including appropriation, crossing boundaries, contexts and agency. Also, this study contains data that combines and pools those ideas and concepts of socio-cultural approach together and shows that HE students are active learners in the context of Saudi females at KSU, who are creating and sharing materials, solving problems, making choices, creating virtual spaces, groups and communities, appropriating tools and resources, and making their time and place stretch to suit their needs. MT is not a distraction that could "hinder student concentration and interrupt class progress" (as stated by Cheon et al. (2012) in section 2.4.2) or a 'noisy phenomenon' (as described by Traxler (2009) in section 2.6.6), but instead is part of the background and context for Saudi students.

6.8 Summary

This chapter presents a discussion of mobile learning in Saudi HE based on higher education students' practices and experiences with ML and introduces a theoretical mobile learning framework that builds on a socio-cultural ecological model, with the aim of answering the third question of this research which is: "What is a conceptual framework design that could support mobile learning in Saudi higher education?".

Saudi females' practices and experiences with mobile learning in the context of HE in SA indicate that these students have rich digital lives and are developing new digital literacy practices according to their own needs, purposes and choices. They are active learners and familiar with the affordances of MT in a way that enables them to

appropriate tools and resources for learning, crossing boundaries of contexts and personalizing their learning. They appropriated MT as learning tools and resources in order to create a learning environment that suits them and serves their own needs, purposes and choices to accomplish both learning tasks and everyday tasks. They cross boundaries by using their MT as boundary-crossing tools, as simple as a physical boundary or as complex as a cultural boundary in order to overcome barriers. They personalize their learning in order to provide themselves with different choices of times, places and learning resources. It has been shown that the agency of learners enables them to take control and responsibility for their learning by negotiating their way through different constraints in a variety of ways.

All in all, this study introduces a theoretical mobile learning framework that builds on a socio-cultural ecological model and is composed of three themes of 'appropriating tools and resources for learning', 'crossing boundaries of context', and 'personalizing learning', that all contribute to 'learner agency' (see Figure 6.3). The themes derived from the students' practices and experiences are not separated but run through all the examples of students' uses of MT. Therefore, MT is seen as a cultural resource and a boundary-crossing tool that is appropriated as a learning tool and resource by students to fulfill their needs and accomplish different learning tasks, purposes and goals.

CHAPTER VII: Conclusions and Recommendations

This chapter summarises the main findings to address each research objective and question, in sequence, and discusses some of the limitations of the research as well as the contribution of the study. Finally, it presents some implications and recommendations for further enquiry and research, and the general conclusions that arose from the study.

7.1 Introduction

It is important for policy makers at HE institutions to understand how to best use mobile technology for educational purposes, as opportunities exist to take advantage of what mobile technology offers in terms of mobility and convenience. A first step in understanding how to best use mobile devices for educational purposes is to understand HE students' experiences with this technology and their use in education.

This study asserts that mobile learning has the potential to support active learning experiences in Saudi Arabia. The majority of the students in this study expressed positive experiences towards their mobile learning. The study shows the ubiquitous use of MT amongst female HE students in Saudi Arabia. The participants' experiences in mobile learning show that the characteristics and structure of this learning are compatible with the uniqueness of the Saudi culture, especially in issues related to women's education. From the perspective of the female Saudi students, mobile learning offers them the flexibility to accomplish some of the learning requirements in HE while maintaining their own values, principles and traditions. Therefore, mobile learning is clearly a recommended and encouraged approach for women in Saudi Arabia. However, MT is not neutral and there are potential disadvantages that need to be acknowledged and then managed by HE institutions, instructors and learners.

7.2 Answering Research Questions

This study analysed the students' current practices and experiences of mobile learning in Saudi higher education. The study also built a conceptual framework for mobile learning in higher education based on students' practices and experiences of mobile learning. Quantitative and qualitative methods were both utilized in this study in order to extract comprehensive data that could answer all research questions. The results enable the researcher to draw conclusions about the collected and analysed data and make recommendations for future practice and study.

The research addresses the following fundamental question:

How can students' practices and experiences of mobile technology be utilized to build a conceptual framework for mobile learning that could support learning in Saudi Higher Education?

This is investigated through the following research questions:

- **Research Question 1**: What is the current state of mobile technology ownership and use among students in Saudi higher education?

- **Research Question 2:** How do students experience learning with mobile technology in Saudi higher education?

- **Research Question 3:** What is a conceptual framework design that could support mobile learning in Saudi higher education?

The following sections present the answers of these questions in three separate sections.

7.2.1 Answering question 1: current uses and practices of MT

The findings, in Chapter IV, show how widespread ownership and use of MT is among HE female students at KSU, as 99.68% of students (N= 7,840) own a mobile phone, while a very small number, 25 students representing 0.32%, do not have a mobile phone. Also, 68.90% of students (N= 5,209) have other mobile devices (one or more) such as tablets (e.g. iPad), PDAs, E-readers, or iPods, while 31.10% of students (N=2,351) do not have any other mobile device. Moreover, Chapter IV shows that students use their MT throughout the day and in different locations to connect to the Internet and SMN accounts. Therefore, Chapter IV demonstrates the background and the wider context of ownership and use of MT among female students in HE in Saudi. As a result, I claim that the ownership and current uses and practices of MT show the ubiquitous use of MT generally, which makes HE students easily available anywhere anytime, as they are always connected to the Internet through their MT.

7.2.2 Answering question 2: students' experiences of mobile learning

The findings, in Chapter V, present a clear picture of mobile learning experiences of female students at KSU. It presents the different utilizations of MT in three large categories of 'mobile learners' ubiquitous use', 'mobile learners' movement', and 'mobile learners' strategies for achieving learning purposes and goals', and describes how these three categories are linked to the criteria that were vital for developing a theory for mobile learning (Sharples et al., 2007). Therefore, Chapter V demonstrates that students' experiences of learning with and through mobile technology through 'mobile learners' ubiquitous use', 'mobile learners' movement', and 'mobile learners' strategies for achieving learning purposes and goals'.

7.2.3 Answering question 3: conceptual framework design

The discussion of the findings, in Chapter VI, demonstrates that the ML framework in a Saudi HE context is about active learners showing their agency through appropriating tools and resources, crossing boundaries of contexts, and personalizing their learning by using their MT as a cultural resource and boundary-crossing tool to accomplish learning tasks, purposes and goals. Figure 7.1 (presented earlier as figure 6.3 in section 6.7) illustrates a framework for ML in HE in a Saudi context. The conceptual framework illuminates how learner agency, together with the affordances of MT, enable appropriation, crossing boundaries and personalization with and through the use of MT.

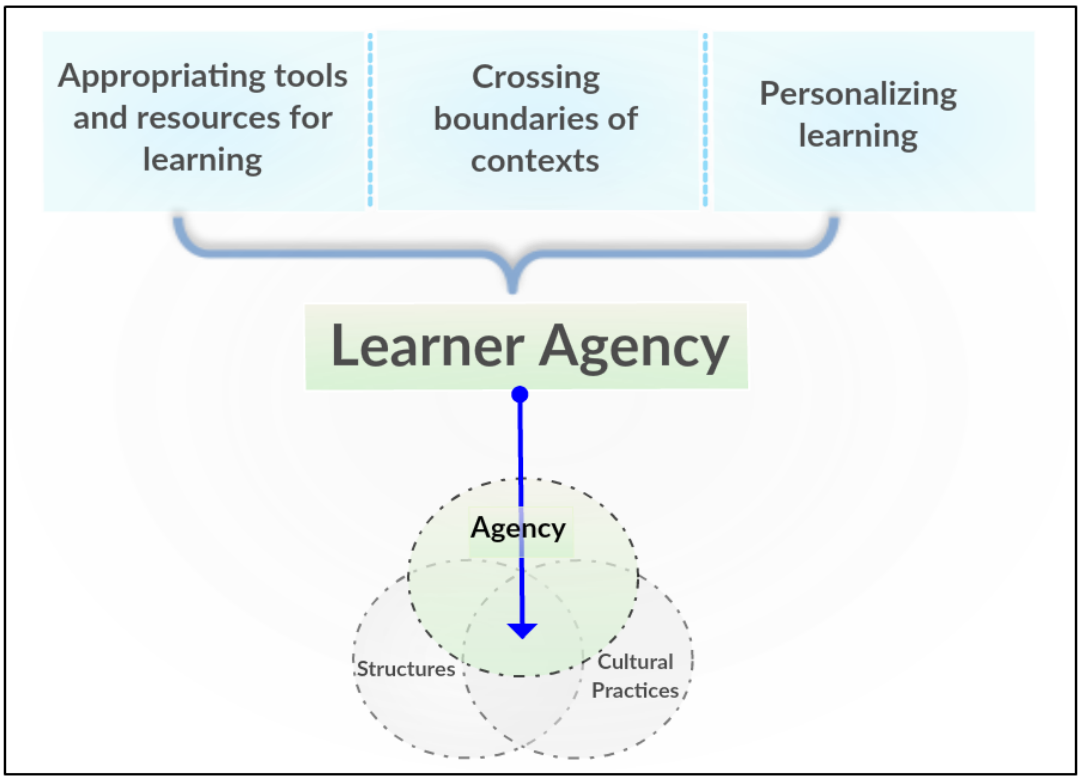

Figure 7-1 Framework for Mobile Learning in Higher Education

7.3 Challenges and Limitations of The Research

This study presents some practical challenges as well as some methodological limitations.

It was a challenge to obtain detailed data from the participants. The majority of the participating students responded in short and repeated answers and did not seem to be able to express their feelings and opinions freely. This might be because students were unused to being part of a qualitative research study, so the use of more probing questions was required to gather more detailed answers. Also, to the best of my knowledge, qualitative research is rarely used in Arabic contexts and almost all of the Arabic educational studies I reviewed were based on the scientific paradigm.

Consequently, the participants' readiness to be part of social research and share their experiences and insights orally was limited. However, the use of probing questions in the interviews, which varied according to the students' responses, helped me encourage the students to expand their answers and express their views in more depth. Furthermore, I was required to translate all of the research instruments into Arabic because English is not commonly used for communication in Saudi Arabia. The collected data was then translated into English and interpreted accordingly. These processes were challenging because I had to look for less ambiguous Arabic words for methods' questions and find the most appropriate English translation for the participants' Arabic responses.

The study was limited to a case study in that it only investigated female students at one university, so, therefore there was a lack of generalization. However, other researchers can take the framework and apply it in other contexts. Future research may want to include multiple institutions and examine differences based on the context of region and available resources. Additional research could also be done to include male students and compare their experiences with females in the same university.

7.4 The Research Contribution

Many researchers in the Middle East have discussed ML and the use of MT in learning and teaching, but not in the way this study discusses it. This study discusses ML with the socio-cultural approach and links it to the mobile complex model. My understanding of socio-cultural approaches influenced the way in which I asked the questions and designed the methods for this study. This study uses a socio-cultural approach of ML as a background to organize, analyze and discuss the study findings. It uses criteria from Sharples et al. (2007) to organize and interpret the collected data, as well as models from Pachler et al. (2010a, 2010b), Pimmer (2016), Perkins (1993) and other more recent researchers to discuss the findings.

Moreover, this study contributes to the body of knowledge by applying the socio-cultural ecological model of Pachler et al. to the Saudi context to demonstrate new insights that are distinctive from using the model in other contexts, while ensuring the study framework will be useful in other contexts as well. Although Pachler et al. use their socio-cultural ecological model to look at particular ML tasks, this study develops the work of Pachler et al. and uses their model to look at a larger case study involving HE female students at KSU.

This study shows how appropriation, crossing boundaries and personalizing learning, the three theoretical themes that emerged from the analysis, are situated at the centre of the model and enable me to discuss the interaction of culture, structure and agency for female Saudi students in their context. It also foregrounds the role of the learners' agency in ML experiences in Saudi HE context. Additionally, the framework

contributes to our understanding of ML in students' practices and experiences within a cultural context and shows that ML in Saudi HE is about active learners showing their agency by appropriating tools and resources for learning, crossing boundaries of contexts and cultures, and personalizing their learning with and through using their MT as a learning tool and resource.

7.5 Implications and Recommendations

Based on the results of this study, the following sections present some recommendations and suggestions to support the effective implementation of ML and the use of MT in learning for each of the following: policy makers within universities, university faculty, university students, and for researchers for further research and enquiries.

7.5.1 For policy makers within universities

Policy makers within universities could consider some issues of infrastructure, training and development, and designs for mobile learning environments and tools.

For infrastructure, policy makers within universities could consider:

- Working to provide good reliable Wi-Fi service for students, especially those who depend on it to accomplish learning tasks and activities.
- Formation of a partnership with a mobile network that reduces the cost of a device and data roaming for students and faculty.

For training and development, policy makers within universities could consider:

- Increased faculty training regarding the capabilities of MT and the potential use in the classroom including applications that are available via application stores and textbook companies.
- Implement training workshops for university faculty and encourage them to implement ML as a part of their teaching practices.
- Implement training or induction workshops for students who need training or more information about using mobile technology in learning.

For the designs of mobile learning environments and tools, policy makers within universities could consider:

- Being aware about how HE students use their MT in learning, as they use them to complete many learning tasks and goals, including appropriating, crossing boundaries and personalizing learning.
- Adding a resource page on the university website with recommendations for mobile applications that may be applicable to students and faculty.

- Collaborating with either the computer science department or an outside resource that could develop course-specific mobile applications that could be used for general education courses.
- Implementing dialogue workshops between the university, faculty and students to address: students' learning needs and preferences; the learning opportunities available through mobile devices; and the ambiguity behind using MT inside classrooms, as some faculty ban it and some students are distracted by it.
- Incorporating the students' professional and in-depth use of MT to the university plans to design and develop virtual learning environments and applications that meet students' expectations and skills in using technology.

7.5.2 For university faculty

University teachers and faculty could be encouraged to:

- Recognise their students' agency.
- Change their pedagogy to incorporate the use of MT inside and outside the classroom.
- Design and create learning opportunities that meet their students' learning needs and their skills in using technology.
- Negotiate with their students about their expectations around using technology in their courses.

7.5.3 For university students

University students could be encouraged to:

- Recognise their agency in appropriating the use of MT in learning, in crossing boundaries of contexts and in personalizing learning.
- Recognise current and potential uses of their MT in learning.
- Voice thier concerns regarding the use of MT in learning to their teachers and policy makers within their university.

