# “INVESTIGATING STUDENTS’ BEHAVIORAL INTENTION TOWARDS ADOPTION OF MOBILE LEARNING IN HIGHER EDUCATION INSTITUTIONS OF PAKISTAN”


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**ISLAMABAD**



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**A thesis submitted in partial fulfillment of the requirements for the degree of**
**MS Engineering Management**

**Thesis Supervisor**

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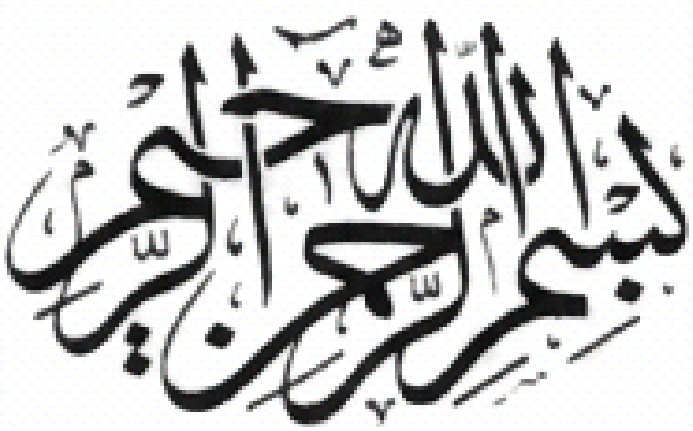


**In the name of Allah, the most**

**Beneficent and the most Merciful**

# Declaration

I certify that this research work titled *"INVESTIGATING STUDENTS' BEHAVIORAL INTENTION TOWARDS ADOPTION OF MOBILE LEARNING IN HIGHER EDUCATION INSTITUTIONS OF PAKISTAN"* is my own work. The work has not been presented elsewhere for assessment. The material that has been used from other sources it has been properly acknowledged / referred.

Signature of Student

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# Language Correctness Certificate

This thesis has been read by an English expert and is free of typing, syntax, semantic, grammatical and spelling mistakes. Thesis is also according to the format given by the university.

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*Dedicated to my honorable parents, my exceptional wife, my loving children and all family members whose tremendous support and cooperation led me to this wonderful accomplishment*

# Publication

I am grateful to my Allah Almighty, who blessed me throughout this work at every step. Without His will and mercy, I would not have been able to accomplish another milestone, which is the acceptance and publication of the paper associated with this study.

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# Abstract

With the advent of 3G/ 4G technology in Pakistan, Mobile Learning has become a newly developing educational field, referring to the use of any kind of wireless mobile devices, where these devices allow the learner to acquire knowledge anytime, anywhere, within and beyond the traditional learning environment. Ubiquitous access to mobile devices with low cost and greater functionalities make M-learning an imperative tool, allowing the students to learn irrespective of time and place. In order to assimilate M-learning in higher education institutes (HEIs) of Pakistan, there was a need to analyze and examine the users' acceptance of the system. The aim of this study was to analyze the determinants that affect students' acceptance of M-learning and whether age or gender play a moderating role in this acceptance, based on the unified theory of acceptance and use of technology (UTAUT). In order to achieve this objective, a quantitative approach using a survey based questionnaire was utilized for collection of data. The questionnaire was distributed to a random sample of 625 students from universities operating in the twin cities of Rawalpindi and Islamabad. According to the results, 76.4% of behavioral intention to accept m-learning has been explained through the model. Performance expectancy, effort expectancy, social influence and attitude towards the use of technology were found to be positively associated with the behavioral intention towards adopt m-learning, moderated by age and gender, whereas facilitating conditions and self-management of learning were found to have no significant effect on behavioral intention. The findings of this research will prove to be useful for management of higher education institutes in making decisions when designing and implementing m-learning technology.



***Keywords:*** Mobile Learning, Technology Acceptance, UTAUT, HEIs, Pakistan

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# List of Acronyms

| Serial | Acronyms | Words |
|---|---|---|
| 1. | APRANET | Advanced Research Projects Agency Network |
| 2. | ATT | Attitude Towards Use of Technology |
| 3. | BI | Behavioral Intentions |
| 4. | CD’s | Compact disc |
| 5. | D-learning | Distance Learning |
| 6. | DVD’s | Digital versatile disc |
| 7. | EE | Effort Expectancy |
| 8. | E-learning | Electronic Learning |
| 9. | FC | Facilitating Condition |
| 10. | HEIs | Higher Education Institutes |
| 11. | ICT | Information and Communications Technology |
| 12. | LMS | Learning Management Systems |
| 13. | M-learning | Mobile Learning |
| 14. | MLEARN | Mobile Learning |
| 15. | PDA | Personal Digital Assistant |
| 16. | PE | Performance Expectancy |
| 17. | PP | Perceived Playfulness |
| 18. | SI | Social Influence |
| 19. | SML | Self-Management of Learning |
| 20. | WWW | World Wide Web |
| 21. | 3G | Third generation of mobile telecommunications technology |

| | | |
|---|---|---|
| 22. | 4G | Fourth generation of mobile telecommunications technology |

# CHAPTER 1
# INTRODUCTION

## 1.0 Background

The advent of new technological era has created numerous opportunities and challenges for the educational structure all over the world. Institutions are now operating in a highly volatile environment, which is changing rapidly being characterized by uncertainty. The Competition is further enhanced by rapid changes in the emergence of new ideas, business areas, new market segments and latest management strategies. In order to survive in this uncertain environment, it has become inevitable for the institutions to continuously learn and upgrade to latest methods corresponding to modern technologies. Educational institutions have also been revolutionized due to the technological advancement. This has caused a significant change in the mediums and tools used in teaching and learning techniques.

Learning changes are triggered by changes in technology (Nelson, 1999). According to White and Bruton (2011) technology can be explained as: The practical application of knowledge and understanding by organizations and individuals in order to support human endeavor. Technology comprises of the information, procedures, tools and arrangements to be utilized in the formation of goods or in the provision of facilities.

Technology plays a vibrant role in the development of educational structure by successfully meeting the challenges faced from competitors, students, and society. Technological progression since the last decade of digital era has influenced the methods of teaching. Paradigm shift in technological advancements has innovatively transformed the cognitive abilities of human race.

Technology affects all aspects of the university processes including educational, managerial, and supportive practices. Technology has now been incorporated in all departments of the university and is becoming a substantial fragment of each university's budget. Technological revolution, with the introduction of 3G/ 4G mobile technologies has proliferated faster communication and information sharing between students and educators (D. Oblinger & J. Oblinger, 2005). Resultantly technological change has transformed the traditional ways of learning giving way to Distant learning (D-learning), Electronic learning (E-learning) and

Mobile learning (M-learning). Distance learning can be defined as the form of teaching-learning procedure in which the learner and educator are geographically separated and the contents are delivered to students in the form of broadcasts, books, handouts, recorded lectures, CD's /DVD's etc (Moore & Thompson, 1990)

Rapid progressions in the field of information communication and technology (ICT) has laid the foundation for distance learning to evolve into electronic learning. With the introduction of the Internet and World Wide Web in 1980s, an Electronic revolution brought forward the electronic learning (E-learning) concept (Keegan, 2002). Electronic learning encompasses the usage of Internet and digital tools in order to educate learners. The traditional way of education requires the students and educators to be present at one location within four walls whereas, E-learning has expanded the boundaries of institutions across the borders, opening the doors of knowledge to those who want to learn while being at a distance (Spodick, 1995) willingly or due to unavoidable compulsions. E-learning comprises of a diverse number of applications and procedures. This includes the transfer of learning material to students through intranet, internet, CDs, television programs or satellite broadcast. This sort of learning can also be described as virtual, online, cyber or blended learning (Watson, 2001). The quality of education has greatly improved due to the adaptation of e-learning by higher education institutions of Pakistan. E-learning has helped students by facilitating access to knowledge (Hameed, Mellor, Badii, & Cullen, 2007) at anytime, anywhere. According to Albon and Trinidad (2002), it is becoming important that students should not only be taught about technology, they should be taught with the help of the latest technology.

The invention of mobile phones has instigated the researchers to persistently develop new ways to exploit mobile technology as a method to deliver quality education in a rapid and enhanced way to the learners. The concept of mobile learning emerged a decade ago when MLEARN was first held in 2002, being the first dedicated conference for mobile learning. Since then, it has become a regular event signifying the importance of mobile learning as the latest area of research.

The emergence of 3G/ 4G technology has resulted in broader coverage and greater reception area, making the m-services in education a meaningful choice and an attractive opportunity (Andreu, Almonte, & Rejas, 2011; Hosny, 2007). M-learning is a newly developing educational field referring to the use of any kind of wireless gadgets that are able to move

with the user to permit learning regardless of the time and place (Trifonova & Ronchetti, 2007) to enhance the learning experience. These devices increase the advantages of E-learning (Motiwalla, 2007) by facilitating formal and informal learning by allowing the user to learn while on the move anytime, anywhere. The main features of mobile devices comprise of portability, instant connectivity and context sensitivity (BenMoussa, 2003; D. Churchill & N. Churchill, 2008; Kloper, Squire, & Jenkins, 2002).

Thus, ubiquitous access to mobile devices with low cost and greater functionalities make m-learning a significant means for education allowing students to learn irrespective of time and place, making it a convenient form of learning that enables the student not to be restricted by locality or time.

All over the world, the prospect of M-learning in the educational field is being realized, leading to numerous researches being conducted to facilitate teaching with the help of Mobile learning in HEIs (Cavus, 2011). There are immense opportunities for M-learning to become an advanced means of providing education resources (Hussain & Cronje, 2010). As indicated by researchers of higher education, mobile learning has the potential to help in bridging the gap between the educators, learners and the institutions in order to enrich their learning and achievement (Watson & White, 2006).

Technological changes have significantly benefitted higher education due to the increasing number of technical applications being employed to make learning quicker and easier. Despite the numerous advantages offered by m-learning in HEIs and extensive use of mobile devices within university campuses, it is still not possible for mobile learning to substitute traditional environment or the electronic learning system (Motiwalla, 2007). However, M-learning can offer added support to supplement the present learning models. In a few circumstances, efficacious acceptance of upcoming educational technologies has been hindered due to the institute's infrastructure limitations and implementation issues.

According to Liu and Han (2010) the opportunities and benefits offered by M-learning have not been explored completely. M-learning still faces lot of issues including limitations related to connectivity, poor network speeds, small screen size and insufficient memory (Park, 2011; Haag, 2011) users' readiness and acceptance (including learners and educators) to accept the latest advancement. A vital apprehension for pedagogical administration anticipating to invest in technology is the user's readiness and acceptance of the new technology. Reluctance

of users to accept the latest technology can lead to structural catastrophe. To ensure efficient use of an institute's resources employed in mobile learning, it's essential to find out the determinants affecting the students' readiness and mobile learning acceptance before its effective deployment.

Being contiguous with the dynamic field of education and innovative learning techniques, Higher Educational Institute (HEI) may accrue maximum advantage if rely aptly on m-Learning. So far, very less investigation has been done to find out about the determinants motivating the intentions and readiness of users to use mobile learning in Pakistan. This study will be conducted by utilizing the UTAUT model (Vanketesh, Morris, B. Davis, & D. Davis, 2003), who defined the basic constructs as follows: Performance Expectancy, which can be explained as "how much a person considers that the system will assist him in achieving his objectives in job performance"; Effort expectancy, which can be explained as "amount of easiness linked with using the system"; Social influence, explained as "extent to which a person believes it to be significant that other people think that he must employ the innovative system"; Facilitating conditions, defined as " how much a person perceives that a structural or methodological structure exists in order to maintain the usage of the system "; Behavioral intention, described as "an individual's personal opinion that that he or she will behave in a certain manner".

Thus this study will aid in analyzing and assessing whether mobile technologies, with the aid of the new emerging 3G/ 4G, can become convenient tools for learners and educators in the existing educational environment of Pakistan. The information and results obtained from this study will help in developing a theoretical model to enable the educators, administration and management of HEIs of Pakistan to understand the students' readiness and intentions to adopt mobile learning to use academic contents anywhere, anytime.

## 1.1 Rationale of Study

From the time mankind came into existence, it has been in search of new ways to learn and excel in every field of life. Education is believed to be an essential element for human progression and growth. Today, the emphasis of education is on producing prolific members of the society that contribute towards an ever changing and pragmatic world (Nabeel, 2009).

Technological advancements of the new era have further created opportunities and posed challenges for the educational system all over the world, influencing and modifying the role of higher education. Higher Education Institutions are the main source of high level learning, where extensive research is done, but due to dynamic changes in technological advancements, the philosophy of learning is required to change. Although HEIs in Pakistan are increasing in number at a very high rate, but the quality of tools used to educate the students are not up to the international standards.

Likewise, students today are well-acquainted with the latest digital technologies that were not there in the past (Carlson, 2005) enabling students to learn more actively using the latest trends. Pakistan, being a developing country needs to improve its educational sector by improvising the methods used for teaching. Due to the prevalence of poverty, most of the people are unable to get higher education due to financial obligations as they have to support their families, which forces them to leave their studies at an early stage. Thus, there is a dire need of an educational system in Pakistan that is financially affordable, easily accessible to all, and does not have an accommodation constraint. To achieve this, informal ways of learning are being explored (Nabeel, 2009).

In order to stay competent in the global market, Pakistan needs to employ the latest trends in technology to face the challenges. The recent development of mobile technology with 3G/ 4G support wireless network technology in Pakistan has brought great opportunities to the educational sector through mobile learning. However, any kind of technology transformation cannot be successful until the human mind perceives its advantages and becomes ready to accept it. This necessitates the need for evaluating the factors affecting students' intentions to adopt m-learning. Although such research has been carried out in other countries, since mobile learning is a novel concept in Pakistan, thus very less research has been done in the past. Therefore, in order to analyze and explore the determinants influencing the acceptance of m-learning by students in higher educational institutes of Pakistan, this thesis will focus on

demographics of students and determining how mobile learning can enhance the educational sector by providing a theoretical framework.

## 1.2 Research Questions

The advancement in mobile technology has given way to new emergent fields including mobile learning. M-learning is a new educational field and requires extensive research in order to understand the determinants that influence students to accept m-learning. As explained earlier in the rationale of the study, very less research has been done in Pakistan associated with analyzing the acceptance level of students regarding mobile learning. Thus in order to successfully implement mobile learning in the HEIs of Pakistan, it's essential to determine and analyze the determinants that influence the acceptance of mobile learning amongst students, with respect to age and gender.

Therefore, this gives lead to the following research questions:

1.2.1 Do students consider m-learning capable of fulfilling their educational requirements?

1.2.2 Whether an association exists between students' performance and effort expectancy and behavioral intentions towards adoption of mobile learning?

1.2.3 Is there any impact of socio-environmental factors on students' behavioral intentions to adopt m-learning?

1.2.4 Is there any relationship between student's attitude and their behavioral intentions to adopt m-learning?

1.2.5 Whether age or gender has a moderated effect on the determinants for the acceptance of m- learning?

## 1.3 Research Objectives

1.3.1 To determine whether students find m-learning a useful mode of learning in order to enhance knowledge.

1.3.2 To evaluate the various determinants (Effort expectancy, performance expectancy, facilitating conditions, social influence, perceived playfulness, self-management of learning and attitude towards use of technology) that influence the acceptance level of students regarding mobile learning.

1.3.3 To identify factors that have the greatest influence towards acceptance of m-learning.

1.3.4 To analyze the influence of gender or age on determinants for the adoption of m-learning.

## 1.4 Significance of the Study

Technology today plays a vital part in the economy of any country. There are innumerable examples of failed businesses, mainly due to the lack of user's acceptability of the new trend in market. Thus the ultimate success of mobile learning is dependent upon users' perception and acceptance. With the help of this study, the administrators and management of HEIs will be able to understand the determinants influencing the acceptance of mobile learning, enabling them to incorporate these factors while designing mobile learning strategies or projects.

Outcome of the suggested theoretical framework will aid in the successful management and utilization of mobile learning for higher educational institutes in Pakistan, offering new educational field that will be easily affordable and accessible to the common people.

By providing a theoretical model to effectively manage m-learning in HEIs, this study will aid the students and universities in the following ways:

1.4.1 The determinants affecting the student's acceptance of m-learning can be used by the management of HEIs to successfully implement m-learning programs by incorporating those factors in the strategic plan.

1.4.2 Empirical evidence from this research will enable better policy making by the management.

1.4.3 With the help of these findings, the HEIs will be in a better position to take decisions regarding the technological investments, thus enabling smarter decision making.

1.4.4 Fiscal benefits for the universities will increase due to greater number of programs offered, with no restriction to any accommodation issues for students as no physical space will be required.

1.4.5 The HEIs of Pakistan will be able to face global competition with the help of the latest trends in technology. This will further attract students who are searching for innovative trends in learning.

1.4.6 The loyalty level of students is perceive to grow more when they observe that their insights are identified and understood by the management.

1.4.7 The students as well as HEIs will be well equipped to face the market challenges of the world.

## 1.5 Thesis Structure

The Study has been divided into six chapters. The first chapter comprises of the introductory part. The chapter will highlight upon the problem to be discussed by focusing on the background of the study, studies already carried out and the gaps in the research previously conducted. It will include the rational of study, significance of research and the research objectives. The research questions together an overview of the thesis structure, will be discussed in this chapter**.** The second chapter (The literature review) will encompass the review of the past studies comprising of all previous studies carried out related to the subject. This will include all the background information to support the objectives, hypothesis and research questions of this study. The third chapter (Research Methodology) will describe in detail the methodology that will be followed to conduct this research, comprising of the research approach, literature resources employed, research Parameters, research strategies and negotiating access and research ethics. The fourth (Data Analysis) will contain the appropriate sampling techniques selected for the research, along with the data collection and analysis, including the response rate. The results of all the hypothesis will be presented here and areas that require due attention will be highlighted. The results obtained through the application of various statistical techniques will aid in the formation of recommendations. The Fifth Chapter (Findings, Recommendation and Conclusion) will provide an overview of the analysis conducted and the findings will be presented in this chapter. Moreover the last section of this part will include the recommendations and conclusions deduced from the results achieved. The recommendation part will contain suggestions and guidelines to implement m-learning technology in an efficient way to improve the education system of higher education institutes of Pakistan.

# CHAPTER 2
# LITERATURE REVIEW

## 2.0 Introduction

In this section, past studies related to the issue under study will be reviewed. The basic fundamental concepts will be discussed in order to support the research hypothesis, objectives, and research questions to analyze the relevant literature pertinent to the issue under study.

## 2.1 Impact of Technology on Society and HEIs

Technology has improved the life of every individual and the society as a whole. It has revolutionized every aspect of society including the educational system. According to Ragus (2006), human social factors are affected by technology in every field of life. During the last decade, technological innovations led to a dramatic improvement in human life leading to greater advancements in lesser time.

Starting from the 1960s, the creation of the microchip caused exponential growth in the field of information technology. As predicted by Ditlea (2000) and Prensky (2004), today's computers, toys and mobile phones have minute processors that are thousand time faster and efficient than old desktops and huge mainframes computers. The creation of personal computers caused a new digital revolution providing the users control over everyday operations and businesses, including the field of education. With the advent of the internet, the digital era further evolved significantly affecting the global economy. Although the internet was originally developed to support and connect computers belonging to the government, colleges began to connect to this net to enhance their efficiency and provide feasibility for the students. The original internet, which was called the APRANET, was later on commercialized and made open source to encourage participation by students and universities for the creation of new protocols. However, it was the advent of the WWW (World Wide Web), which caused the transition of several different entities into one global village, enabling easy access to information anytime, anywhere (Levene, 2003). The electronic revolution has led to new challenges and opportunities giving way to e-commerce, e-banking, e-government and e-learning. According to Wagner (2005), the mobile revolution

has been progressing side by side together with e-revolution. As stated by Watson and White (2006), the mobile revolution overcomes the age differences, by involving both young and old in this revolution.

Wagner (2005) explains that technology linked with mobiles are influencing the subsequent era of information. Electronic businesses are now being transformed into m-commerce and e-learning into m-learning. Students are now more technologically aware and are using different modes of learning to gain access to unlimited information. According to Alexander (2004), the two main aims of higher educational system has been to educate students and conduct research. The availability of the modern literacy tools has enhanced the educational process allowing students to conduct up to date research according to the current era. Boylan (2004) explains that the relationship between the educational system and the economy has been influenced greatly due to technological advancements. Today's era is driven by technological advancements and evolutions impacting every sphere of life. Thus the higher educational system faces great opportunity to be part of the latest technological era and should not wait further for the right time to gain access to educational enhancements through latest technologies (Ragus, 2006). Latest mobile advancements have made it possible to improve the learning experience of users by providing accessibility to a larger number of students. Although mobility is an old concept, but it now provides a multidimensional approach towards teaching and learning.

## 2.2 Evolution of Learning Paradigm

Learning can be defined as a profound social paradigm that provides access to knowledge, association, appropriate resources, conversant research, critical analysis and cohesive results (Wedge & Kearns, 2005). The existence of mankind depends upon the evolution of its behavior and adaptation to newer trends. Technological advancements have revolutionized all aspects of the society including the educational environment. During the last century, there has been great improvement in human advancement, with digital advancements increasing speed of the progress, with personal computers revolutionizing everyday operations in all spectrums of life. With the invention of internet, the world experienced information revolution changing the traditional ways of learning forever. It reformed the information delivery process by making information available to everyone, anytime, anywhere (Freitas & Levene, 2003), making the world one global village. The electronic revolution introduced innovative ideas and opportunities for all sectors of life including businesses, government and

educational institutions giving way to e-businesses, e-government, e-banking and e-learning, making it more practical for HEIs to cater the needs of distant learners (Collis & Wende, 2002). Similarly, the mobile revolution has also been in progress (Wagner, 2005). The progressions in the computing technologies have led to the development of cheaper and smaller mobile devices, facilitating the development and acceptance of mobile phones. The usage of cell phones, tablets and PDAs are being used commonly by both young and the old generation (Watson & White, 2006; Wagner, 2005). This has also affected the educational system as students are now in more power to control their learning as they have access to unlimited information, anytime, anywhere.

Researchers are exploring the relationships between distance learning, electronic learning and mobile learning, while focusing on specific areas such as education, sociology and technology. Traditionally, distance learning allows the student to learn while being away from the university. However, unlike distance learning, e-learning can be done both inside and outside the university, but may function differently in both situations. E-learning is mostly associated in parallel with m-learning (Rosenberg, 2001) while in other research it interprets the association as being vested in one another (T. Georgiev, E. Georgieva, & Smrikarov, 2004). The educational system today has the opportunity to take part in this technological revolution (Ragus, 2006), shifting from electronic learning to mobile learning, altering the methodology of learning and education.

### 2.2.1 Traditional to Distance Learning

The success of any nation depends heavily on its education system. Graduating students become the building stones of the state's economy and play a vital role in its enhancement. Thus in order to contribute towards the country's progress, it is important for higher education institutions to apprehend the demands and requirements of the society, and implement flexible and up to date modes of teaching to make education easily accessible to everyone. Traditionally, transfer of knowledge, especially higher education, has always been through face to face interaction of teacher and student, which is both time and space restricted. However, this classroom teaching method is still the most popular and common mode of teaching in universities nowadays.

Economic pressures have led to an increasing number of working adults in our society. This has put increased pressure on universities to offer programs to students who are physically

away from the university through distance learning programs. Distance education is not a new concept in the world of education. Such courses have been offered over the last century, even before the advancement of technology (Valentine, 2002). However, Keegan (1995) describes distant education as a mode of education in which the instructor and student are physically separated. Thus universities started offering distant education to reach geographically dispersed students and those who have occupational obligations and are unable to attend classes due to time and job constraints. Moreover, increased competition and a need to generate greater income has further motivated universities to start distant education programs (Valentine, 2002).

According to Ferguson and Wijekumar (2010), past literature supports the success of distant learning in higher education. Moore and Lockee (1999) acknowledge television, audio and video tapes as an effective mode of early distant education. The electronic revolution has further modernized distance learning, transforming it into electronic and mobile learning, making it more feasible and attractive for students.

### 2.2.2 Electronic Learning

The advancement in technology and the electronic revolution has greatly enhanced the progress made in e-learning, making it more attractive and practical for universities to offer distance learning (Collis & Wende, 2002). This has made online teaching, together with blended teaching very extensive. E-learning can be offered as a standalone system, or together with traditional methods as a blended education system (Matheos, Daniel, & McCalla, 2005). Blended teaching includes the features of face-to-face together with distant learning.

E-learning has been defined in several different ways in the past studies. Trifonova and Ronchetti (2003) define electronic learning as technology enhanced mode of education, where teaching and learning methods are technology driven. Electronic learning to be an educational process reinforced through digital mediums (Pinkwart, Hoppe, Milrad, & Perez, 2003). Begicevic and Divjak (2006) explain electronic learning to be a method of learning that is supported by information and communications technology which enhances the quality of education. Rosenberg (2011) defines electronic learning to be an interactive mode of teaching that relies upon the net. Therefore it can be claimed that electronic learning is primarily learning through the internet. Online education includes the delivery of knowledge

through email, white boards, chat rooms and instant messaging via internet. E-learning is supported by Learning Management Systems (LMS) such as Black Board, Web and Author ware in order to support distant students (Keegan, 2002).

E-learning is an entrenched mode of education and is offered by a number of higher education institutes. Its popularity is increasing as the digital tools for imparting distant education are being refined and upgraded. In order to make it successful, it is important to provide constant technical support and train the students and instructors about the system.

### 2.2.3 Advantages and Limitations of E-learning

Today, e-learning is widely recognized as an effective teaching methodology. E-learning crosses the barriers of time and space, allowing the user to access educational material anytime, anywhere according to his own convenience. Thus electronic learning greatly helps students who are working and due to job constraints, they are unable to attend regular classes in universities. E-learning provides such students the opportunity to get higher education while being able to earn a living as well. E-learning systems such as LMS provides administrators and students different services such as student feedback, online tests and grade management (Caladine, 2008). Harriman (2007) identified several advantages of e-learning including self-paced learning, increased retention and consistency, reduced learning time, accommodating multiple learning styles, user engagement and collaborative learning. E-learning is also useful for users with special needs as they can easily access educational materials. However, there are some limitations of e-learning such as the requirement of internet connectivity and immobility. E-learning can be done on personal computers which have to be connected to the internet. This limits the user's movement, which motivated the researchers to find out new methods of teaching that allowed the user to learn will on the move.

### 2.2.4 Mobile Learning

#### 2.2.4.1 History and Evolution of M-learning

Mobile learning is a concept that provides the user the facility to learn while on the move. With the advancement in electronics, mobile technology has also gained pace and is being developed rapidly. Thus in this rapidly changing environment, it is important to take maximum advantage of the resources available and utilize the technological advancements.

Students can utilize mobile devices to learn while on the go (Muhlhauser & Trompler, 2012) as they can easily carry their mobile devices anytime, anywhere (Cereijo-Roibas, 2002). Although it may seem that mobile education is a new concept, M-learning existed well before the technology era; the book being the initial m-learning device conceived by man (Watson & White, 2006). The progress in information technology has altered the mode and usage of m-learning, allowing a bundle of reading material in your hand, which you can read anytime you want. PDAs, smartphones and tabs have extensive capabilities of offering such services.

The development of the first mobile educational device is accredited to Alan Key in the late 1960s (Najmi & Lee, 2009). With the passage of time, the advancements in technology made personal computers more accessible and cheaper. In 1990s, the introduction of wireless devices like PDAs and phones made information sharing much easier allowing mobility. As the devices improved, the smaller size and lower cost motivated more users towards purchasing the wireless gadgets i.e mobile phones which are still used extensively (Doneva, 2006). Almost 97% of students that were born since 1980 own a mobile phone, with university students being the ubiquitous users (Kennedy, Krause, Judd, Churchward, & Gray, 2006).

Since the last decade, wireless technologies have created extensive learning opportunities, inside and beyond the traditional class room environment offering new prospects for distinguished research in the educational field (Buedding & Schroer, 2009). With the help of these devices, students and instructors can communicate and share information easily (Khaddage, Lanham, & Zhow, 2009). Moreover, they permit the user to study while on the move, and communicate even when they are not present in the institutional premises (Lam, Wong, Cheng, Ho, & Yuen, 2011).

According to Georgiev et al. (2004), mobile learning can be explained as a subset of electronic learning, whereas electronic learning can be defined as a subset of distance learning, as illustrated in figure 2-1.

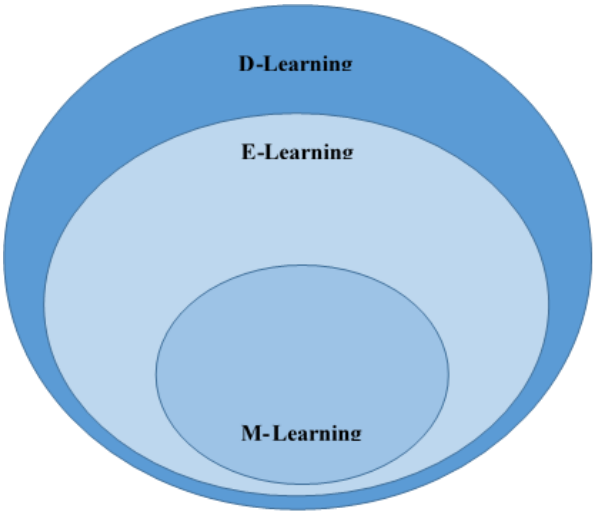


*Figure 2-1:* Learning Paradigms (Georgiev et al., 2004)

M-learning is often thought of being a subset of Electronic learning. Early researchers predicted that mobile learning would have a short life span and will eventually blend into e-learning (Traxler, 2009), however, the progressions in technology have enhanced m-learning even further, giving it its own distinctiveness.

### 2.2.4.2 What is M-learning?

The omnipresent access to mobile technologies has inspired higher education institutions to incorporate these technologies in the learning processes. The definitions of mobile learning found in past studies vary depending upon the mobility of the user, technology and the measurement of the gadget (Traxler, 2009).

A number of definitions exist that start from the simple descriptions of the devices to more sophisticated definitions referring to the m-learner's preferences supporting a flexible and portable learning environment that is user oriented (Watson & White, 2006; Parsons & Ryu, 2006; Sharples, 2006; Traxler, 2009).

According to Georgieva and Smrikarov (2005), m-learning has the capability of supporting learning anytime, anywhere. Mobile learning employs mobile gadgets including phones, smartphones, handhelds, laptops, palmtops, iPods and PDAs for learning (Naismith, Lonsdale, Vavoula & Sharples, 2004). According to Keegan (2005) view point on mobility while defining the concept of m-learning, eliminating laptop from the definition, restricting to only such devices that can become completely flexible and portable in the learning process

(Pachler, Bachmair & Cook, 2010). Table 2-1 below shows the different concepts of m-learning from the past research.

Table 2-1: M-learning Concepts by Different Researchers

| M-Learning Concepts | Author(s), Date |
|---|---|
| E-learning with the help of portable devices such as Windows CE machines, Palms, or digital mobiles. | Quinn (2000) |
| A process in which learners cooperate with their peers and teachers to formulate a transitorily steady understanding of their world. | Sharples (2005) |
| Imparting education and learning through mobiles, palmtops / PDAs /handhelds and smartphones. | Keegan (2005) |
| Gaining knowledge through communication by using mobile devices and intelligent user interfaces. | Sharma and Kitchens (2004) |
| E-learning with the advantage of learning everywhere, at any time by using mobiles or any other portable devices. | Georgiev et al. (2004) |
| An innovative mode of electronic learning which employs mobile gadgets and networks to communicate for learning or teaching. | Doneva, Nikolaj and Totkov (2006) |
| An educational process that comprises mainly of handhelds or palmtops. | Taxler (2007) |

| | |
|---|---|
| Utilization of mobile computing devices to facilitate delivery of learning content to learners. | Parsons and Ryu (2006) |
| Using mobile devices to study and access contents in order to interconnect with others. | Ally ( 2009) |
| An innovative method of electronic learning for enhancement of the teaching or learning process by using mobile devices and internet. | Denova et al. (2006) |
| Any type of knowledge that is gained through the use of portable devices. | Trifonova (2003) |
| Electronic learning done by using of moveable devices and internet. | Pinkwart et al. (2003) |
| Learning that is done through the network. | Polsani (2003) |
| Educational experience that takes place as a consequence of person to person mobile communication | Nyiri (2002) |

According to Traxler (2007), most of the definitions of m-learning are too restricting, and 'technocentric'. He suggests that other definitions should also be explored that highlight the learner's experience of the system and distinguish it from e-learning. Thus in order to integrate a broad variety of learning opportunities, researchers have scrutinized more specific characteristics of mobile learning, and the numerous contexts that can support m-learning (Sharples, 2006; Kukulska-hulme & Traxler, 2007; Naismith et al., 2004). Sharples ( 2006) describes the characteristics of m-learning as: Provides knowledge building capabilities in different circumstances, facilitates gathering data that is distinctive with respect to location and time, learners have the privilege of customizing their path of study, supports interactivity between users and breaks through the restrictions of time and space allowing the opportunity to learn anytime, anywhere.