7.5.4 For researchers for further research and enquiries

Researchers could consider the usefulness of the framework in new contexts. They could:

- Conduct research on the two other components of the mobile complex model, the structures and cultural practices, and see how they influence students' experience of ML.
- Investigate the experiences of students and the perceptions of instructors in other universities towards mobile learning.
- Evaluate the framework with male participants' practices and experiences of ML in order to investigate any differences in a segregated context.
- Explore the perceptions of educationalists in Saudi Arabia towards the impact of the ML on traditional teaching strategies to enrich the debate about ML in Saudi Higher Education.

- Conduct research about ML in Arab countries, as the shortage of Arabic resources in mobile learning highlights the need for continuous research in Arab contexts, in general, and in Saudi contexts, in particular.

Although this framework is specifically related to the experiences of mobile learning at universities in Saudi Arabia, I am confident that the assumptions and recommendations contained herein will be of great value to other populations facing similar challenges. Certainly, this framework will need to be used and developed further by researchers and practitioners in ML and I intend to incorporate it in future research studies with teachers and faculty. It is hoped that this mobile learning framework will provide insight into how mobile learning can be integrated into Saudi Higher Education.

7.6 Personal Reflection on The Thesis Journey

My PhD journey in the field of mobile learning was a wonderful experience as my studying background is in the combined areas of Computer Science and Education. I obtained my Bachelor's degree in Computer Information System and my Master's degree in Computers in Education. My interest in ML was a result of being a lecturer in the Computer Education department. After reading some literature on ML, I found that ML is an educational approach that has been utilized recently in HE in other countries and was useful in enhancing learning processes and supporting students in their learning.

I became convinced that ML would be the future of learning in HE. Therefore, I developed my PhD proposal around exploring the experiences HE Saudi female students had with ML. For my personal skills development, my PhD research gave me the opportunity to develop further critical thinking skills that I had not achieved through my previous studies such as critical reading and writing. In addition, as a result of my research into ML practices and experiences, I started to recognize the importance of my role as a lecturer in encouraging and recommending the use of ML to my students such as encouraging them to download and use some applications that I found useful to engage them in some activities during classes. Furthermore, I am now convinced that active learning strategies need to be encouraged in the Saudi Higher Education system to enhance students' learning skills and engagement.

Finally, I recognize how ML provides a flexible learning approach for women in Saudi society and culture. I selected this topic based on my interest in exploring a new learning environment that could help Saudi women to continue their education while meeting their traditional and cultural obligations. The positive conclusions of the research have increased my passion to do further research and development in ML in SA, in particular with regard to female students.

7.7 Conclusion

This research critically investigated and evaluated mobile learning in Saudi Arabia by identifying the research questions, approaching the literature, designing the methodology and methods, and analyzing and placing the findings within international models of mobile learning.

This study conducts a qualitative led mixed methods design and uses a case study methodology in order to investigate and analyse students' practices and experiences of ML in Saudi HE within the socio-cultural approach of ML. A large-scale online survey was used to collect general information from a large number of students in order to have broad patterns across the population. In addition, diaries, group interviews and individual interviews were used to collect data from a small number of students in order to provide rich descriptive data and deeper understanding and insight. The study classifies the findings within the mobile learning theory criteria and relates them to some theoretical models in the field of mobile learning. Therefore, it contributes to the literature by investigating HE students' practices and experiences of ML in a new context.

All in all, this study offers a conceptual framework for mobile learning in higher education based on students' practices and experiences of ML. The framework adopted the socio-cultural ecology model for ML by applying it to the Saudi context for female students in HE. Also, the study started with the LMLG definition of ML (see section 1.1) and developed it further. It concludes that ML is about how the learner agency, together with the affordances of MT, enables higher education students to appropriate tools and resources, to cross boundaries of contexts, and to personalize their learning with and through the use of their mobile tecnology in learning.

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Appendices

Appendix A - Mobile Phone Subscriptions by Country

2014
States and Markets

5.11 World Development Indicators: Power and communications

	Electric power		Telephones access and use				Telephones quality	Telephones affordability and efficiency			
	Consumption per capita	Transmission and distribution losses	Fixed telephone	Mobile cellular	Fixed telephone	Mobile cellular network	Population covered by mobile cellular network	Fixed telephone sub-basket	Mobile cellular sub-basket	Telecom revenue	Mobile cellular and fixed -line subscribers per employee
	kWh	% of output	Subscriptions per 100 people	Subscriptions per 100 people	International voice traffic minutes per person	International voice traffic minutes per person	%	$ per month	$ per month	% of GDP	
	2011	2011	2013	2013	2012	2012	2012	2012	2012	2012	2012
Afghanistan	..	..	0	70	..	..	88	1.9	9.7	..	..
Albania	2,254	25	9	116	36	272	99	7.5	25.9	4.3	825
Algeria	1,091	19	8	102	25	58	..	6.4	14.1	2.4	..
American Samoa	..	..	18	..	..	..	..	..	..	..	..
Andorra	..	..	49	81	..	..	99	..	..	..	383
Angola	248	11	1	62	..	..	..	16.9	20.0	..	..
Antigua and Barbuda	..	..	37	127	768	..	100	12.8	25.3	..	397
Argentina	2,967	14	23	159	..	..	..	4.5	39.4	2.3	..
Armenia	1,755	12	19	112	30	293	100	3.0	8.8	4.2	757
Aruba	..	..	34	135	..	..	..	..	..	..	..
Australia	10,712	5	44	107	..	..	99	33.0	20.3	2.9	358
Austria	8,374	6	39	156	..	..	99	27.8	14.7	1.4	1,124
Azerbaijan	1,705	20	19	108	15	83	100	2.5	10.4	2.4	619
Bahamas, The	..	..	36	76	..	..	100	16.3	17.5	..	468
Bahrain	10,018	7	22	166	135	2,085	100	4.8	15.0	3.5	772
Bangladesh	259	10	1	67	57	105	99	2.6	1.6	6.5	171
Barbados	..	..	52	108	..	..	99	22.0	24.6	..	..
Belarus	3,628	11	48	119	54	54	100	1.4	8.4	1.7	561
Belgium	8,021	5	41	111	..	..	100	36.1	39.7	1.6	896
Belize	..	..	7	53	137	..	..	19.2	31.3	4.6	396
Benin	..	..	2	93	9	56	99	13.4	14.4	6.3	4,875
Bermuda	..	..	110	144	..	..	..	..	..	..	..
Bhutan	..	..	4	72	..	151	100	1.7	3.5	2.7	734
Bolivia	623	11	8	98	65	..	95	24.0	11.8	4.8	1,339
Bosnia and Herzegovina	3,189	10	23	91	187	84	100	10.4	15.4	4.9	524
Botswana	1,603	56	9	161	..	..	96	17.9	13.0	4.2	1,907
Brazil	2,438	16	22	135	..	1	100	29.8	60.2	2.9	1,221
Brunei Darussalam	8,507	7	14	112	..	..	..	12.5	20.8	..	..
Bulgaria	4,864	9	27	145	58	86	100	11.9	34.8	2.9	726
Burkina Faso	..	..	1	66	..	32	..	14.8	12.2	..	6,982
Burundi	..	..	0	25	2	14	..	..	..	..	1,726
Cabo Verde	..	..	13	100	95	177	96	10.8	32.9	8.2	701
Cambodia	164	28	3	134	..	..	..	3.8	7.5	5.5	1,333
Cameroon	256	10	4	70	2	17	..	17.9	18.8	3.3	2,788
Canada	16,473	5	50	78	..	..	99	29.3	40.8	2.4	392
Cayman Islands	..	..	63	168	..	..	100	..	..	..	..
Central African Republic	..	..	0	29	0	16	63	..	..	2.2	755
Chad	..	..	0	36	0	14	36	16.7	15.4	2.1	4,378
Channel Islands	..	..	..	..	..	..	..	..	..	..	..
Chile	3,568	7	18	134	26	10	95	35.1	22.8	3.7	696
China	3,298	6	19	89	4	1	..	4.9	2.3	2.1	..
Hong Kong SAR, China	5,949	14	63	239	1,461	671	100	14.1	1.8	3.9	1,130
Macao SAR, China	..	..	28	304	161	992	100	8.4	5.7	1.7	1,330
Colombia	1,123	12	15	104	79	..	100	10.0	22.7	5.4	1,080
Comoros	..	..	3	47	..	..	..	10.0	13.5	5.9	234
Congo, Dem. Rep.	105	13	0	44	0	11	50	9.9	11.9	3.4	9,745
Congo, Rep.	172	46	0	105	..	102	95	..	..	3.2	3,147
Costa Rica	1,844	11	20	146	..	17	..	4.7	3.8	2.2	660
Cote d'Ivoire	212	22	1	95	..	59	95	20.7	20.1	6.4	5,043
Croatia	3,901	17	37	115	103	53	100	15.3	17.6	3.7	797
Cuba	1,327	16	11	18	16	21	85	0.3	26.5	..	129
Curacao	..	..	36	128	..	..	..	..	..	..	..
Cyprus	4,271	3	31	95	244	390	100	25.2	8.4	3.1	472
Czech Republic	6,289	5	19	131	88	85	100	29.1	27.7	1.8	798
Denmark	6,122	7	37	127	169	183	..	30.5	10.3	2.0	680
Djibouti	..	..	2	28	..	..	95	6.9	13.2	..	194

5.11 World Development Indicators: Power and communications

	Electric power		Telephones access and use				Telephones quality	Telephones affordability and efficiency			
	Consumption per capita	Transmission and distribution losses	Fixed telephone	Mobile cellular	Fixed telephone	Mobile cellular network	Population covered by mobile cellular network	Fixed telephone sub-basket	Mobile cellular sub-basket	Telecom revenue	Mobile cellular and fixed -line subscribers per employee
	kWh	% of output	Subscriptions per 100 people	Subscriptions per 100 people	International voice traffic minutes per person	International voice traffic minutes per person	%	$ per month	$ per month	% of GDP	
	2011	2011	2013	2013	2012	2012	2012	2012	2012	2012	2012
Dominica	..	..	24	130	127	171	90	10.7	15.4	6.8	520
Dominican Republic	893	30	11	88	116	34	95	16.6	14.9	3.2	1,135
Ecuador	1,192	17	15	111	48	17	96	6.9	17.1	2.3	1,846
Egypt, Arab Rep.	1,743	11	8	122	8	68	100	3.0	6.3	2.6	1,609
El Salvador	830	13	15	136	15	398	..	6.9	14.7	3.8	3,226
Equatorial Guinea	..	..	2	67	..	..	..	..	..	..	..
Eritrea	49	14	1	6	30	25	85	4.1	11.8	3.1	190
Estonia	6,314	7	33	160	67	139	100	12.8	24.6	2.6	648
Ethiopia	52	10	1	27	1	8	73	1.0	3.8	1.6	2,481
Faeroe Islands	..	..	36	121	..	..	100	..	..	..	329
Fiji	..	..	9	101	..	..	..	6.9	21.1	..	..
Finland	15,738	3	14	172	..	..	..	31.4	13.8	1.9	..
France	7,292	5	61	98	313	112	99	28.1	42.2	2.0	791
French Polynesia	..	..	20	86	61	53	98	..	..	..	..
Gabon	907	18	1	215	25	22	..	52.9	23.3	..	..
Gambia, The	..	..	3	100	..	..	..	3.5	6.0	..	598
Georgia	1,918	11	28	115	48	61	99	2.4	6.0	2.7	579
Germany	7,081	4	59	119	..	45	99	28.6	18.9	1.4	824
Ghana	344	18	1	108	12	67	87	5.2	6.6	2.3	5,207
Greece	5,380	5	48	117	133	151	100	25.4	43.3	3.1	1,009
Greenland	..	..	32	106	..	..	100	..	..	..	218
Grenada	..	..	27	126	..	..	..	13.4	14.7	7.1	551
Guam	..	..	41	..	..	..	..	..	..	..	..
Guatemala	539	7	12	140	206	..	100	5.8	19.8	..	..
Guinea	..	..	0	63	..	..	..	1.6	4.1	..	969
Guinea-Bissau	..	..	0	74	..	..	65	..	..	..	..
Guyana	..	..	20	69	68	88	97	3.1	9.0	5.2	984
Haiti	32	55	0	69	..	50	..	5.6	12.6	3.7	..
Honduras	708	20	8	96	24	274	..	6.3	17.0	5.3	1,137
Hungary	3,895	11	30	116	..	..	99	25.3	25.1	2.6	..
Iceland	52,374	3	51	108	159	119	99	21.0	21.9	1.9	430
India	684	21	2	71	..	..	..	3.2	3.5	2.1	..
Indonesia	680	9	16	122	22	..	100	4.8	7.9	2.0	5,576
Iran, Islamic Rep.	2,649	15	38	84	14	22	96	0.2	5.0	2.0	2,447
Iraq	1,343	35	6	96	..	..	..	0.4	12.5	..	1,431
Ireland	5,701	7	44	103	..	..	99	27.8	46.0	1.5	629
Isle of Man	..	..	..	..	..	..	..	..	..	..	..
Israel	6,926	3	45	123	..	..	99	18.2	36.2	2.7	359
Italy	5,515	7	34	159	..	..	99	28.8	31.9	1.7	1,790
Jamaica	1,553	18	9	100	159	1,006	..	15.0	10.5	3.6	..
Japan	7,848	5	50	115	..	..	100	29.0	30.7	2.8	2,396
Jordan	2,289	15	5	142	20	267	99	9.4	7.8	5.4	2,049
Kazakhstan	4,893	7	27	181	..	65	95	3.2	11.3	2.0	664
Kenya	155	17	0	71	1	32	89	12.6	3.7	3.3	4,580
Kiribati	..	..	9	17	..	..	..	12.9	18.1	..	..
Korea, Dem. Rep.	739	16	5	10	..	..	..	..	..	..	..
Korea, Rep.	10,162	3	62	111	20	44	100	6.1	7.4	4.0	696
Kosovo	2,947	16	..	..	..	..	..	..	..	..	..
Kuwait	16,122	12	15	190	..	..	100	..	..	..	..
Kyrgyz Republic	1,642	22	8	121	12	219	98	1.4	5.7	6.7	620
Lao PDR	..	..	10	66	2	14	72	4.6	6.2	1.7	1,940
Latvia	3,264	10	23	137	..	..	..	10.9	13.3	3.6	..
Lebanon	3,499	11	18	81	..	..	99	10.3	20.9	..	..
Lesotho	..	..	3	86	2	190	81	13.8	19.8	4.7	4,383
Liberia	..	..	0	60	..	66	..	..	..	..	..
Libya	3,926	13	13	165	..	..	..	..	..	..	..
Liechtenstein	..	..	49	98	1,805	..	100	29.0	23.4	..	..
Lithuania	3,530	21	21	151	50	88	98	13.9	10.8	1.7	199
Luxembourg	15,530	6	50	149	1,054	581	100	28.5	27.7	1.2	576
Macedonia, FYR	3,881	20	19	106	55	80	100	9.1	13.3	4.9	..
Madagascar	..	..	1	36	1	4	..	8.8	17.7	3.3	3,821