In addition to this, Kukulska-hulme and Traxler (2007) have acknowledged distinctive groupings which classify mobile learning into: **M-learning through technological tools** – Advancements in technology specifically employed for validating feasibility of technology

and educational content. **Portable e-learning** – Converting conventional electronic learning on wireless and mobile gadgets. **Interconnected learning in classroom** – Technologies incorporated in a classroom setting to support collaborative learning for example by connecting to other classrooms, or linking PDAs to interactive boards. **M-training and performance sustenance** – Technologies employed to enhance productivity and effectiveness of users by providing up to date information for their respective roles and obligations. **Inclusion and diversity** – Using multifarious mobile interfaces to provide extensive educational content to users. **Rural, secluded m-learning** – technologies used to deliver education to far flung areas, overcoming the environmental barriers, where traditional modes of e-learning would not work.

Although these categories define the different aspects of mobile learning, a lot of gap in research still exists between actual potential of m-learning and its actual use. Due to the fact that m-learning is still in the beginning stage, a lot of research is required to be done to find out how mobile gadgets can help in enhancing the education.

## 2.3 M-learning Vs E-learning

Mobile learning classification carries a broad range of literature regarding the difference between mobile learning and electronic learning. M-learning is basically an integration of two distinct concepts, i.e. ‘mobile’ and ‘learning’, so while explaining the idea behind ‘mobile’, the learning part should not be ignored as well. According to Brown (2003), mobile learning can be defined as a subgroup of electronic learning, while online learning and mobile learning both are macro models of electronic learning. Quinn (2000) defines concept of m-learning as electronic learning that takes place through mobile devices. This will include all devices such as palmtops, smartphones and PDAs. This concept can be explained through figure 2-2.

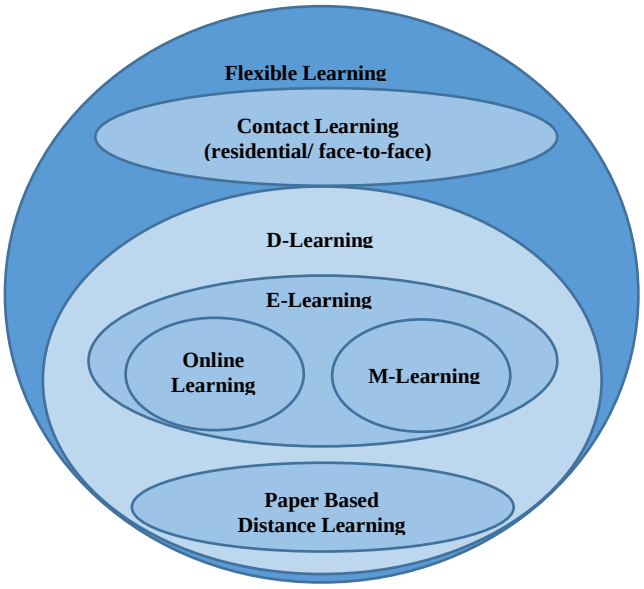


*Figure 2-2:* Flexible learning (Brown, 2003)

As seen in the figure 2-2, learning types can be classified as two main categories namely contact and distance learning. Contact learning implies any form of traditional learning that takes place in the classroom environment, whereas distant learning includes any learning process where no direct contact is present between teacher and student. Distant learning can be further categorized into electronic learning and paper based learning. The figure shows that distance learning encompasses electronic learning, whereas mobile learning and online-learning are subsections of electronic learning. Conversely, no intersection occurs between mobile and online-learning, showing that these two are unrelated. Martin (2011) states that blended learning is not included in the diagram although students always have the option of

using mobile gadgets while present in the lecture hall (integration of face-to-face and mobile learning).

It is important to understand the differences amongst electronic learning and mobile learning, as a number of researchers mention mobile learning in context with electronic learning, implying that mobile learning is electronic learning done through portable gadgets ( Pinkwart et al., 2003; Georgiev et al., 2004). Table 2-3 compares the different aspects of mobile and e-learning with respect to literature review (Attewall, 2005; Laouris & Eteokleous, 2005; Traxler, 2007).

Table 2-2: E-Learning Vs M-Learning

| Feature. | E-learning. | M-learning. |
|---|---|---|
| **Network** | Local Area Network | WiFi / Wireless |
| **Devices** | Desktop Computer; laptop | Hand Held Mobile phones; smart phone and Tablet PC |
| **Accessibility** | No time limitation (Anytime) | Beyond the premises (Anywhere)) |
| **Connectivity** | Through Internet media ; Intranet Networks | Mobile (3G/ 4G) Networks |
| **Learning** | D- learning | Situated Learning |
| | In the Formal way | Very Informal |
| **Instructor-Student Communication** | Late communication | Immediate Communication |
| | Scheduled | Unprompted |
| | Face to face | Flexible |

Kloper et al. (2002) identifies mobility as a new opportunity to promote learning activities and societal interactivity. Mobile learning can be employed while using multiple approaches, in diverse contexts. Different projects regarding usefulness of m-learning were also examined (Chen, Millard, & Wills, 2008). These systems including projects like Game system, Voting system, Mobile phone for language learning, Student partner system, Remote Laboratory system and Mobile blogging, play a major role to improve the knowledge capacity and can prove to be more successful than traditional learning methods.

## 2.4 Potential Benefits and Technological Advantages of Mobile learning

Numerous previous studies have been done in order to learn the advantages gained through the use of hand held portable devices to pursue education and promote learning (Caudill, 2007). Mobile learning has enabled students to utilize computing powers anywhere, at any time. Nikana (2000) has pointed out a number of potential advantages of mobile learning. One of the most important advantage being that mobile learning can result in improved understanding of the learning contents. Nikana explains that different and interesting methods of teaching create student's interest in learning contents. Moreover, features such as student group discussions and feedback may increase students' motivation and memory retention. It is also established that hand held portable devices may also be used as a gauging means, allowing the users to express their ideas in a better way (Nikana, 2000). Another major benefit pointed out by Nikana is that of lesser cost. Mobile devices may prove to be less expensive as compared to the collective price of textbooks, or computers. Thus it is obvious that using the mobile devices for learning can be very effective plus interactive mode of learning (Denk, Weber & Belfin, 2007). Therefore, use of portable devices in education may enhance mechanism of sharing the suggestions and promoting the interaction between instructors and students. Wang and Ryu (2009) identify mobility as one of the most important aspects of m-learning, enabling students to maintain contact between instructors and students at all times, even outside the classroom. Mobile devices have the capability of providing learning with portability (Juniu, 2002).

M-learning allows an interactive environment, providing constant communication and collaboration in learning activities (Barker, Krull & Mallinson, 2005). The data interchange can take place through different channels such as emails, blogs, forums and messages, enhancing the level of interaction between peers and student and instructor (Denk et al., 2007). Being subclass of e-learning, m-learning has similar advantages to the prior (Hashemi, Azizinezhad, Najafi, & Nesari, 2011) such as the privilege of self-studying, easy access to learning contents, self-assessment and instant feedback.

M-learning also supports learning in the school environment (Hung, Hwang, Lin, Wu, & Su, 2013). A number of educational applications exist that can aid the students in the learning process in classes. With the increase in the demand of mobile devices, many new universities have started to support m-learning and teaching through it (Cavus, 2011; Wu, Hwang, Su &

Huang, 2012). According to El-Hussein and Cronje (2010), mobile learning can be effective approach in teaching and knowledge in higher education institutions.

## 2.5 Limitations and Challenges

Although m-learning provides multiple learning opportunities for users, providing them the facility to make learning mobile, it has some limitations and issues that need to be addressed for its success. According to previous studies, the limitations include:

### 2.5.1 Physical limitations of Mobile Devices

As indicated by Park (2011), despite the fact that mobile devices today are just like mini computers, previous studies indicate the existence of a few barriers to the use of these gadgets for example the size of the screen, limited battery life, less memory space, small keyboard or slow network speed.

### 2.5.1 Psychological barriers of students

Students mostly use mobile devices for entertainment purposes only (Wang, Shen, Novak & Pan, 2009 ; Park, 2011). Also, users might not be aware of how to download or use educational applications and may find it difficult.

### 2.5.2 Network Speed

According to Smordal and Gregory (2005), slow network or internet connection may distract students and make them lose interest in the learning process.

### 2.5.3 Security aspects

Being small and portable, it is much easier to lose mobile devices as they can be easily stolen, causing disturbance for students' who are from low-income backgrounds (Barker et al., 2005). They can also break easily, which might cause hindrance in the learning process if the user is solely dependent upon the device for learning.

### 2.5.4 Cost

Mobile devices may be expensive for students, together with the expenses of a wireless internet connection (Barker et al., 2005). The overall budget required for the employment of mobile learning, including maintenance of devices, training for teachers & students and wireless connections may lead to increased cost.

Naismith et al. (2004) identifies the following issues that need to be addressed in order to implement a mobile learning system:

2.5.5 **Mobility:** M-learning offers the students a chance of studying anytime, anywhere, posing challenge to the traditional learning practices.

2.5.6 **Context:** M-learning provides information regarding the users' surroundings and environment, which might lead to security hazards.

2.5.7 **Learning over time:** Efficient mobile devices are required to offer the facility to lifelong learners to acquire knowledge.

2.5.8 **Informality:** M-learning supports informal mode of learning, but this can be distracting for learners who might start using the mobile device for entertainment purposes.

2.5.9 **Ownership:** mobile learning allows the user to control their pace of learning but it poses problem for institution as it has to monitor the proprietorship of the technology.

## 2.6 Student's Acceptance for Mobile-learning

Successful implementation of mobile learning in educational sector depends upon the students' perception of mobile learning in the higher education institutions. According to Donald R. L. (2011), the acceptance of mobile learning by instructors and students is essential in order to effectively implement m-learning, leading to the importance of the factors that undermine their acceptance. Therefore, it's imperative to carry out research on underlying determinants that affect the acceptance of the technology.

### 2.6.1 Unified Theory of Acceptance and Use of Technology (UTAUT Model)

Till now, researchers have developed a number of models to evaluate the user's acceptance and motivation to embrace new technologies. One of the most extensively used model is the Technology Acceptance Model (TAM) (Davis, 1989). As shown in figure 2-3, the model offers a hypothetical base to elucidate the effect of external variables and intentions to adopt the system. TAM has gained the reputation of being the most extensively used model in IT due to its simplicity and ease of use (King & He, 2006). Defining the two main constructs of TAM, Davis (1989) identifies perceived usefulness as the extent to which a person believes that he would be assisted by the system in performing his job, whereas perceived ease of use is the extent to which a system is user friendly and would be trouble free to use. The key

strength of the TAM model is its consistency as it shows only 40% variance in the use of behavior and intentions of people in organizations (Donaldson, R. L, 2010).

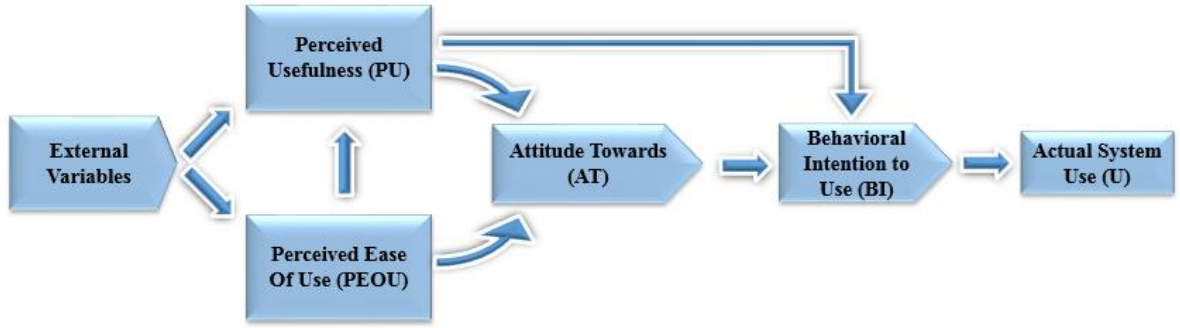


*Figure 2-3:* Technology Acceptance Model (Davis, 1989, p. 319)

An additional prevalent and latest model is the Unified Theory of Acceptance and Use of Technology (UTAUT) as shown in figure 2-4, model was proposed by Vanketesh et al. (2003). It incorporates and compares various elements from 8 different models: Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behavior (TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (ITD), Social Cognitive Theory (SCT), Combined TAM &.TPB (C-TAM-TPB).

The eight models were equated by Vanketesh et al. (2003) and resulted in the formulation of the UTAUT model that integrates the systems' and the users' characteristics to predict the level of acceptance of any new technology. The model comprises of four factors of information technology user behavior and four mediators that determine the effects of behavioral intentions and user behavior. The direct determinants include effort expectancy, performance expectancy, social influence and facilitating conditions whereas the moderating variables include age, gender, experience and voluntariness of use. According to Vankatesh et al. (2003), UTAUT model can help managers in assessing the users' behavior intention to adopt any new technology.

The model has shown a variance of 70% in intention, (Vankatesh et al., 2003). According to Baron et al. (2006), there are still some empty areas in the UTAUT model that require further researches to cater for the technology that falls between the 30% unexplained acceptance. Moreover, individual factors such as self-management of learning, attitude towards

technology and perceived playfulness are not included, which may prove to be helpful in assessing the users' acceptance of a new technology.

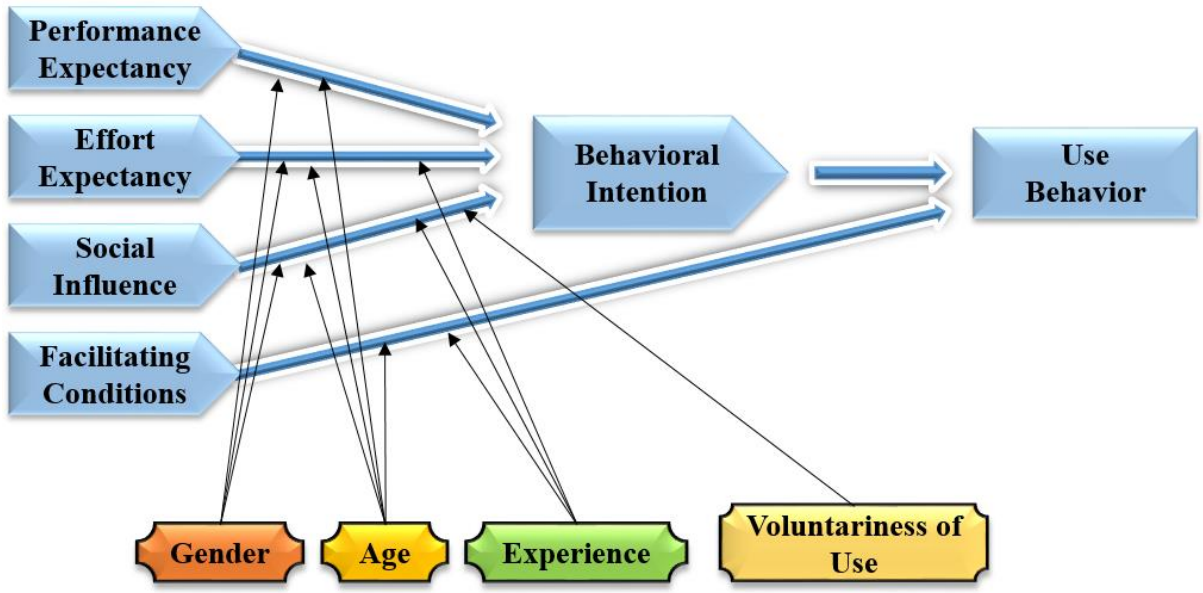


*Figure 2-4:* UTAUT Model (Venkatesh et al., 2003)

### 2.6.2 Constructs of UTAUT

Following are the important constructs of UTAUT model:

#### 2.6.2.1 Performance Expectancy

According to Venkatesh et al. (2003), performance expectancy can be defined as the degree to which an individual thinks or believes that using a system would assist him in performing his job well. Five main determinants (i.e perceived usefulness, extrinsic motivation, job-fit, relative advantage and outcome expectations) from the previous models formulate the conception of performance expectancy. It has also been observed that the strongest predictor of behavioral intention is performance expectancy. Incorporating performance expectancy in m-learning will improve learning activities and help in increasing the learning efficiency. According to Venkatesh and Morris (2000), age and gender are said to act as moderating variables on the effect of performance expectancy on behavioral intention, with men, particularly younger ones having a stronger effect. Venkatesh et al. (2003).

#### 2.6.2.2 Effort Expectancy

Effort expectancy can be explained as "the amount of ease linked with the usage of the system". Venkatesh et al. ( 2003) defines complexity, perceived ease of use and ease of use as three major constructs related to effort expectancy. Performance expectancy and intention to use directly affect effort expectancy, which leads to greater overall performance (Liu, Li, & Carlsson, 2010). According to Venkatesh and Morris (2000) effort expectancy constructs are strong determinants for women and older individuals.

#### 2.6.2.3 Social Influence

According to Venkatesh et al. (2003), social influence can be defined as "the degree to which a user perceives important that others are of the opinion that he or she should employ a new information system". According to Venkatesh et al. (2003) subjective norm, social factors, and image are three constructs from previous models that formulate the concept of social influence. Based on past studies (Morris & Venkatesh, 2000), it can be seen that social influence significantly affects behavioral intention to use mobile learning, with gender and age being the moderating variables, such that the effect is stronger in case of women, especially in older ones.

#### 2.6.2.4 Facilitating Conditions

Facilitating conditions can be explained as "the extent to which a person believes that an organizational and technical infrastructure exists to support use of the system." Venkatesh et al. (2003) defines three constructs formulating the facilitating conditions as perceived behavioral control, compatibility and facilitating conditions. According to Pedersen and Ling (2003) and Wang et al. (2009), it is suggested that facilitating conditions has been omitted in several previous researches because of the fact that if both effort and performance expectancy are present, effect of facilitating conditions on predicting intentions becomes non-significant. (Venkatesh et al., 2003).

#### 2.6.2.5 Perceived Playfulness

Moon and Kim (2001) explain perceived playfulness as a state of mind whereas, Webster and Martocchio (1992) define it as an individual trait. Based on Moon and Kim's definition, there are three aspects to perceived playfulness. It can be explained as the degree to which a person believes that his interest or attention is focused on mobile learning, is inquisitive throughout

the interaction, and thinks of the interaction as enjoyable. According to Agarwal and Karahanna (2000), perceived playfulness is included as a determinant because intrinsic motivation occurs when a person becomes fully involved in a technology. Past literature supports that a positive association exists between perceived playfulness and behavioral intention to use mobile learning (Huang, Lin & Chuang, 2007; Phuangthong & Malisawan, 2005).

#### 2.6.2.6 Self-Management of Learning

Self-management of learning refers to the degree to which a person perceives that he can maintain self-discipline and can engage in self-directed learning. According to Sharples (2003), competence and learning skills are necessary for self-management of learning. These skills are essential for flexible and distance based learning (Smith, 2005; Smith, Murphy & Mahoney, 2003). Wang et al. (2009) explains that self-management of learning is a strong determinant of behavioral intention to adopt mobile learning, and is seen to be stronger in women than men.

#### 2.6.2.7 Attitude towards Technology

Attitude towards technology involves the overall aptitude of an individual towards the use of technology. This is made up of four main components namely attitude towards behavior, intrinsic motivation, affect towards use and affect. According to Venkatesh et al. (2003), because of the strong relationship seen between performance expectancy and intention and effort expectancy and intention, we can deduce that attitude towards technology will not have a significant effect on behavioral intention.

#### 2.6.2.8 Behavioral Intention

Behavioral intentions comprise of factors that lead to person's motivation to behave in a certain manner or the effort that a person puts in to behave in a particular way (Ajzen, 1991). Chau and Hu (2002) describe behavioral intention as a predictor of an individual's likelihood of carrying out an act, such as the intention to accept a technology. Several past studies have used behavioral intention to measure the users' acceptance of a new technology (Wang et al., 2009; Jairak, Praneetpolgrang & Mekhabunchakij, 2009). Therefore, behavioral intention is used in this research as well to find out the users' intentions to adopt m-learning.

### 2.6.3 M-Learning Acceptance and UTAUT Model

According to Venkatesh et al. (2003), UTAUT has the potential to assess the introduction of the latest technology, enabling the organizational managers to understand the factors affecting the user's behavior in the acceptance of the technology.

Wang et al. (2009) used the UTUAT model to find out the determinants affecting m-learning acceptance and observe whether gender or age affect the acceptance of mobile learning or not. Perceived playfulness and self-management of learning were two more variables included in the study by the researchers. According to the results, effort expectancy, performance expectancy, perceived playfulness, social influence, and self-management of learning significantly affect the behavioral intention to accept mobile learning. With respect to the two moderating variables gender and age differences, the results showed that effort expectancy and social influence were moderated by difference in age, and self-management of learning and social influence were moderated by gender differences.

Similarly, Iqbal and Qureshi (2012) included perceived playfulness in the UTAUT factors to investigate the students' intentions regarding mobile learning. The results indicated that perceived playfulness has a lesser impact as compared to the other factors that affect users' acceptance intentions, whereas facilitating conditions and ease of use significantly affect the students' intention to accept mobile learning. Social influence was also found to affect the acceptance level negatively.

Jairak et al. (2009) conducted a study using the UTAUT model to investigate the acceptance level of m-learning in Thai students. The results showed that attitude towards behavior was positively affected by performance expectancy, social influence, and effort expectancy. Moreover, behavioral intention was also seen to have a positive relationship with effort expectancy, social influence and facilitating conditions. Support (facilitating conditions) of university and the users' intentions of acceptance are the leading determinants for the successful implementation of mobile learning system in universities.

Lownthal (2010) applied the UTAUT model using performance expectancy, self-management of learning and effort expectancy, with gender and age being the moderating variables. According to the results, behavioral intention was positively influenced by performance expectancy and effort expectancy whereas self-management of learning did not

have a significant effect. Moreover, age and gender did not prove to be moderating factors for the study.

In other study at East Africa applied the UTAUT model to check behavioral intentions affecting the m-learning acceptance level in students of higher education institutions of East Africa. The sample consisted of 823 students from five universities, which was tested against the modified UTAUT model using regression analysis. The results depicted that all direct four factors of the UTAUT model had significant effect with performance expectancy being the strongest variable and social influence being the lowest (Joel, Roope & Raisamo, 2014).

Similarly, in recent study carried out (Ali, Noorminshah & Ali Saleh, 2013) in University of Technology Malaysia, it was found that UTAUT model is an efficient tool in assessing the factors that influence the user's acceptance of any latest technological trends in the market. The study proposes a theoretical model to observe the determinants affecting the students' intentions to use M-learning. Three additional variables related to M-learning perspective are incorporated in the proposed model; Self-management of Learning, Perceived Playfulness and Voluntariness of Use.

Ayman (2013) conducted a study using a survey of 80 students to find out about the acceptance level of m-learning in higher education institutions of Saudi Arabia. Using the modified UTUAT model, the results from the statistical analysis showed high prevalence of acceptance level in the students of Saudi Arabia, with effort expectancy and facilitating conditions having high levels of acceptance.

The study conducted on the acceptance of mobile learning in developing countries, using UTAUT model based upon TAM. The deduction concluded from the research that cultural effects are also important in the UTAUT model (Troy, Lenandlar & Kemuel, 2013). Whenever the UTAUT model is used, it is judicious to embrace all the effects on culture and country differences on an exploratory foundation to avoid possible non-detection relationships and the probable detection of counterfeit relationships. Although the results obtained confirm many of the relationships as suggested by Venkatesh et al. (2003) but the UTAUT model is contradicting in the sense that effort expectancy doesn't have a significant effect on behavioral intention, once the effect of facilitating conditions is controlled. Moreover, even when the effects of performance expectancy and effort expectancy on

behavioral intention are included, the facilitating conditions significantly affects behavioral intentions.

Kook (2014) conducted a study using UTAUT model based upon TAM on 276 students of higher education institutes of Korea about their attitude and perception towards the use of m-learning. The main focus of the study was on identifying the factors affecting students' behavioral intentions to use mobile learning. The results showed that there is a positive significant relationship between facilitating conditions and attitude towards technology on behavioral intentions, whereas a negative relationship exists between social influence and behavior intentions to use mobile learning.

The research carried out the on higher education students of Saudi Arabia (Omar, Enas, & Mutaz, 2014), using a sample size of 300 undergrad and post graduate students. The results showed that performance expectancy, effort expectancy and social influence are the major determinant having an impact on students' adoption to use mobile learning in future. Facilitating conditions, on the other hand, has no profound influence on the behavior intentions to adopt m-learning. Findings revealed that the model that has been developed explains 62.4% of the variance in the adoption intentions to use m-learning.

Abu-Al-Aish and Love (2013) used the modified acceptance framework of UTAUT through convenience sampling in United Kingdom. The results extend the UTAUT in the context of m-learning acceptance by adding two additional variables i.e. quality of service and personal innovativeness and also provide educators with important guidelines to implement a successful m-learning system. The result indicated that effort expectancy, performance expectancy, personal innovativeness and quality of service have a positive influence on dependent variable (behavioral intention to use mobile learning).

On the basis of literature review, this study will analyze the gaps that are prevalent in the past literature and will try to overcome them. It is observed that very less studies have been done earlier in Pakistan and other developing countries, there is no research that investigates readiness and acceptance level both on the same platform. The latest advancement of mobile technology, with the introduction of 3G/ 4G in Pakistan has opened up new channels of education. Thus a dire need can be seen to create a theoretical model that characterizes a roadmap for successful deployment of m-learning in the higher education sector of Pakistan

and to identify the determinants affecting the pre-deployment success factors by assessing the consumers' readiness and acceptance.

## 2.7 HYPOTHESIS

### 2.7.1 Performance Expectancy (PE)

$H_{o1}$: Performance Expectancy has a no relationship with behavioral intentions to use Mobile-learning.

H1: Performance Expectancy has a positive relationship with behavioral intention to use M-learning.

H2: The association between Performance Expectancy and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

### 2.7.2 Effort Expectancy (EE)

$H_{o2}$: Effort Expectancy has a no relationship with behavioral intentions to use Mobile-learning.

H3: Effort expectancy has a positive relationship with behavioral intention to use M-learning.

H4: The association between Effort Expectancy and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

### 2.7.3 Social Influence (SI)

$H_{o3}$: Social Influence has a no relationship with behavioral intentions to use Mobile-learning.

H5: Social influence has a positive relationship with behavioral intention to use M-learning.

H6: The association between Social Influence and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

### 2.7.4 Facilitating Conditions (FC)

$H_{o4}$: Facilitating Conditions has a no relationship with behavioral intentions to use M-learning.

H7: Facilitating conditions has a positive relationship with behavioral intention to use M-learning.

H8: The association between Facilitating Conditions and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

### 2.7.5 Perceived Playfulness (PP)

$H_{o5}$: Perceived Playfulness has a no relationship with behavioral intentions to use Mobile-learning.

H9: Perceived playfulness has a positive relationship with behavioral intention to use M-learning.

H10: The association between Perceived Playfulness and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

### 2.7.6 Self-management of learning (SML)

$H_{o6}$: Self-management of learning has a no relationship with behavioral intentions to use Mobile-learning.

H11: Self-management of learning has a positive relationship with behavioral intention to use M-learning.

H12: The association between Self-Management of Learning and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

### 2.7.7 Attitude towards Technologies (ATT)

$H_{o7}$: Attitude towards the use of technologies has a no relationship with behavioral intentions to use Mobile-learning.

H13: Attitude towards the use of the technologies for learning is positively related with behavioral intention.

H14: The association between Attitude towards technology and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

## 2.8 THEORETICAL FRAMEWORK

In order to investigate the research questions, relationships between the independent and dependent variables will be identified to determine the underlying cause and effect relationships. An independent variable is that variable which is varied by the researcher whereas the effect of the change is measured on the dependent variable. The independent viable gives the cause while the dependent variable is used to measure the consequent effect (Saunders, Lewis & Thornhill, 2009).

Figure 2-5 depicts the construct of the research model and the various dimensions and suggested associations amongst the determinants of the model. The model illustrated below has been established for the study based on the relationships between Behavior Intentions as dependent variable and Effort Expectancy, Performance Expectancy, Social Influence, Facilitating Condition, Self-management of Learning, Perceived Playfulness, and Attitude towards use of technology as independent variables. Perceived Playfulness, Self-management of Learning, Attitude towards use of technology has been adopted from the past studies as described in the table 2-3. Four core constructs including dependent variable is adopted from UTAUT model.

Table 2-3: Additional adopted Variables and References

| Constructs | Items | Past Study |
|---|---|---|
| **Attitude toward use of technology (ATT)** | 3 | Malhotra and Galletta (1999), Moon and Kim (2001), Kook (2014) |
| **Perceived Playfullness (PP)** | 5 | Moon and Kim (2001), Wang et al. (2009) Hadi and Kishik (2014), Iqbal and Qureshi (2012), Ali et al. (2013) |
| **Self-management of learning (SML)** | 4 | Wang et al. (2009) ; Hadi and Kishik (2014) |

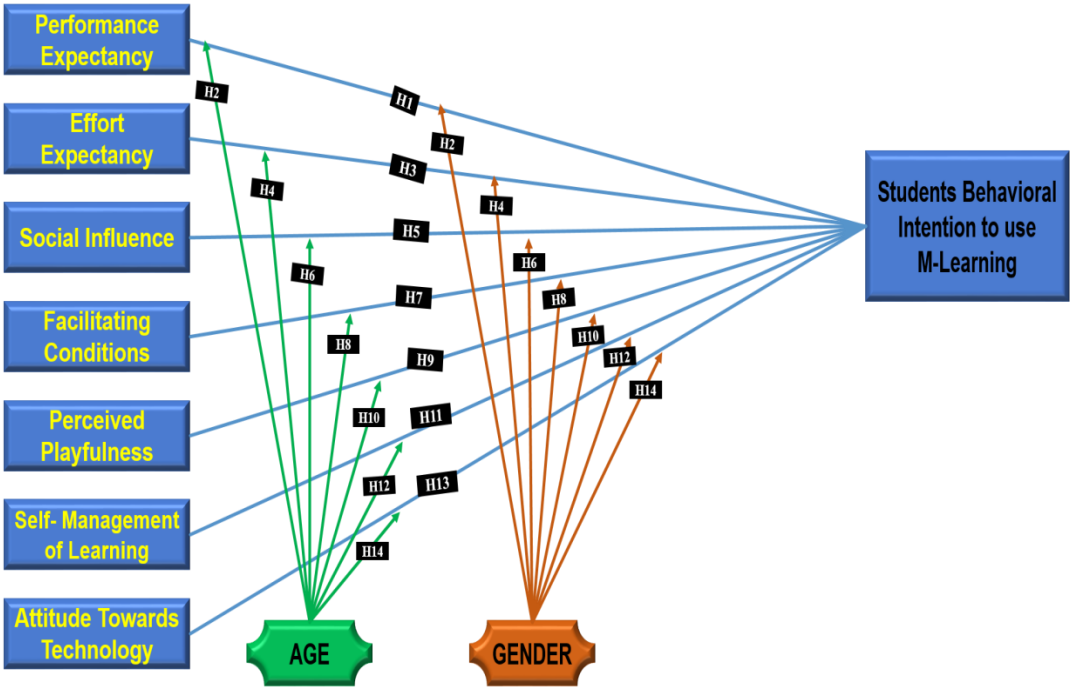


*Figure 2-5:* Proposed Theoretical Frame Work

# CHAPTER 3
# RESEARCH METHODOLOGY

## 3.0 Introduction

This chapter encompasses the research methodology and design used during this study. It provides overall details of the structure of the research, elaborating each component such as research design, various techniques employed for sampling, collection of data and its analysis, pilot study together with the development of questionnaire to reach the objectives of the study and research questions.