5.11 World Development Indicators: Power and communications

	Electric power		Telephones access and use				Telephones quality	Telephones affordability and efficiency			
	Consumption per capita	Transmission and distribution losses	Fixed telephone	Mobile cellular	Fixed telephone	Mobile cellular network	Population covered by mobile cellular network	Fixed telephone sub-basket	Mobile cellular sub-basket	Telecom revenue	Mobile cellular and fixed -line subscribers per employee
	kWh	% of output	Subscriptions per 100 people	Subscriptions per 100 people	International voice traffic minutes per person	International voice traffic minutes per person	%	$ per month	$ per month	% of GDP	
	2011	2011	2013	2013	2012	2012	2012	2012	2012	2012	2012
Malawi	..	..	0	32	5	1	85	21.5	21.0	..	..
Malaysia	4,246	6	15	145	73	..	97	5.4	7.4	4.6	..
Maldives	..	..	7	181	0	656	100	3.6	6.0	..	559
Mali	..	..	1	129	2	60	..	8.3	15.5	6.3	13,230
Malta	4,689	11	54	130	142	87	100	13.6	28.2	2.9	470
Marshall Islands	..	..	..	..	..	..	..	45.8	22.2	..	..
Mauritania	..	..	1	103	1	67	..	17.6	14.6	6.0	5,432
Mauritius	..	..	29	123	74	123	99	5.4	6.5	2.8	1,518
Mexico	2,092	15	17	86	223	..	100	19.2	23.4	2.6	915
Micronesia, Fed. Sts.	..	..	10	30	..	..	..	147.0	13.6	..	..
Moldova	1,470	21	35	106	94	185	..	0.5	13.2	4.7	608
Monaco	..	..	124	94	..	1,037	100	21.2	52.6	..	274
Mongolia	1,577	14	6	124	4	57	91	1.1	5.7	4.2	449
Montenegro	5,747	25	27	160	..	..	100	8.3	17.5	..	..
Morocco	826	13	9	129	91	64	99	2.3	23.2	4.3	3,660
Mozambique	447	15	0	48	..	11	..	12.9	13.0	5.9	1,757
Myanmar	110	21	1	13	5	..	2	..	..	..	146
Namibia	1,549	28	8	110	36	..	100	12.8	16.0	3.3	1,381
Nepal	106	34	3	71	..	..	35	2.7	3.5	..	3,188
Netherlands	7,036	4	43	114	..	85	100	35.1	43.5	1.6	..
New Caledonia	..	..	33	94	..	..	..	..	..	..	..
New Zealand	9,399	7	41	106	..	..	97	53.4	51.6	2.5	615
Nicaragua	522	19	5	112	..	..	..	3.8	27.8	..	..
Niger	..	..	1	39	7,473	..	75	11.7	16.6	4.6	..
Nigeria	149	10	0	73	1	29	96	9.5	9.8	1.6	7,819
Northern Mariana Islands	..	..	43	..	..	..	..	..	..	..	..
Norway	23,174	8	26	116	..	..	..	38.0	25.2	1.1	..
Oman	6,292	13	10	155	20	324	98	13.2	8.7	2.4	1,462
Pakistan	449	17	3	70	15	69	92	3.5	3.5	2.0	..
Palau	..	..	33	90	..	..	98	..	..	..	263
Panama	1,829	14	15	163	82	86	96	9.5	12.6	2.4	1,510
Papua New Guinea	..	..	2	41	..	..	..	11.5	30.4	..	..
Paraguay	1,228	6	6	104	54	21	94	8.8	8.8	..	..
Peru	1,248	6	11	98	..	..	97	12.3	12.8	2.9	1,752
Philippines	647	11	3	105	..	..	99	15.0	10.5	2.1	..
Poland	3,832	7	14	150	..	..	100	21.6	11.3	2.7	1,063
Portugal	4,848	8	43	113	..	129	99	25.0	25.3	3.9	1,286
Puerto Rico	..	..	18	84	..	..	..	..	..	..	392
Qatar	15,755	2	19	153	..	..	100	9.1	18.7	1.1	982
Romania	2,639	12	22	106	47	144	100	13.0	25.7	1.8	598
Russian Federation	6,486	10	28	153	..	..	..	4.1	11.1	2.3	735
Rwanda	..	..	0	57	0	20	98	9.0	14.7	2.7	7,536
Samoa	..	..	..	..	..	..	..	12.7	18.1	..	..
San Marino	..	..	60	117	..	..	98	25.6	23.8	..	..
Sao Tome and Principe	..	..	4	65	9	53	70	8.6	13.2	5.8	1,480
Saudi Arabia	8,161	9	16	176	42	768	99	13.2	14.1	2.6	2,435
Senegal	187	17	2	93	8	89	91	12.5	19.5	9.8	4,944
Serbia	4,490	15	39	119	106	59	100	7.0	12.5	4.9	994
Seychelles	..	..	23	147	50	61	98	9.0	15.3	..	411
Sierra Leone	..	..	0	44	..	..	..	..	..	..	..
Singapore	8,404	5	36	156	..	..	100	8.8	9.3	2.5	..
Sint Maarten (Dutch part)	..	..	..	..	..	..	..	..	..	..	..
Slovak Republic	5,348	2	18	114	53	126	100	18.9	17.5	2.6	790
Slovenia	6,806	5	38	110	65	113	100	18.7	25.1	2.4	543
Solomon Islands	..	..	1	58	..	..	..	10.3	14.5	..	..
Somalia	..	..	1	49	..	..	80	..	..	..	..
South Africa	4,604	8	9	147	..	..	..	28.3	32.6	4.4	..
South Sudan	..	..	0	25	..	48	..	..	..	..	3,777
Spain	5,530	9	41	107	144	..	100	33.5	39.9	2.2	1,051

5.11 World Development Indicators: Power and communications

	Electric power		Telephones access and use				Telephones quality	Telephones affordability and efficiency			
	Consumption per capita	Transmission and distribution losses	Fixed telephone	Mobile cellular	Fixed telephone	Mobile cellular network	Population covered by mobile cellular network	Fixed telephone sub-basket	Mobile cellular sub-basket	Telecom revenue	Mobile cellular and fixed -line subscribers per employee
	kWh	% of output	Subscriptions per 100 people	Subscriptions per 100 people	International voice traffic minutes per person	International voice traffic minutes per person	%	$ per month	$ per month	% of GDP	
	2011	2011	2013	2013	2012	2012	2012	2012	2012	2012	2012
Sri Lanka	490	12	13	95	35	99	98	3.4	1.1	1.9	1,823
St. Kitts and Nevis	..	..	35	142	..	..	..	12.6	22.1	5.6	786
St. Lucia	..	..	18	116	..	307	..	13.4	21.6	6.5	506
St. Martin (French part)	..	..	..	..	..	..	..	..	..	..	..
St. Vincent and the Grenadines	..	..	17	115	..	..	100	10.9	24.6	6.7	800
Sudan	143	22	1	73	0	57	88	4.9	5.6	2.0	..
Suriname	..	..	16	127	55	370	100	2.9	14.2	1.0	677
Swaziland	..	..	4	71	20	48	97	6.8	22.5	4.3	904
Sweden	14,030	7	41	124	..	..	100	28.3	20.6	1.4	..
Switzerland	7,928	7	58	134	..	..	100	34.6	51.3	2.3	647
Syrian Arab Republic	1,715	8	20	56	42	66	90	1.3	21.3	..	666
Tajikistan	1,714	17	5	92	..	..	..	0.9	8.5	..	..
Tanzania	92	19	0	56	0	3	95	8.9	7.7	..	..
Thailand	2,316	7	9	138	11	19	100	6.2	10.6	2.3	..
Timor-Leste	..	..	0	57	..	..	92	20.8	16.3	6.1	..
Togo	..	..	1	63	2	44	91	10.5	17.8	8.9	2,277
Tonga	..	..	29	55	..	..	..	6.4	11.0	..	..
Trinidad and Tobago	6,332	5	22	145	172	209	100	15.6	15.1	2.9	1,626
Tunisia	1,297	14	9	116	54	90	99	6.0	10.6	3.9	1,292
Turkey	2,709	14	18	93	43	44	100	13.7	31.4	2.1	2,203
Turkmenistan	2,444	13	11	117	..	..	..	..	..	..	..
Turks and Caicos Islands	..	..	..	..	..	..	..	..	..	..	..
Tuvalu	..	..	15	34	..	..	..	..	..	..	..
Uganda	..	..	1	44	..	18	100	9.2	9.0	3.7	3,080
Ukraine	3,662	11	26	138	..	..	100	3.7	7.8	3.4	..
United Arab Emirates	9,389	7	22	172	..	..	100	4.1	9.1	2.1	1,977
United Kingdom	5,472	8	53	124	..	..	100	36.2	47.8	1.9	..
United States	13,246	6	42	96	..	..	100	15.0	35.6	3.4	516
Uruguay	2,810	12	31	155	83	43	100	12.0	22.4	2.5	853
Uzbekistan	1,626	9	7	74	104	94	92	1.4	2.4	2.9	1,265
Vanuatu	..	..	2	59	..	..	92	40.4	25.1	4.9	728
Venezuela, RB	3,313	20	26	102	74	..	..	1.7	14.9	2.9	1,520
Vietnam	1,073	10	10	131	..	..	..	2.0	4.1	..	..
Virgin Islands (U.S.)	..	..	71	..	..	..	..	..	..	..	..
West Bank and Gaza	..	..	9	74	..	..	..	..	..	..	949
Yemen, Rep.	193	27	5	69	21	64	84	0.9	11.1	..	1,273
Zambia	599	24	1	72	2	14	78	7.4	16.5	71.5	4,219
Zimbabwe	757	4	2	96	8	37	81	9.8	20.6	..	2,742
World	3,045	8	16	93	..	..	..	10.4	14.6	2.6	1,137
Low income	219	15	1	53	..	40	84	8.9	11.9	4.4	3,188
Middle income	1,816	10	12	92	..	..	..	6.9	13.0	2.5	1,360
Lower middle income	736	16	5	85	..	..	..	4.8	10.1	2.8	1,716
Upper middle income	2,932	9	19	100	27	9	..	9.4	14.9	2.5	1,256
Low & middle income	1,646	10	10	86	..	..	..	7.2	12.6	2.6	1,726
East Asia & Pacific	2,582	6	16	95	6	2	..	5.2	7.7	2.2	..
Europe & Central Asia	2,955	12	21	112	..	..	99	3.7	12.5	2.4	620
Latin America & Caribbean	1,985	15	18	114	..	..	99	7.9	14.9	2.9	1,280
Middle East & North Africa	1,696	15	15	101	27	57	97	4.5	10.9	2.7	1,829
South Asia	605	20	2	71	..	..	..	3.0	3.5	2.4	1,823
Sub-Saharan Africa	535	11	1	66	..	23	84	10.5	14.6	3.2	4,219

5.11 World Development Indicators: Power and communications

	Electric power		Telephones access and use				Telephones quality	Telephones affordability and efficiency			
	Consumption per capita	Transmission and distribution losses	Fixed telephone	Mobile cellular	Fixed telephone	Mobile cellular network	Population covered by mobile cellular network	Fixed telephone sub-basket	Mobile cellular sub-basket	Telecom revenue	Mobile cellular and fixed -line subscribers per employee
	kWh	% of output	Subscriptions per 100 people	Subscriptions per 100 people	International voice traffic minutes per person	International voice traffic minutes per person	%	$ per month	$ per month	% of GDP	
	2011	2011	2013	2013	2012	2012	2012	2012	2012	2012	2012
High income	8,905	6	42	120	..	..	100	25.2	20.6	2.6	794
Euro area	6,626	6	47	122	..	..	99	27.8	25.2	1.8	824

Most Recent Value (MRV) if data for the specified year or full period are not available; or growth rate is calculated for less than the full period.

About the Data

Electric power consumption (kWh per capita)

Long definition

Electric power consumption measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants.

Source

International Energy Agency (IEA Statistics © OECD/IEA, http://www.iea.org/stats/index.asp), Energy Statistics and Balances of Non-OECD Countries and Energy Statistics of OECD Countries.

Telephone lines (per 100 people)

Long definition

Telephone lines are fixed telephone lines that connect a subscriber's terminal equipment to the public switched telephone network and that have a port on a telephone exchange. Integrated services digital network channels ands fixed wireless subscribers are included.

Source

International Telecommunication Union, World Telecommunication/ICT Development Report and database, and World Bank estimates.

Population covered by mobile cellular network (%)

Long definition

Population covered by mobile cellular network is the percentage of people that live in areas served by a mobile cellular signal regardless of whether they use it.

Source

International Telecommunication Union, World Telecommunication/ICT Development Report and database, and World Bank estimates.

Residential fixed line telephone tariff (US$ per month)

Long definition

Residential fixed-line tariff is the monthly subscription charge plus the cost of 30 three-minute local calls (15 peak and 15 off-peak).

Source

International Telecommunication Union, World Telecommunication/ICT Development Report and database.

Please see the online table at http://wdi.worldbank.org/table/5.11 for observation-level metadata, which can be downloaded in Excel.

Appendix B - List of Expert Advisors

	Expert Name (Last certificate)	Experience	Current position	Email
1	**Prof. Nidhal AlAhmad** University of Michigan	More than 10 years	Full professor - College of Education - KSU	nsahmad@ksu.edu.sa
2	**Prof. Latifa AlSemairi** Makkah College of Education	More than 10 years	Full professor - College of Education - KSU	Lsemairi@hotmail.com
3	**Dr. Ahmad Almassaad** King Saud University	More than 10 years	Associate professor - College of Education – Computer Curriculum and Instruction Department - KSU	aalmassaad@ksu.edu.sa
4	**Dr. Riyadh Alhassan** The Florida State University	More than 10 years	Associate professor - College of Education - Computer Curriculum and Instruction Department - KSU	alhassan@ksu.edu.sa
5	**Dr. Magda Selim** Helwan University	More than 10 years	Associate professor - College of Education - KSU	mselime@ksu.ed.sa
6	**Nagwa Aly** Minia University	More than 10 years	Assistant Professor - College of Education - KSU	dr8182@yahoo.com
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8	**Amal Yusuf** Helwan University	More than 5 years	Assistant Professor - College of Education - KSU	Dr-yousef2011@hotmail.com
9	**Reem Alebaikan** University of Exeter	Less than 10 years	Assistant Professor - College of Education - Computer Curriculum and Instruction Department - KSU	ebaikan@ksu.edu.sa
10	**Elham A. Alsadoon** Ohio University	Less than 5 years	Assistant Professor - College of Education - Computer Curriculum and Instruction Department - KSU	ealsadoon@ksu.edu.sa

Appendix C - KSU's Permission Letter (in Arabic)

جامعة الملك سعود
King Saud University

قم القيد ٣/ ٤٤٤١٠٣/ ١
تاريخ ١٤٣٥/١٢/٢٨
مرفقات

For ... Research

بسم الله الرحمن الرحيم

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الملك سعود
مكتب وكيل الجامعة
للدراسات العليا والبحث العلمي

Date.: ..... التاريخ: ..... No.: ..... الرقم:

سعادة وكيل الجامعة للدراسات العليا والبحث العلمي **حفظه الله**

السلام عليكم ورحمة الله وبركاته

إشارة إلى القرار الإداري رقم ٤/٥٢/٦٠٩٨٢ وتاريخ ١٤٣٤/١١/٢٤هـ، بخصوص ابتعاث المحاضرة/حياة بنت عبدالرحمن العجلان (رقم وظيفي ٢٥٣٩٧) إلى جامعة **برايتون** ببريطانيا ضمن برنامج الإشراف الخارجي المشترك للمحاضرات والمعيدات.

وبناءً على الطلب المقدم من المحاضرة /حياة بنت عبدالرحمن العجلان بخصوص طلبها بإجراء تقديم دراسة استبانات بعنوان "**استبيان التعلم الجوال**" توزع على طلاب وطالبات ومنسوبي ومنسوبات جامعة الملك سعود بحيث تحوي بنود الدراسة على معلومات تقنية تربوية بحتة.

لذا آمل من سعادتكم التكرم بالموافقة على طلب المحاضرة المذكورة اعلاه بعمل استبانة بالطريقة النظامية وتوزيعها داخل حرم الجامعة.

والله يرعاكم،،،

المشرف العام على

برنامج الإشراف الخارجي المشترك

د. إبراهيم بن محمد الحركان

ISO 9001:2008
BUREAU VERITAS
Certification

P.O. Box 2454, Riyadh 11451 Tel: 4670108 Fax: 4677999 ص.ب ٢٤٥٤ الرياض ١١٤٥١ هاتف: ٤٦٧٠١٠٨ فاكس: ٤٦٧٧٩٩٩

Appendix D - Data Collection Method Forms

Appendix D-1: Questionnaire

Mobile Learning Survey

This is a survey on university students' use of mobile technology for learning. Your voluntary participation is needed and we encourage you to provide accurate answers so that we can gather accurate data that will benefit research, especially given the limitations of such statistics in the field of learning and technology in Saudi Arabia.

The survey is divided into seven sections. It should take approximately 20 minutes to complete the survey. Your name will not be recorded on the questionnaire and your responses will be anonymous. Completing this questionnaire means that you have consented to the use of the information provided for research purposes.

For the purpose of this survey,

- **"Mobile devices" includes mobile phones and other handheld devices such as iPads, Galaxy Tablets, or similar devices; and excludes tablet PCs and laptops**.
- **"Mobile phone" includes mobile phones only such as iPhone, etc.**

Thank you for your assistance.

Contact details
Researcher: Hayat Alajlan, University of Brighton, H.Alajlan1@uni.brighton.ac.uk
Research Supervisors:
Prof. Avril Loveless, University of Brighton, a.m.loveless@brighton.ac.uk
Prof. Olfat Fodah, King Saud University, omfodah@ksu.edu.sa
Prof. Keith Turvey, University of Brighton, kt6@brighton.ac.uk
Dr. Richard Griffiths, University of Brighton, R.N.Griffiths@brighton.ac.uk

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Section 1 – General information about you

This section contains 7 general questions about you.

1. Gender: □Female □Male

2. Your Colleges:
   □KSU colleges □Other (specify) ……

3. Your age:
   □17-20 □21-24 □25-28 □29-32 □33 and above

4. Your current academic level:
   □Preparatory year (1st year) □Undergraduate
   □Master □PhD □Other (specify) ……

5. Your major (subject)/ the college that you enrolled in:
   - ☐ Education
   - ☐ Arts
   - ☐ Tourism & Antiquities
   - ☐ Sport Science
   - ☐ Arabic Language Institute
   - ☐ Teachers Colleges

- ☐ Language & Translation
- ☐ Law & Political Science
- ☐ Business Administration
- ☐ Computer & Information Sciences
- ☐ Sciences
- ☐ Food & Agricultural Sciences
- ☐ Architecture & Planning
- ☐ Engineering
- ☐ College of Medicine
- ☐ Prince Sultan College for Emergency Medical Services
- ☐ Applied Medical Science
- ☐ Nursing
- ☐ Dentistry
- ☐ Pharmacy
- ☐ College of Applied Studies and Community Service
- ☐ Riyadh Community College
- ☐ Preparatory year

6. Do you have a laptop? □Yes □No

7. Do you have a mobile phone? □Yes □No
   If Yes, please complete the whole survey beginning with Section2 -Part B
   If No, please answer Section2- Part A only

Section 2- Part A: Reasons behind not having a mobile phone

This part contains 5 general questions about your reasons for not having a mobile phone and what you do if you need to use a mobile/electronic device.

8. Why you don't have a mobile phone?
   - ☐ Unnecessary.
   - ☐ I can't afford it.
   - ☐ I think line phone is enough.
   - ☐ I think it is a kind of time waste.
   - ☐ I have one but it does not work.
   - ☐ Other (specify) ……

9. If you would like to make a voice call, what devices do you use?
   - ☐ Landline phone.
   - ☐ Family mobile phone
   - ☐ Friend's mobile phone.
   - ☐ Other (specify) ……

10. If you want to use the Internet (send emails, browse, etc.) for personal purposes, what device do you use?
    - ☐ Personal PC.
    - ☐ University Computer pool.
    - ☐ Friend or family mobile phone.

- ☐ Friend or family mobile device.
- ☐ I rarely use Internet.
- ☐ Other (specify) ……

11. I your courses have homework assignments or study requirements, or you need to contact the university, what device do you use?
    - ☐ Personal PC.
    - ☐ University Computer pool.
    - ☐ Friend or family mobile phone.
    - ☐ Friend or family mobile device.
    - ☐ I rarely use Internet.
    - ☐ Other (specify) ……

12. To receive regular messages from KSU, what mobile number did you provide them with?
    - ☐ Friend mobile phone number.
    - ☐ Family mobile phone number.
    - ☐ None
    - ☐ Other (specify) ……

Section 2- Part B: Information about your mobile devices and Internet

This part contains questions about your mobile devices and Internet availability.

13. Do you own any of the following mobile device(s): (Please tick all that apply)
    - ☐ Tablet (e.g. iPad)
    - ☐ PDA (Personal Digital Assistant)
    - ☐ E-reader
    - ☐ I don't have any mobile devices
    - ☐ Other (specify) ……

14. How many mobile phones (Basic mobile phone/Smartphone) do you have?
    - ☐ 1
    - ☐ 2
    - ☐ 3
    - ☐ 4
    - ☐ More than 4

15. When did you own your first mobile phone?
    - ☐ In elementary school
    - ☐ In middle school
    - ☐ In high school
    - ☐ At university

16. Do you connect to the Internet via your mobile phone or other mobile devices?
    - ☐ Yes
    - ☐ No

If Yes, please complete the remaining questions in this section (from Q17 to Q22)
If No, please go to Section3

17. How often is your mobile phone connected to the Internet?
    - ☐ Always
    - ☐ Most times
    - ☐ Rarely
    - ☐ Never

18. How often is your other mobile device(s) connected to the Internet?
    - ☐ Always
    - ☐ Most times
    - ☐ Rarely
    - ☐ Never

19. What kind of Internet connection do you use?
    - ☐ WI-FI
    - ☐ 3G
    - ☐ Modem (dial-up (cable, DSL, etc.))
    - ☐ Broadband
    - ☐ I do not know

20. How often do you connect to the Internet?
    - ☐ Everyday
    - ☐ Once a day
    - ☐ Whenever I need to

21. Do you connect to the Internet for free or do you have to pay?
    - ☐ Free
    - ☐ Pay
    - ☐ Both
    - ☐ I do not know

22. What kind of Internet connection do you use when you are at university?
    - ☐ University Wi-Fi
    - ☐ My own connection
    - ☐ Both
    - ☐ I do not know

Section 3 – What does your mobile device(s) mean to you?

This section contains 5 questions about the value of your mobile phone.

23. Describe your mobile phone: "it is a ……. ": (Please tick all that apply)
    - ☐ Communication device
    - ☐ A window to my identity (private pictures/ passwords/private info)
    - ☐ Game device
    - ☐ A web browsing device & searching for information
    - ☐ Social media device
    - ☐ Part of my fashion
    - ☐ Essential part of my daily life

- ☐ Other (specify) ……

24. What kind of information do you save on your mobile? (Please tick all that apply)
    - ☐ Personal information
    - ☐ Personal pictures and videos
    - ☐ Other important information
    - ☐ Non-important information
    - ☐ Non-personal information
    - ☐ Other (specify) ……

25. What do you do if you forget your mobile at home?
    - ☐ It doesn't matter
    - ☐ I'll struggle without it
    - ☐ I'll return home to pick it up
    - ☐ Other (specify) ……

26. What would you do if you lose your mobile?
    - ☐ It doesn't matter (I have another/ I'll buy a new one)
    - ☐ It will negatively affect me (I don't have another / I can't afford another one)
    - ☐ It doesn't matter (I have a backup of the information/ the information is not important)
    - ☐ It will negatively affect me (I don't have a backup / the information is important)
    - ☐ Other (specify) ……

27. How many times do you replace your mobile device?
    - ☐ Every year
    - ☐ Every 2 years
    - ☐ Every 3 years or more

- If you replace your mobile every year or every two years, please answer question 28, then move to section 4.
- If you don't replace your mobile every year or every two years, please answer question 29.

28. Why do you replace your mobile every year or every two years? (Please tick all that apply)
    - ☐ A problem with the old device (damaged/doesn't work/ screen broken, etc.)
    - ☐ New features
    - ☐ Faster
    - ☐ Larger storage capacity
    - ☐ Lighter weight
    - ☐ A new design
    - ☐ More fashionable
    - ☐ I got it as a present
    - ☐ Other (specify) ……

29. Why don't you replace your mobile every year or every two years? (Please tick all that apply)
    - ☐ My mobile is still working
    - ☐ I got used to my mobile
    - ☐ No need for new features
    - ☐ Out of my budget
    - ☐ I don't know how to transfer the information and number to a new device
    - ☐ Other (specify) ……

Section 4 – Places & Times

This section contains 5 questions about the places and times that you use your mobile device.

30. What five places do you use your mobile devices the most in? (Please tick the top five places)
    - ☐ Home
    - ☐ University
    - ☐ Café Shop
    - ☐ Shopping mall
    - ☐ Restaurant
    - ☐ In a car/bus/taxi
    - ☐ Other (specify) ……

31. Where are you most often connected to the Internet? (Please tick all that apply)
    - ☐ Home
    - ☐ University
    - ☐ Café Shop
    - ☐ Shopping mall
    - ☐ Restaurant
    - ☐ In a car/bus/taxi
    - ☐ Other (specify) ……

32. When do you use your mobile device the most (through the day)?
    - ☐ Morning
    - ☐ Afternoon
    - ☐ Evening
    - ☐ When I am not busy
    - ☐ All the time

33. When do you use your mobile the most (through the week)?
    - ☐ On the weekdays
    - ☐ On the weekends
    - ☐ Everyday

34. How long do you think you spend daily on your mobile?
    - ☐ Less than an hour
    - ☐ 2-3 hours
    - ☐ 4-6 hours

- ☐ More than 6 hours
- ☐ I do not know

Section 5 – Mobile Features:

This section includes questions about features on your mobile and how you use them in two levels: personally and academically.

35. Please rank the features that you use on your mobile phone from the most used to the least used. (1= the most used and 9 = the least used)
    - _ Voice call
    - _ SMS (sending / receiving)
    - _ Multimedia (Camera: photo, Video: recording or watching, Audio: recording or listening)
    - _ Web browser
    - _ Applications (Apps) and Games (downloading/using)
    - _ Email (sending / receiving)
    - _ Work-Organizing tools (Clock: set alarm and check time, Calendar, Note, Calculator)
    - _ Location Services (GPS) (ex: Google map)
    - _ Downloading ability

36. Please rank the features that you use on your other mobile devices (excluding mobile phones) from the most used to the least used. (1= the most used and 7= the least used)
    - _ Multimedia (Camera: photo, Video: recording or watching, Audio: recording or listening)
    - _ Web browser
    - _ Applications (Apps) and Games (downloading/using)
    - _ Email (sending / receiving)
    - _ Work-Organizing tools (Clock: set alarm and check time, Calendar, Note, Calculator)
    - _ Location Services (GPS) (ex: Google map)
    - _ Downloading ability

37. Please indicate if you use your mobile features at each level

	Level 1 Do you use it for personal purposes?	**Level 2 Do you use it for learning purposes?**
1. **Voice call**	**□Yes □No**	**□Yes □No**
2. **Messages** SMS	**□Yes □No**	**□Yes □No**
3. **Multimedia** (Camera, Video, Audio)	**□Yes □No**	**□Yes □No**
4. **Web browser**	**□Yes □No**	**□Yes □No**

5. **Application (Apps) & Games**	◻Yes ◻No	◻Yes ◻No
6. **Email**	◻Yes ◻No	◻Yes ◻No
7. **Work-Organizing tools** (Clock, Calendar, Note, Calculator)	◻Yes ◻No	◻Yes ◻No
8. **Location Services** (e.g. Google map)	◻Yes ◻No	◻Yes ◻No
9. **Download ability**	◻Yes ◻No	◻Yes ◻No

Section 6 – Mobile Applications

This section contains 5 questions about applications that are not often sold with mobile devices and can be downloaded.