## 3.1 Research Methodology

The framework of the methodology adopted is described in the figure 3-1:

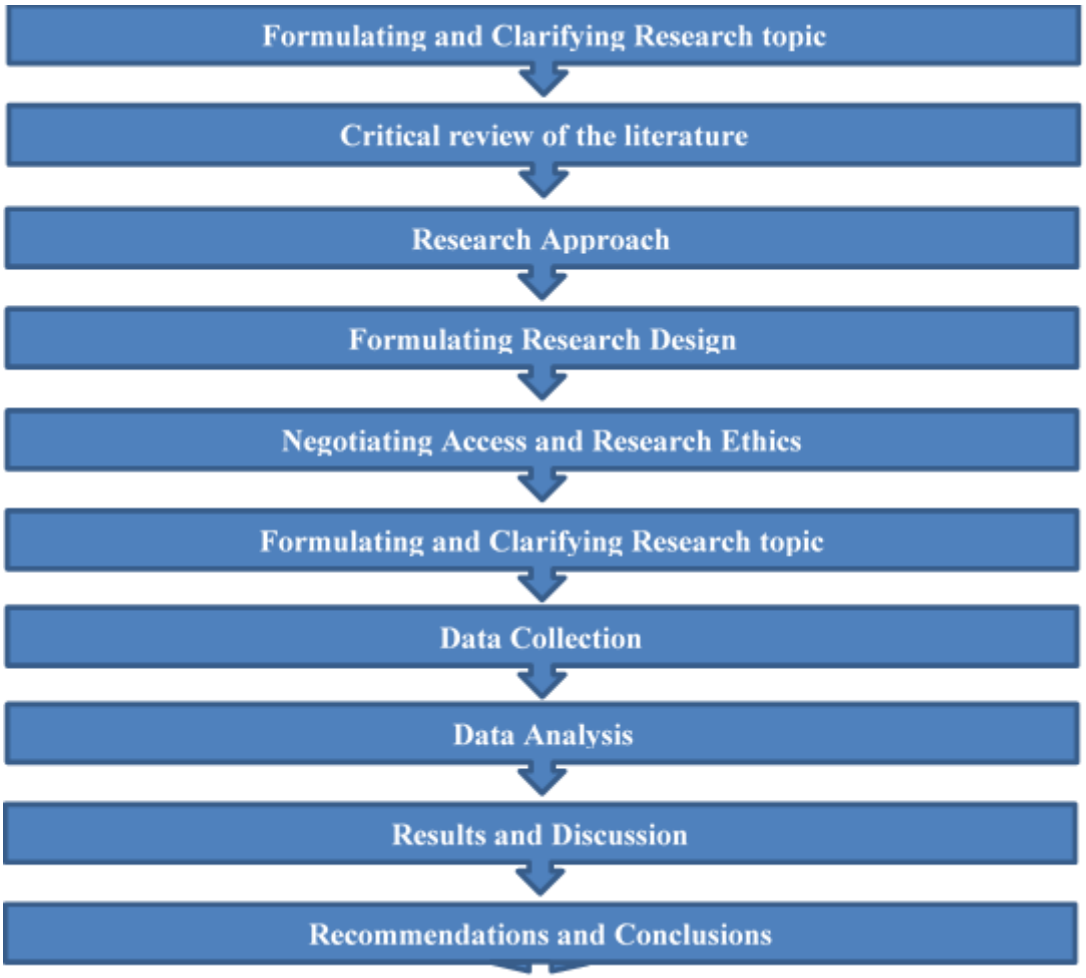


*Figure 3-1:* Research Methodology

## 3.2 Formulating and clarifying the research topic

The foremost step in conducting any study is the formulation and selection of the topic (Saunders et al., 2009). After carrying out extensive literature review of related subject under study and identifying the gaps present in the past studies, different research areas were identified. The highlighted research areas were further explored and narrowed down to a few selected topics that were according to my aptitude towards investigating the impact of latest mobile technologies on education in Pakistan. After discussing the selected areas of interest with research supervisor, faculty members, and colleagues and also with different experts from the telecommunication and education industries, the research topic was then selected and approved by respected Department of Engineering management.

## 3.3 Review of Literature

It is important to conduct critical analysis of the related literature in order to understand the research topic better. According to Saunders et al. (2009), reviewing the literature helps in understanding the important concepts better. In the beginning, past studies related to m-learning were studied, along with the UTAUT model. Relevant work of other authors was studied and the research parameters were refined and modified, giving way to the development of theoretical framework.

## 3.4 Research design

As illustrated in the figure 3-1, Saunders et al. (2009) defines research design to be composed of several layers, commonly known as a ‘research onion’. The different layers of this onion define the different steps or procedures involved in the research design, with each layer offering unique choices for the respective step. The layers of the onion comprise of research philosophies, research approaches, research strategies, techniques and procedures, research choices and the time horizon involved in the research. The research onion provides complete guidelines that can be followed to adopt the best practices for conducting the research.

## 3.5 Approach to Research

In any research, there are two different types of research approaches that can be used to fulfill the research objectives. Saunders et al. (2009) identifies that in order to decide that which

type is best suited for your research, it is mandatory to understand the theory of the research. One is inductive approach while the second is called deductive approach.

In deductive approach you develop the theory, objectives and hypothesis and then design the strategy to test the hypothesis and fulfill the objectives. In this approach we move from theory to data. It is also known as the waterfall approach as we start from the top, i.e. the theory and then come down. Collis and Hussey (2003) identify that by using deductive approach, theory is developed which is further tested vigorously and verified. Quantitative data collection technique is used in this approach and the explanatory and descriptive studies are used for the approach.

In inductive approach you first collect the data and then develop the theory from the results of the data or we move from data to theory. Inductive approach is more suitable for studies where a new topic is being explored and previous theories related to the topic are not present. Qualitative data collection technique is used for this approach and exploratory study is done for this type of research.

Therefore, I have used deductive approach to complete my research as the theories related to my topic already existed and the hypothesis are made from the theory, which are tested for validation.

## 3.6 Purpose of Research

The motivation behind the research is to examine the student's behavioral intentions to adopt m-learning and analyze the most recent impact of the technology trends on educational sector of Pakistan. Objective of research are:-

3.6.1 To determine whether students find m-learning a useful mode of learning in order to enhance knowledge.

3.6.2 To evaluate the various determinants (Effort expectancy, performance expectancy, facilitating conditions, social influence, perceived playfulness, self-management of learning and attitude towards use of technology) that influence the acceptance level of students regarding mobile learning.

3.6.3 To identify factors that have the greatest influence towards acceptance of m-learning.

### 3.6.4 To analyze the influence of gender or age on determinants for the adoption of m-learning

According to Saunders et al. (2009), the path adopted to investigate the research objectives and research question dictates the type of research to be followed in the study. There are different classifications of research i.e exploratory research, descriptive research, explanatory research, descripto-explanatory study.

**Exploratory Study or research** means finding something new or gaining new insights to find out what is happening (Robson, 2002). This type of study is normally done when the problem is not clear. For this purpose, the literature needs to be searched according to the findings, interview of the experts of the relevant field, and focused group interviews, to find the problematic areas. Exploratory studies mostly are conducted through qualitative analysis method, using inductive approach.

**Descriptive Study or research** means to explain or describe the actual details of the person, process, phenomenon or the problem on which data will be collected (Robson, 2002).

**Explanatory study or research** creates and explains the cause and effect relation between the different variables. In this type of research, the hypothesis is verified by identifying and examining the relationship between the independent and dependent variables. Explanatory studies mostly are conducted through quantitative analysis method, using deductive approach.

**Descripto-Explanatory research** is a mixture of descriptive and explanatory research. This type of study is used commonly when it is important to describe and study a particular phenomenon or issue to explain the relationship between independent and dependent variables.

As the objectives of this study are to analyze and asses the actual picture regarding the awareness of m-learning in higher education institutes of Pakistan, a descriptive study has been used to carry out this process. Moreover, the objectives of this study also focus upon identifying the causal relationships between the dependent and independent variables which makes explanatory research more suitable. Therefore, I have used descripto-explanatory study, as this study describes the actual picture of the phenomenon or the problem and also the cause and effect relationship between the variables while testing the hypothesis.

## 3.7 Research Strategies

A number of research strategies have been used by past researchers including:

3.7.1 Ethnography

3.7.2 Archival research

3.7.3 Case study

3.7.4 Action research

3.7.5 Grounded theory

3.7.6 Experiments

3.7.7 Surveys

A number of reasons led to the selection of the survey strategy as the best possible approach for the research. In the beginning, deductive approach was chosen due to the fact that theory already existed and the objective of the research was to analyze the theory in order to test and verify it. Deductive approach is commonly linked with survey strategy as it is frequently used to answer what, where, who and how many questions, making it useful for exploratory and descriptive type of research. Surveys provide an economic way of collecting large amount of data from a huge population. According to Cooper and Emory (1995), hypothesis testing can be done best through survey strategy making the results more reliable as compared to other research strategies. Thus survey strategy has been adopted to carry out this research.

## 3.8 Research Choice

A number of research choices are available that can be selected according to the data collection and analysis techniques. The two main types of choices include mono and multiple methods of research, where mono deals with only one data collection and analysis technique, while multiple method includes a number of data collection and analysis techniques combined together to perform the job. Multiple method may include only qualitative or quantitative methods, or a combination of both the methods.

Multiple methods of research have been opted for the study undertaken, as various quantitative methods have been used for this research. Quantitative methods involve tabulation of data and different statistical tests performed on numerical data to extract useful results (Smith, 1988). Moreover, quantitative research comprises of specifying precisely both dependent and independent variables under study, making the interpretations and results more reliable (Bernard, 2000). The data has been collected at a single point of time making the study cross-sectional (Zikmund, 2003). This type of study is more useful when the research has to be finished in a limited time frame, making it convenient to identify and analyze the relationships between the various determinants involved (Saunders et al., 2009).

## 3.9 Questionnaire Development

Questionnaire method has been used in this research. A questionnaire is a type of a research instrument that is used to collect feedback and information from the respondents through a series of questions. Questionnaires are an efficient medium to collect different types of data such as respondent's opinions. It allows flexibility of time and resources, allowing the research to gather large amount of data without physically asking questions individually to every respondent.

The questionnaire used in this survey comprises of two main parts, with the opening section comprising of seven (7) questions related to the demographic details and opinion of the respondent regarding internet usage through mobile devices for educational purpose, and the second part containing thirty one (31) questions measuring the respondent's acceptance level of m-learning. At first, the questionnaire was verified by a number of experts to validate language and comprehensiveness of questionnaire. After doing this, pilot study was conducted by handing out the questionnaire to 55 students of HEIs, resulting in 37 responses, out of which 35 were valid responses whereas 2 were incomplete, making the response rate 67.9%. The feedback and comments received were incorporated into the questionnaire and the questions were updated.

The items that have been used to measure effort expectancy, performance expectancy, facilitating conditions, social influence, attitude towards learning and behavioral intentions has been adopted from the work of Venkatesh et al. (2003). The questions used to measure perceived playfulness have been adopted from Moon and Kim (2001), whereas the questions used to quantify self-management of learning have been taken from Smith et al. (2003). The

questionnaire comprises of total 38 questions, attached at appendix A. The questions have been kept precise and close ended to avoid ambiguous answers and respondents' biasness. A five point Likert scale will be used with (1) corresponding to "Strongly disagree", (2) "Disagree", (3) "Neutral", (4) "Agree" and (5) to "Strongly Agree".

The results of pilot study are as depicted in table 3-1:-

Table 3-1: Cronbach Alpha for Pilot testing

| Constructs | Cronbach's Alpha | No. of items |
|---|---|---|
| **Facilitating Conditions** | 0.856 | 4 |
| **Perceived Playfulness** | 0.765 | 5 |
| **Self-Management Of Learning** | 0.836 | 4 |
| **Attitude Towards Learning** | 0.880 | 3 |
| **Behavioral Intentions** | 0.909 | 3 |
| **Social Influence** | 0.848 | 4 |
| **Effort Expectancy** | 0.965 | 4 |
| **Performance Expectancy** | 0.951 | 4 |

The items were considered reliable and consistent as the results of the pilot tests showed the reliability being greater than 0.7. Therefore the questionnaire was further distributed to respondents to gain more results.

## 3.10 Negotiating access and ethical issues

Due to the recent security measures prevalent in all the educational institutes of Pakistan, it was difficult to get access to students in order to get the questionnaires filled. A special permission was taken through a letter asking permission to enter the institute's premises and gain access to students. Military college of Signals, College of EME, CASE and Virtual University of Pakistan were easier to gain access to as compared to other institutes. All ethical issues have been adhered to as specified by the regulations. All the past literature and work of different authors used in the research have been properly cited and referenced. Confidentiality of all the respondents has been maintained to ensure unbiased and unprejudiced responses.

# CHAPTER 4
# DATA ANALYSIS

## 4.0 Overview

The section comprises of information that has been gathered using questionnaires in order to extract results and findings to test the hypothesis and validate the results. The chapter will give details regarding the data collection method adopted, including the sampling technique used and the different sources used in order to conduct data analysis to meet the objectives of this research. The chapter will also include the results and findings based on the mean responses. The results have been obtained through the IBM SPSS 20.0 software. This will comprise of specific details regarding the percentages of the results obtained. It will also include the various results obtained through statistical analysis, testing the correlation between the variables.

## 4.1 Data Collection

As described in the previous chapter, data collection has been done using survey strategy, through structured questionnaires, in order to collect data. Questionnaires are used normally when conducting an explanatory or descriptive study. Questionnaires are of different types, depending on how much contact is established between the researcher and the respondents. The questionnaires used in this survey are self-administrated as the questionnaires were passed to a number of students from different universities to fill on their own. This was done to cater respondents scattered over different universities, to get a reasonable sample size to in order to reach reliable results, and to meet the time constraints. Close ended, objective type questions have been used in the survey to achieve better results and address the research hypothesis accurately. Effort has been made to eliminate researcher and respondents errors and biased opinions while collecting data. The question regarding the name of the institution and respondent has been kept optional to maintain confidentiality of the participants.

### 4.1.1 Data Collection Sources

Three types of data collection sources have been defined by past researchers namely primary, secondary and tertiary sources of data collection. Tertiary sources are used in order to ascertain primary and secondary sources of data. This will include abstracts, indexes, encyclopedias and bibliographies. The data collection methods adopted for this research are discussed below:

#### 4.1.1.1 Secondary Data

The published data is called secondary data. It includes the related work that has already been carried out by others. For this literature review has been done from the different books, journals, and the research papers of the different authors to establish bench marking and to validate the hypothesis.

#### 4.1.1.2 Primary Data

The un-published data is called primary data. For collection of primary data from the students of higher institutes of Pakistan, survey methodology was adopted and validated self-administered questionnaire, which has been used earlier by other researchers in relevant studies, has been selected from the literature review.

## 4.2 Sampling Technique

Sampling techniques provide multiple methods that enable the researcher to reduce the amount of data that has to be collected by considering the data from a sub-group instead of the whole population. Sampling proves to be efficient and a valid alternative when: Budget constraints prevent from surveying whole population; It is impossible / impracticable to survey the whole population; Time constraints restrict surveying the whole population; Complete data has been collected but results are required quickly.

Two types of sampling techniques are normally used while conducting studies, i.e. probability and non-probability sampling. With probability sampling, the chances of each case being selected from the population are known and equal whereas in non-probability sampling, the probability of the selection of each case is unknown and unequal. Probabilistic

sampling is normally linked with survey based strategies in which you are required to make deductions from your sample related to a population to answer your research questions. Random sampling is a type of probabilistic sampling technique, which has been used in this study. This involves selecting the sample randomly from the sampling frame either through a random number table or a random number generator. Thus random sampling has been used in this survey to investigate the research hypothesis.

### 4.2.1 Sample Frame

The sample frame consists of the students of HEIs of Pakistan, studying in the twin cities i.e. Rawalpindi and Islamabad. The sample frame has been kept restricted to the twin cities due to time and financial constraints and lack of resources. Moreover, the twin cities encompass most of the recognized HEIs of Pakistan, and being modern region, the students of these cities are well aware of the latest technological trends, thus the results achieved from these cities can be generalized to make inferences about other cities of Pakistan as well. There are twenty seven higher educational institutes in Rawalpindi and Islamabad. Out of these, ten institutions were selected keeping in view the different academic programs offered by these institutions, their fee structures and the facilities being offered, in order to cater all students belonging from different academic backgrounds. The ten chartered universities included in the sample frame consist of: College of EME, MCS, NBS, CASE, COMSAT, Virtual University of Pakistan, APCOMS, FAST, Air University and Quaid i Azam.

### 4.2.2 Sample Size

Primary data is required for the subject research so it would be collected by questionnaire. According to Saunders et al. (2009), a confidence level of 95% with 5% error margin, the minimum size of sample should be 384 to achieve reliable results. In order to achieve true results, random sampling was used to distribute the questionnaires among 650 respondents, among ten universities. A few questionnaires were filled by students on the spot in classrooms, while the rest were given to administration and faculty members to get them filled by students later as some of the institutions restricted direct access to students due to security measures. Around 419 questionnaires were filled and received back, from which 11 were ineligible. Therefore an overall response rate of 65.5% was achieved.

## 4.3 Analysis of Data

The collected data from the questionnaires is usually in raw form, and has to be processed in order to convert it into useful information. Data is thus processed, organized, and structured to form information. According to Saunders et al. (2009), quantitative analysis techniques allow us to examine the relationships between different variables under study through graphs, charts and other statistical methods. Almost every study conducted involves the usage of quantitative data to extract some useful results, on the basis of which the study is concluded and recommendations are given. In order to extract some useful inferences, data analysis is necessary which is now much easier to perform with the help of latest software such as Statistical Package for the Social Sciences (SPSS). Huge amounts of data are now easily analyzed and several different statistical tests can be performed easily with the help of powerful computers. The data collected from the questionnaires was first coded to transform it into quantitative data. For this, five point Likert scale was used with '1' representing 'strongly disagree' and '5' representing 'strongly agree'. The data was then entered into IBM SPSS, and after validation (checking for inconsistencies), it was converted into tabular form and then interpreted. Descriptive investigation was done on the data in order to analyze the mean, standard deviation and variances of every question in the survey questionnaire. Scale measurement such as reliability and validity analysis, normality test, inferential analysis such as correlation analysis, multiple regression analysis, t-test, Analysis of variance (ANOVA) and hypothesis testing were carried out on the data to extract useful results. The questionnaire used in this survey comprises of two main parts, with the opening section comprising of 7 questions related to the demographic details and opinion of the respondent regarding internet usage through mobile devices for educational purpose, and the second part containing 31 questions measuring the respondent's acceptance level of m-learning.

## 4.4 Demographic Information

The first section of the Questionnaire is related to the demographics and general information of the respondent regarding internet usage through mobile devices for educational purpose. Demographic information is essential in order to interpret the data and view it from different perspectives. Demographic information is collected through a series of questions regarding the gender, age, qualification, and name of the educational institute. Other questions are related to the respondents' opinion regarding the usage of internet through mobile devices in

order to extract educational content. The data obtained from the first portion of the questionnaire is summarized below:

Table 4-1: Respondents Statistics –Gender

| Gender of Respondents | | | | | |
|---|---|---|---|---|---|
| | | Frequency. | Percent | Valid. Percent | Cumulative Percent |
| Valid | Male | 300 | 73.5 | 73.5 | 73.5 |
| | Female | 108 | 26.5 | 26.5 | 100.0 |
| | Total | 408 | 100.00 | 100.00 | |

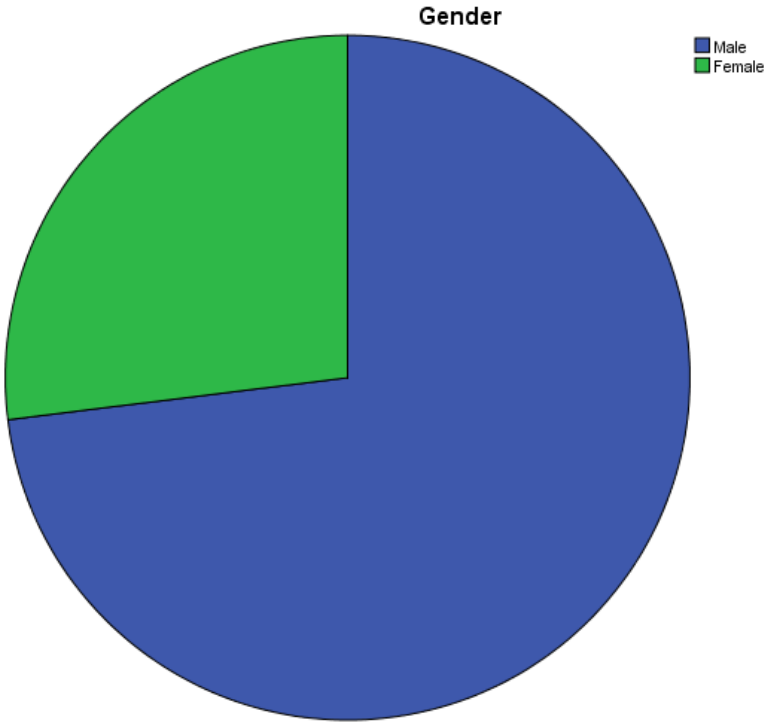


*Figure 4-1:* Graphical analysis – Gender

According to the Table 4-1 and Figure 4-1, both male and female students were approached to fill questionnaire, out of 408 total respondents, 300 (73.5%) respondents were male and only 108 (26.47%) respondents were female.

Table 4-2: Percentage of Respondents According to Age

| Age of Respondents | | | | |
|---|---|---|---|---|
| | Frequency | Percent | Valid. | Cumulative. |

| | | | | Percent | Percent |
|---|---|---|---|---|---|
| Valid | Less than 20 years | 150 | 36.80 | 36.80 | 36.80 |
| | 20 to 24 years | 131 | 32.10 | 32.10 | 68.90 |
| | 25 to 30 years | 83 | 20.30 | 20.30 | 89.20 |
| | Above 30 years | 44 | 10.80 | 10.80 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

Table. 4-3: Respondents statistics -Gender *Age

| **Gender * Age Cross tabulation** | | | | | | |
|---|---|---|---|---|---|---|
| | | Age | | | | Total |
| | | Less than 20 years | 20 to 24 years | 25 to 30 years | Above 30 years | |
| Gender | Male | 93 | 86 | 71 | 48 | 298 |
| | Female | 28 | 31 | 24 | 27 | 110 |
| Total | | 121 | 117 | 95 | 75 | 408 |

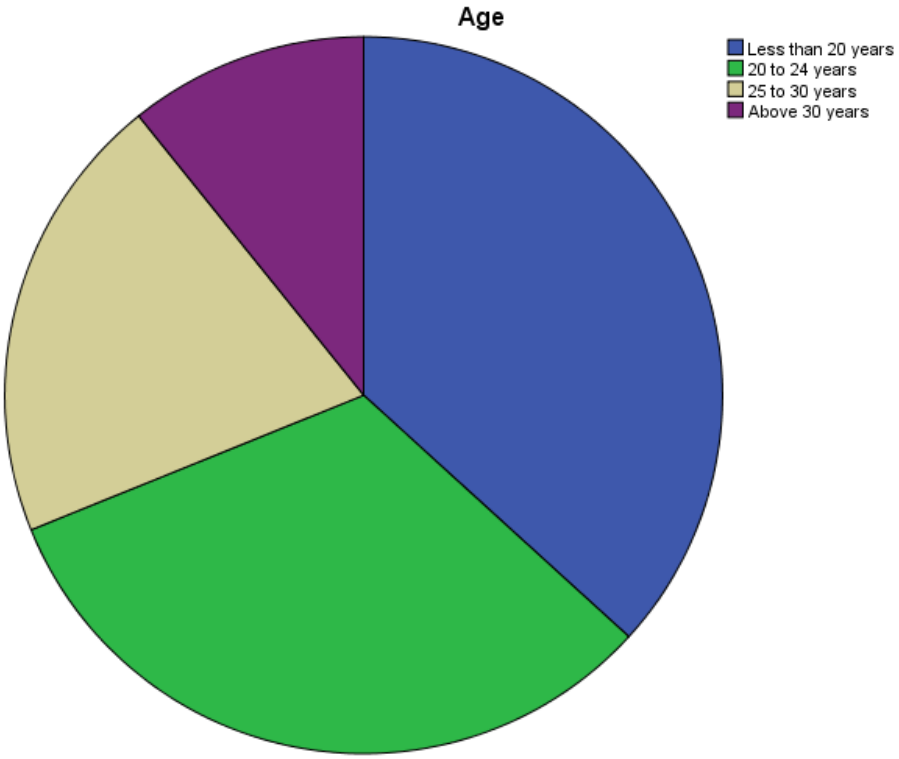


*Figure 4-2:* Graphical Analysis – Age

Table 4-2 and figure 4-2 present the % of the students according to the different age groups. Most of the respondents belong to the group accounting for age less than twenty years with a percentage of 36.8%, 32.1% from 20 to 24 years of age group, 20.3% from 25 to 30 years of age group and 10.8% from 30 years and above.

In addition, table 4-3 describes the age group in reference with gender. 28 females and 93 males are in the group accounting for age less than twenty years, 86 males and 31 females belong to 20 to 24 years of age group, 71 males and 24 females belong to third group of 25 to 30 years of age, and from above 30 years of age group there were 48 males and 27 females.

Table 4-4: Percentage of Respondents' Qualification

| Qualification | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Under Graduate | 220 | 53.9 | 53.9 | 53.9 |
| | Graduate | 146 | 35.8 | 35.8 | 89.7 |

| | | | | | |
|---|---|---|---|---|---|
| | Post Graduate | 42 | 10.3 | 10.3 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

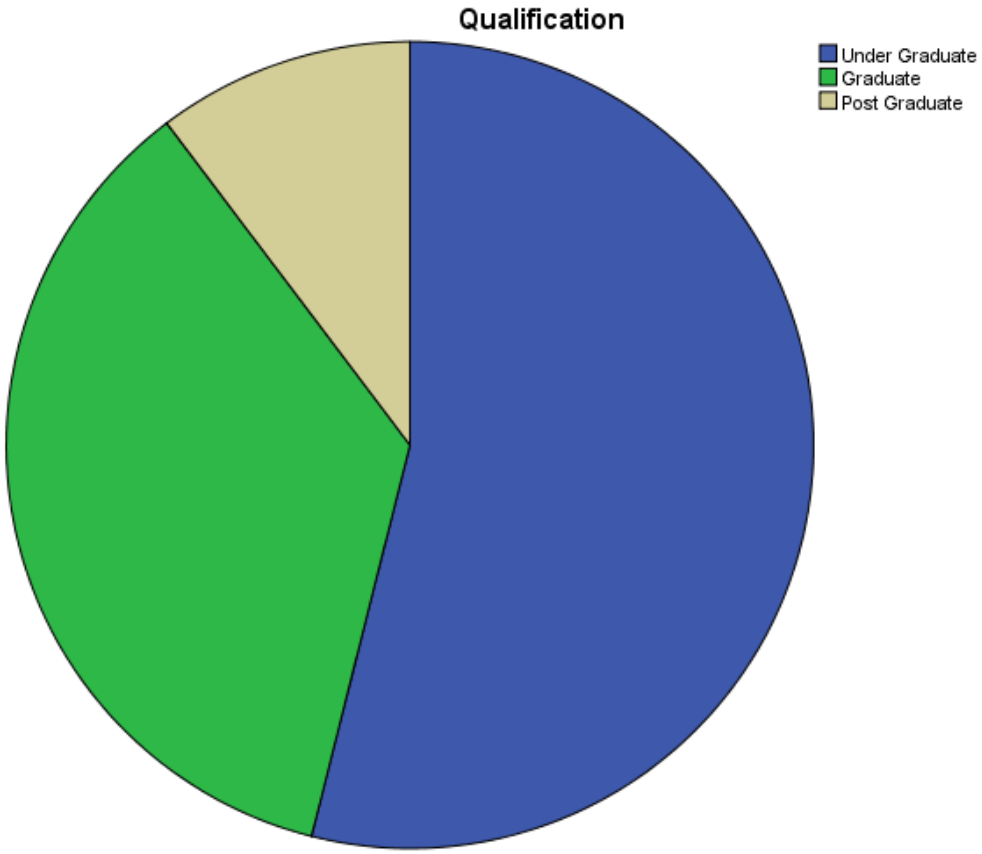


*Figure 4-3:* Graphical Representation – Qualification

Figure 4-3 and Table 4-4 portray the qualifications of the respondents. The highest percentage i.e. 53.9% of respondents belong to the under graduate group, as the main population in the higher education institutions consists of under graduates. 35.8% of the respondents are graduates, whereas 10.3% are post graduates or PhD scholars.

Table 4-5 Percentage of Respondents with respect to HEIs

| **Higher Education Institutes** | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | College of EME | 58 | 14.2 | 14.2 | 14.2 |

| | | | | | |
|---|---|---|---|---|---|
| | MCS | 51 | 12.5 | 12.5 | 26.7 |
| | NBS | 47 | 11.5 | 11.5 | 38.2 |
| | CASE | 40 | 9.8 | 9.8 | 48.0 |
| | COMSAT | 36 | 8.8 | 8.8 | 56.9 |
| | VU of Pakistan | 39 | 9.6 | 9.6 | 66.4 |
| | APCOMS | 40 | 9.8 | 9.8 | 76.2 |
| | FAST | 30 | 7.4 | 7.4 | 83.6 |
| | AIR University | 32 | 7.8 | 7.8 | 91.4 |
| | Quaid-E-Azam University | 35 | 8.6 | 8.6 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

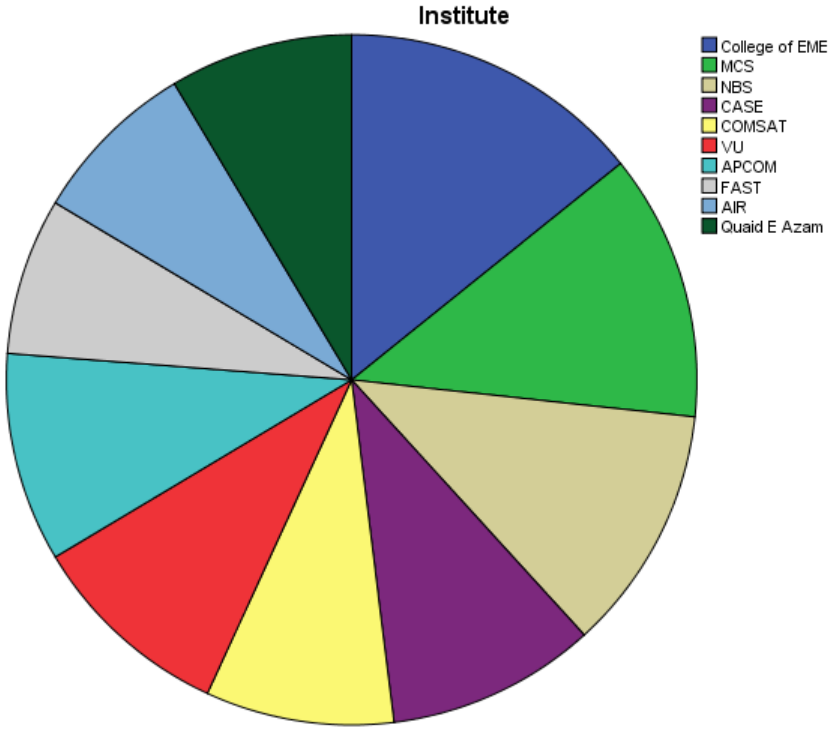


*Figure 4-4:* Graphical analysis - HEIs

Table 4-5 and figure 4-4 illustrate the percentage of responses received from different universities. The maximum response rate was received from College of EME, i.e. 14.2%, while the least response was received from FAST Islamabad, which was 7.4%.

Table 4-6: Types of Mobile Devices

| | Frequency | Percent | Valid | Cumulative |
|---|---|---|---|---|

| | | | | Percent | Percent |
|---|---|---|---|---|---|
| Valid. | Call & Text – Simple Phone | 103 | 25.2 | 25.2 | 25.2 |
| | Smart phone | 193 | 47.3 | 47.3 | 72.5 |
| | PDA | 51 | 12.5 | 12.5 | 85.0 |
| | Tablet PC | 45 | 11.0 | 11.0 | 96.1 |
| | Other devices | 16 | 3.9 | 3.9 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

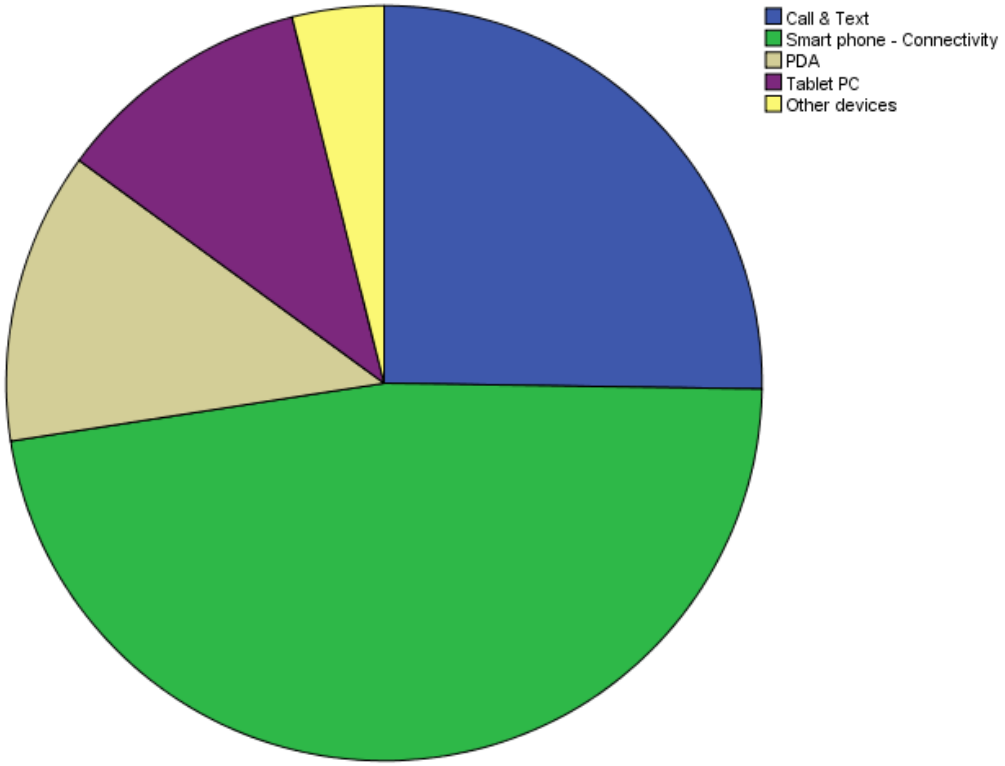


*Figure 4-5:* Types of Mobile Devices

Table 4-6 and figure 4-5 depicts the results received from the respondents for the question ***"My mobile device can be best classified as"***. The highest percentage of students, i.e 47.3% responded that they were using smartphones, whereas 25.2% selected the option of simple mobile phones that has call and text facility. 12.5% classified PDAs as their mobile device, while 11% selected tablet PCs and 3.9% indicated using other devices as their mobile devices.