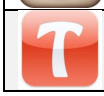
38. How often do you download an app?
    - ☐ Many times a day
    - ☐ Daily
    - ☐ Weekly
    - ☐ Monthly
    - ☐ Every two months or more
    - ☐ Never

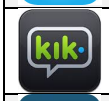
39. How many apps do you have on your mobile phone?
    - ☐ Less than 10 apps
    - ☐ 10-20 apps
    - ☐ More than 20

40. Do you have Arabic apps on your mobile phone?
    - ☐ Yes
    - ☐ No

41. How many apps on your mobile phone support the Arabic language (written)?
    - ☐ All
    - ☐ Some
    - ☐ None

42. Do you use any of the following Communication Apps?

	1. Twitter	☐ Use ☐ Not used
	2. WhatsApp	☐ Use ☐ Not used
	3. Snapchat	☐ Use ☐ Not used
	4. Skype	☐ Use ☐ Not used
	5. Instagram	☐ Use ☐ Not used
	6. Tango	☐ Use ☐ Not used

	7. Facetime	□ Use □ Not used
	8. Foursquare	□ Use □ Not used
	9. Kik	□ Use □ Not used
	10. Keek	□ Use □ Not used
	11. Path	□ Use □ Not used
	12. Pinterest	□ Use □ Not used
	13. Ask.fm	□ Use □ Not used
Other communication Apps (specify) ……		

Section 7 – Inside your classroom

This section contains 5 questions about the use of mobiles inside the classroom.

43. What tools/resources do you use to support your learning (at home, or at university or elsewhere)? (Please tick all that apply)
    - ☐ Books
    - ☐ Pen & pencil & papers
    - ☐ PC
    - ☐ Laptop
    - ☐ Mobile phone
    - ☐ Other mobile devices
    - ☐ TV
    - ☐ Other (specify) .....

44. Do your teachers allow you to use your laptops inside the classroom?
    ☐Yes ☐No ☐ Don't say anything
45. If Yes, for what?
    - ☐ In-class activity
    - ☐ Searching for class-related information
    - ☐ Looking for something related to the course
    - ☐ Homework
    - ☐ Other (specify) .....

46. Do your teachers allow you to use your **mobile phone** inside the classroom?
    ☐Yes ☐No ☐ Don't say anything
47. If Yes, for what?
    - ☐ In-class activity
    - ☐ Searching for class-related information
    - ☐ Looking for something related to the course
    - ☐ Homework
    - ☐ Other (specify) .....

48. Do you use your mobile phone inside the classroom, regardless of your teacher's instructions?
    ☐Yes ☐No ☐Sometimes
49. If Yes or sometimes, for what?
    - ☐ Voice call
    - ☐ Texting
    - ☐ Socializing
    - ☐ Searching for non-class information
    - ☐ Checking/looking for something
    - ☐ Looking for something
    - ☐ Other (specify) .....

50. How might the university help you to use your mobile in learning? (Please tick all that apply)
    - ☐ By providing educational sessions on mobile learning
    - ☐ By providing training courses and tutorials about the uses of mobile devices on learning (F2F/online)
    - ☐ By providing Blackboard on mobiles (virtual learning environment & discussions)
    - ☐ By downloading courses materials on mobile devices
    - ☐ By integrating mobile learning with traditional learning (Blended learning)
    - ☐ By recording and watching lectures on mobile devices
    - ☐ By supporting and encouraging the use of mobile devices for courses

Thank you for taking the time to assist me in my educational endeavors; it is greatly appreciated.

This study contains many stages, and this survey represents the first stage. If you would like to participate in other stages (which include keeping a simple diary for two days, and taking part in a group interview and a one-to-one interview), please check the box below.
A certificate of appreciation will be sent to you if you enter your email address below, though you may submit without entering your email address.
If you are selected, please note the group interview should take no longer than 40 minutes and the individual interview should take no longer than 60 minutes.

Please enter your email address:_____

Check the box below if would like to participate more in this study:
☐ I would like to participate (Only female participants)

If you want to add any other information, please write it below.
.....
.....

END

Appendix D-2: Diary Template

"Diary for using My Mobile Phone/Device"

Name (optional): ……..…… Day: …….. Date: …….. Place ……..

Type of device used: ……..... Are you connected to the Internet now? Yes/No

Time (Day): 8 am – 8 pm

Please list below your mobile phone/device use throughout the following two days - one weekday and one weekend day.

For each entry, please include: which device was used; the specific application or feature used, and the purpose it was used for (personal / educational).

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“Diary for using My Mobile Phone/Device”

Name (optional): …… Day: …….. Date: …….. Place ……..

Type of device used: ……..... Are you connected to the Internet now? Yes/No

Time (Night): 8 pm – 8 am

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Thank you for taking the time to participate in this study, it is greatly appreciated.

This study contains many stages, and the diary represents the second stage. If you would like to continue participating in other stages (which include a group and individual interview) please enter your email address below.

A certificate of appreciation will be sent to you if you enter your email address below, though you may submit without entering your email address. If you are selected, please note that the group interview will take no longer than 40 minutes and the individual interview will take no longer than 60 minutes.

Please enter your email address: ……..……..

Appendix D-3: Group Interview Questions

1. Please provide some examples of learning activities that you have experienced with the use of your mobile technology devices.
    - Where did you learn these activities (different locations)?
    - What were the different tools that you used to learn?
    - What was the purpose of the learning activities that you accomplished (personal, educational)?

2. Have you heard of the term "mobile learning"?
    - What do you think it means?
    - Is this term well-known among students?

3. How do you think we can use mobile technology in learning, in general?
    - How do you use your mobile for learning, fun, and socializing?
    - Have you ever personally used your mobile device for learning? How?
    - What is the thing you use your mobile the most for, in general?

4. If someone asks you what mobile learning means, what will you say to him or her?

***Note**: To ensure ease of communication with participants, all methods were translated into Arabic.*

Appendix D-4: In-depth Interview Questions

Part I: Student's Experience

1. Tell me about some learning opportunities in which you used your mobile?
   - How do you personally use your mobile device for learning?
   - What is the purpose/goal/activity that you use your mobile the most for in learning?
   - What does "having/owning a mobile phone at university" mean to you? Can you imagine yourself without a mobile phone? Why?

2. What was your initial expectation of "mobile learning"?
   - What are the advantages of mobile learning, from your point-of-view?
   - Do you face any technical obstacles while using your mobile in learning? Do you face any other obstacles?

3. Can you please describe your learning space at home?
   - What tools do you use?
   - Where do you usually put your mobile while studying?

Part II: In the classroom / University

4. Can you please describe your learning space in class?
   - Where do you put your mobile device when you are in class? Where do your teacher and the other students place their mobile devices?
   - Do you ever use it in class? If so, for what?
   - Do you see students using mobile devices in your class? How often? What do you think they are doing with them?

5. How do you think your teachers view students' use of mobile devices in class?
   - What are the kinds of policies in place?
   - Do any teachers encourage the use of mobile devices for learning? If yes, how? If no, why do you think?

6. What are some of the opportunities/barriers to your learning at university? Do you think mobile learning could help to widen/overcome that?

Part III: Recommendations: opportunities / barriers

7. What would you recommend as appropriate and inappropriate use of mobile devices in the class? Why?
   - In what ways might mobile devices be able to be used as part of the classroom?
   - What activities/tasks would you like to do with your mobile inside and outside of class?
   - Which tasks can you NOT do with your mobile?

8. How well do you think mobile learning fits into: (3 levels)
   - Your life? Saudi culture? A female's life?
   - Do you think mobile learning could effectively fit into the Saudi Higher Education system? Why or Why not?

9. What advantages/disadvantages do you think mobile learning could bring to learning at the university level?
   - Would you attend mobile learning training or watch online videos of training for support?
   - What kind of training would be necessary in order for you to be able to use your mobile in learning?

10. Do you have any suggestions or comments?

***Note**: To ensure ease of communication with participants, all methods were translated into Arabic.*

Appendix D-5: Advertisement

WE NEED YOU!

KSU students are needed to take part in a study to understand the role mobile technology plays in learning in order to help us develop the use of mobile technology in higher education.

Have you ever wanted to take part in a scientific study?
Well, if you are a student at KSU and would like to be a part of this study,
Then this is your opportunity!
If you would like to participate, or want more information, please contact:

H.Alajlan1@uni.brighton.ac.uk

Appendix D-6: Example of students' Group Interview

(Group Interview (1) with 4 Undergraduate students from Humanities colleges)

1. **Researcher: Please provide some examples of learning activities that you have experienced with the use of your mobile technology devices.** Where did you learn these activities (different locations)? What were the different tools that you used to learn? What was the purpose of the learning activities that you accomplished (personal, educational)?

Samar: I use my mobile for learning by searching in Google. I search for demonstrations and explanations similar to the class topics that I do not understand. My study in administration is in English so I always find explanations and discussions (in English) about my study topics on the Internet. I use YouTube as I like watching videos a lot. I use Snapchat for fun. I also use different social media sites such as Twitter and Instagram. And you will find me everywhere on social media; and if you ask me to describe my mobile I will tell you that my mobile is a tool for social media.

I remember a situation when I felt that my mobile was very useful to me. Last week, we had a midterm exam and there was certain part of our curriculum I had not present for the lecture. I used the WhatsApp group to review with girls before the exam. Some members ask questions and others replied with the answers. I was so grateful to review with the girls because they discussed a question that I had not come across while I studied since it was not from our textbook, but the teacher had talked about it in a lecture that I did not attend. And then the same question came up in the exam and I answered it correctly.

We usually use WhatsApp groups because the WhatsApp application is fast, simple and all of us have it on our mobile and can use it. WhatsApp groups can accommodate more than 100 members. We usually have a group for each subject and if a group of girls have a common project, we make a WhatsApp group for that project. Sometimes we have more than one subject in common between us and we ask questions for subjects that are different from the one specific to this group's subject; for example, we ask questions on administration in the computer group.

Manal: I use my mobile for learning as I use it to search for answers to exam questions and to search for previous exams' forms. I also do searches for references, interviews forms and models as I am currently studying how to conduct interviews. I like reading stories, download puzzles, or other items that require thinking and construction.

I like to use social media and especially unknown and unpublicized social programs such as (Catfiz). I like to communicate with people I do not know and I usually use a nickname rather than my real name.

We usually use our mobile during the lecture as an educational tool. For example, one of the instructors asked us to search for information related to the class and also to verify the validity of the information. We worked in groups and used our phones or tablets. And another instructor prepared a video for us but it did not open in her slides so she asked us to open the video from YouTube on our mobiles to see it and then we discussed it together.

Ameera: I use my mobile in learning through searching for any kind of information on Google. I also use my mobile for social communication mostly through the WhatsApp application to communicate with my family and my friends and I communicate with my teachers through email. I use Twitter, Instagram and Snapchat for entertainment. I also communicate with family and friends through voice calls and SMS.

I used my mobile inside the classroom because one instructor asked us to open a video on YouTube during the class as it did not open in her presentation. And there are a number of applications that can be used for the purpose of learning on a mobile. I have apps to learn a language. One of them offers virtual rooms to learn the different skills of a language; for example, a room for chatting, a room for texting, and a room for grammar. It is wonderful and I use it a lot.

Salma: I use WhatsApp for educational purposes more than social purposes. I communicate via WhatsApp with my peers and instructors. Also, I have the mobile numbers of most of our professors and call them if the case is urgent. Otherwise, if I have any questions I write a message on WhatsApp or send an email to our professors. WhatsApp communication is easier and faster than email, therefore I use WhatsApp groups to send any information to students. I do not use my mobile a lot in social interactions or for entertainment.

The use of my mobile has helped me in different learning situations as I always search for answers to some questions during lectures. My peers and I always use MT in the classroom to verify the validity of information as that is requested by our instructor.

---

2. **Researcher: Have you heard of the term "mobile learning"?** What do you think it means? Is this term well known among students?

Samar: We heard a little about this term. I am currently studying (e-commerce) and we took a lecture today about mobile learning (learning anything via mobile). I think communication between teachers and students is not a must in mobile learning; for example, in educational sites the communication will be with more than one person.

Manal: I am joining in Quran memorization workshops at the university. We are required in these workshops to send a voice recording of the part we memorized in the workshop. After sending the voice recording we get a message containing feedback about our mistakes. So I suppose this is mobile learning and I see mobile learning as learning anything from a mobile, and it is between a teacher and learner.

Ameera: Honestly, I did not hear about this term before.

Salma: I did not hear about this term before too.

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3. **Researcher: How do you think we can use mobile technology in learning, in general?** How do you use your mobile for learning, fun, and socializing? Have you ever personally used your mobile device for learning? How? What is the thing you use your mobile the most for, in general?

Samar: I recently had a certificate accredited from Microsoft with my name, course name, number of hours spent to complete the course, and start date and end date written on it. The course was 'Big Data Analysis' and consisted of a series of videos and exams, which could be accessed from a mobile device any time you like. I

completed all the requirements in my spare time. After finishing the course successfully, they sent the certificate.

There is another Arabic site doing the same idea of this course but the time is limited. For example, you have to finish exams and videos within 2 months, then they send the certificate. I think mobile learning suits different specializations. It did not consume much time to reach what we needed.

Manal: I do not use my mobile a lot and I usually use it for voice calls. I only use WhatsApp groups to communicate with University students.

I use my mobile to search about references for researches. One of our professors has asked us to do a research with 5 references. This research was assigned 15 marks. The research topic was very difficult, therefore the professor assigned it 20 marks. I searched the topic and found what I was searching for.

Ameera: One day, I searched for how to apply a 'Behavior Support Plan' like the one I missed because of my absence, but I never found anything similar or even close to it, I used my mobile and looked for the plan on Google. Actually I found many explanations but it was different from the teacher's one. I felt that I had a problem with the practical application of the plan, as I did not find enough information about the method I searched for.

One of my peers posted on our WhatsApp group that there are newly uploaded questions for review on the teacher's site. These questions were very useful and some of the exam questions were similar to them.

Salma: I have an application that can help with Quran memorization. And on Instagram there are free English courses provided from different accounts such as a 'teacher Mohamad' account. Mobile learning is distinguished from computers as it is uses small devices which are fast and always on hand; but if the material requires a large capacity and there is a lot of information that needs careful reading, the use of a mobile here will be less important compared to a computer.

Manal: I think mobile learning would suit children if it is used for entertainment. It may not suit adults for entertainment purposes.

Ameera: I think the use of mobiles in education is more difficult than the use of mobile devices in entertainment. I think a computer is better for educational purposes but a mobile is faster and takes no time to reach any piece of information.

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4. **Researcher: If someone asks you what mobile learning means, what will you say to him or her?**

Samar: All that we mentioned today.

Manal: Learning through sites and applications such as Quran memorizing and the translation application.

Ameera: Today we benefit from what our friends mentioned about sites and applications.

Salma: As my friends said, I personally will benefit from the examples mentioned today.

Appendix D-7: Example of a student's In-depth Interview

(In-depth Interview (1) with Noha- an undergraduate student from Education)

1. **Researcher: Tell me about some learning opportunities in which you used your mobile?**

Noha: I often use my laptop for surfing the Internet, visiting professors and instructors' sites, reading emails and making presentations on "Power Point" or "Prezi" software. I also use my mobile to enter the university website and KSU electronic gate to open lecture slides and materials and see my timetable.

But my use for mobile is less than my use for laptop specifically in education. I use my mobile because it is easier and faster than the laptop to reach what I want. My mobile is easy to carry at any time, and it is always with me everywhere.

Researcher: How do you personally use your mobile device for learning? What is the purpose/goal/activity that you use your mobile the most for in learning?

Noha: We have educational groups on "WhatsApp" for each course. The students make these groups by themselves, and sometimes our instructors ask us to make these educational groups. Some instructors are members in the group with their students and some other instructors are not and prefer to communicate with us through one of the group members without entering the group themselves. This group member communicates the instructor's message to the whole group.

I use the WhatsApp university group to communicate and contact peers. We usually tell each other about any changes in the lecture's location or time. It is the easiest and fastest way to know

As group members, we exchange pictures and homework, and have discussions in our WhatsApp group. I always take a picture of the homework that is written on the smart board and then share it with my peers through the group. I also take a picture of the textbook cover and share it with peers through a WhatsApp group. It is faster to take a picture of the book than write its title, writer, published date and version required.

Not all group members share information on the group; almost all group members interact and participate in the discussions, but there are a few students who just browse and take their needs without participating.

Researcher: What does "having/owning a mobile phone at university" mean to you? Can you imagine yourself without a mobile phone? Why?

Noha: As a college student, it is very important for me to have a mobile. Actually, having my mobile with me all the time makes it the easiest way to contact and communicate with others for reasons related to my studies. For example, I can ask if there is any change in our lecture place.

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2. **Researcher: What was your initial expectation of "mobile learning"?**

Noha: I heard about Mobile Learning from my participation in the questionnaire but I did not see how, nor tried to use my mobile in education.

When I first heard about mobile learning, I thought that it was courses on a mobile or just free mobile applications or material we download on a mobile and watch and listen to it. I don't have any background on mobile learning. I think mobile learning means something in addition to the curriculum. This might mean each subject has its own application, but that may be difficult.

Researcher: What are the advantages of mobile learning, from your point-of-view?

Noha: We can consider WhatsApp groups as mobile learning. The WhatsApp groups are so important generally, and benefit all of us a lot, such as in doing homework and discussing exams with peers.

Researcher: Do you face any technical obstacles while using your mobile in learning? Do you face any other obstacles?

Noha: I like different technological devices and I can use them skillfully, and I don't face any obstacles in using my mobile.

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3. **Researcher: Can you please describe your learning space at home? What tools do you use? Where do you usually put your mobile while studying?**

Noha: I didn't study in my room. I study on the dining table. I like studying in a quiet place. If I am studying an easy subject, I study on the sofa. But if I am studying a difficult subject, I study on the dining table. In both cases, I keep my mobile close to me while I am studying at home to ask peers and enquire about anything I did not understand.

My friends always send links and previous exam questions via mobile. Therefore, it is very important to keep my mobile close to me while studying, especially before exams. I got used to reviewing with peers through WhatsApp. I might need to ask my peers about something and wait for their responses. Also I always receive useful web links and old exam forms that help me a lot. If I am going to remember and memorize certain subjects, I put my mobile on silent.

Sometimes I need to take breaks when I study for a long time so I usually use SMNs or call friends to get away from studying.

The use of mobiles is distinguished from other tools and devices because it is fast, easy and you carry it everywhere. For example, in the car; I can benefit from my time while commuting. Mobiles can also consume time; for example, when I search for something related to my studies, I come across things that I cannot leave, such as messages and updates on social media applications, and these things take a lot of my time without me noticing.

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4. **Researcher: Can you please describe your learning space in class?**

Noha: I never study at the university, but I can revise with my friends.

Researcher: Where do you put your mobile device when you are in class? Where do your teacher and the other students place their mobile devices? Do you see students using mobile devices in your class? How often? What do you think they are doing with them?

Noha: I usually put my mobile inside my bag and do not use it, but I notice other students who use their mobiles during some lectures to socialize and text each other.

Professors and lecturers differ in their use of mobiles. Some of them put their mobile on the table and answer their incoming calls. I think those that have important calls. Other professors do not bring their mobiles into the lecture hall or put it on silent.

Researcher: Do you ever use it in class? If so, for what?

Noha: Sometimes I use my mobile inside the lecture hall to take pictures of the book or the board and share them with peers in our group.

---

5. **Researcher: How do you think your teachers view students' use of mobile devices in class?**

Noha: Professors differ in their reaction towards the use of mobile inside the lecture hall. Some do not accept the use of mobile at all. One of our lecturers told us at our first meeting that using mobile devices is totally prohibited. I remember she said she will take off two marks from students who use their mobiles in her class. Another professor said "I consider the use of mobile as being absent from the university".

Researcher: Do any teachers encourage the use of mobile devices for learning? If yes, how? If no, why do you think?

Noha: Sometimes some professors ask us to use our mobiles; for example, one professor asked us to use our mobiles to search for information. But I have to say that most professors do not encourage the use of mobiles inside the lecture.

Researcher: What are the kinds of policies in place?

Noha: I don't see any formal and written policies about the use of mobiles inside the university or inside the class, but there are some certain policies that all students know and follow. For example, taking photos is not allowed inside the campus without taking permission, but it is noticed that many girls take pictures. And if the security staff see you taking pictures then they might take your mobile away and ask you to sign an agreement with your commitment not to repeat this again

I remember that there was a big problem between girls because one girl took a picture of another girl without her permission.

I usually put my mobile on silent mode and do not bring it out of the bag during the lectures and almost all the students do the same.

I think if the university allows girls to use their mobiles inside the lecture hall, the students won't use it appropriately. If our professor asks us to use our mobile to do certain tasks, half of the girls will do the task and the second half will do anything other than the required task. Therefore, I think if the university provides specific

devices with specific properties for students that would be better, but this means that we won't carry this device in everywhere!

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6. **Researcher: What are some of the opportunities/barriers to your learning at university? Do you think mobile learning could help to widen/overcome that?**

Noha: I did not face any obstacles since I entered the university but I notice that some professors do not give space for discussion and dialogue, and are not clear about what is expected from students and they think that it is the student's fault if she did not do what is required. I think students should complain about them. In this term, we complain about one professor because she attended only two lectures and we have a lot of questions she did not answer. She did not reply to emails or attend office hours. When we complained about her they told us to wait until after the exams.

The situation was much better in the preparatory year. They changed one professor as soon as we complained about her.

---

7. **Researcher: What would you recommend as appropriate and inappropriate use of mobile devices in the class? Why?**

Noha: I do not support the use of mobiles inside lecture halls because of the real status I see now. Every girl is busy with her mobile; they use it too much. We lose real interactions as human. When I enter the first lecture of each course everyone is busy using their personal mobiles and there is no place to make new relationships. They are addicted to using mobile devices.

Researcher: In what ways might mobile devices be able to be used as part of the classroom?

Noha: I use my mobile to search for specific information during class. For example, I was seeking some information about two things that I had never used before, the "Prezi" program and the "acadox" site.

This semester, one of our instructors asked us to make a presentation by using the "Prezi" program. At the beginning, I was very annoyed by her request but as soon as we downloaded the program, and searched on Google about how to use it, I found it very easy.

Similarly, when another instructor put her site on (acadox) I feel a lit bit annoyed because the site is not easy to use and needs time to get used to it. After awhile I felt that I benefit a lot from using these new things and I expanded my technological skills by knowing how to use this program and this site. I feel like I was developing myself and benefiting from using new things on my mobile

Researcher: What activities/tasks would you like to do with your mobile inside and outside of class? Which tasks can you NOT do with your mobile?

Noha: I must use my mobile to see and check Twitter everyday. I use Twitter to read the university news and to see the available courses for students that are offered by the university through the university account on Twitter. They usually announce these courses and add links to the registration site, which I usually use to register for these

courses.

Actually King Saud University account on Twitter is very useful because it informs us about different announcements and workshops; and it constantly advertises for new courses available for students.

I follow my peers on Twitter. I also follow many accounts related to KSU such as university manager, skills' development dean, university reading club, and university news account.

I wanted to improve my personal skills so I joined a course by watching a series of videos and doing many quizzes through my mobile. It was about 'How to be a trainer in the future' and I was accredited with a Canadian certificate after completing all the videos and quizzes. This course was very long in the numbers of hours, (I do not remember the number). This course helped me develop my personal skills.

I use my mobile a lot to handle any problem I have or for getting an answer to any question because it is always with me and charged; and also it is easier and faster than opening the laptop. Sometimes I open YouTube or a link or read about anything on my mobile. I can't imagine myself without my mobile, but at the same time I can't imagine my mobile without Internet. I use my mobile to do simple tasks, but I prefer to do other tasks on the laptop.

---

8. **Researcher: How well do you think mobile learning fits into: Your life? Saudi culture? A female's life?**

Noha: I do not like depending on mobile devices a lot, but mobile learning would be appropriate for me personally because it would be faster in getting responses and communicating with faculty members.

I think mobile learning will succeed in Saudi Arabia in the long term when people recognize the importance of learning seriously and that a mobile can be used in education effectively. But the addiction to mobile devices for many girls annoys me.

Researcher: Do you think mobile learning could effectively fit into the Saudi Higher Education system? Why or Why not?

Noha: I think mobile learning will facilitate cooperation in Saudi Higher Education and will facilitate communication between students and teachers through groups, for example.

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9. **Researcher: What advantages/disadvantages do you think mobile learning could bring to learning at the university level?**

Noha: One of the benefits mobile learning bring to the university is that the use of this application will help in developing the students and organizing their ideas. For example, using an application to arrange exams times in tables and remind students about the required reports. There is another benefit from mobile devices in that the student gets a message as she registers in the university and the message includes details about her courses.

Researcher: Would you attend mobile learning training or watch online videos of

training for support? What kind of training would be necessary in order for you to be able to use your mobile in learning?

Noha: I'd like to attend workshops about mobile learning, but I do not need any support or training about how to use my mobile in learning.

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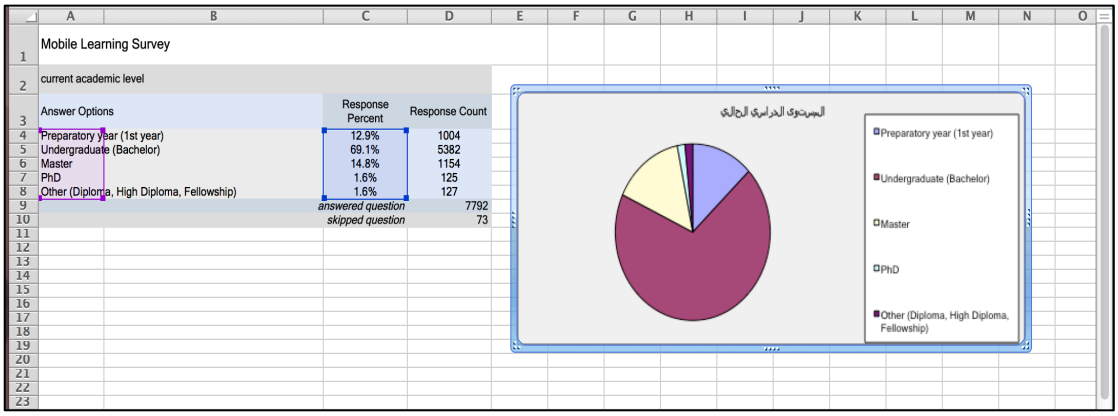
10. Researcher: Do you have any suggestions or comments?

Noha: I'd like to suggest providing many applications for learning or designing a specific device for the purpose of learning.