Table 4-7: Internet Usage via Mobile Devices

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Daily | 247 | 60.5 | 60.5 | 60.5 |
| | Weekly | 107 | 26.2 | 26.2 | 86.8 |
| | Monthly | 42 | 10.3 | 10.3 | 97.1 |
| | Rarely | 12 | 2.9 | 2.9 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

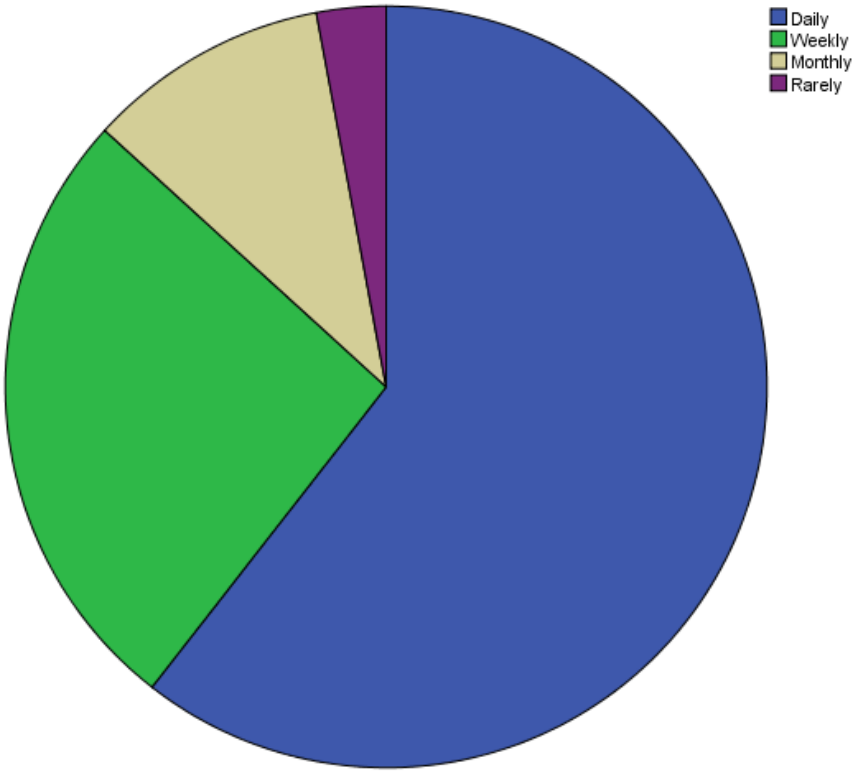


*Figure 4-6:* Graphical analysis - Internet Usage

Table 4-7 and figure 4-6 depicts the results received from the respondents for the question ***"How often do you use the internet from your mobile device?"*** According to the results, around 60.5% of the students were using mobile devices to access the internet every day, 26.2% accessed the internet every week, 10.3% used it monthly whereas 2.9% students used it rarely.

Table 4-8: Percentage of respondents using 3G/ 4G

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Valid | Yes | 263 | 64.5 | 64.5 | 64.5 |
| | No | 145 | 35.5 | 35.5 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

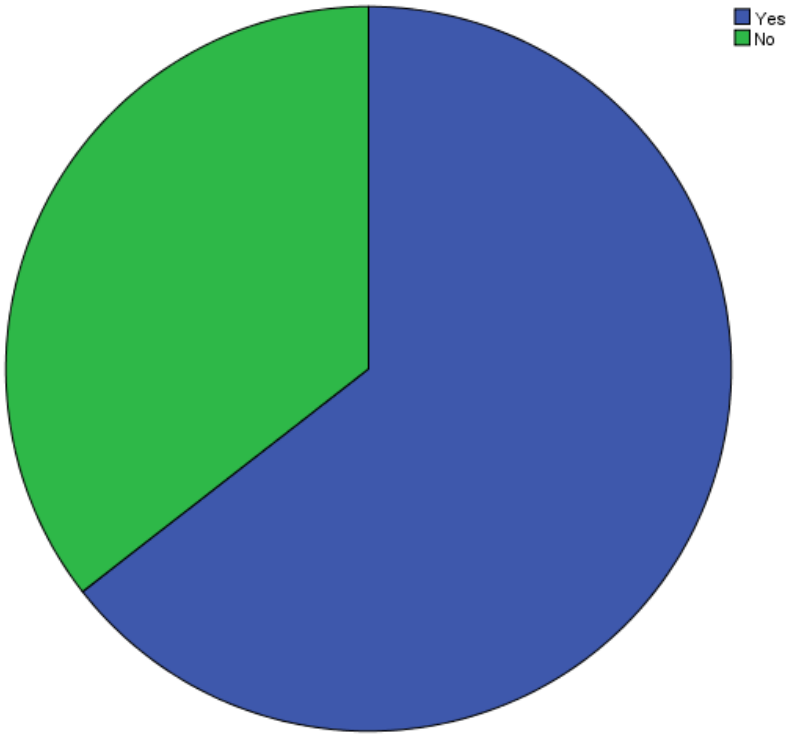


*Figure 4-7:* Graphical analysis - Respondents using 3G/ 4G

Table 4-8 and figure 4-7 depicts the results received from the respondents for the question ***"Do you access the internet using 3G/4G mobile network?"***. The results showed that 64.5% of the students accessed the internet using 3G/4G from their mobile devices, whereas 35.5% did not use 3G/4G networks.

Table 4-9: Respondents using educational application

| | Frequency | Percent | Valid Percent | Cumulative |
|---|---|---|---|---|

| | | | | | Percent |
|---|---|---|---|---|---|
| Valid | Yes | 319 | 78.2 | 78.2 | 78.2 |
| | No | 89 | 21.8 | 21.8 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

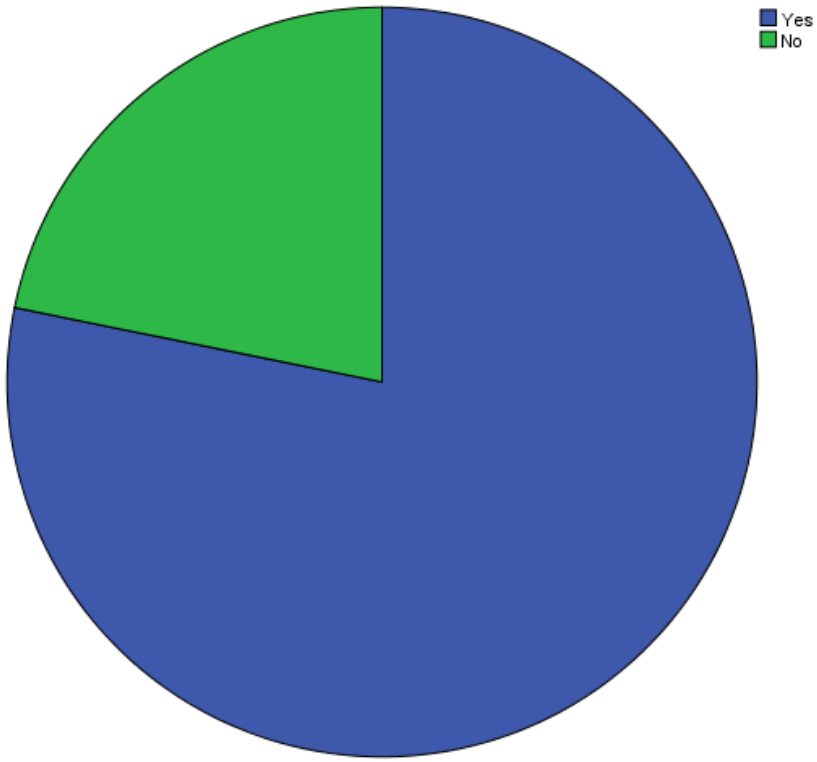


*Figure 4-8:* Graphical analysis - Respondents using educational application

Table 4-9 and figure 4-8 depicts the results received from the respondents for the question **"Have you used any educational application on your mobile device?"**. The results depicted that 78.2% of students used educational applications from their mobile devices, whereas 21.8% did not use any type of educational applications.

Table 4-10: Respondents using educational contents

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Yes | 186 | 45.6 | 45.6 | 45.6 |
| | No | 222 | 54.4 | 54.4 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

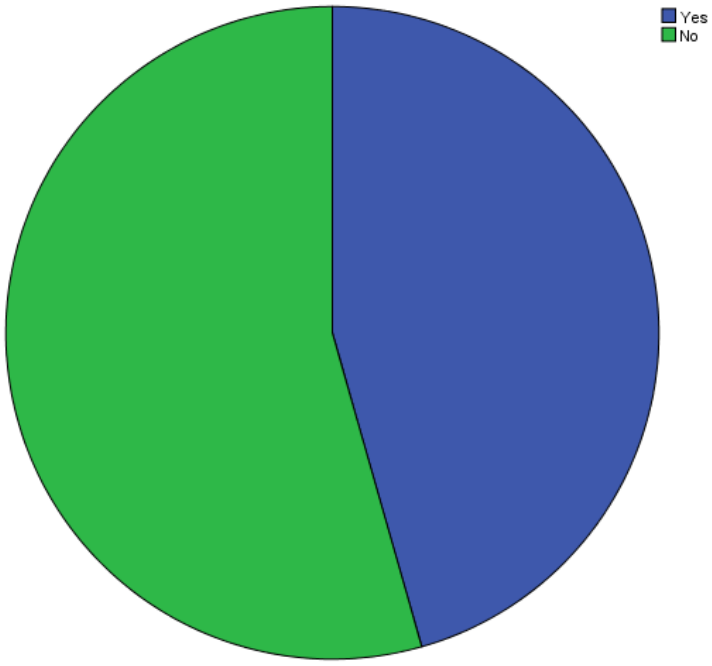


*Figure 4-9:* Graphical analysis - Respondents using educational contents

Table 4-10 and figure 4-9 depicts the results received from the respondents for the question **"Do you access educational contents/ materials using 3G/4G mobile networks?".** The results showed that 45.6% of the students accessed educational contents using 3G/4G from their mobile devices, whereas 54.4% did not use 3G/4G networks to access educational material.

Table 4-11: Respondents awareness of mobile learning

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Yes | 280 | 68.6 | 68.6 | 68.6 |
| | No | 128 | 31.4 | 31.4 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

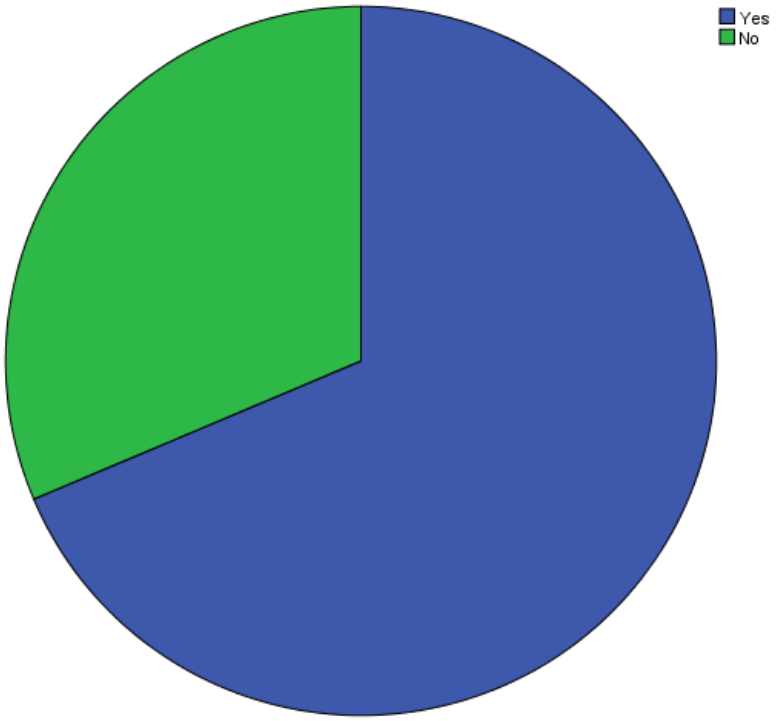


*Figure 4-10:* Respondents awareness of mobile learning

Table 4-11 and figure 4-10 depicts the results received from the respondents for the question **"Have you heard about Mobile Learning (M-Learning)?".** The results depicted that 68.6% of students had already heard about m-learning, whereas 31.4% did not know about it.

Table 4-12: Respondents Opinion about Mobile Learning

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Good idea and .like to use | 297 | 72.8 | 72.8 | 72.8 |
| | Good. idea and. not like to use | 57 | 14.0 | 14.0 | 86.8 |
| | Think not a good idea | 25 | 6.1 | 6.1 | 92.9 |
| | Others | 29 | 7.1 | 7.1 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

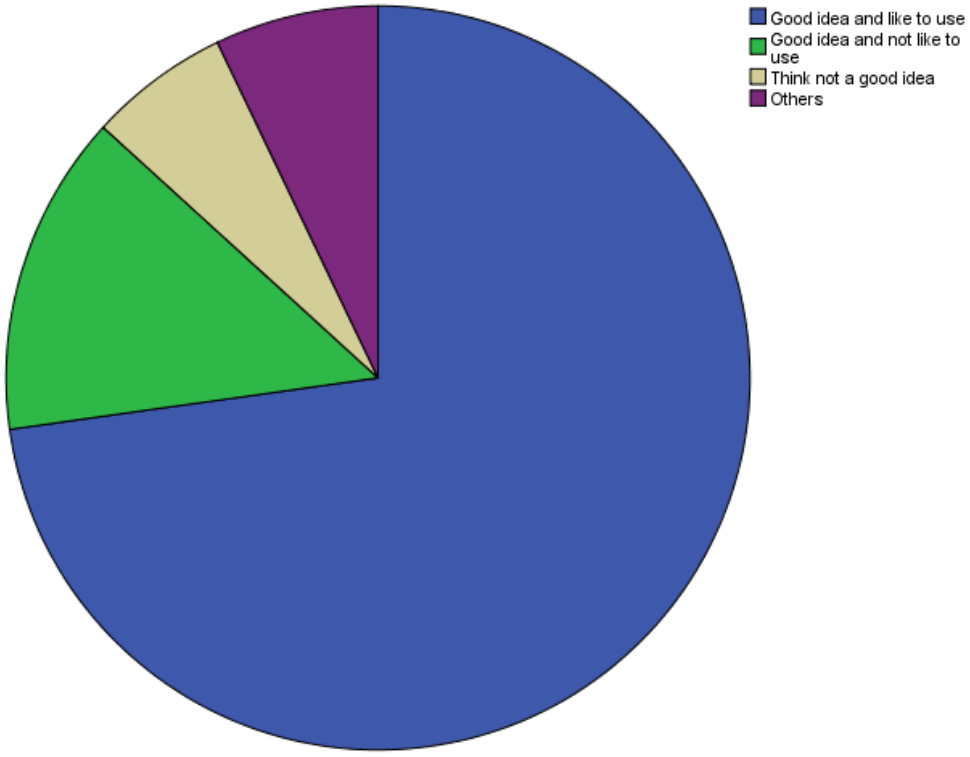


*Figure 4-11:* Respondents Opinion about Mobile Learning

Table 4-12 and figure 4-11 depicts the results received from the respondents for. **"What is your opinion of M-Learning?"**. According to the results, 72.8% of students responded that mobile learning is a good idea and they would like to use it, whereas 17% responded that it is a good idea but they would not like to use it. 6.1% of the student's didn't think of m-learning as a good idea, while the remaining 7.1% had no genuine supposition on this.

## 4.5 Dimensions of UTAUT

The UTAUT model integrates the systems' and the users' characteristics to predict the level of acceptance of any new technology. The model comprises of four factors of information technology user behavior and four mediators that determine the effects of behavioral intentions and user behavior. The direct determinants include performance expectance, effort expectancy, social influence and facilitating conditions whereas the moderating variables include gender, age, experience and voluntariness of use. According to Venkatesh et al. (2003), the UTAUT model can help managers in assessing the users' behavior intention to adopt any new technology. Moreover, individual factors such as self-management of learning, attitude towards technology and perceived playfulness are also included in the model, which may prove to be helpful in assessing the users' acceptance of a new technology.

### 4.5.1 Performance Expectancy

Performance expectancy is defined as the degree to which an individual thinks or believes that using a system would assist him in performing his job well. Incorporating performance expectancy in m-learning will improve learning activities and help in increasing the learning efficiency. Four items have been used to measure performance expectancy, which will help us to investigate how the students' believe that m-learning will aid them in improving their performance.

#### 4.5.1.1 Respondents opinion about finding m-learning useful in their education

The respondents were asked to give their opinion regarding the usefulness of m-learning in their education.

Table 4-13: Frequency table regarding 'M-learning Usefulness in Education'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 25 | 6.1 | 6.1 | 6.1 |
| | Disagree | 16 | 3.9 | 3.9 | 10.0 |
| | Neutral | 39 | 9.6 | 9.6 | 19.6 |
| | Agree | 85 | 20.8 | 20.8 | 40.4 |
| | Strongly Agree | 243 | 59.6 | 59.6 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

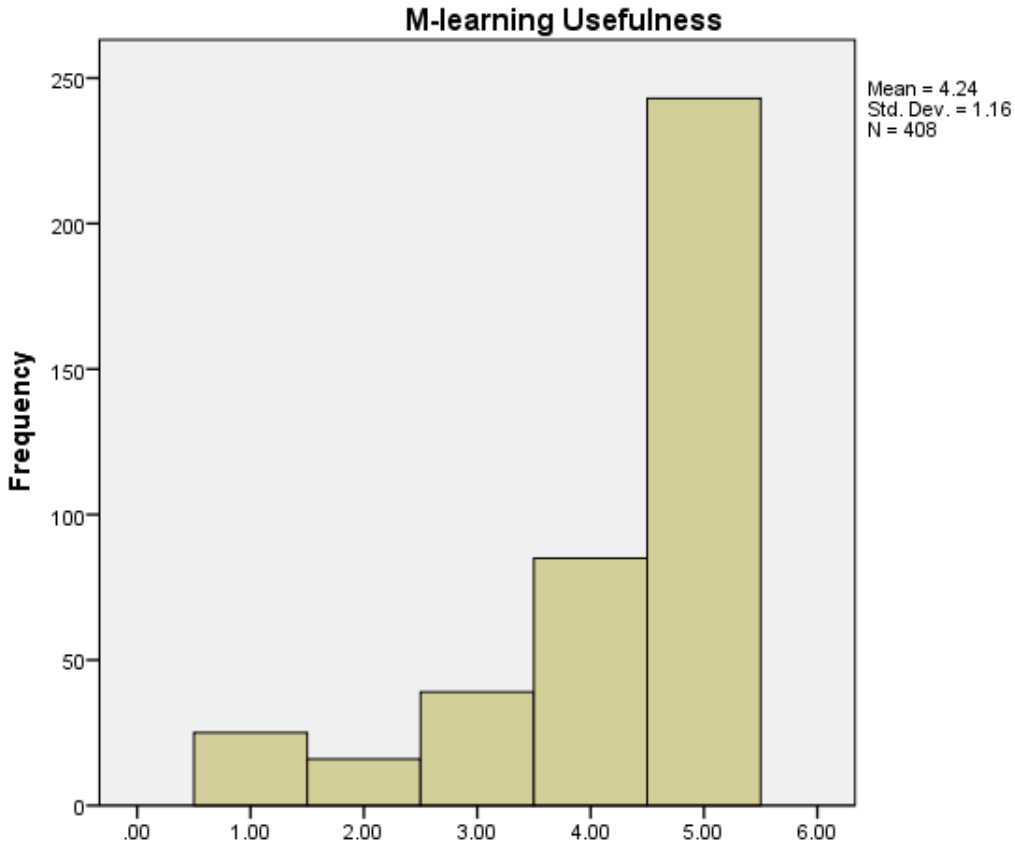


*Figure 4-12:* Graphical Analysis - 'M-learning Usefulness in Education'

Table 4-13 and figure 4-12 show that 80.4% respondents believe that m-learning plays a vital role in improving their education with (mean) $\mu = 4.24$ and (SD) $\sigma = 1.16$. Few of the respondents i.e; 10% do not agree with statement. Thus majority of the students are of the opinion that m-learning will enable them to accomplish their learning activities more quickly and will help them to achieve better education.

### 4.5.1.2 Respondents opinion regarding the use of m-learning in accomplishing learning activities more quickly

The respondents were asked to give their opinion regarding the usefulness of m-learning to accomplish their learning activities more quickly.

Table 4-14: Frequency table regarding 'M-learning Accomplish Learning Activities More Quickly'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 12 | 2.9 | 2.9 | 2.9 |
| | Disagree | 33 | 8.1 | 8.1 | 11.0 |
| | Neutral | 26 | 6.4 | 6.4 | 17.4 |
| | Agree | 107 | 26.2 | 26.2 | 43.6 |
| | Strongly Agree | 230 | 56.4 | 56.4 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

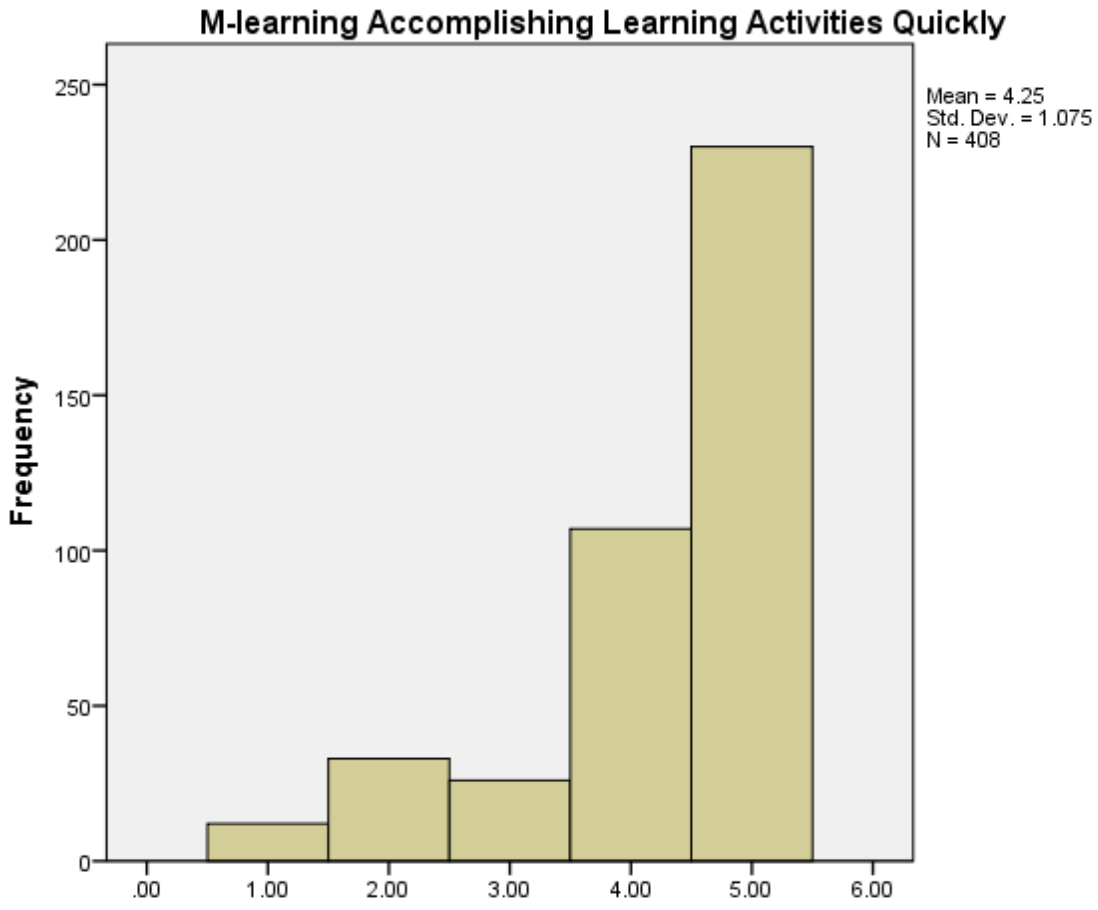


*Figure 4-13:* Graphical Analysis - 'M-learning Accomplish Learning Activities More Quickly'

Table 4-14 and figure 4-13 illustrate that 82.6% respondents believe that mobile learning helps them to complete their learning activities more rapidly, with μ= 4.25 and σ= 1.075. Few of the respondents i.e. 11% did not agree with statement. Therefore, majority of the students are of the opinion that m-learning will help them to accomplish their learning activities more rapidly and will help them to achieve better education.

#### 4.5.1.3 Respondents opinion about the use of m-learning in increasing their learning productivity

This question required the respondents to give their opinion regarding the usefulness of m-learning to help them increase their learning productivity.

Table 4-15: Table of Frequency regarding 'M-Learning Increases Learning Productivity'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 15 | 3.7 | 3.7 | 3.7 |
| | Disagree | 28 | 6.90 | 6.90 | 10.50 |
| | Neutral | 39 | 9.60 | 9.60 | 20.10 |
| | Agree | 91 | 22.30 | 22.30 | 42.40 |
| | Strongly Agree | 235 | 57.60 | 57.60 | 100.00 |
| | Total | 408 | 100.00 | 100.00 | |

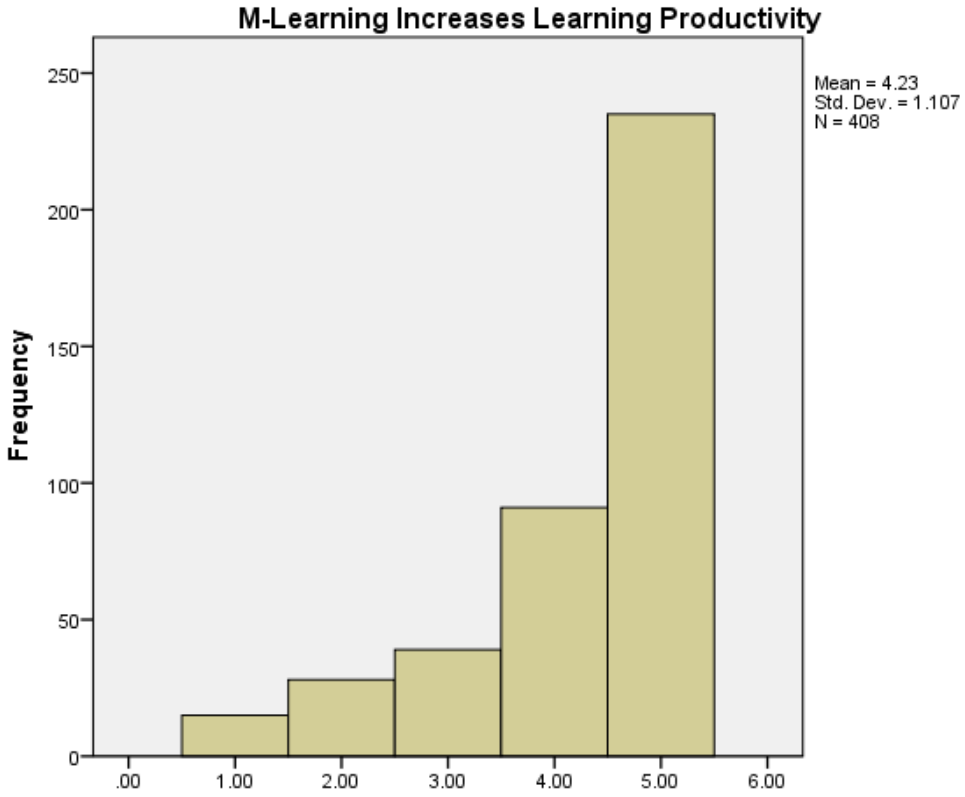


*Figure 4-14:* Graphical Analysis – 'M-Learning helps Increasing Learning Productivity'

According to figure 4-14 and table 4-15, about 79.9% users believe that using m-learning increases their learning productivity, with $\mu = 4.23$ and $\sigma = 1.107$. Few of the respondents i.e; 11.6% disagree with the statement. Thus most of the students think that m-learning will increase their learning productivity helping them in their education.

### 4.5.1.4 Respondents opinion regarding the use of m-learning to increase their chances of getting better education

The users were asked to give their opinion regarding getting better education through the use of m-learning.

Table 4-16: Frequency table regarding 'Increase Chance of Getting Better Education'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 17 | 4.2 | 4.2 | 4.2 |
| | Disagree | 24 | 5.9 | 5.9 | 10.0 |
| | Neutral | 35 | 8.6 | 8.6 | 18.6 |
| | Agree | 111 | 27.2 | 27.2 | 45.8 |
| | Strongly Agree | 221 | 54.2 | 54.2 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

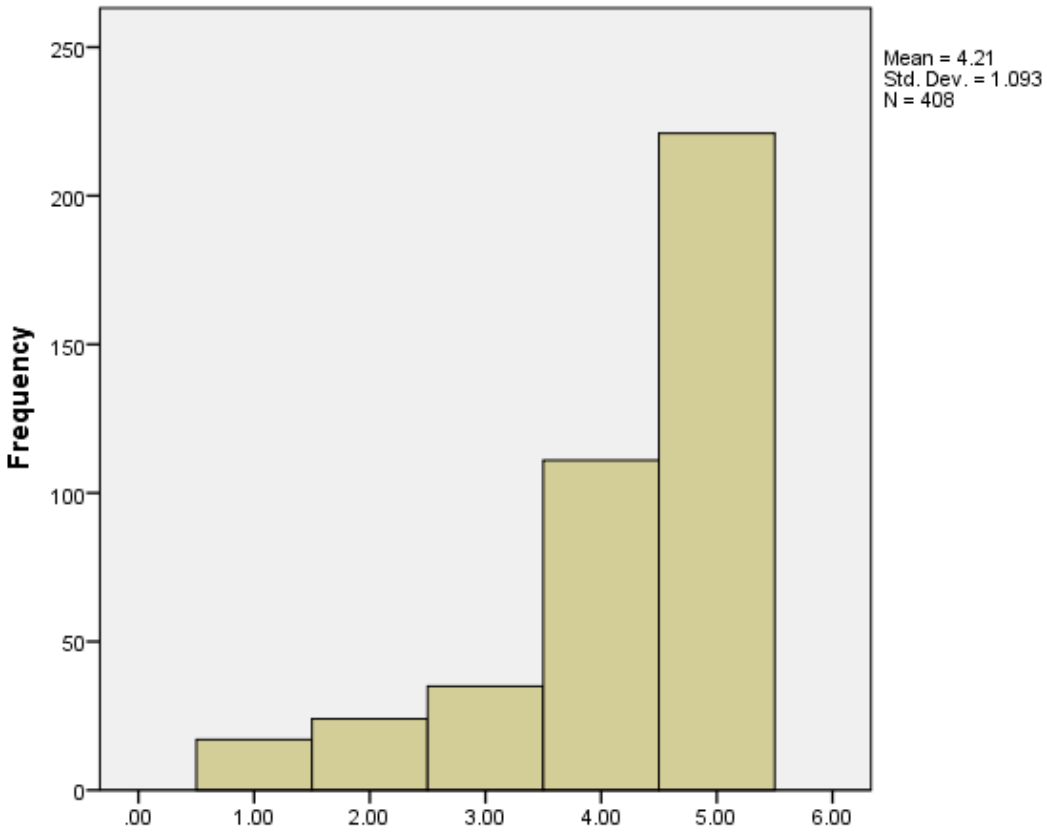


*Figure 4-15:* Graphical analysis - 'Increase Chance of Getting Better Education'

Table 4-16 and figure 4-15 show that 81.4% respondents believe that they will be able to achieve better education through the use of m-learning. The mean value of responses was

4.21 and standard deviation was 1.093. A few respondents i.e; 10.1% do not agree with the statement. Thus most of the respondents believe that m-learning will enable them to achieve better education.