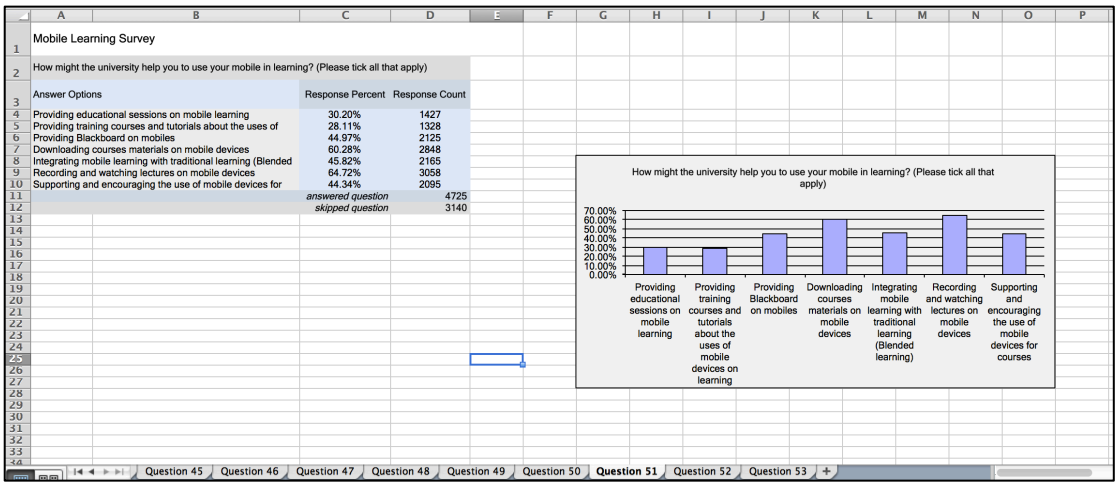
Appendix D-8: Example of analysis process using SPSS



Mobile Learning Survey

current academic level

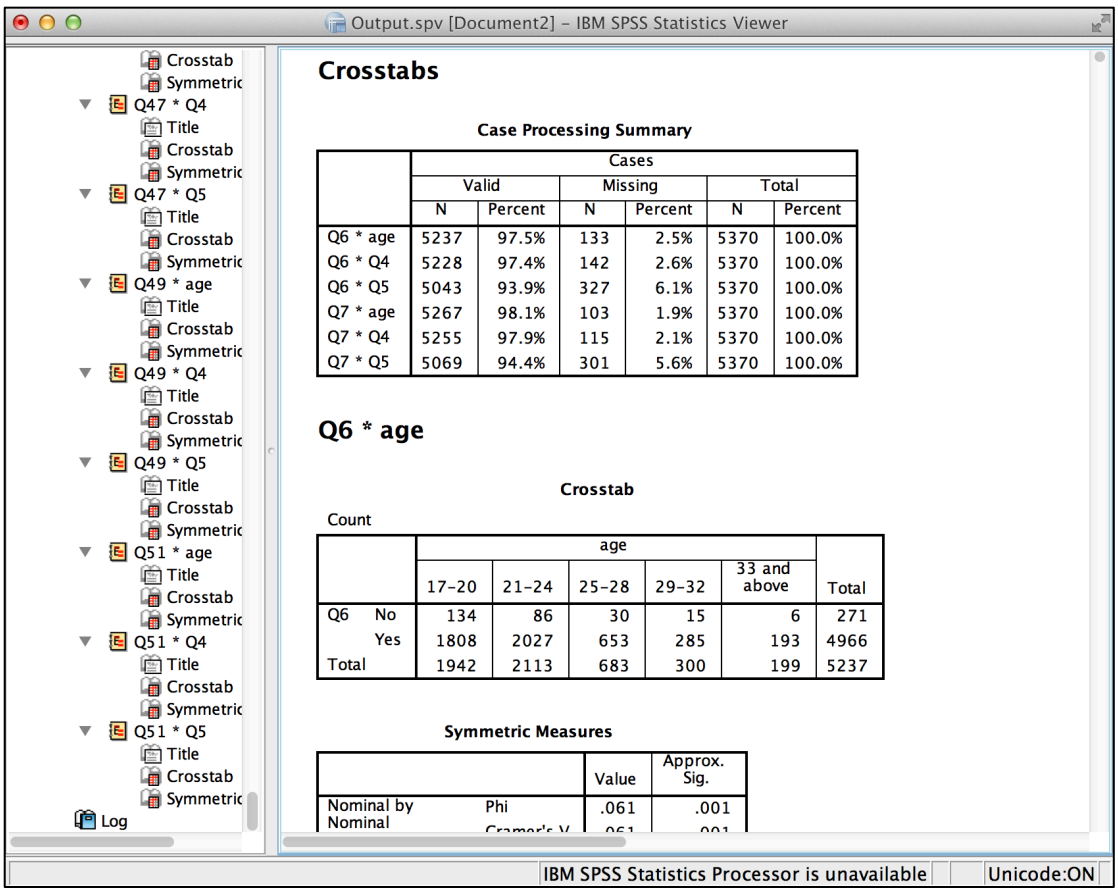
Answer Options	Response Percent	Response Count
Preparatory year (1st year)	12.9%	1004
Undergraduate (Bachelor)	69.1%	5382
Master	14.8%	1154
PhD	1.6%	125
Other (Diploma, High Diploma, Fellowship)	1.6%	127
answered question		7792
skipped question		73



Mobile Learning Survey

How might the university help you to use your mobile in learning? (Please tick all that apply)

Answer Options	Response Percent	Response Count
Providing educational sessions on mobile learning	30.20%	1427
Providing training courses and tutorials about the uses of	28.11%	1328
Providing Blackboard on mobiles	44.97%	2125
Downloading courses materials on mobile devices	60.28%	2848
Integrating mobile learning with traditional learning (Blended	45.82%	2165
Recording and watching lectures on mobile devices	64.72%	3058
Supporting and encouraging the use of mobile devices for	44.34%	2095
answered question		4725
skipped question		3140



Output.spv [Document2] – IBM SPSS Statistics Viewer

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Q6 * age	5237	97.5%	133	2.5%	5370	100.0%
Q6 * Q4	5228	97.4%	142	2.6%	5370	100.0%
Q6 * Q5	5043	93.9%	327	6.1%	5370	100.0%
Q7 * age	5267	98.1%	103	1.9%	5370	100.0%
Q7 * Q4	5255	97.9%	115	2.1%	5370	100.0%
Q7 * Q5	5069	94.4%	301	5.6%	5370	100.0%

Q6 * age

Crosstab

Count

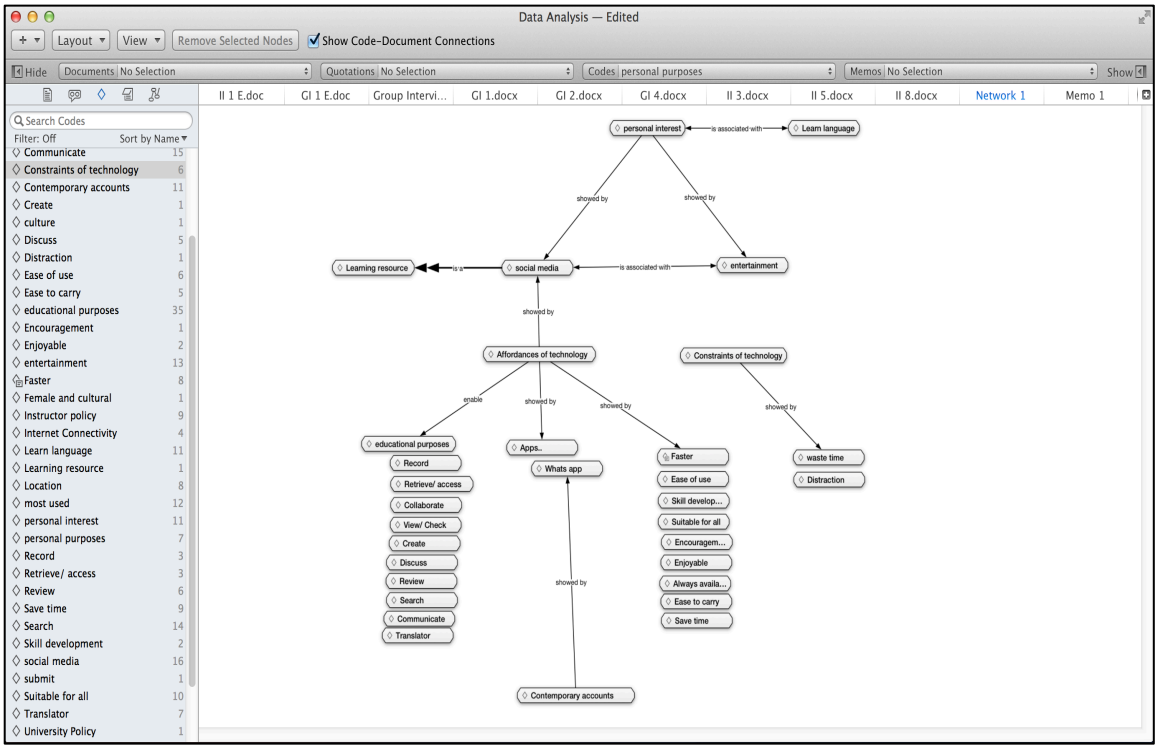
		age					
		17-20	21-24	25-28	29-32	33 and above	Total
Q6	No	134	86	30	15	6	271
	Yes	1808	2027	653	285	193	4966
Total		1942	2113	683	300	199	5237

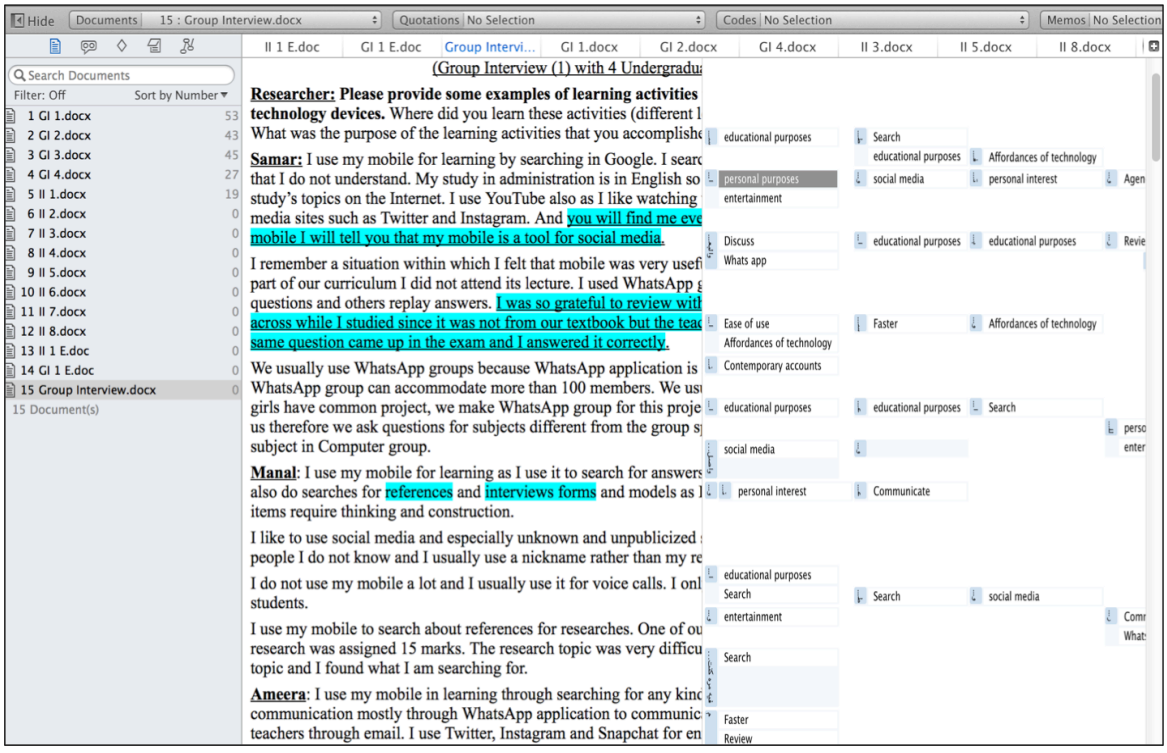
Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.061	.001
	Cramer's V	.061	.001

IBM SPSS Statistics Processor is unavailable | Unicode:ON

Appendix D-9: Example of analysis process using Atlas





Appendix E: Ethical Research Forms

Appendix E-1: Participant Information Sheet

PARTICIPANT INFORMATION SHEET

I would like to invite you to take part in a research study. Before you make a decision about whether or not to participate, I would like you to understand why this research is important and what it would involve for you. Please take the time to carefully read over the following information. You are allowed to talk to others about the study and can contact the researcher or supervisors at any time if anything is unclear or if you would like more information.

It is your decision to participate in the study, as taking part in the research is entirely voluntary. After you have read through this information sheet, which describes the study, I will then ask you to sign a consent form to show that you have agreed to take part in the study. You will be given a copy of the information sheet and the consent form to keep. You are free to decline participation or to withdraw at any time without giving a reason.

I am conducting a study about the uses of mobile technology for learning in higher education. The title of the study is "Mobile Learning in Saudi Higher Education". The purpose of this study is to understand how students are currently using mobile technology formally and informally for educational purposes. The study will also investigate students' practices and experiences with mobile learning in order to help us develop the use of mobile technology in higher education.

I will be doing a case study at KSU –Riyadh, female campus and need help from students in four ways:

1. I need a large group of students to complete a survey about how you use mobile technology in learning;
2. I need volunteers to keep a simple diary of how you are using mobile technology for two days during one week;
3. I would like some volunteers to take part in a group interview discussion about mobile technology and learning. We will meet on campus for about 30 – 40 minutes and I will provide snacks!
4. I would then like to speak to volunteers individually about their personal practices and experiences of mobile learning. We will meet on campus for about an hour with refreshments provided.

The group interviews and individual interviews will be audio-recorded. I will share the transcriptions with you to check if there are any comments that you would not wish me to use in my analysis.

All the information from the questionnaires, diaries, group interviews and interviews will be anonymised and confidential and there will be no personal details used. I shall keep the data stored safely on a password-protected laptop in a locked drawer, and the data will be destroyed securely at the end of the project in 2016.

It is important to note that this study presents minimal, if any, risk to you as a participant. You can voluntarily participate in one or more of these four ways. All data will be anonymised and confidential.

Thank you,
Hayat

Contact details
Researcher: Hayat Alajlan, University of Brighton, H.Alajlan1@uni.brighton.ac.uk
Research Supervisors: Prof. Avril Loveless, University of Brighton, a.m.loveless@brighton.ac.uk
Prof. Olfat Fodah, King Saud University, omfodah@ksu.edu.sa
Prof. Keith Turvey, University of Brighton, kt6@brighton.ac.uk
Dr. Richard Griffiths, University of Brighton, R.N.Griffiths@brighton.ac.uk

Appendix E-2: Participant Consent Form

PARTICIPANT CONSENT FORM

- I agree to take part in this research, which is to build a conceptual framework for mobile learning in higher education.
- The researcher has explained to my satisfaction the purpose, principles and procedures of the study and the possible risks involved.
- I have read the information sheet and I understand the principles, procedures and possible risks involved.
- I am aware that a digital audio recorder will be used during group interviews and interviews, and later will be transcribed.
- I understand how the data collected will be used, and that any confidential information will be seen only by the researchers and supervisors and will not be revealed to anyone else.
- I understand that I am free to withdraw from the study at any time without giving a reason and without incurring any consequences from doing so.
- I agree that should I withdraw from the study, the data collected up to that point may be used by the researcher for the purposes described in the information sheet.
- I understand that I have the right to veto parts of or the complete transcript of any particular interview that I provide.
- I will participate in (please indicate the ways you will be participating by ticking the appropriate boxes):
  - ☐ Providing a two-day diary.
  - ☐ Interviewing with a group of students (Group Interview).
  - ☐ Interviewing individually.
- I am also aware that the answers provided in the diary and/or interviews will be used as data.

Thank you very much for agreeing to take part in this study.

Name (please print) ……

Signed ……..

Date ……..

One copy of this form will be kept by the participant; a second copy will be kept by the researcher.

If you have any concerns about the project that you would like to discuss, please contact the researcher or research supervisors.

Contact details
Researcher: Hayat Alajlan, University of Brighton, H.Alajlan1@uni.brighton.ac.uk
Research Supervisors: Prof. Avril Loveless, University of Brighton, a.m.loveless@brighton.ac.uk
Prof. Olfat Fodah, King Saud University, omfodah@ksu.edu.sa
Prof. Keith Turvey, University of Brighton, kt6@brighton.ac.uk
Dr. Richard Griffiths, University of Brighton, R.N.Griffiths@brighton.ac.uk

Appendix F: FREGC Response

FACULTY OF EDUCATION AND SPORT
FACULTY RESEARCH ETHICS AND GOVERNANCE COMMITTEE
FREGC-29-14: 'Building a Conceptual Framework for Learning Using Mobile Technology in Higher Education' – Hayat Alajlan et al.

The proposal was considered by panel correspondence in accordance with Faculty practice.
No significant issues were raised by respondents but a small number of queries and suggested areas for consideration were noted as follows:

Item	Comment	Action
1. Particpants	The proposal states (section 4, page 4 et al) that the survey will be sent to all KSU students, both male and female, by email. The panel requests that survey is sent to female students only to avoid collecting data which will not be used in the study.	Amendment to protocol required
2. Consent	The panel asks that the word, 'typically' is removed, from, or further clarification provided for its inclusion in, the 5th bullet point in the participant consent form related to data and by whom it will be seen.	Amendment to protocol required
3. Female sample	To consider clearly indicating in the title of the study that participants will be exclusively female.	Advisory
4. Female sample	In relation to the reference to the Greek research indicating no differences in male and female usage the panel thought this required further consideration as it is not clear that the Greek context necessarily transfers to a society where gender segregation is socially embedded.	Advisory
5. Diary sample	The panel suggests that the researcher considers further that participant self-selection through volunteering, or a randomised sample selected by the researcher, may not yield as rigorous results as a criterion-based approach that produces a sample reflective of the wider population.	Advisory
5. Group and individual interviews	The panel suggests that further detail relating to the methodology employed in selecting individuals and groups for interview, and further reflection in relation to the potential pitfalls	Advisory

	associated with conducting group interviews alone, would benefit the proposal.	
6. Consent	To reflect upon the value of granting particpants the right to veto parts of, or their complete interview transcript.	Advisory
7. Insider research	To reflect further on the impact of the relationship between the researcher as lecturer and her students who participate in the survey.	Advisory

Items 1-2 require minor amendments to the documentation.
The amended protocol should be sent to; m.g.warne@brighton.ac.uk
Subject to receipt of the revised documentation as above, the proposal is **approved**.
MgW
21/07/14

Appendix G: Published Paper

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A Work in Progress Survey on Mobile Learning in Higher Education in Saudi Arabia

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Abstract: As mobile devices have become more advanced and cost less, the use of this technology has grown to the extent where it can substitute for other devices to find or manipulate information. Mobile technology with cellular connectivity can provide content delivery and engage students wherever they are. Higher education (HE) students have become more and more dependent on their mobile devices such as smartphones, tablets, PDAs, and E-book readers. Features that are built-in and applications that run on these devices allow students to consume, discover and produce content (Dahlstrom, 2012). Therefore, mobile devices continue to transform the way in which HE students learn.
This paper examines the use of mobile devices in HE among students in Saudi Arabia, and also looks into the opportunities provided by this technology that enhance and foster learning and increase cooperation among students. A survey was developed using online survey software (the SurveyMonkey, http://www.surveymonkey.com) and distributed online. 10,943 responses were collected and analyzed. The survey results showed that 99.57% of the students own a cell phone and, of them, 34.41% have more than one cell phone. With such widespread use of cell phones we looked at the most widely used applications and features and how many of them supported students' learning. The most used applications among students are social media applications such as Twitter, Snapchat and Instagram. The most used communication application in learning among students and between students and teachers is WhatsApp. Also, surprisingly, most HE students did not have any games on their mobile phone as they need them for surfing the internet and watching educational and instructional videos almost as much as for voice calls.

Introduction

Mobile learning is defined through its mobility and is considered to be the ability to use mobile devices to support teaching and learning. Using wireless mobile technology in learning has the potential to open a venue for learners to access learning and information materials regardless of their time and location (Ally, 2009). Prior to the advent of mobile technology, the concept of learning anytime, anyplace was far more difficult to attain. However, the advent of better and cheaper mobile devices has allowed personal technology to make mobile learning (m-learning) possible and "more ubiquitous" (u-learning) (Boulos et al., 2006).

Mobile learning has many formal and informal aspects that overlap and are hard to distinguish; it bridges formal and informal learning practices and creates mutual support between them. This could be considered a

distinctive feature of mobile learning that does not threaten formal education, rather it can be viewed as an approach that offers a means to extend everyday life activities (Sharples et al., 2007). In fact, some scholars argue that there is a need to establish theoretical frameworks that will provide a solid foundation for the use of mobile technology in the field of learning and teaching (Farley and Murphy, 2013).

This study aims to fill some of the gaps that currently exist in the research of mobile learning in Saudi Arabia, where there are still 'unknowns' about mobile technology ownership, usage, engagement with educational structures and purposes, and the implications for higher education learning environments and teaching. What is known, is that Saudi Arabia experienced a growth of around 53.7 million mobile subscribers with a penetration rate of 188% by the end of 2011 (Saudi-CITC, 2012). The figures clearly indicate an average of more than one mobile connection per person in Saudi Arabia.

The study carried out a large-scale survey to gather and analyze generalizable data. This gave insights into how mobile technology is currently being used. This study seeks to answer the following questions:

1. What is the percentage of mobile phone ownership among higher education students in Saudi Arabia?
2. What applications are used most by higher education students in Saudi Arabia - personally, socially and educationally?
3. What features are used most by higher education students in Saudi Arabia - personally, socially and educationally?
4. How does mobile use (applications and features) relate to students' learning?

Methodology

This study employed two methods of data collection; quantitative and qualitative. Quantitative data collection was done through the distribution of a large-scale survey using online survey software (http://www.surveymonkey.com). And qualitative data was collected through group discussions and interviews. The survey explored general information about students' ownership of and practices with mobile technology in higher education in Saudi Arabia; while the group discussions and interviews looked into the learning aspect of mobile use.

The survey was conducted during the winter term 2014. There were 10,943 respondents on the survey. Participants were made up of undergraduate (N = 9,245) and graduate (N = 1,698) students. The survey is currently open for students to complete. There were 12 participants in the group discussions that were divided into three groups and 12 students, three of whom were in the group discussions, were individually interviewed. All of the students in the group discussion and individual interviews completed the survey as well.

Results

Question 1: What is the percentage of mobile phone ownership among HE students in Saudi?

The survey showed that more than 99.57% of respondents (N = 10,896) own a mobile phone, and only a small number (N=47) do not own a mobile phone. The reasons for not having a mobile phone were varied, such as thinking that it was unnecessary (N=9), cost (N=3), landline phone was enough (N=5), waste of time (N=2), owned a phone that was not working (N=2), or other personal reasons (N=2).

What is more, 34.36% of HE students who have mobile phones (N = 10,896) own more than one mobile phone. Figure 1 shows a detailed breakdown of the number of mobile phone(s) owned by HE students.

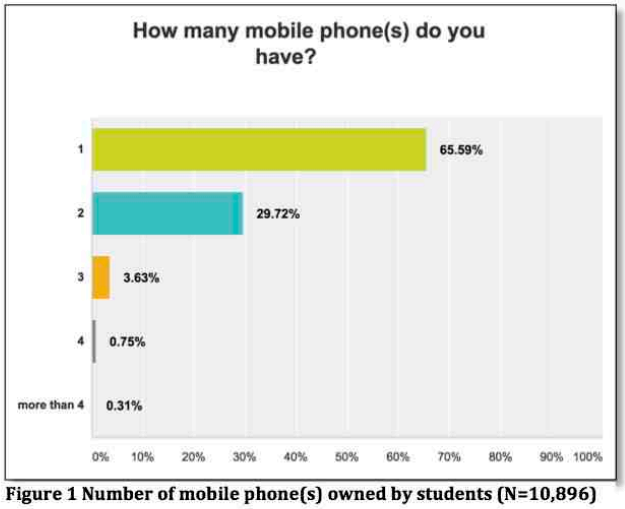

Figure 1 Number of mobile phone(s) owned by students (N=10,896)

Additionally, 68.53% of HE students (N= 7,499) have other mobile devices (one or more) such as tablets, PDAs (Personal Digital assistant), E-readers, or iPods; and 31.47% of HE students (N=3,444) do not have any other mobile device. Figure 2 shows a detailed breakdown of other mobile devices owned by HE students.

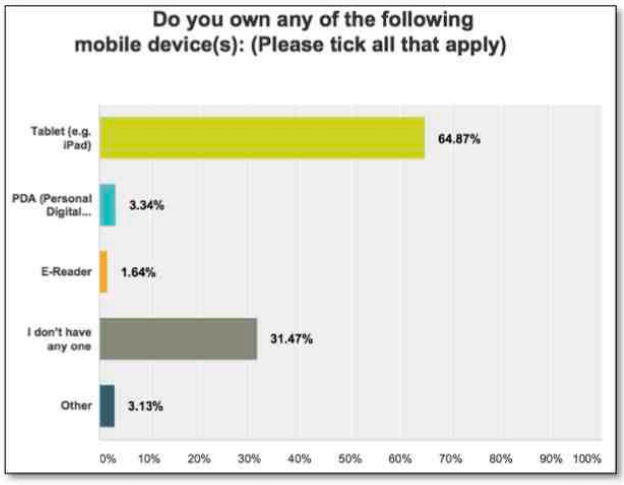

Figure 2 Type of other mobile device owned by students (N=10,943)

Question 2: What applications are used most by higher education students in Saudi Arabia - personally, socially and educationally?

The survey results indicate that the most used applications among students are social media applications, such as Twitter, and indirect communication applications, such as Snapchat, Instagram and WhatsApp. The

application most used for learning and communication among students and between students and teachers is WhatsApp. Table 1 shows the percentage of usage by students of different applications.

Table 1 The level of the frequent used Apps

App	Used	Not used
1. Twitter	99.88 %	0.12%
2. WhatsApp	99.76 %	0.24 %
3. Snapchat	75.70 %	24.30 %
4. Skype	38.40 %	61.60 %
5. Instagram	93.67 %	6.33 %
6. Tango	29.71%	70.29 %
7. Facetime	9.80 %	90.20 %
8. Foursquare	15.35 %	84.65 %
9. Kik	39.38 %	60.62 %
10. Keek	17.30 %	82.70 %
11. Path	35.91 %	64.09 %
12. Pinterest	8.74 %	91.26 %
13. Ask.fm	24.92 %	75.08 %

Question 3: What features are used most by higher education students in Saudi Arabia - personally, socially and educationally?

Students were asked about mobile features that are used for personal or educational reasons. The results indicate that HE students use the different features of their mobile phones and devices for both personal and educational purposes. The web browser feature is the most used feature for both personal and educational purposes (93.32% and 97.03% respectively); while the second most used feature for personal purposes is voice calls (90.97%), and email (94.93%) for educational purposes. Table 2 summarizes the percentage of students' use of different mobile features for personal and educational reasons.

Table 2 The Percentage of Students' use of some Mobile's Features

Apps/Features	Personal uses	Educational uses
Voice call	90.97%	63.59%
SMS	76.49%	54.48%
Multimedia	87.30%	71.66%
Web browser	93.32%	97.03%
Email	82.57%	94.93%
Calendar	71.09%	70.91%
Note	80.98%	73.88%
Calculator	77.17%	79.96%
Location services	69.22%	33.47%
Downloading	80.11%	75.81%
Apps & Games	63.05%	41.04%

Question 4: How does mobile usage (applications and features) relate to students' learning?

Saudi HE students already use their mobile devices to accomplish various tasks related to their learning. Some examples of what students mentioned in the survey and interviews include: recording lectures, taking pictures of notes on blackboard or from a colleague's notebook, translating foreign words, accessing their academic progress and information (e.g. timetable, grades), setting a calendar reminder to an assignment deadline or a test date, recording data on mobile note, accessing course materials and learning management systems, searching for different information and videos, following university teachers and colleagues on social media, sending and receiving messages and emails from and to university teachers and colleagues, and downloading specific applications related to their major (e.g. Semanoor Periodic Table app, Khan Academy: Chemistry app, Khan Academy: Physics app).

Other examples of students' use from the group discussions (a group of five science students) revealed that they frequently use the web browser on their mobile phone to search for videos on YouTube to learn about specific topics related to their courses. They pointed out that these videos were useful especially when the topics were hard to understand from the lecture. Even students, who had no credit to make calls, brought their phones to the university to connect to the university Wi-Fi to learn from these videos.

Indeed, it is obvious that mobile devices are integrated into Saudi HE students' academic lives and the blended learning environments, using both traditional (face-to-face) and mobile technology, are the norm for them to learn.

Conclusions

Mobile learning in Saudi higher education already exists. Almost all higher education students in Saudi Arabia own at least one mobile device. Students mostly use their mobile devices for informal self-directed learning activities rather than for formal learning activities. However, there were some surprising results: most students did not have games on their mobile phones but preferred to connect through social networking applications. They also tended to use their web browser, indirect communication applications like WhatsApp, Instagram, Snapchat, and social media (e.g. Twitter) at times more than the voice call feature on their mobile phones.

As educators, we need to know how to benefit from this mobile platform to boost educational learning. The challenge is to educate teachers on how to keep up with this fast moving trend and use it to build a new conceptual framework that views mobile technology as a tool to enhance learning rather than as just a communication device.

Acknowledgments

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