#### 4.5.1.5 Statistical Analysis Summary – Performance Expectancy

Table 4-17: Statistical analysis summary - Performance Expectancy

| Descriptive Statistics of Performance Expectancy | | | | |
|---|---|---|---|---|
| | M-learning usefulness in education | M-learning Accomplish Learning Activities Quickly | M-learning increases learning productivity | Increase Chance of Getting Better Education |
| N | 408 | 408 | 408 | 408 |
| Mean | 4.2377 | 4.2500 | 4.2328 | 4.2132 |
| Std. Deviation | 1.16030 | 1.07518 | 1.10714 | 1.09325 |
| Variance | 1.346 | 1.156 | 1.226 | 1.195 |

Table 4-17 displays a statistical summary of performance expectancy, being the first dimension of our model. According to the summary, that mean value of all three questions is greater than 3, implying that students perceive that m-learning will increase their learning productivity, enabling them to achieve better education.

### 4.5.2 Effort Expectancy

Effort expectancy can be explained as the degree of ease associated with the use of the system. Liu et al. (2010) explains that performance expectancy and intention to use directly affect effort expectancy, which leads to greater overall performance. Incorporating effort expectancy in m-learning will improve learning activities and help in increasing the learning efficiency. Four items have been used to measure effort expectancy, which will help us to investigate how the students' believe that m-learning will aid them in improving their performance.

### 4.5.2.1 Respondents opinion regarding their understandability of interaction with m-learning

The respondents were asked to give their opinion regarding whether their interaction with m-learning would be clear and understandable.

Table 4-18: Table of Frequency regarding respondents 'Understanding of Mobile learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 17 | 4.2 | 4.2 | 4.2 |
| | Disagree | 28 | 6.9 | 6.9 | 11.0 |
| | Neutral | 60 | 14.7 | 14.7 | 25.7 |
| | Agree | 48 | 11.8 | 11.8 | 37.5 |
| | Strongly Agree | 255 | 62.5 | 62.5 | 100.0 |
| | Total | 408 | .100.00 | 100.00 | |

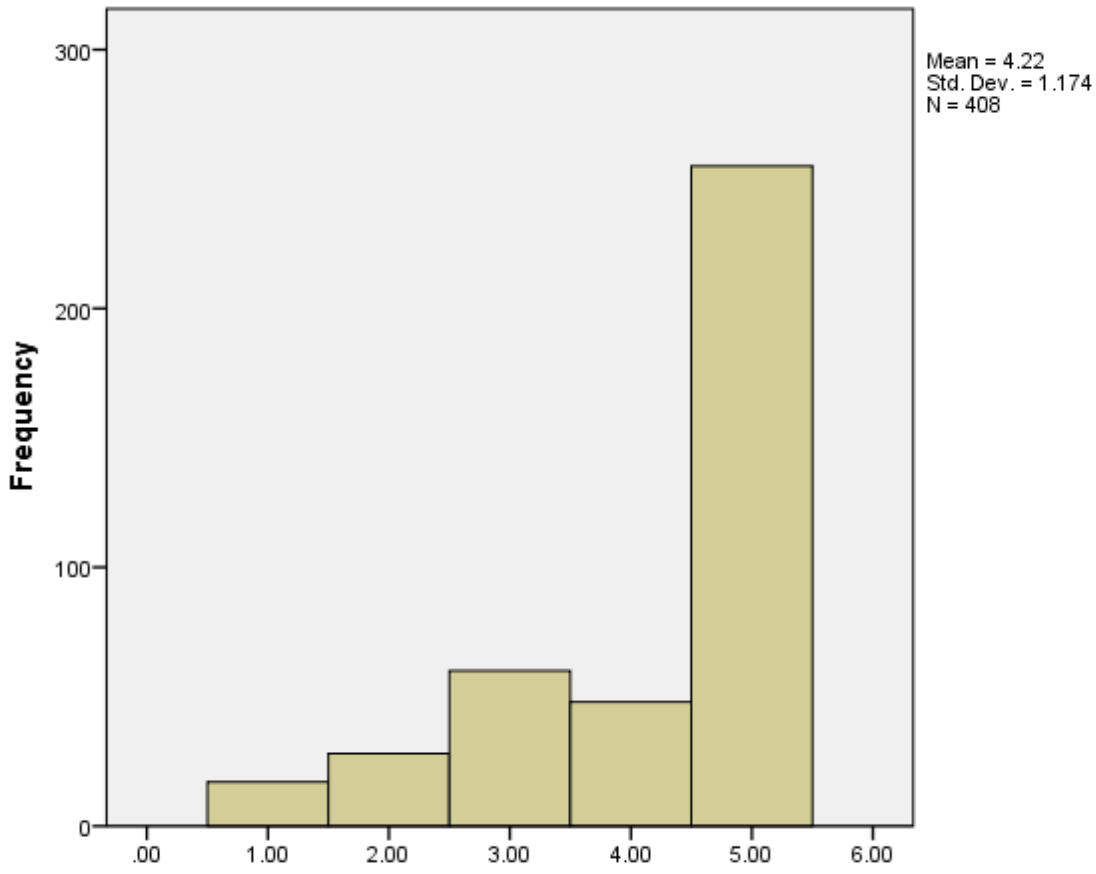


*Figure 4-16:* Graphical Illustration - 'Understanding of M-learning'

According to table: 4-18 and figure: 4-16 show that 74.3% respondents believe that their interaction with mobile learning would be understandable with μ= 4.22 and σ= 1.174. Few of the users i.e; 11.1% do not agree with the statement. Therefore majority of the respondents are of the opinion that m-learning will be easily understandable.

#### 4.5.2.2 Respondents opinion regarding the easiness to become skillful in using m-learning

This question involved asking the respondents to give their opinion about whether it will be easy for them to become skillful in using mobile learning for their educational purposes.

Table 4-19: Frequency table regarding 'Respondents' skillfulness in using m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 15 | 3.7 | 3.7 | 3.7 |
| | Disagree | 20 | 4.9 | 4.9 | 8.6 |
| | Neutral | 70 | 17.2 | 17.2 | 25.7 |
| | Agree | 89 | 21.8 | 21.8 | 47.5 |
| | Strongly Agree | 214 | 52.5 | 52.5 | 100.0 |
| | Total | 408 | 100.00 | 100.00 | |

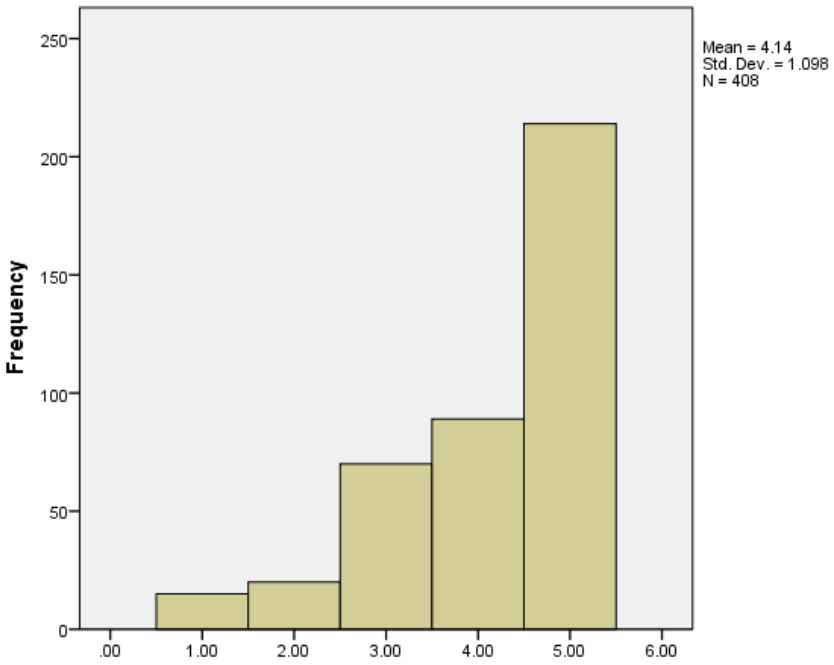


*Figure 4-17:* Graphical Analysis - 'Respondents' skillfulness in using m-learning'

According to table 4-19 and figure 4-17, 74.3% respondents believe that it will be easy for them to become efficient in using mobile learning, with μ= 4.14 and σ= 1.098. Some of the users i.e. 8.6% do not agree with the statement. Therefore majority of respondents think that they can become proficient in using m-learning easily.

### 4.5.2.3 Respondents opinion regarding ease of use of m-learning

This question required the respondents to give their opinion regarding the ease of use of m-learning.

Table 4-20: Frequency table regarding 'Ease of use of m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 16 | 3.9 | 3.9 | 3.9 |
| | Disagree | 27 | 6.6 | 6.6 | 10.5 |
| | Neutral | 46 | 11.3 | 11.3 | 21.8 |
| | Agree | 96 | 23.5 | 23.5 | 45.3 |
| | Strongly Agree | 223 | 54.7 | 54.7 | 100.0 |

| | | | | | |
|---|---|---|---|---|---|
| | Total | 408 | 100.0 | 100.0 | |

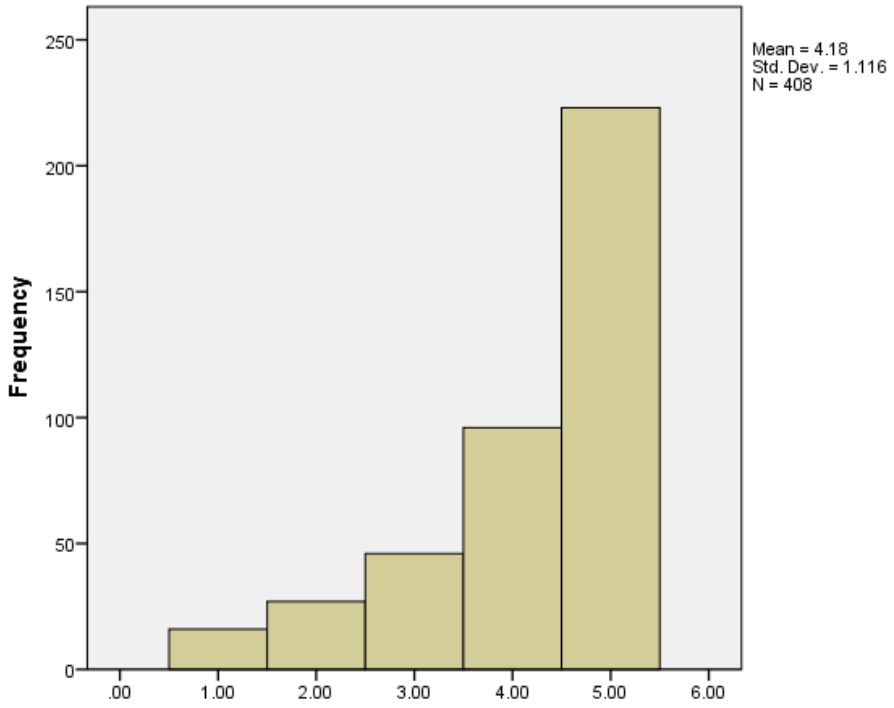


*Figure 4-18:* Graphical Analysis - 'Ease of use of m-learning'

Table 4-20 and figure 4-18 show that 78.2% respondents think that m-learning would be easy for them to use, with a mean value of 4.18 and standard deviation of 1.116. About 10.5% disagree with the statement, showing that most of the students perceive that mobile learning would be convenient and easily usable.

### 4.5.2.4 Respondents opinion regarding the easiness to learn to operate m-learning

This question required the users to give their opinion regarding the easiness through which they can learn to operate m-learning in their education.

Table 4-21: Frequency table regarding 'Easiness of learning to use m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 20 | 4.9 | 4.9 | 4.9 |
| | Disagree | 22 | 5.4 | 5.4 | 10.3 |
| | Neutral | 59 | 14.5 | 14.5 | 24.8 |
| | Agree | 105 | 25.7 | 25.7 | 50.5 |
| | Strongly | 202 | 49.5 | 49.5 | 100.0 |

| | | | | | |
|---|---|---|---|---|---|
| | Agree | | | | |
| | Total | 408 | 100.0 | 100.0 | |

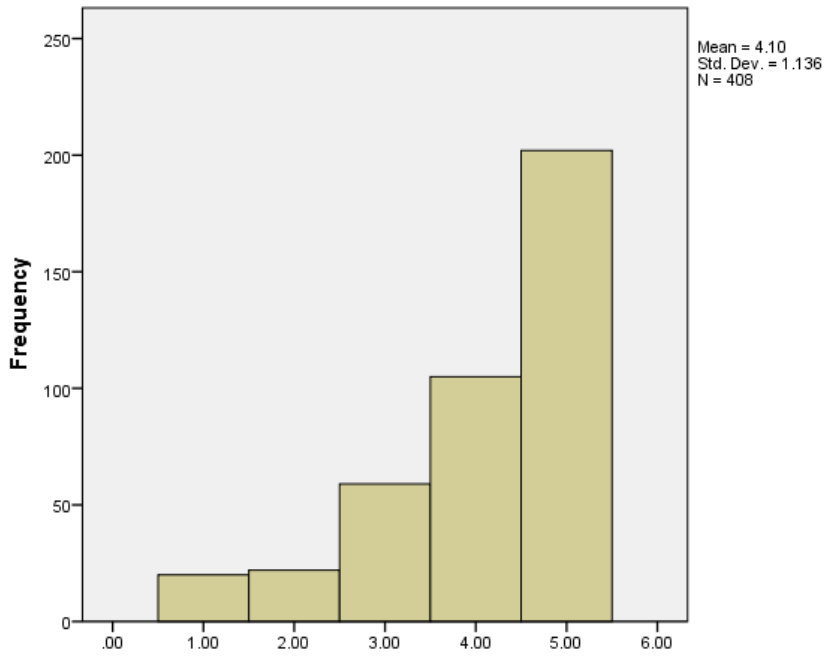


*Figure 4-19:* Graphical Analysis - 'Easiness of learning to use m-learning'

Table 4-21 and figure 4-19 show that 75.2% respondents believe that it would be easy for them to learn to operate m-learning, with μ= 4.10 and σ= 1.136. Few of the students i.e; 10.3% did not agree with statement. Thus majority of students are of the opinion that learning to operate m-learning would be easy for them.

### 4.5.2.5 Statistical Analysis Summary – Effort Expectancy

Table 4-22: Statistical analysis summary - Effort Expectancy

| | Understanding of M-learning | Respondents' skillfulness in using m-learning | Ease of use of m-learning | Easiness of learning to use m-learning |
|---|---|---|---|---|
| N | 408 | 408 | 408 | 408 |
| Mean | 4.2157 | 4.1446 | 4.1838 | 4.0956 |
| Std. Deviation | 1.17406 | 1.09776 | 1.11634 | 1.13604 |
| Variance | 1.378 | 1.205 | 1.246 | 1.291 |

Table 4-22 displays a statistical summary of effort expectancy, being the second dimension of our model. According to the summary, mean value of the three questions is more than 3.5, implying that the students perceive that m-learning will be easy to use and understand.

### 4.5.3 Social Influence

Social influence can be explained as the extent to which a person perceives important that others believe that he or she should use a new information system. Incorporating social influence in m-learning will improve learning activities and help in increasing the learning efficiency. Four items have been used to measure social influence, which will help us to investigate how the students' believe that m-learning will aid them in improving their performance.

#### 4.5.3.1 Respondents opinion regarding whether the people who influence their behavior will think that they should use m-learning

The question required the students to give their opinion regarding whether the people who influence the respondent's behavior think that they should use m-learning.

Table 4-23: Table of Frequency regarding 'Influence of .others on respondents' use of m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 24 | 5.9 | 5.9 | 5.9 |
| | Disagree | 25 | 6.1 | 6.1 | 12.0 |
| | Neutral | 28 | 6.9 | 6.9 | 18.9 |
| | Agree | 115 | 28.2 | 28.2 | 47.1 |
| | Strongly Agree | 216 | 52.9 | 52.9 | 100.0 |
| | Total | 408 | 100.00 | 100.00 | |

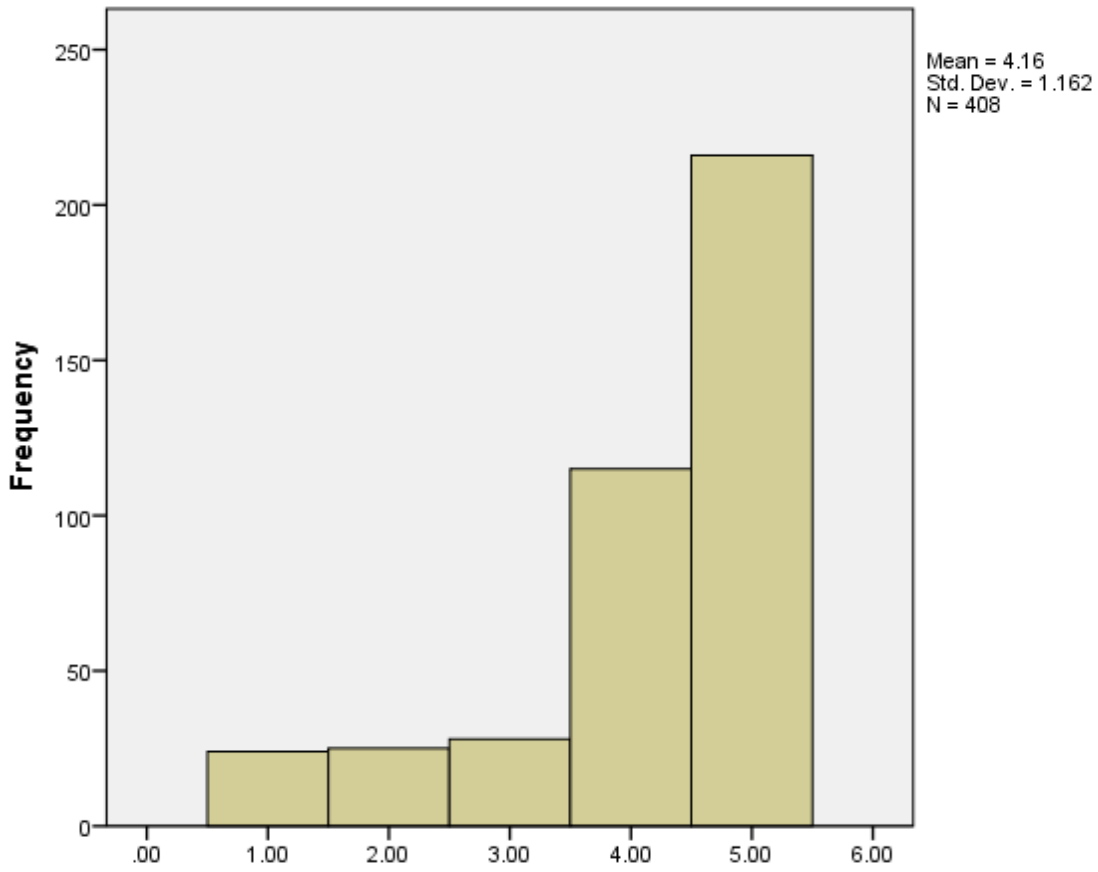


*Figure 4-20:* Graphical Analysis - Influence of people on respondents' use of m-learning

According to table 4-23 and figure 4-20, 81.1% respondents believe that people who influence their behavior think that they should use m-learning, with μ= 4.16 and σ= 1.162. Few of the students i.e; 12% did not agree with the statement.

### 4.5.3.2 Respondents opinion regarding whether the people who are important will think that m-learning should be used

This question required the respondents to give their opinion regarding whether the people who are important in their lives would think that the respondent should use m-learning or not.

Table 4-24: Frequency table regarding 'Important people advocate to use m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 23 | 5.6 | 5.6 | 5.6 |
| | Disagree | 27 | 6.6 | 6.6 | 12.3 |
| | Neutral | 41 | 10.0 | 10.0 | 22.3 |
| | Agree | 92 | 22.5 | 22.5 | 44.9 |

| | | | | | |
|---|---|---|---|---|---|
| | Strongly Agree | 225 | 55.1 | 55.1 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

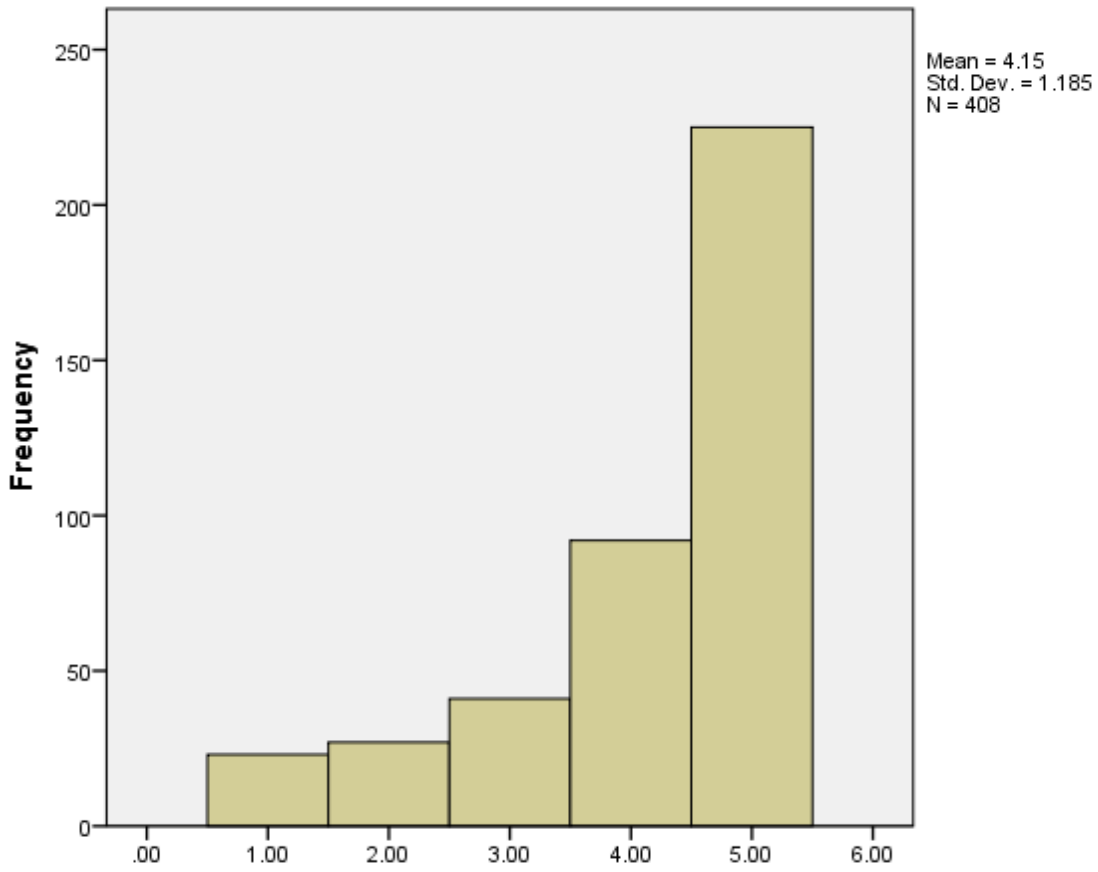


*Figure 4-21:* Graphical Analysis - Important people advocate to use m-learning

According to table 4-24 and figure 4-21, 77.6% respondents are of the opinion that people who play an important part in their lives think that the respondent should use m-learning, with μ= 4.15 and σ= 1.185. Few of the students i.e; 12.2% disagree with the statement. Therefore most of the respondents think that people who are important to them think that they should use m-learning.

### 4.5.3.3 Respondents opinion regarding whether the lecturers and other staff at their institution will be helpful in the use of m-learning

In this question, the respondents were asked to give their opinion regarding whether they think that the lecturers and other administrative staff in their institution will prove to be helpful in the use of mobile learning.

Table 4-25: Frequency table regarding 'Faculty staff helpful in using m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 23 | 5.6 | 5.6 | 5.6 |
| | Disagree | 27 | 6.6 | 6.6 | 12.3 |
| | Neutral | 23 | 5.6 | 5.6 | 17.9 |
| | Agree | 106 | 26.0 | 26.0 | 43.9 |
| | Strongly Agree | 229 | 56.1 | 56.1 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

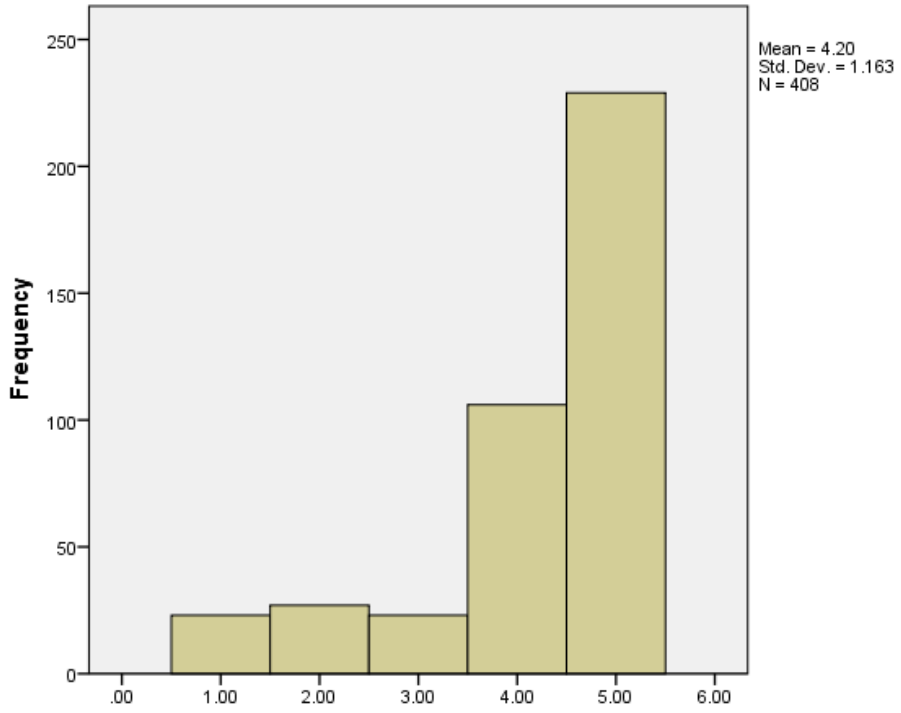


*Figure 4-22:* Graphical Analysis - 'Faculty staff helpful in using m-learning'

According to table 4-25 and figure 4-22, 82.1% respondents believe that the faculty and staff of their institution would be helpful in using m-learning, with a mean value of 4.20 and standard deviation of 1.163. Some of the respondents i.e; 12.2% disagree with the statement. Therefore most of the respondents think that they will get help from the staff for the use of m-learning.

### 4.5.3.4 Respondents opinion regarding whether their institution will support the use of m-learning

In this question, the respondents were asked to give their opinion regarding whether their institution will support the use of m-learning or not.

Table 4-26: Frequency table regarding 'M-learning support by institution'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 25 | 6.1 | 6.1 | 6.1 |
| | Disagree | 23 | 5.6 | 5.6 | 11.8 |
| | Neutral | 18 | 4.4 | 4.4 | 16.2 |
| | Agree | 81 | 19.9 | 19.9 | 36.0 |
| | Strongly Agree | 261 | 64.0 | 64.0 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

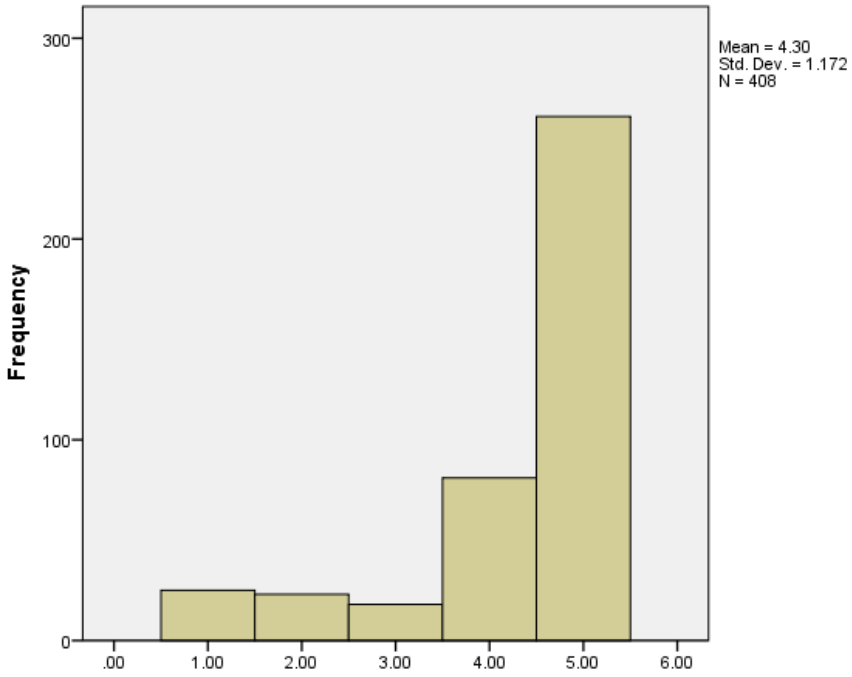


*Figure 4-23:* Graphical Analysis - 'M-learning support by institution'

According to table 4-26 and figure 4-23, 83.9% respondents believe that their institution would support the use of m-learning, with $\mu = 4.30$ and $\sigma = 1.172$. Few students i.e; 11.7% did not agree with the statement. Therefore majority of the respondents think that they their institution would help and support in the use of m-learning.

### 4.5.3.5 Statistical Analysis Summary – Social Influence

Table 4-27: Statistical analysis summary – Social Influence

| | Influence of people on respondents' use of m-learning | Important people advocate to use m-learning | Faculty staff helpful in using m-learning | M-learning support by institution |
|---|---|---|---|---|
| N | 408 | 408 | 408 | 408 |
| Mean | 4.1618 | 4.1495 | 4.2034 | 4.2990 |
| Std. Deviation | 1.16176 | 1.18537 | 1.16260 | 1.17249 |
| Variance | 1.350 | 1.405 | 1.352 | 1.375 |

Table 4-27 shows a statistical summary of the determinant social influence. According to the summary, that mean value of all the questions is more than 3.5, signifying that the students perceive that they will be supported by other people and their institutions in the use of m-learning.

### 4.5.4 Facilitating Conditions

Facilitating conditions can be explained as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system. Incorporating facilitating conditions in m-learning will improve learning activities and help in increasing the learning efficiency. Four items have been used to measure facilitating conditions, which will help us to investigate how the students' believe that m-learning will aid them in improving their performance.

#### 4.5.4.1 Respondents opinion regarding whether they have the resources necessary to use m-learning

This question required the respondents to give their opinion regarding whether they had available the resources required to use m-learning.

Table 4-28: Frequency table regarding 'Resources availability by respondents to use m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 21 | 5.1 | 5.1 | 5.1 |

| | | | | | |
|---|---|---|---|---|---|
| | Disagree | 31 | 7.6 | 7.6 | 12.7 |
| | Neutral | 65 | 15.9 | 15.9 | 28.7 |
| | Agree | 61 | 15.0 | 15.0 | 43.6 |
| | Strongly Agree | 230 | 56.4 | 56.4 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

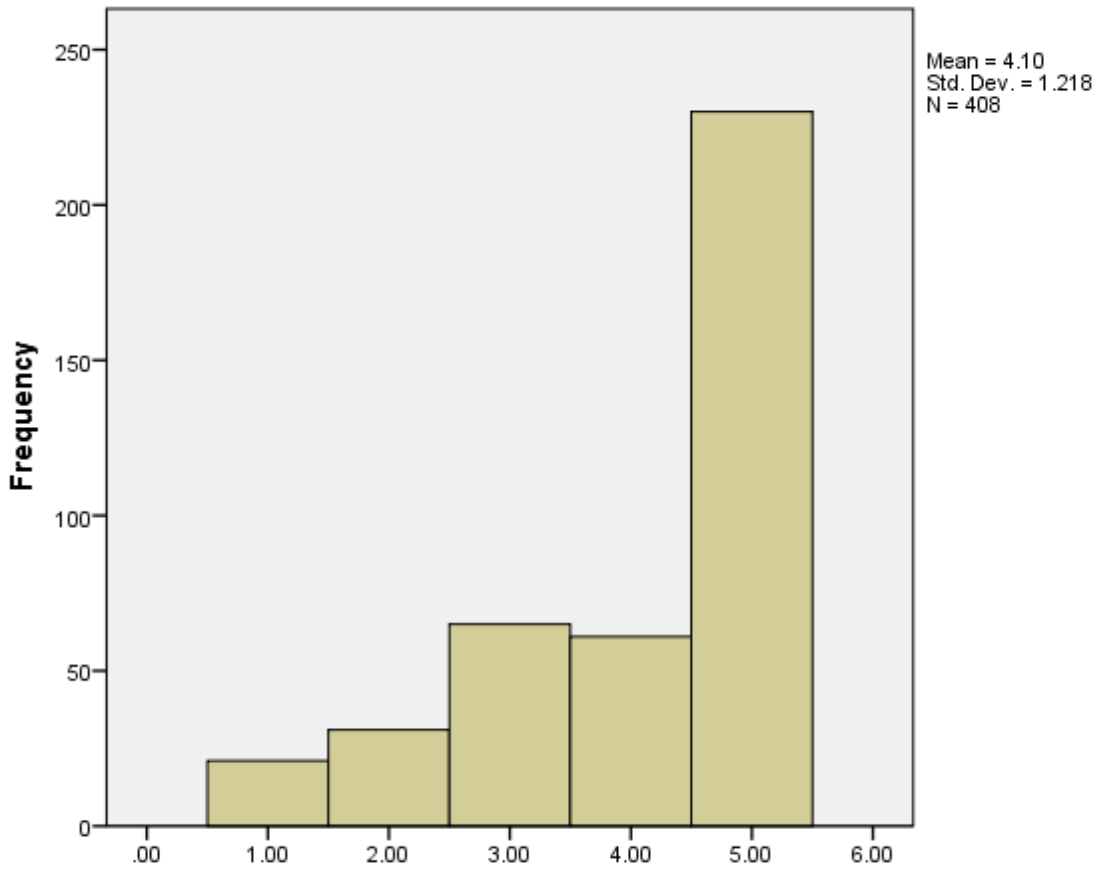


*Figure 4-24:* Graphical Analysis - Resources availability by respondents to use m-learning

According to table 4-28 and figure 4-24, 71.4% respondents had the resources available that would enable them to use m-learning, with μ= 4.10 and σ= 1.218. Few of the student i.e; 12.7% do not agree with the statement, showing that they did not have the required resources. Thus most of the students had the resources available to help them use m-learning.

### 4.5.4.2 Respondents opinion regarding whether they have the knowledge necessary to use m-learning

This question required the respondents to give their opinion regarding whether they had the required knowledge that is necessary to use mobile learning.

Table 4-29: Frequency table regarding 'Knowledge available to use m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 14 | 3.4 | 3.4 | 3.4 |
| | Disagree | 30 | 7.4 | 7.4 | 10.8 |
| | Neutral | 72 | 17.6 | 17.6 | 28.4 |
| | Agree | 126 | 30.9 | 30.9 | 59.3 |
| | Strongly Agree | 166 | 40.7 | 40.7 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

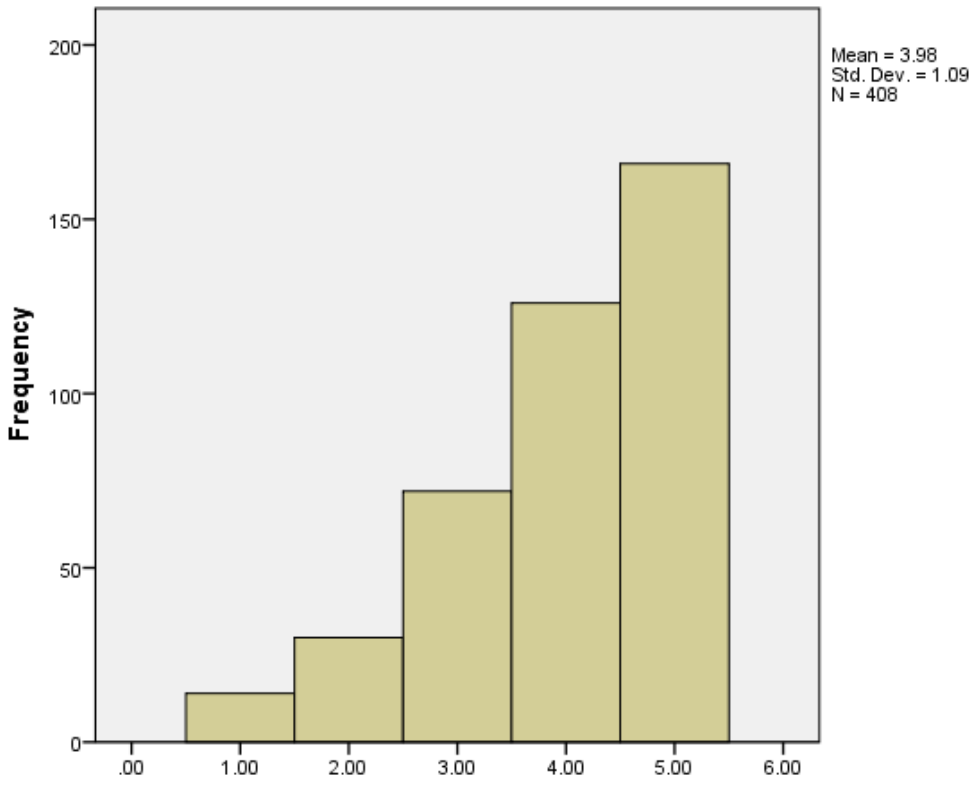


*Figure 4-25:* Graphical analysis - Knowledge available to use m-learning

According to table 4-29 and figure 4-25, 71.6% respondents believe that they have the knowledge required to use m-learning, with $\mu = 3.98$ and $\sigma = 1.09$. However, 10.8% of students do not agree with this statement showing that majority of the respondents think that they can easily become proficient in using m-learning as they already have the required knowledge.

### 4.5.4.3 Respondents opinion regarding whether the m-learning applications are going to be similar to the other systems used in mobile devices

This question required the respondents to give their opinion regarding whether the m-learning applications were similar to the other systems the respondents were using in their mobile devices.

Table 4-30: Frequency table regarding 'M-learning applications are analogous with other system'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 16 | .3.9 | 3.9 | 3.9 |
| | Disagree | 34 | 8.3 | 8.3 | 12.3 |
| | Neutral | 84 | 20.6 | 20.6 | 32.8 |
| | Agree | 63 | 15.4 | 15.4 | 48.3 |
| | Strongly Agree | 211 | 51.7 | 51.7 | .100.0 |
| | Total | 408 | 100.0 | 100.0 | |

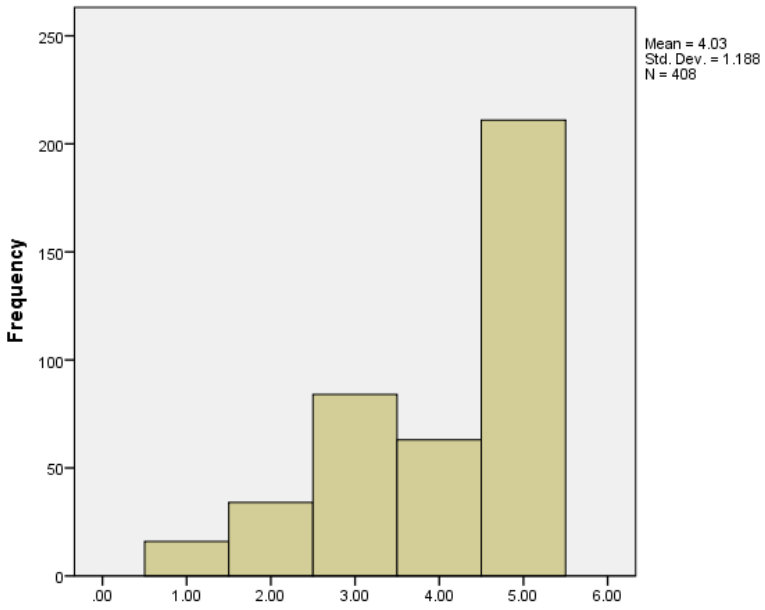


*Figure 4-26:* Graphical Analysis - M-learning applications are analogous with other system

According to table 4-30 and figure 4-26, 67.1% respondents believe that the m-learning applications would be similar to the other applications used in mobile devices so it will be stress-free for them to become efficient in using m-learning, with $\mu = 4.03$ and $\sigma = 1.188$. Few of the users i.e. 12.2% do not agree with the statement. Therefore maximum number of

respondents believe that m-learning applications would be similar to the other applications, making them easy to use and comprehend.

#### 4.5.4.4 Respondents opinion regarding whether the can get help from others when they have difficulties using m-learning

In this question, the respondents were asked to give their opinion regarding whether they think that they would be able to get help from others when they face difficulties in using m-learning or not.

Table 4-31: Frequency table regarding 'Learning from others'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 21 | 5.1 | 5.1 | 5.1 |
| | Disagree | 26 | 6.4 | 6.4 | 11.5 |
| | Neutral | 99 | 24.3 | 24.3 | 35.8 |
| | Agree | 74 | 18.1 | 18.1 | 53.9 |
| | Strongly Agree | 188 | 46.1 | 46.1 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

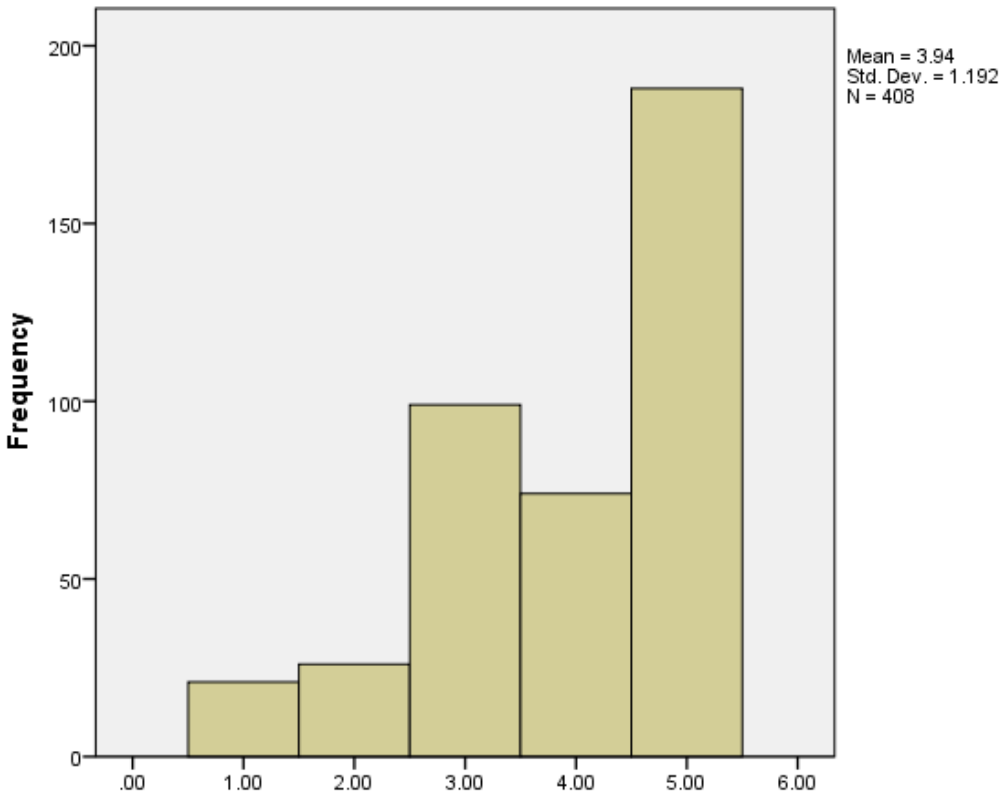

*Figure 4-27:* Graphical Analysis - Learning from others

According to table 4-31 and figure 4-27, 64.2% respondents believe that they would be able to get help from others if they face any difficulties while using m-learning, with μ= 3.94 and σ= 1.192. Few of the students i.e; 11.5% do not agree with the statement. Therefore majority of the respondents believe that they can get help from others if they face difficulties in using m-learning.

#### 4.5.4.5 Statistical Analysis Summary – Facilitating Conditions

Table 4-32: Statistical analysis summary – Facilitating Conditions

| | Resources available by respondents to use m-learning | Knowledge available to use m-learning | M-learning applications are analogous with other system | Learning from others |
|---|---|---|---|---|
| N | 408 | 408 | 408 | 408 |
| Mean | 4.0980 | 3.9804 | 4.0270 | 3.9363 |
| Std. Deviation | 1.21829 | 1.09032 | 1.18830 | 1.19205 |
| Variance | 1.484 | 1.189 | 1.412 | 1.421 |

Table 4-32 portrays a statistical summary of facilitating conditions, being the fourth dimension of our model. As shown in the summary, that mean value of all three questions is greater than 3.5, implying that students perceive that they will be helped and facilitated while using m-learning.

### 4.5.5 Perceived Playfulness

Perceived playfulness is defined either as a state of mind or an individual trait. It can be explained as the degree to which a person believes that his interest is fixated on mobile learning, is inquisitive during the interaction, and discovers the interaction to be enjoyable. Incorporating perceived playfulness in m-learning will improve learning activities and help in increasing the learning efficiency. Five items have been used to measure perceived playfulness, which will help us to investigate how the students' believe that m-learning will aid them in improving their performance.

### 4.5.5.1 Respondents opinion regarding whether they will realize the time elapsed when using m-learning

This question requires the respondents to give their opinion regarding whether they think that they will realize the time elapsed using m-learning or otherwise.

Table 4-33: Frequency table regarding 'Respondents not realizing time elapsed'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 17 | 4.2 | 4.2 | 4.2 |
| | Disagree | 26 | 6.4 | 6.4 | 10.5 |
| | Neutral | 57 | 14.0 | 14.0 | 24.5 |
| | Agree | 103 | 25.2 | 25.2 | 49.8 |
| | Strongly Agree | 205 | 50.2 | 50.2 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

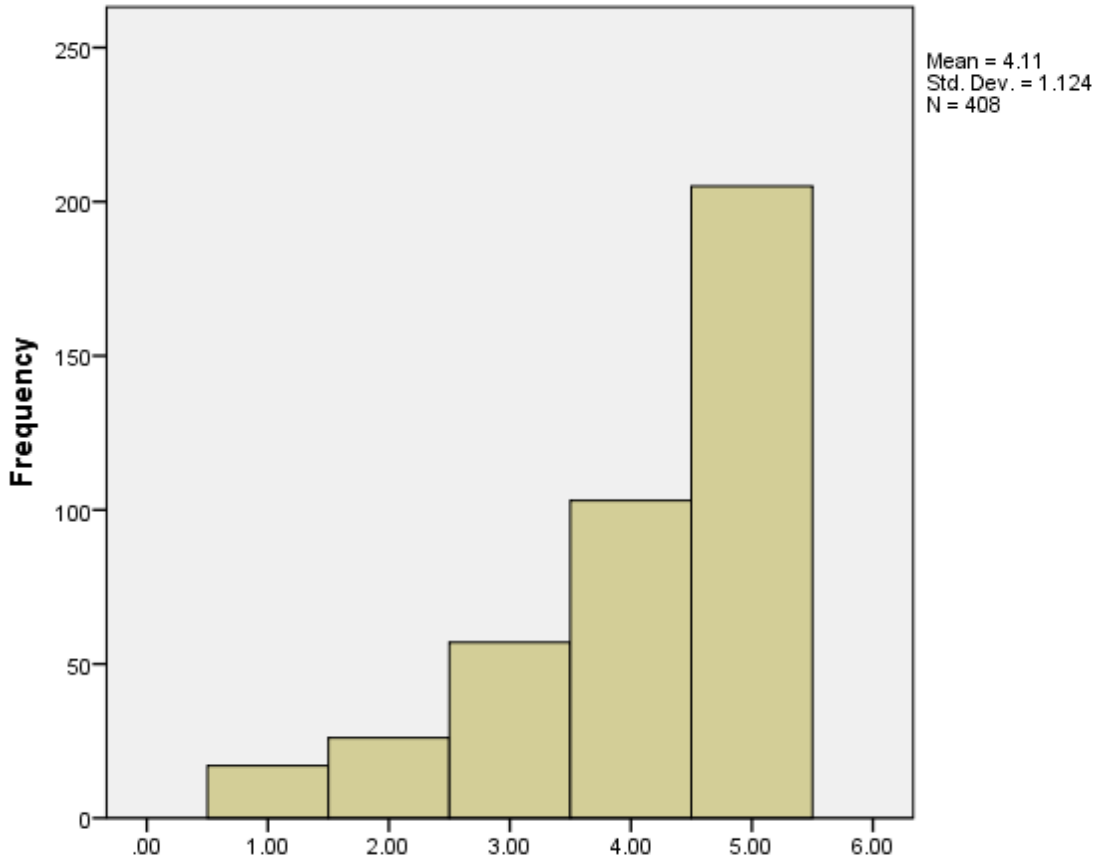


*Figure 4-28:* Graphical analysis - Respondents not realizing time elapsed

According to table 4-33 and figure 4-28, 75.4% respondents believe that they will not realize the time elapsed while using m-learning, with a with $\mu = 4.11$ and $\sigma = 1.124$. Few of the

students i.e. 10.6% do not agree with the statement. Therefore majority of the respondents believe that they do not realize that how much time has passed while using m-learning.

#### 4.5.5.2 Respondents opinion regarding whether they will forget the work to be done when using m-learning

This question requires the respondents to give their opinion regarding whether they will forget the work that has to be done while they use m-learning.

Table 4-34: Frequency table regarding 'Respondents forgetfulness of the work using m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | StronglyDisagree | 14 | 3.4 | 3.4 | 3.4 |
| | Disagree | 32 | 7.8 | 7.8 | 11.3 |
| | Neutral | 39 | 9.6 | 9.6 | 20.8 |
| | Agree | 82 | 20.1 | 20.1 | 40.9 |
| | StronglyAgree | 241 | 59.1 | 59.1 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

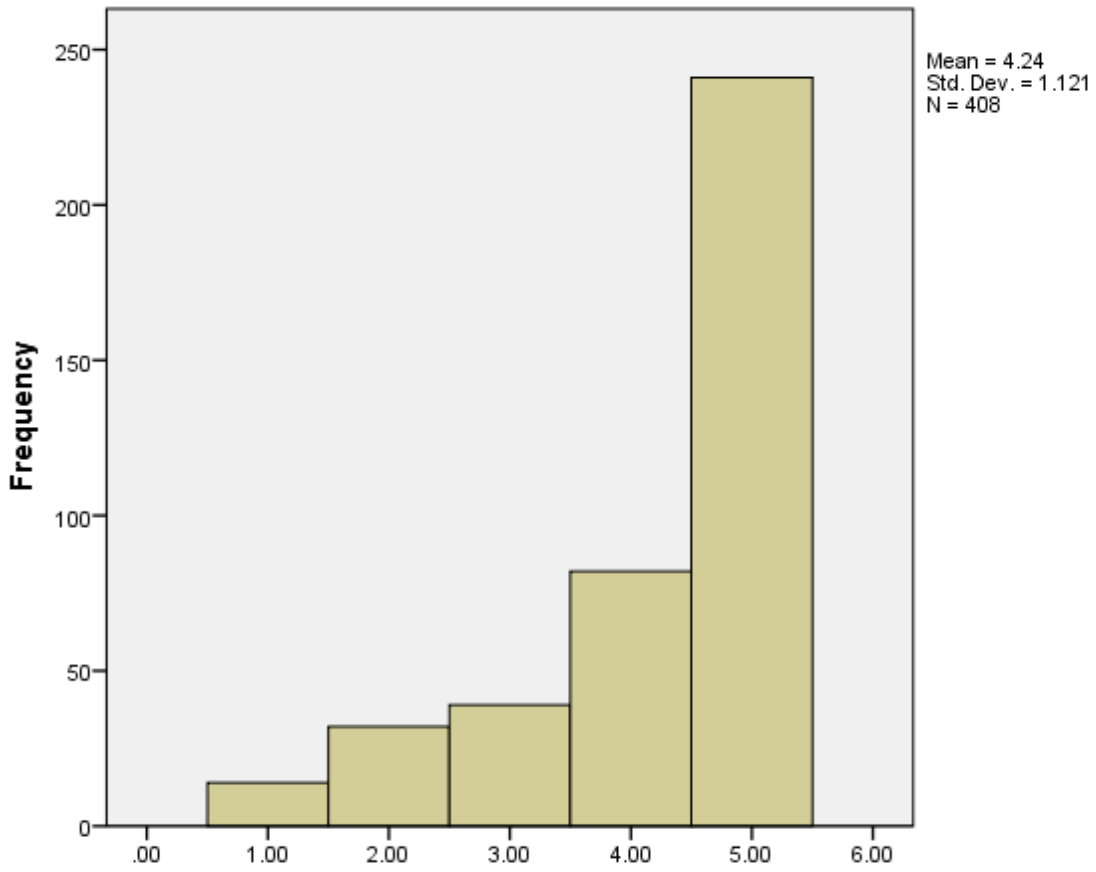


*Figure 4-29:* Graphical Analysis - Respondents forgetfulness of the work using m-learning

As shown in table 4-34 and figure 4-29, 79.2% respondents believe that they will become forgetful of the work that must be done while using m-learning, with a with μ= 4.24 and σ= 1.121. Few number of students i.e. 11.2% do not agree with the statement, implying that majority of the students think that they will become forgetful of other things that must be done while using m-learning.

### 4.5.5.3 Respondents opinion regarding whether using m-learning will give them enjoyment while learning

This question requires the scholars to give their opinion regarding whether they will enjoy learning through m-learning or not.

Table 4-35: Frequency table regarding 'Respondents enjoyment through m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly | 22 | 5.4 | 5.4 | 5.4 |

| | | | | | |
|---|---|---|---|---|---|
| | Disagree | | | | |
| | Disagree | 28 | 6.9 | 6.9 | 12.3 |
| | Neutral | 40 | 9.8 | 9.8 | 22.1 |
| | Agree | 105 | 25.7 | 25.7 | 47.8 |
| | Strongly Agree | 213 | 52.2 | 52.2 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

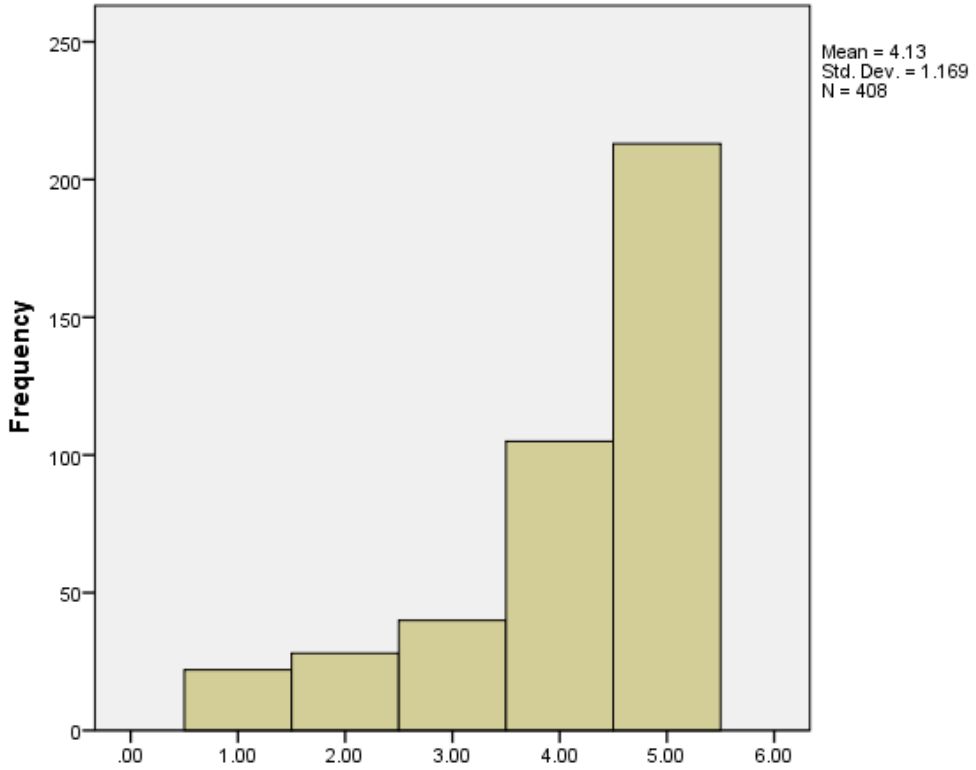


*Figure 4-30:* Graphical Analysis - Respondents enjoyment through m-learning

As shown in table 4-35 and figure 4-30, 77.9% respondents believe that they will enjoy learning through m-learning, with a with $\mu = 4.13$ and $\sigma = 1.169$. Few number of students i.e. 12.3% do not agree with the statement implying that majority of the students think that they will enjoy the learning process through m-learning.

### 4.5.5.4 Respondents opinion regarding whether using m-learning will stimulate their curiosity

This question the students were required to give their opinion regarding whether using m-learning will stimulate their curiosity or not.

Table 4-36: Frequency table regarding 'Respondents increase in curiosity due to m-learning'

| | Frequency | Percent | Valid Percent | Cumulative |
|---|---|---|---|---|

| | | | | | Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 14 | 3.4 | 3.4 | 3.4 |
| | Disagree | 31 | 7.6 | 7.6 | 11.0 |
| | Neutral | 45 | 11.0 | 11.0 | 22.1 |
| | Agree | 92 | 22.5 | 22.5 | 44.6 |
| | Strongly Agree | 226 | 55.4 | 55.4 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

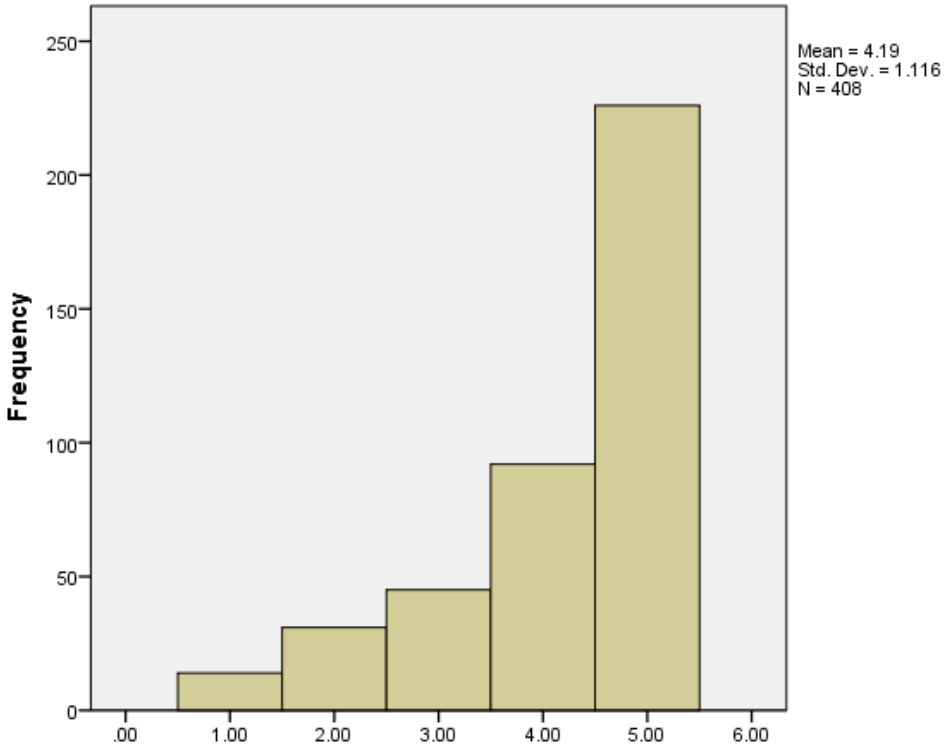


*Figure 4-31:* Graphical Analysis - Respondents increase in curiosity due to m-learning

According to table 4-36 and figure 4-31, 77.9% respondents believe that using m-learning would increase their curiosity, with a with μ= 4.19 and σ= 1.116. Few of the students i.e. 11% do not agree with the statement implying that majority of the students think that they will become curious and increase their learning capabilities while using m-learning.

### 4.5.5.5 Respondents opinion regarding whether using m-learning will lead to their exploration

This question requires the respondents to give their opinion regarding whether using m-learning would increase their exploration or not.

Table 4-37: Frequency table regarding 'Respondents exploration through m-learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 20 | 4.9 | 4.9 | 4.9 |
| | Disagree | 27 | 6.6 | 6.6 | 11.5 |
| | Neutral | 43 | 10.5 | 10.5 | 22.1 |
| | Agree | 85 | 20.8 | 20.8 | 42.9 |
| | Strongly Agree | 233 | 57.1 | 57.1 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

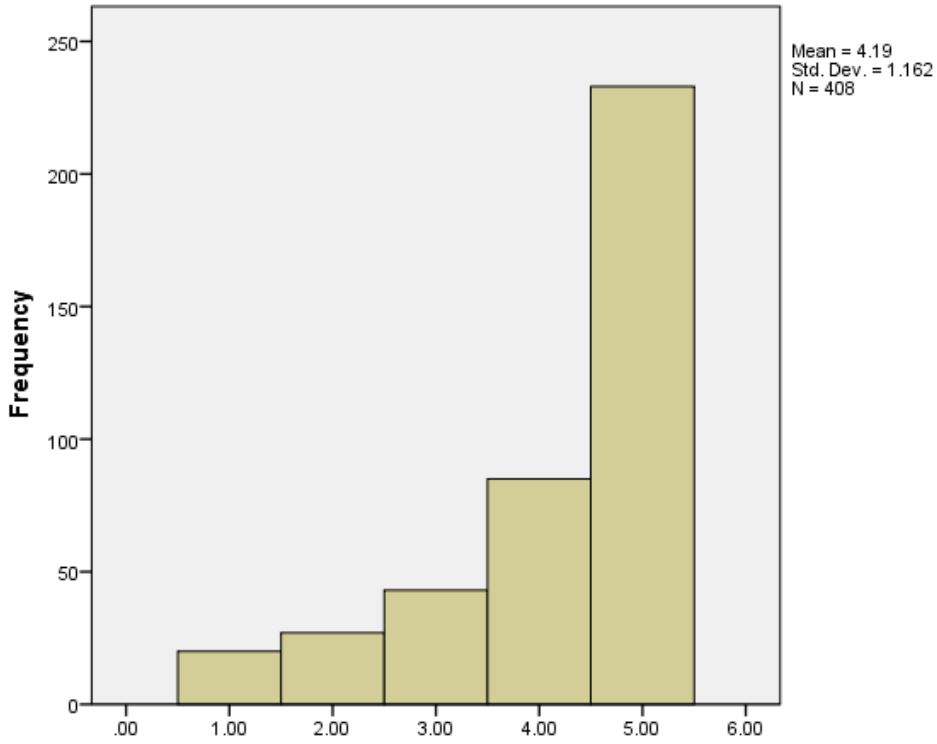


*Figure 4-32:* Graphical analysis - Respondents exploration through m-learning

As illustrated in table 4-37 and figure 4-32, 77.9% respondents believe that m-learning would cause their exploration to increase, with a with $\mu = 4.19$ and $\sigma = 1.162$. Few of the students i.e. 11.5% do not agree with the statement implying that majority of the students think that they can increase their exploration through m-learning.

### 4.5.5.6 Statistical Analysis Summary – Perceived Playfulness

Table 4-38: Statistical analysis summary – Facilitating Conditions

| | Respondents non realization of time | Respondents forgetfulness of the work using m- | Respondents enjoyment through m-learning | Respondents increase in curiosity due to m- | Respondents exploration through m-learning |
|---|---|---|---|---|---|

| | elapsed | learning | | learning | |
|---|---|---|---|---|---|
| N | 408 | 408 | 408 | 408 | 408 |
| Mean | 4.1103 | 4.2353 | 4.1250 | 4.1887 | 4.1863 |
| Std. Deviation | 1.12383 | 1.12095 | 1.16946 | 1.11552 | 1.16231 |
| Variance | 1.263 | 1.257 | 1.368 | 1.244 | 1.351 |

Table 4-38 portrays a statistical summary of perceived playfulness, being the fifth dimension of our model. According to the summary, that mean value of all three questions is greater than 3.5, signifying that students perceive that learning through m-learning will be entertaining, resulting in increased curiosity and learning power of the student.

### 4.5.6 Self-Management of Learning

It refers to how much a person perceives that he can maintain self-discipline and can engage in self-directed learning. It can be explained as the degree to which a person believes that his interest is focused on m-learning, is curious during the interaction, and finds the interaction enjoyable. According to Wang et al. (2009), self-management of learning is a strong determinant of behavioral intention to adopt m-learning, and is seen to be stronger in women than men. Incorporating perceived playfulness in m-learning will improve learning activities and help in increasing the learning efficiency. Five items have been used to measure perceived playfulness, which will help us to investigate how the students' believe that m-learning will aid them in improving their performance.

#### 4.5.6.1 Respondents opinion regarding whether they are self-directed when it comes to learning and studying

This question required the respondents to give their views regarding whether they think that they are self-directed when they have to learn or study, meaning that whether they can adjust their own timetable and pace for learning and studying.

Table 4-39: Frequency table regarding 'Respondents self-direction of learning'

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 25 | 6.1 | 6.1 | 6.1 |
| | Disagree | 23 | 5.6 | 5.6 | 11.8 |
| | Neutral | 47 | 11.5 | 11.5 | 23.3 |
| | Agree | 131 | 32.1 | 32.1 | 55.4 |
| | Strongly Agree | 182 | 44.60 | 44.60 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

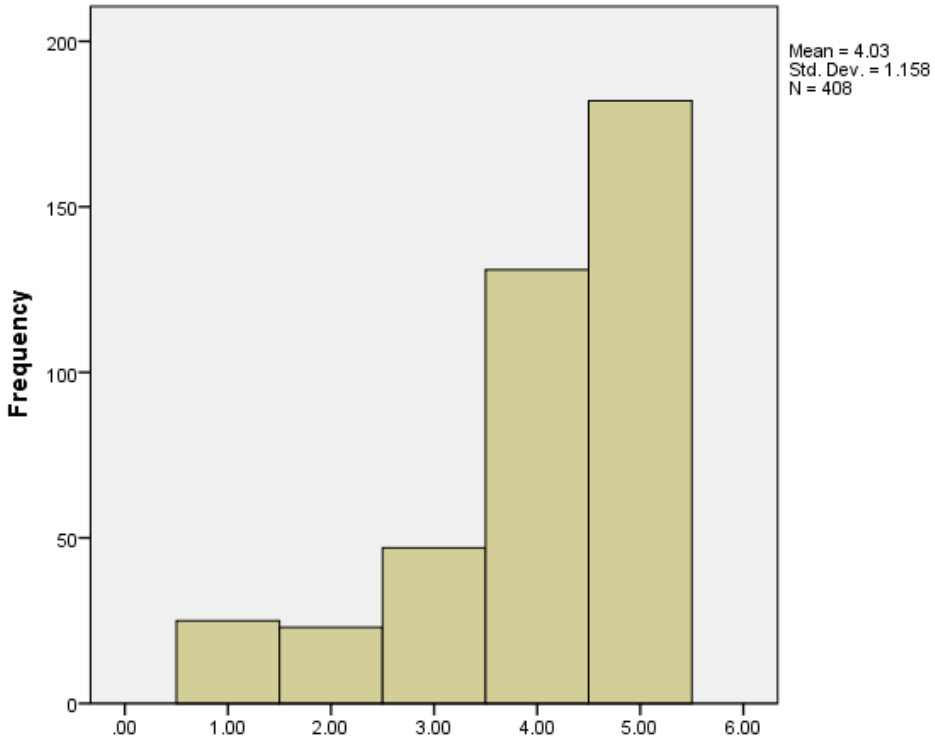


*Figure 4-33:* Graphical Analysis - Respondents self-direction of learning

According to table 4-39 and figure 4-33, 76.7% respondents believe that it would be easy for them to set their own pace of learning and become self-directed, with with $\mu = 4.03$ and $\sigma = 1.158$. Few students i.e. 11.7% do not agree with the statement implying that most of the respondents think that they can become self-directed in learning.

### 4.5.6.2 Respondents opinion regarding whether they are self-disciplined in studies and find it easy to set aside reading and homework time

This question required the students to contribute their belief regarding whether they find themselves self-disciplined in setting their own time and pace for studies.

Table 4-40: Frequency table regarding 'Respondents being self-discipline towards learning'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 20 | 4.9 | 4.9 | 4.9 |
| | Disagree | 24 | 5.9 | 5.9 | 10.8 |
| | Neutral | 58 | 14.2 | 14.2 | 25.0 |
| | Agree | 121 | 29.7 | 29.7 | 54.7 |
| | Strongly Agree | 185 | 45.3 | 45.3 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

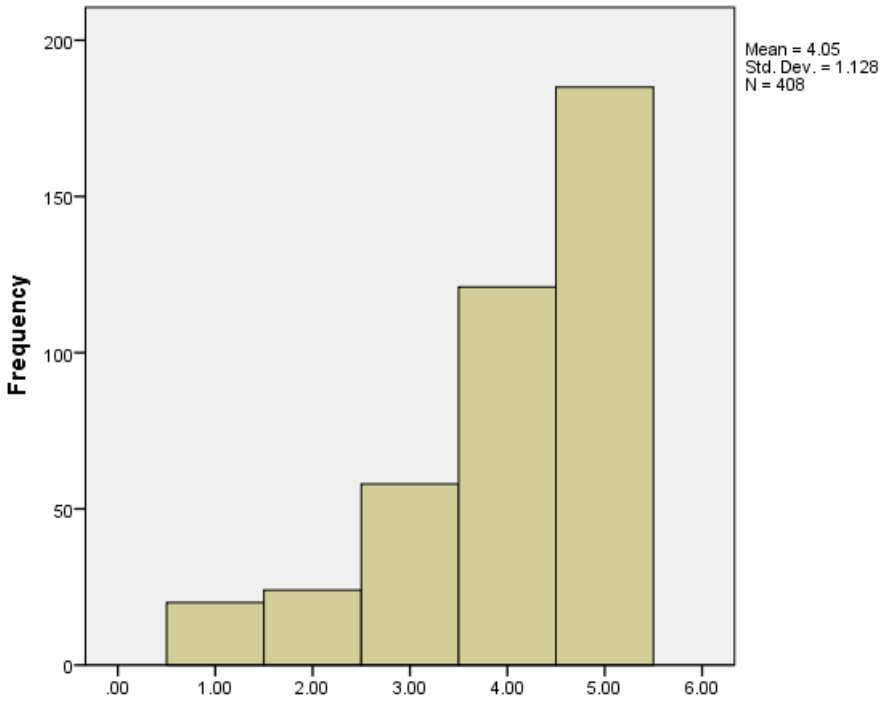


*Figure 4-34:* Graphical Analysis - Respondents being self-discipline towards learning

According to table 4-40 and figure 4-34, 75% respondents believe that it would be easy for them to become self-disciplined and set their own time and pace for reading and studying, with μ= 4.05 and σ= 1.128. Few number of students that is 10.8% do not agree with the declaration implying that majority of the students think that they can set their own time for study and become self-disciplined easily.

### 4.5.6.3 Respondents opinion regarding the whether they are able to manage their study time effectively and easily complete assignments on time

This question required the respondents to contribute their ides regarding whether they can easily manage their education time and complete assignments on time or otherwise.

Table 4-41: Frequency table regarding 'Respondents ability to complete assignment on time'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 20 | 4.9 | 4.9 | 4.9 |
| | Disagree | 32 | 7.8 | 7.8 | 12.7 |
| | Neutral | 48 | 11.8 | 11.8 | 24.5 |
| | Agree | 119 | 29.2 | 29.2 | 53.7 |
| | Strongly Agree | 189 | 46.30 | 46.30 | 100.00 |
| | Total | 408 | 100.00 | 100.00 | |

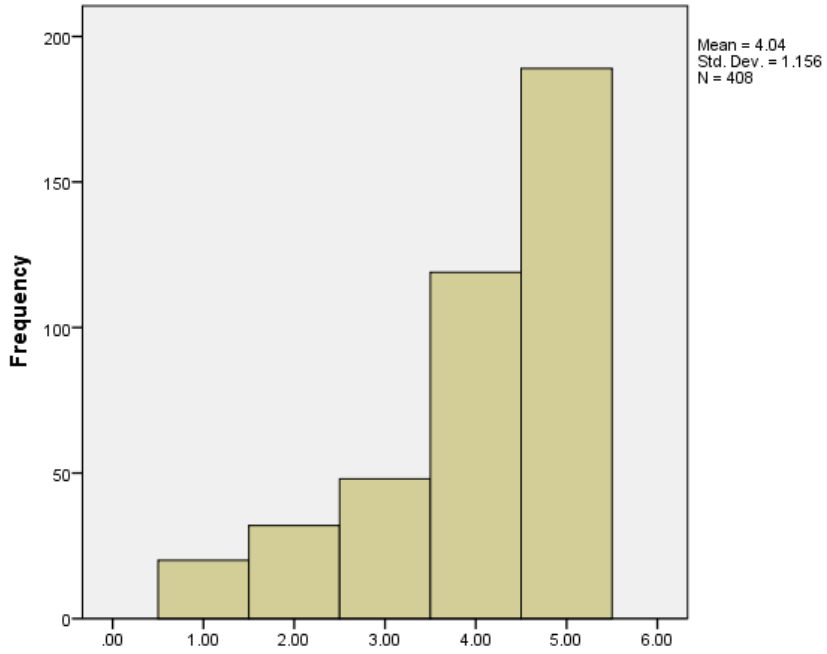


*Figure 4-35:* Graphical analysis - Respondents being self-discipline towards learning

According to table 4-41 and figure 4-35, 75.5% respondents believe that it would be easy for them to manage their time effectively and complete their assignments timely, with μ= 4.04 and σ= 1.156. Few amongst the students i.e. 12.7% disagree with the statement. Therefore most of the respondents think that they can manage their time effectively and complete their work on time.

### 4.5.6.4 Respondents opinion regarding whether they set goals and have a high degree of initiative in their studies

This question required the respondents to contribute their opinion regarding whether they have the ability to set goals and have initiative in their studies or not.

Table 4-42: Frequency table regarding 'Respondents goals and initiative in studies'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 19 | 4.70 | 4.70 | 4.70 |
| | Disagree | 24 | 5.90 | 5.90 | 10.50 |
| | Neutral | 54 | 13.2 | 13.2 | 23.8 |
| | Agree | 114 | 27.9 | 27.9 | 51.7 |
| | Strongly Agree | 197 | 48.3 | 48.3 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

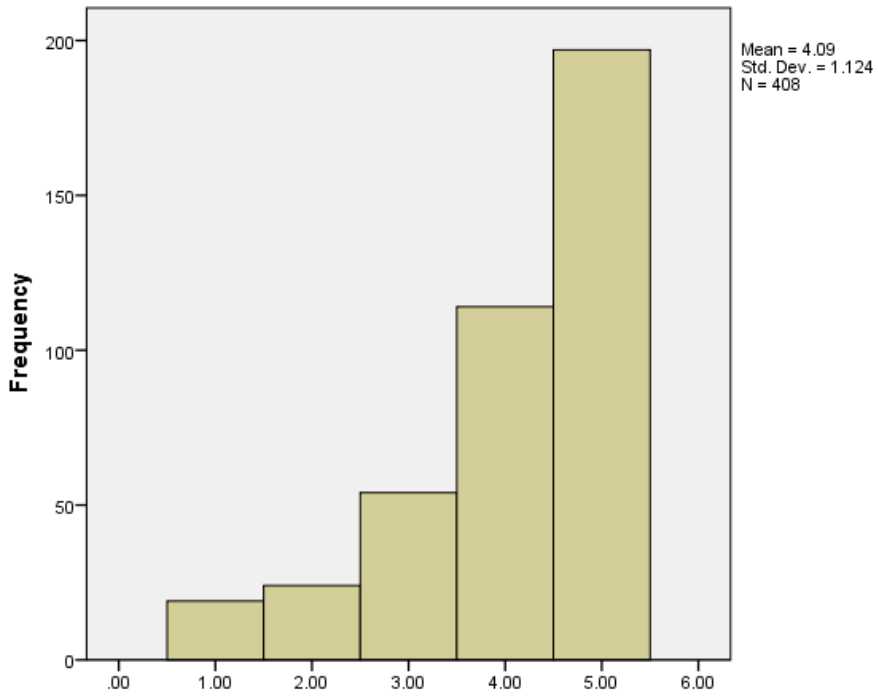


*Figure 4-36:* Graphical analysis - Respondents goals and initiative in studies'

According to table 4-42 and figure 4-36, 76.2% respondents believe that it would be easy for them to set goals and initiative in their studies, with $\mu = 4.09$ and $\sigma = 1.124$. Students in fewer number i.e. 10.6% do not agree with the declaration, showing that majority are of the opinion that they can easily set goals and gain high initiative in their studies.

#### 4.5.6.5 Statistical Analysis Summary – Self-Management of Learning

Table 4-43: Statistical analysis summary – Self-Management of Learning

| | Respondents self-direction of learning | Respondents being self-discipline towards learning | Respondents ability to complete assignment on time | Respondents goals and initiative in studies |
|---|---|---|---|---|
| N | 408 | 408 | 408 | 408 |
| Mean | 4.0343 | 4.0466 | 4.0417 | 4.0931 |
| Std. Deviation | 1.15773 | 1.12828 | 1.15643 | 1.12429 |
| Variance | 1.340 | 1.273 | 1.337 | 1.264 |

Table 4-43 displays a statistical summary of Self-Management of Learning, being the sixth dimension of the model. According to the summary, that value of mean for all the questions is more than 3.5, implying students to believe and provide them confidence for self-direction and self-disciplined in their studies, being able to manage their own time and space in doing their work and studies.

### 4.5.7 Attitude towards Use of Technology

Attitude towards technology involves the overall aptitude of an individual towards the use of technology. This is made up of four main components namely attitude towards behavior, intrinsic motivation, affect towards use and affect. According to Venkatesh et al. (2003), because of the strong relationship seen between performance expectancy and intention and effort expectancy and intention, we can deduce that attitude towards technology will not have a significant effect on behavioral intention.

#### 4.5.7.1 Respondents opinion regarding whether using m-learning is good idea

The students were required to provide their opinion regarding whether using m-learning is a good idea or not.

Table 4-44: Frequency table regarding 'Respondents opinion – M-learning usage is a good idea'

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Valid | StronglyDisagree | 16 | 3.9 | 3.9 | 3.9 |
| | Disagree | 30 | 7.4 | 7.4 | 11.3 |
| | Neutral | 42 | 10.3 | 10.3 | 21.6 |
| | Agree | 99 | 24.3 | 24.3 | 45.8 |
| | Strongly Agree | 221 | 54.2 | 54.2 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

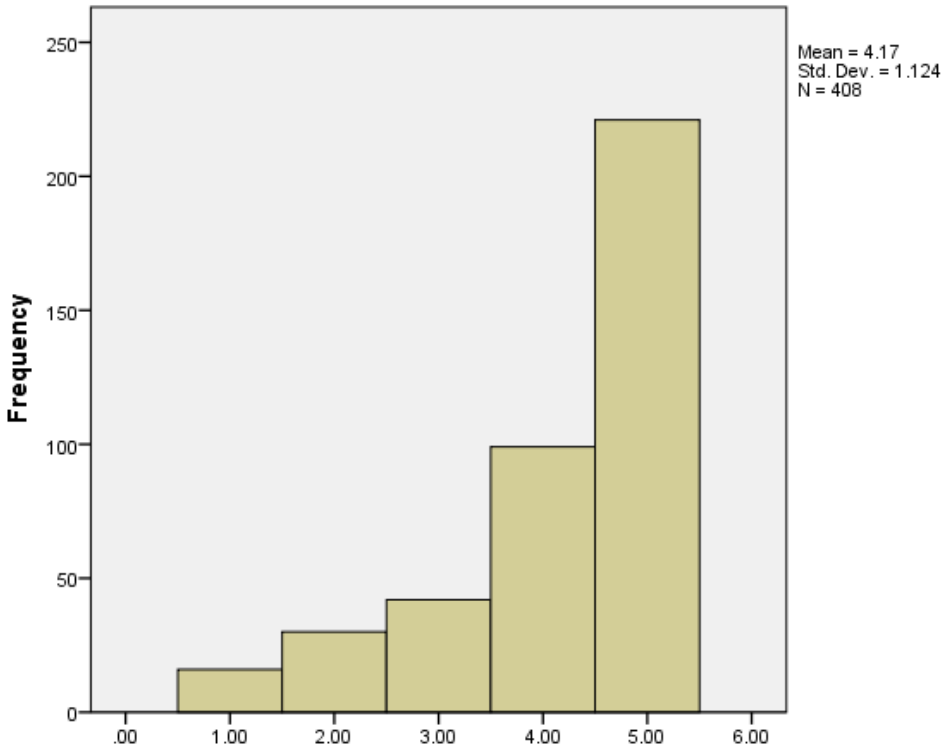


*Figure 4-37:* Graphical Analysis – M-learning is a good idea

According to table 4-44 and figure 4-37, 78.5% respondents believe that it would be a good idea to use m-learning, with μ= 4.17 and σ= 1.124. Few of the students i.e. 11.3% do not agree with the statement implying that majority of the students are of the opinion that m-learning usage in education would definitely help the users greatly.

### 4.5.7.2 Respondents opinion regarding they would like to use m-Learning

This question was asked from the students to provide their idea regarding whether they would like to use m-learning or not.

Table 4-45: Frequency table regarding 'Respondents like to use m-learning'

| | Frequency | Percent | Valid | Cumulative |
|---|---|---|---|---|

| | | | | Percent | Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 16 | 3.9 | 3.9 | 3.9 |
| | Disagree | 28 | 6.9 | 6.9 | 10.8 |
| | Neutral | 37 | 9.1 | 9.1 | 19.9 |
| | Agree | 108 | 26.5 | 26.5 | 46.3 |
| | Strongly Agree | 219 | 53.7 | 53.7 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

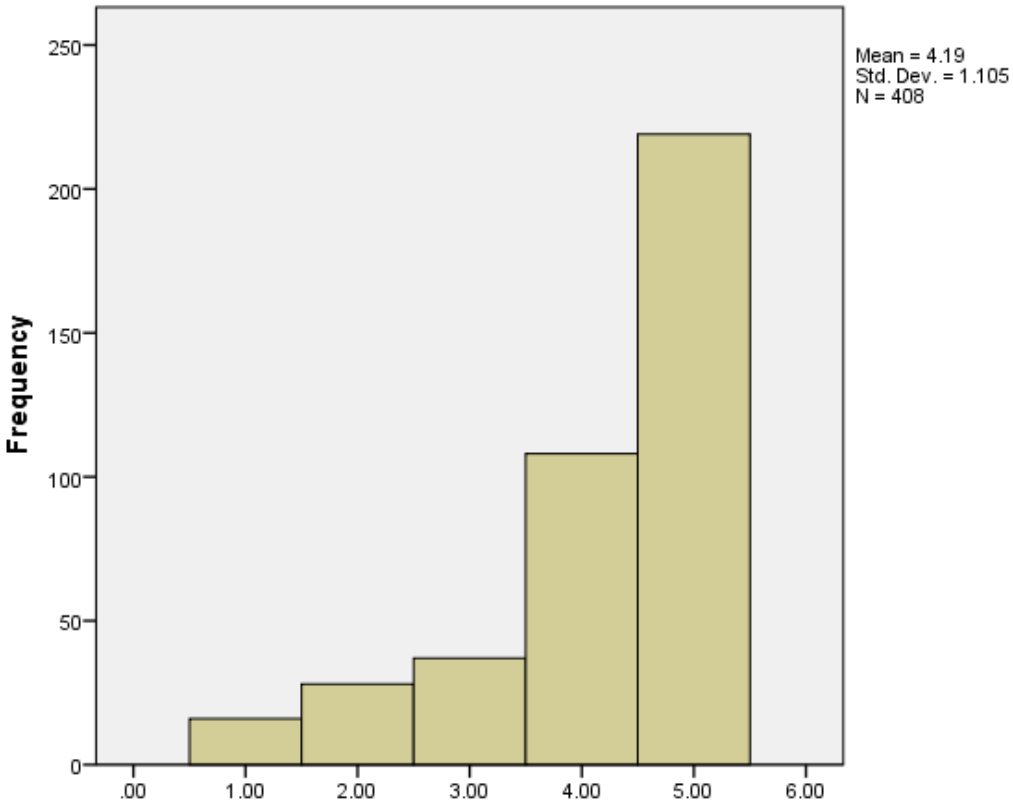


*Figure 4-38:* Graphical analysis – Respondents like to use m-learning

According to table 4-45 and figure 4-38, 80.2% respondents are of the opinion that they would like to use m-learning, with $\mu = 4.19$ and $\sigma = 1.105$. Few of the respondents i.e. 10.8% do not agree with the declaration. Therefore majority of the students believe that m-learning usage would be a commendable impression and they would like to practice it.

### 4.5.7.3 Respondents opinion regarding whether working with m-learning is fun

The students were required to comment whether they find working with m-learning enjoyable or not.

Table 4-46: Tabulated statistics - 'M-learning usage is a fun'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 20 | 4.9 | 4.9 | 4.9 |
| | Disagree | 26 | 6.4 | 6.4 | 11.3 |
| | Neutral | 40 | 9.8 | 9.8 | 21.1 |
| | Agree | 97 | 23.8 | 23.8 | 44.9 |
| | Strongly Agree | 225 | 55.10 | 55.10 | 100.00 |
| | Total | 408 | 100.00 | 100.00 | |

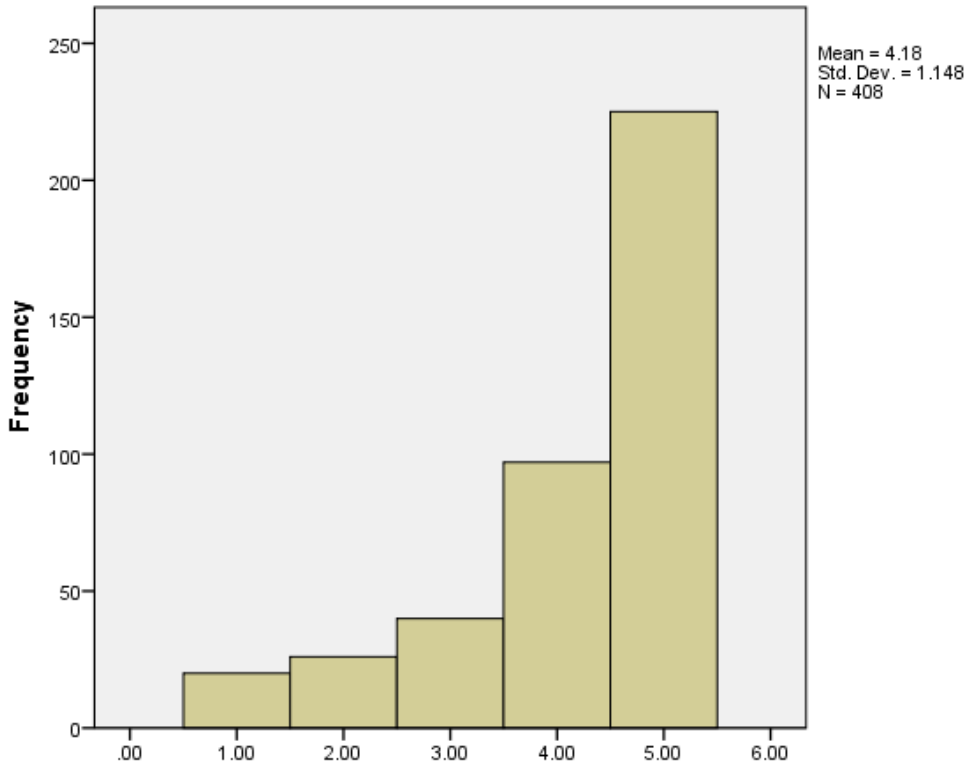


*Figure 4-39:* Histogram – M-learning usage is fun

According to above statistics, 78.9% respondents believe that using m-learning is fun and an enjoyable experience for them, with mean value = 4.18 and standard deviation = 1.148. Few of the respondents i.e. 11.3% do not agree with the statement showing that most of the respondents are of the opinion that learning through m-learning will be fun.

#### 4.5.7.4 Statistical Analysis Summary – Attitude Towards use of Technology

Table 4-47: Statistical analysis summary – Attitude towards use of Learning

| | M-learning usage is good idea | Respondents like to use m-learning | Using M-learning is fun |
|---|---|---|---|
| N | 408 | 408 | 408 |
| Mean | 4.1740 | 4.1912 | 4.1789 |
| Std. Deviation | 1.12449 | 1.10515 | 1.14752 |
| Variance | 1.264 | 1.221 | 1.317 |

Table 4-47 displays a statistical summary of Attitude towards the use of Technology, the value of mean for all the questions are more than 3.5, resultantly implying students inclination towards the use of technology, regarding m-learning as a good idea which can be incorporated to enhance their learning experience and increase their knowledge.

### 4.5.8 Behavioral Intentions

Behavioral intentions comprise of factors that lead to person's motivation to behave in a certain manner or the effort that a person puts in to behave in a particular way (Ajzen, 1991). Chau and Hu (2002) describe BI as a prediction of a individual's probability of carrying out an act, such as the intention to accept a technology. Several past studies have used behavioral intention to measure the users' acceptance of a new technology (Jairak et al., 2009; Wang et al., 2009).

### 4.5.8.1 Respondents opinion regarding whether they intend to use m-learning in the future

This question was asked from the scholars to describe their idea regarding whether they intend using mobile learning in the future or not.

Table 4-48: Frequency table regarding 'Respondents opinion –Intentions to use m-learning in future'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 17 | 4.2 | 4.2 | 4.2 |
| | Disagree | 20 | 4.9 | 4.9 | 9.1 |
| | Neutral | 66 | 16.2 | 16.2 | 25.2 |
| | Agree | 117 | 28.7 | 28.7 | 53.9 |
| | Strongly Agree | 188 | 46.10 | 46.10 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

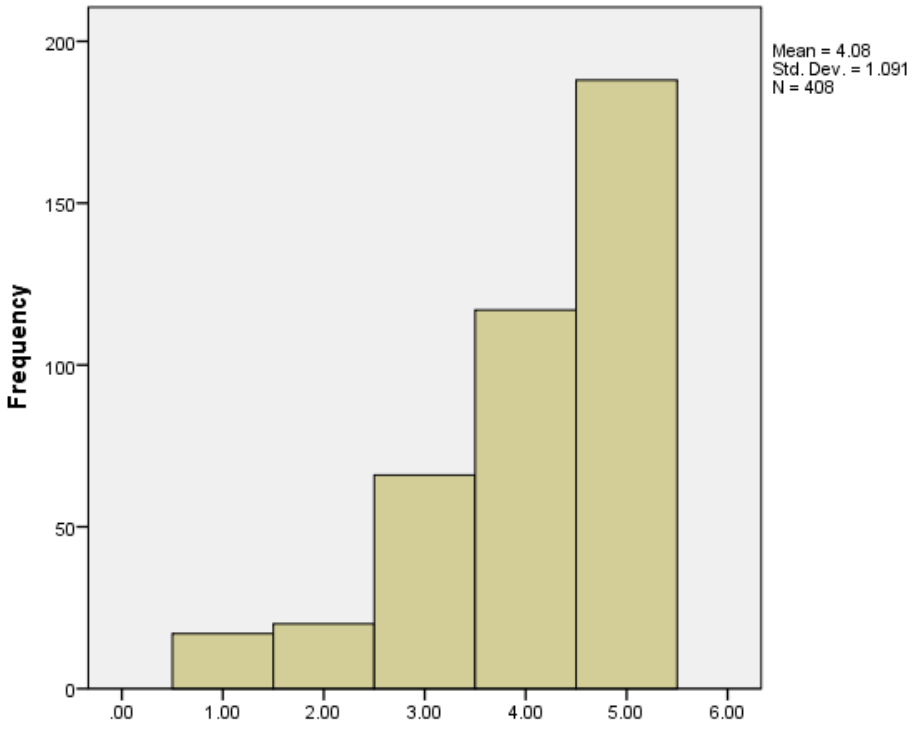


*Figure 4-40:* Graphical Analysis – Future Intentions to use m-learning

According to table 4-48 and figure 4-40, 74.8% respondents were prepared in future will use m-learning, with μ= 4.08 and σ= 1.091. Few number of scholars i.e. 9.1% do not agree with

the declaration implying that majority of the students believe that they would like to use m-learning in the future.

### 4.5.8.2 Respondents opinion regarding whether they predict that they will use m-learning in the future

The question was asked from the users regarding their prediction about using m-leaning in the future.

Table 4-49: Frequency table regarding 'Respondents opinion –Prediction to use m-learning in future'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 16 | 3.9 | 3.9 | 3.9 |
| | Disagree | 21 | 5.1 | 5.1 | 9.1 |
| | Neutral | 76 | 18.6 | 18.6 | 27.70 |
| | Agree | 110 | 27.00 | 27.00 | 54.70 |
| | Strongly Agree | 185 | 45.30 | 45.30 | 100.00 |
| | Total | 408 | 100.0 | 100.0 | |

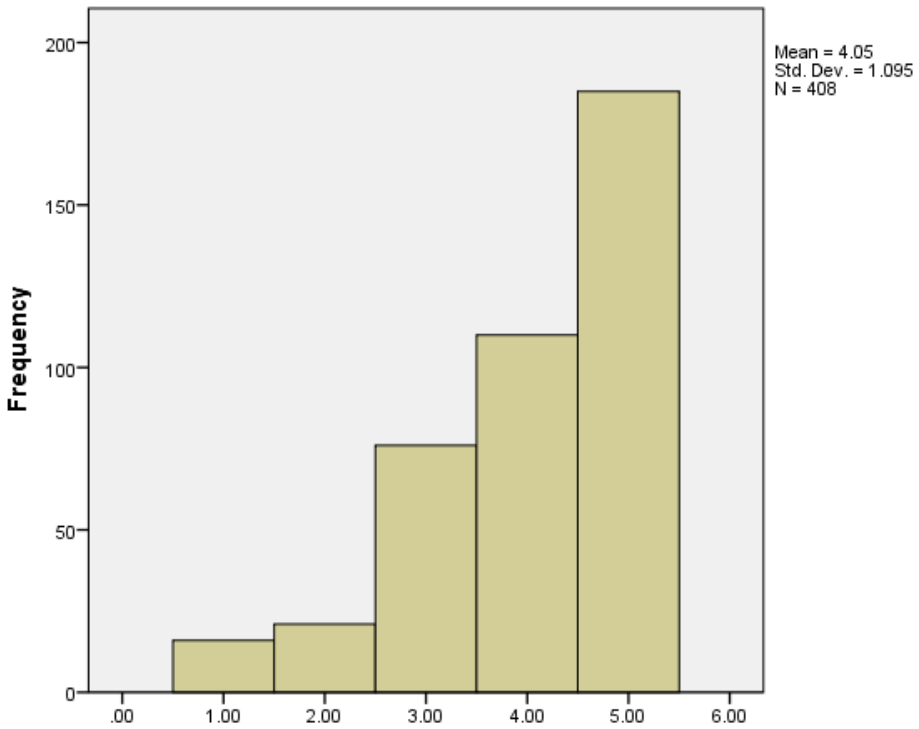


*Figure 4-41:* Graphical Analysis –Prediction to use m-learning in future

According to table 4-49 and figure 4-41, 72.3% respondents predict that they would use m-learning in the future, with μ= 4.05 and σ= 1.095. Few of the students i.e. 9.0% do not agree

with the question's declaration. Therefore, majority of students believe that they will use m-learning in the future.

### 4.5.8.3 Respondents opinion regarding whether they plan to use m-learning in the future

The respondents in this question were enquired regarding whether they plan to use m-learning in the future or not.

Table 4-50: Frequency table regarding 'Respondents plan to use m-learning in future'

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Strongly Disagree | 25 | 6.1 | 6.1 | 6.1 |
| | Disagree | 23 | 5.6 | 5.6 | 11.8 |
| | Neutral | 53 | 13.0 | 13.0 | 24.8 |
| | Agree | 89 | 21.8 | 21.8 | 46.6 |
| | Strongly Agree | 218 | 53.4 | 53.4 | 100.0 |
| | Total | 408 | 100.0 | 100.0 | |

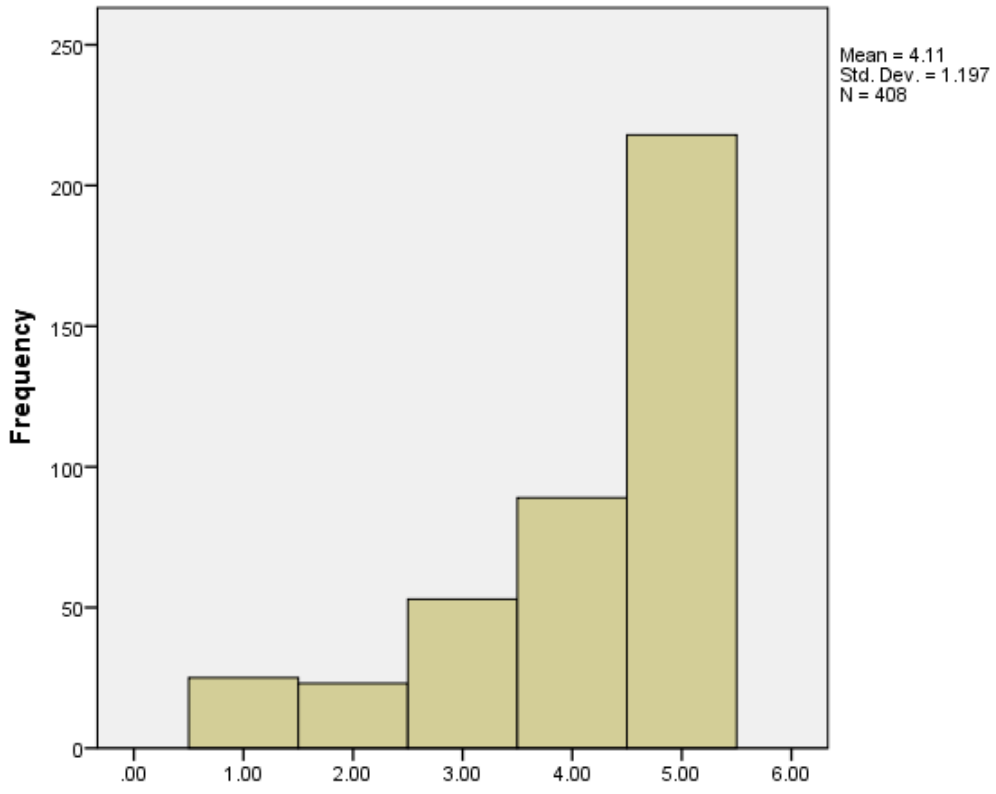


*Figure 4-42:* Graphical Analysis – Respondent plan to use m-learning in future

According to table 4-50 and figure 4-42, 75.2% respondents have plans and likely to utilize m-learning in their education, with μ= 4.11 and σ= 1.197. Few of the users i.e. 11.7% do not agree with the question's declaration. Therefore, majority of the scholars are planning to use m-learning in the future.

### 4.5.8.4 Statistical Analysis Summary – Behavioral Intentions

Table 4 51: Statistical analysis summary – Behavioral Intentions

| | Respondents Intentions to use m-learning in future | Prediction to use m-learning in future | Respondent plan to use m-learning in future |
|---|---|---|---|
| N | 408 | 408 | 408 |
| Mean | 4.0760 | 4.0466 | 4.1078 |
| Std. Deviation | 1.09123 | 1.09513 | 1.19710 |
| Variance | 1.191 | 1.199 | 1.433 |

Table: 4-51 displays a statistical summary of Behavioral Intentions. According to the summary, the mean value of all three questions is greater than 3.5, implying that the students perceive m-learning as an attractive and useful idea and in future they intend using m-learning in their studies.

## 4.6 Descriptive Analysis – UTAUT Dimensions

Table 4 52: Descriptive Statistics – Dimensions of UTAUT

| Constructs | Minimum | Maximum | Mean | Std. Deviation | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| **Performance Expectancy** | 1.00 | 5.00 | 4.2335 | 0.99871 | -0.195 | 2.554 |
| **Effort Expectancy** | 1.00 | 5.00 | 4.1599 | 0.96563 | -0.367 | 1.911 |
| **Social Influence** | 1.00 | 5.00 | 4.2034 | 1.06050 | -0.501 | 1.852 |
| **Facilitating Conditions** | 1.00 | 5.00 | 4.0104 | 0.99802 | -0.518 | 0.600 |
| **Perceived Playfulness** | 1.20 | 5.00 | 4.1691 | 0.97825 | -0.520 | 2.104 |
| **Self-Management of Learning** | 1.00 | 5.00 | 4.0539 | 0.99020 | -0.353 | 1.449 |
| **Attitude Towards Technology** | 1.00 | 5.00 | 4.1815 | 1.02190 | -0.240 | 1.913 |
| **Behavioral Intentions** | 1.00 | 5.00 | 4.0769 | 0.97220 | -0.513 | 1.470 |

The table 4-52 relates to the descriptive statistics and these results demonstrate the average value measured by mean, the maximum and minimum value, the dispersion in the series measured by standard deviation and the value of skewness to check whether the series are positively skewed or negatively skewed. The values of kurtosis have also been mentioned, which depicts the peak of the curves, of the series of values used in the study.

The average response of the respondents for all variables varies between 4.0104 and 4.2335, with the standard deviation ranging between 0.96563 and 1.06050. The mean value of PE is 4.2335 indicating that students find m-learning useful, helping them to increase their learning productivity and increase their knowledge. EE has a mean value of 4.1599 implying that students perceive m-learning to be easy and convenient to use, with clear understanding. The mean of SI is 4.2034 indicating that students are positively influenced by others to use m-learning. They will be supported by their institution and administrative staff to use m-learning. Facilitating Conditions has a mean value of 4.0104, meaning that they have the required resources to use m-learning and they will be able to get help from others whenever

they face difficulty in using m-learning. Perceived Playfulness has a mean value of 4.1691 indicating that students believe that m-learning will be enjoyable to use and will stimulate their curiosity and exploration. The mean of Self-management of learning is 4.0539 showing that most of the students will be self-directed and self-motivated to use m-learning, setting their own pace and time of study and allocating their time responsibly for all the tasks to be performed. Attitude towards the use of technology has a mean of 4.1815 indicating that students want to use to use m-learning and think of it as an enjoyable and fun activity, whereas Behavioral Intentions has a mean value of 4.0769 implying that students intend and plan to use m-learning in the future thinking of it as an attractive option.

### 4.6.1 Normality Test

In order to successfully run statistical tests, it is mandatory for the data to be normally distributed. The values of skewness for all the variables, as showing in table 4-52, lie in between +1 to -1 (Hair, Tatham, Anderson & Black, 2006), demonstrating that the data distribution is typical/ normal. Moreover, the values of the result for kurtosis for all the variables are within the range ± 3 demonstrating that the data distribution is normal.

## 4.7 Scale Measurement: Reliability Analysis (Cronbach's Alpha)

Table 4-51: Reliability Test – Dimensions of UTAUT

| S.No | Variables | Cronbach's Alpha | No. of items |
|---|---|---|---|
| **1** | Facilitating Conditions | 0.873 | 4 |
| **2** | Perceived Playfulness | 0.911 | 5 |
| **3** | Self-Management of Learning | 0.890 | 4 |
| **4** | Attitude Towards Technology | 0.893 | 3 |
| **5** | Behavioral Intentions | 0.826 | 3 |
| **6** | Social Influence | 0.927 | 4 |
| **7** | Effort Expectancy | 0.876 | 4 |
| **8** | Performance Expectancy | 0.922 | 4 |

In order to apply regression analysis, the data has to be tested first for reliability. Cronbach's alpha measures the reliability or internal consistency i.e. whether a set of items are closely related or not. Table 4-53 demonstrates the values of the Cronbach's Alpha or reliability coefficient of all the determinants used in this study. All of the Cronbach's Alpha reliabilities of determinants are greater than 0.7 and lie between 0.826 to 0.927. Perceived Playfulness (0.911), Social Influence (0.927) and Performance Expectancy (0.922) have achieved highest

values of Cronbach Alpha, these constructs are extremely stable as they can contribute in achieving consistent results. However, Facilitating Conditions (0.873), Self-Management of Learning (0.890), Attitude towards use of technology (0.893) and Effort Expectancy (0.876) are also good and reliable. For the dependent variable (Behavioral Intentions) the value of Cronbach Alpha is 0.826 which also reflects that the variable is reliable and helps in providing consistent output.

Though, all the variables in this research are good and reliable as meeting the minimum acceptance level which is 0.7 (Saunders et al. 2009), implying that the variables can be used for further analysis in the study.

## 4.8 Inferential Analysis

### 4.8.1 Correlations Analysis (Pearson correlation and Multi-collinearity Test)

Statistical Correlation is the association among different constructs, identifying whether the relationship is positive or negative. The strength of the relationship can also be identified through correlation analysis. The correlation coefficient, such as the Pearson correlation coefficient, can be used to check if a inear relationship exists between the variables. The correlation coefficient (r) can be used to meaure the strength of the relationship. A linear relationship is identified if the value lies etween ±1.0, whereas a value greater than zero indicates a positive linear relationship and a value less than zero indicates a negative linear relationship. A value that is equal to zero signifies no linear relationship.

Table 4-52: Correlation analysis - UTAUT constructs

| Variables | PE | EE | SI | FC | PP | SML | ATT | BI |
|---|---|---|---|---|---|---|---|---|
| **Performance Expectancy** | 1.000 | 0.568 | 0.593 | 0.234 | 0.586 | 0.336 | 0.545 | 0.552 |
| **Effort Expectancy** | 0.568 | 1.000 | 0.554 | 0.327 | 0.608 | 0.371 | 0.439 | 0.559 |
| **Social Influence** | 0.593 | 0.554 | 1.000 | 0.279 | 0.649 | 0.347 | 0.454 | 0.573 |
| **Facilitating Conditions** | 0.234 | 0.327 | 0.279 | 1.000 | 0.320 | 0.355 | 0.213 | 0.281 |
| **Perceived Playfulness** | 0.586 | 0.608 | 0.649 | 0.320 | 1.000 | 0.398 | 0.489 | 0.613 |
| **Self-Management of Learning** | 0.336 | 0.371 | 0.347 | 0.355 | 0.398 | 1.000 | 0.342 | 0.369 |
| **Attitude Towards Technology** | 0.545 | 0.439 | 0.454 | 0.213 | 0.489 | 0.342 | 1.000 | 0.497 |
| **Behavioral Intentions** | 0.552 | 0.559 | 0.573 | 0.281 | 0.613 | 0.369 | 0.497 | 1.000 |
| ****. Correlation is significant at the 0.01 level (2-tailed).** | | | | | | | | |
| ***. Correlation is significant at the 0.05 level (2-tailed).** | | | | | | | | |

Table 4-53: Pearson correlation coefficient - UTAUT

| Correlations Matrix | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Control Variables | | | PE | EE | SI | FC | PP | SML | ATT | BI |
| Institute & Gender & Age & Qualification & Mobile Classification & Mobile usage & Internet access & Educational application & Educational content & M-Learning Heard & M-Learning Opinion | PE | Correlation | 1.000 | .568 | .593 | .234 | .586 | .336 | .545 | .552 |
| | | Significance (2-tailed) | . | .000 | .000 | .000 | .000 | .000 | .000 | .000 |
| | | Df | 0 | 395 | 395 | 395 | 395 | 395 | 395 | 395 |
| | EE | Correlation | .568 | 1.000 | .554 | .327 | .608 | .371 | .439 | .559 |
| | | Significance (2-tailed) | .000 | . | .000 | .000 | .000 | .000 | .000 | .000 |
| | | Df | 395 | 0 | 395 | 395 | 395 | 395 | 395 | 395 |
| | SI | Correlation | .593 | .554 | 1.000 | .279 | .649 | .347 | .454 | .573 |
| | | Significance (2-tailed) | .000 | .000 | . | .000 | .000 | .000 | .000 | .000 |
| | | Df | 395 | 395 | 0 | 395 | 395 | 395 | 395 | 395 |
| | FC | Correlation | .234 | .327 | .279 | 1.000 | .320 | .355 | .213 | .281 |
| | | Significance (2-tailed) | .000 | .000 | .000 | . | .000 | .000 | .000 | .000 |
| | | Df | 395 | 395 | 395 | 0 | 395 | 395 | 395 | 395 |
| | PP | Correlation | .586 | .608 | .649 | .320 | 1.000 | .398 | .489 | .613 |
| | | Significance (2-tailed) | .000 | .000 | .000 | .000 | . | .000 | .000 | .000 |
| | | Df | 395 | 395 | 395 | 395 | 0 | 395 | 395 | 395 |
| | SML | Correlation | .336 | .371 | .347 | .355 | .398 | 1.000 | .342 | .369 |
| | | Significance (2-tailed) | .000 | .000 | .000 | .000 | .000 | . | .000 | .000 |
| | | Df | 395 | 395 | 395 | 395 | 395 | 0 | 395 | 395 |
| | ATT | Correlation | .545 | .439 | .454 | .213 | .489 | .342 | 1.000 | .497 |
| | | Significance (2-tailed) | .000 | .000 | .000 | .000 | .000 | .000 | . | .000 |
| | | Df | 395 | 395 | 395 | 395 | 395 | 395 | 0 | 395 |
| | BI | Correlation | .552 | .559 | .573 | .281 | .613 | .369 | .497 | 1.000 |
| | | Significance (2-tailed) | .000 | .000 | .000 | .000 | .000 | .000 | .000 | . |
| | | Df | 395 | 395 | 395 | 395 | 395 | 395 | 395 | 0 |

Table 4-54 and 4-55 illustrates the relationship between the variables. All the variables are showing positive relationships with each other with moderate and weak strength of relationship. The following determinants i.e. performance expectancy ($r = 0.552$, $p < 0.001$), effort expectancy ($r = 0.559$, $p < 0.001$), social influence ($r = 0.573$, $p < 0.001$) and perceived playfulness ($r = 0.613$, $p < 0.001$) have a moderate relationship with behavioral intentions (dependent variable), whereas, facilitating conditions ($r = 0.281$, $p < 0.001$), self-management of learning ($r = 0.369$, $p < 0.001$) and attitude towards use of technology ($r = 0.497$, $p < 0.001$) has a weak relationship with behavioral intentions. Hence all the hypothesis have been found to statistically significant and positively correlated with dependent variable.

Furthermore, results depicted that there is no serious issue of multi-collinearity among independent variables as highest value of correlation is less than 0.9 (Hair et al., 2006) which

is 0.649 between Social influence and Perceived playfulness. Thus, regression analysis can be carried out conveniently.

### 4.8.2 Hypothesis Testing

Data analysis mainly comprises of two main parts. The first part encompasses the assessment of the fitness of model (through regression analysis) to evaluate whether the model is appropriate for the study while the second part consists of hypothesis testing. Hypothesis testing involves different statistical tests performed to validate whether the set forth hypothesis should be accepted or rejected based upon the data collected. Following hypothesis have set based upon past studies and researches which will be tested using the various statistical techniques.

**Performance Expectancy (PE)**

$H_{01}$: Performance Expectancy has a no relationship with behavioral intentions to use Mobile-learning

H1: Performance Expectancy has a positive relationship with behavioral intention to use M-learning.

H2: The association between Performance Expectancy and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

**Effort Expectancy (EE)**

$H_{02}$: Effort Expectancy has a no relationship with behavioral intentions to use Mobile-learning.

H3: Effort expectancy has a positive relationship with behavioral intention to use M-learning.

H4: The association between Effort Expectancy and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

**Social Influence (SI)**

$H_{03}$: Social influence has a no relationship with behavioral intentions to use Mobile-learning

H5: Social influence has a positive relationship with behavioral intention to use M-learning.

H6: The association between Social Influence and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

**Facilitating Conditions (FC)**

$H_{04}$: Facilitating Conditions has a no relationship with behavioral intentions to use Mobile-learning

H7: Facilitating conditions has a positive relationship with behavioral intention to use M-learning.

H8: The association between Facilitating Condition and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

**Perceived Playfulness (PP)**

$H_{05}$: Perceived Playfulness no relationship with behavioral intentions to use Mobile-learning

H9: Perceived playfulness has a positive relationship with behavioral intention to use M-learning.

H10: The association between Perceived Playfulness and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

**Self-Management of learning (SML)**

$H_{06}$: Self-Management of learning has a no relationship with behavioral intentions to use Mobile-learning.

H11: Self-management of learning has a positive relationship with behavioral intention to use M-learning.

H12: The association between Self-Management of Learning and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

**Attitude towards Technologies (ATT)**

$H_{07}$: Attitude towards Technology Effort Expectancy has a no relationship with behavioral intentions to use Mobile-learning.

H13: Attitude towards the use of the technologies for learning is positively related to behavioral intention.

H14: The association between Attitude towards the use of the technologies and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

#### 4.8.2.1 Regression Analysis

Multiple Regression Analysis is a statistical technique that involves the prediction of an unknown value of a variable, through two or more known variables and analyzes the linear relationship between a dependent and two or more independent variable. It can also be used to infer cause and effect between independent and dependent variables. The variable that is predicted is known as the dependent variable, which is Behavioral Intentions in our case, whereas the independent variables include Performance expectancy, Effort expectancy, Social Influence, Facilitating Conditions, Perceived playfulness, Self-management of learning and Attitude towards the use of technology. In order to assess the strength & nature of relationship between variables and statistical significance of each coefficient, regression analysis has been carried out.

### 4.8.2.2 Assessment of Model Fitness

Table 4-54: Model Summary of Regression Model

| Model Summary | | | | |
|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .874[a] | .764 | .760 | .47660 |
| a. Predictors: (Constant), ATT, FC, SML, SI, EE, PE, PP | | | | |

Table 4-56 shows the model summary of the regression model. It includes the value of R, known as the multiple correlation coefficient, which is the square root of R Square and can be defined as the correlation between the predicted and observed values of the dependent variable, which is Behavioral Intentions in our case. The value of R = 0.874 signifies a reasonably strong relationship between the independent variables ATT,FC, SML, SI, EE, PE, PP and the dependent variable i.e. BI. Adjusted R Square, which is a modified version of R Square adjusted for the amount of predictors in the model, is 76.4%. The value of R Square specifies 76.4% of the variability of dependent variable (behavioral intentions) is elucidated by independent variables and explanatory power of model is 76.4%. The remaining 23.6% of the variability in dependent variable (Behavioral Intention) is explained by other factors not considered in this research.

Table 4-57 explains the analysis of variance. The value of F (7, 400) is equal to 184.7, with $p < 0.05$ showing that the dependent variable is significantly predicted by the independent determinants.

Table 4-55: Analysis of Variance

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 293.823 | 7 | 41.975 | 184.788 | .000[b] |
| | Residual | 90.860 | 400 | .227 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), ATT, FC, SML, SI, EE, PE, PP | | | | | | |

### 4.8.2.3 Test of Statistical Significance

Table 4-58: Coefficient for Regression Analysis

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .145 | .119 | | 1.216 | .225 |
| | PE | .129 | .053 | .133 | 2.444 | .010 |
| | EE | .177 | .051 | .176 | 3.484 | .001 |
| | SI | .171 | .049 | .187 | 3.514 | .000 |
| | FC | .031 | .032 | .032 | 0.979 | .328 |
| | PP | .263 | .058 | .265 | 4.564 | .000 |
| | SML | .046 | .035 | .047 | 1.314 | .190 |
| | ATT | .124 | .038 | .131 | 3.234 | .001 |
| a. Dependent Variable: BI | | | | | | |

The overall tests and analysis performed predicted that causal relationship exists between the independent and dependent variables. A total of five (Effort Expectancy, Performance Expectancy, Perceived Playfulness, Social Influence, and Attitude towards use of technology) out of seven variables have been found to be statistically significant, with the adjusted $R^2$ = 0.764. Thus the regression model can be considered as fit and statistically significant to predict m-learning acceptance amongst the students.

Table 4-58 predicts that *Performance Expectancy* ($\beta = 0.133$, $p \leq 0.010$), *Effort Expectancy* ($\beta = 0.176$, $p \leq 0.001$), *Social Influence* ($\beta = 0.187$, $p \leq 0.000$), *Perceived Playfulness* ($\beta = 0.265$, $p \leq 0.000$) and Attitude towards use of Technology ($\beta = 0.131$, $p \leq 0.001$) are significantly and positively related to Behavioral Intensions of M-learning. Whereas, results predict that *Facilitating Conditions* ($\beta = 0.032$, $p \leq 0.328$) and Self-Management of Learning ($\beta = 0.047$, $p \leq 0.190$) are positive but insignificant at $p \leq 0.001$ level. Moreover, Perceived playfulness is found to have the highest effect on behavioral intention.

### 4.8.2.4 H1: Performance Expectancy has positive relationship with behavioral intention to use M-learning.

According to table 4-58, Performance expectancy has a path coefficient of 0.133. This shows that performance expectancy has a positive relationship with behavioral intentions. Moreover,

as the value of p is 0.010, it can be stated that performance expectancy is considerably different than behavioral intentions. Therefore, the null hypothesis is rejected and H1 is accepted.

#### 4.8.2.5 H3: Effort Expectancy has a positive relationship with behavioral intention to use M-learning.

According to table 4-58, Effort expectancy has a path coefficient of 0.176. This shows that effort expectancy is positively associated with behavioral intentions. Moreover, as the value of p is 0.001, which is less than 0.01, it can be stated that effort expectancy is considerably different than behavioral intentions. Therefore, the null hypothesis is rejected and H3 is accepted.

#### 4.8.2.6 H5: Social Influence has a positive relationship with behavioral intention to use M-learning.

According to table 4-58, Social Influence has a path coefficient of 0.187. This shows that effort expectancy has a positive relationship with behavioral intentions. Moreover, as the value of p is 0.000, which is less than 0.01, it can be stated that social influence is considerably different than behavioral intentions. Therefore, the null hypothesis is rejected and H5 is accepted.

#### 4.8.2.7 H7: Facilitating Conditions has a positive relationship with behavioral intention to use M-learning.

According to table 4-58, Social Influence has a path coefficient of 0.032. This shows that facilitating conditions has a positive relationship with behavioral intentions. Moreover, as the value of p is 0.328, which is greater than 0.01, it can be established that variable (Facilitating conditions) is not significant. Therefore, the null hypothesis is accepted and H7 is rejected.

#### 4.8.2.8 H9: Perceived Playfulness has a positive relationship with behavioral intention to use M-learning.

According to table 4-58, Perceived Playfulness has a path coefficient of 0.265. This shows that Perceived Playfulness has a positive relationship with behavioral intentions. Moreover, as the value of p is 0.000, which is less than 0.01, it can be stated that Perceived Playfulness is considerably different than behavioral intentions. Therefore, the null hypothesis is rejected and H9 is accepted.

#### 4.8.2.9 H11: Self-Management of learning has a positive relationship with behavioral intention to use M-learning.

According to table 4-58, Self-Management of learning has a path coefficient of 0.047. This shows that Self-Management of learning has a positive relationship with behavioral intentions. Moreover, as the value of p is 0.190, which is greater than 0.01, it can be stated that Self-Management of learning is not considerably different than behavioral intentions. Therefore, the null hypothesis is accepted and H11 is rejected.

#### 4.8.2.10 H13: Attitude towards Use of Technology has a positive relationship with behavioral intention to use M-learning.

According to table 4-58, Attitude towards use of technology has a path coefficient of 0.131. This shows that Attitude towards use of technology has a positive relationship with behavioral intentions. Moreover, as the value of p is 0.001, which is less than 0.01, it can be stated that Attitude towards use of technology is considerably different than behavioral intentions. Therefore, the null hypothesis is rejected and H13 is accepted.

Therefore, simple regression equation is:

***Behavioral Intentions = 0.145 + (0.129 x Performance Expectancy) + (0.177 x Effort Expectancy) + (0.171 x Social Influence) + (0.031 x Facilitating Conditions) + (0.263 x Perceived Playfulness) + (0.046 x Self-Management of Learning) + (0.124 x Attitude towards use of Technology)***

The first value signifies the constant, which is also called the y-intercept, i.e. the point where the regression line crosses the Y-axis. This is also known as the predicted value of Behavioral Intentions, when the value of all other determinants is zero. As shown in the equation, when the performance expectancy of m-learning is high, the behavioral intention to adopt mobile learning will increase by 0.129, if all other determinants remain constant. Similarly, if the students perceive effort expectancy to be high, then the behavioral intention to adopt mobile learning will increase by 0.177, if other variables remain constant. If the students believe that they will be influenced by others to use m-learning (social influence), then the behavioral intention to adopt m-learning will increase by 0.171, with all other determinants remaining constant. Likewise, if the students believe that they will be well facilitated by their universities and staff to use m-learning (facilitating conditions), then the behavioral intention to adopt m-learning will increase by 0.031, with all other factors being constant. If the

students believe that m-learning will be fun to use (perceived playfulness), then the behavioral intention to adopt m-learning will rise by 0.263, with all other factors remaining constant. Moreover, if the students believe that they can adjust their own time tables and set their own pace in study (self-management of learning), then the behavioral intention to adopt m-learning will increase by 0.046, with other factors being constant. Similarly, if the students believe that they are inclined towards the use of technology and plan to use m-learning in the future (attitude towards the use of technology), then the behavioral intention to adopt m-learning will increase by 0.124, with all other factors remaining constant.

#### 4.8.2.11 H2: The association between Performance Expectancy and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

Table 4-56: Model Summary of Regression Analysis (PE and Age)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.804[a] | 0.646 | .0.645 | 0.57954 | .0.646 | 370.173 | 2 | 405 | 0.000 |
| 2 | 0.808[b] | 0.653 | 0.651 | 0.57470 | 0.007 | 7.857 | 1 | 404 | 0.005 |
| a. Predictors: (Constant), Age, PE | | | | | | | | | |
| b. Predictors: (Constant), Age, PE, PE_Age | | | | | | | | | |

Table 4-57: Analysis of Variance (PE and Age)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 248.658 | 2 | 124.329 | 370.173 | 0.000[b] |
| | Residual | 136.026 | 405 | 0.336 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 251.252 | 3 | 83.751 | 253.579 | 0.000[c] |
| | Residual | 133.431 | 404 | 0.330 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors:(Constant), Age, PE | | | | | | |
| c. Predictors: (Constant), Age, PE, PE_Age | | | | | | |

Table 4-58: Coefficient for Regression (PE and Age)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 0.736 | 0.152 | | 4.853 | 0.000 |
| | PE | 0.010 | 0.029 | 0.010 | 0.328 | 0.743 |
| | Age | 0.785 | 0.029 | 0.806 | 26.697 | 0.000 |
| 2 | (Constant) | 1.498 | 0.311 | | 4.820 | 0.000 |
| | PE | -0.311 | 0.118 | -0.320 | -2.635 | 0.009 |
| | Age | 0.605 | 0.070 | 0.622 | 8.618 | 0.000 |
| | PE_Age | 0.077 | 0.027 | 0.353 | 2.803 | 0.005 |
| a. Dependent Variable: BI | | | | | | |

Table 4-59: Model Summary of Regression Analysis (PE and Gender)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.808[a] | 0.653 | 0.651 | 0.57444 | 0.653 | 380.382 | 2 | 405 | 0.000 |
| 2 | 0.814[b] | 0.662 | 0.660 | 0.56693 | 0.010 | 11.798 | 1 | 404 | 0.001 |
| a. Predictors: (Constant), PE, Gender | | | | | | | | | |
| a. Predictors: (Constant), PE, Gender, PE Gender | | | | | | | | | |

Table 4-60: Analysis of Variance (PE and Gender)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 251.040 | 2 | 125.520 | 380.382 | 0.000[b] |
| | Residual | 133.644 | 405 | 0.330 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 254.832 | 3 | 84.944 | 264.282 | 0.000[c] |
| | Residual | 129.851 | 404 | 0.321 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), PE, Gender | | | | | | |
| c. Predictors: (Constant), PE, Gender, PE_Gender | | | | | | |

Table 4-61: Coefficient for Regression (PE and Gender)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.072 | 0.168 | | 6.368 | 0.000 |
| | Gender | 0.763 | 0.029 | 0.784 | 25.990 | 0.000 |
| | PE | -0.180 | 0.066 | -0.082 | -2.707 | 0.007 |
| 2 | (Constant) | 2.278 | 0.388 | | 5.865 | 0.000 |
| | Gender | 0.474 | 0.089 | 0.487 | 5.322 | 0.000 |
| | PE | -0.997 | 0.247 | -0.453 | -4.040 | 0.000 |
| | PE_Gender | 0.200 | 0.058 | 0.428 | 3.435 | 0.001 |
| a. Dependent Variable: BI | | | | | | |

The above results (Table 56-61) depict that age and gender significantly moderate the effect between PE and BI as the value of change of R-square is significant [(Age, 0.005) & (Gender, 0.001)], which means that while including the moderating variables (age and gender), the relationship between PE and BI is significantly affected. Therefore, age and gender play a moderating role between PE and BI statistically, leading to the acceptance of hypothesis H2.

### 4.8.2.12 H4: The association between Effort Expectancy and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

Table 4-62: Model Summary of Regression Analysis (EE and Age)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.801[a] | 0.642 | 0.640 | 0.58302 | 0.642 | 363.360 | 2 | 405 | 0.000 |
| 2 | 0.805[b] | 0.649 | 0.646 | 0.57843 | 0.006 | 7.447 | 1 | 404 | 0.007 |
| a. Predictors: (Constant), EE, Age | | | | | | | | | |
| b. Predictors: (Constant), EE, Age, EE_Age | | | | | | | | | |

Table 4-63: Analysis of Variance (EE and Age)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 247.020 | 2 | 123.510 | 363.360 | 0.000[b] |
| | Residual | 137.664 | 405 | 0.340 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 249.511 | 3 | 83.170 | 248.579 | 0.000[c] |
| | Residual | 135.172 | 404 | 0.335 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), EE, Age | | | | | | |
| c. Predictors: (Constant), EE, Age, EE_Age | | | | | | |

Table 4-64: Coefficient for Regression (EE and Age)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 0.702 | 0.154 | | 4.557 | 0.000 |
| | Age | 0.006 | 0.029 | 0.007 | 0.217 | 0.828 |
| | EE | 0.808 | 0.031 | 0.803 | 26.447 | 0.000 |
| 2 | (Constant) | 1.461 | 0.317 | | 4.604 | 0.000 |
| | Age | -0.304 | 0.118 | -0.313 | -2.589 | 0.010 |
| | EE | 0.626 | 0.073 | 0.622 | 8.533 | 0.000 |
| | EE_Age | 0.076 | 0.028 | 0.344 | 2.729 | 0.007 |
| a. Dependent Variable: BI | | | | | | |

Table 4-65: Model Summary of Regression Analysis (EE and Gender)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.803[a] | 0.645 | 0.643 | 0.58054 | 0.645 | 368.202 | 2 | 405 | 0.000 |
| 2 | 0.814[b] | 0.663 | 0.661 | 0.56621 | 0.018 | 21.765 | 1 | 404 | 0.000 |
| a. Predictors: (Constant), EE, Gender | | | | | | | | | |
| b. Predictors: (Constant), EE, Gender, EE_Gender | | | | | | | | | |

Table 4-66: Analysis of Variance (EE and Gender)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 248.188 | 2 | 124.094 | 368.202 | 0.000[b] |
| | Residual | 136.496 | 405 | 0.337 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 255.165 | 3 | 85.055 | 265.308 | 0.000[c] |
| | Residual | 129.518 | 404 | 0.321 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), EE, Gender | | | | | | |
| c. Predictors: (Constant), EE, Gender, EE_Gender | | | | | | |

Table 4-67: Coefficient for Regression (EE and Gender)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 0.947 | 0.175 | | 5.402 | 0.000 |
| | Gender | -0.127 | 0.068 | -0.058 | -1.874 | 0.062 |
| | EE | 0.791 | 0.031 | 0.786 | 25.552 | 0.000 |
| 2 | (Constant) | 2.611 | 0.396 | | 6.601 | 0.000 |
| | Gender | -1.258 | 0.251 | -0.572 | -5.006 | 0.000 |
| | EE | 0.383 | 0.092 | 0.381 | 4.149 | 0.000 |
| | EE_Gender | 0.284 | 0.061 | 0.578 | 4.665 | 0.000 |
| a. Dependent Variable: BI | | | | | | |

The above results (Table 62-67) depict that age and gender significantly moderate the effect between EE and BI as the value of change of R-square is significant [(Age, 0.007) & (Gender, 0.000)], which means that while including the moderating variables (age and gender), the relationship between EE and BI is significantly affected. Therefore, age and gender play a moderating role between EE and BI statistically, leading to the acceptance of hypothesis H4.

### 4.8.2.13 H6: The association between Social Influence and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

Table 4-68: Model Summary of Regression Analysis (SI and Age)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.810[a] | 0.656 | 0.654 | 0.57150 | 0.656 | 386.407 | 2 | 405 | 0.000 |
| 2 | 0.813[b] | 0.661 | 0.659 | 0.56797 | 0.005 | 6.042 | 1 | 404 | 0.014 |
| a. Predictors: (Constant), SI, Age | | | | | | | | | |
| b. Predictors: (Constant), SI, Age, SI_Age | | | | | | | | | |

Table 4-69: Analysis of Variance (SI and Age)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 252.407 | 2 | 126.204 | 386.407 | 0.000[b] |
| | Residual | 132.276 | 405 | 0.327 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 254.356 | 3 | 84.785 | 262.826 | 0.000[c] |
| | Residual | 130.327 | 404 | 0.323 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), SI, Age | | | | | | |
| c. Predictors: (Constant), SI, Age, SI_Age | | | | | | |

Table 4-70: Coefficient for Regression (SI and Age)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 0.928 | 0.142 | | 6.521 | 0.000 |
| | Age | 0.010 | 0.029 | 0.010 | 0.340 | 0.734 |
| | SI | 0.744 | 0.027 | 0.812 | 27.284 | 0.000 |
| 2 | (Constant) | 1.569 | 0.297 | | 5.288 | 0.000 |
| | Age | -0.253 | 0.111 | -0.260 | -2.285 | 0.023 |
| | SI | 0.593 | 0.067 | 0.647 | 8.808 | 0.000 |
| | SI_Age | 0.064 | 0.026 | 0.295 | 2.458 | 0.014 |
| a. Dependent Variable: BI | | | | | | |

Table 4-71: Model Summary of Regression Analysis (SI and Gender)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.812[a] | 0.659 | 0.658 | 0.56877 | 0.659 | 392.075 | 2 | 405 | 0.000 |
| 2 | 0.820[b] | 0.672 | 0.669 | 0.55906 | 0.012 | 15.180 | 1 | 404 | 0.000 |
| a. Predictors: (Constant), SI, Gender | | | | | | | | | |
| b. Predictors: (Constant), SI, Gender, SI_Gender | | | | | | | | | |

Table 4-72: Coefficient for Regression (SI and Gender)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.185 | 0.162 | | 7.298 | 0.000 |
| | Gender | -0.133 | 0.066 | -0.060 | -2.004 | 0.046 |
| | SI | 0.728 | 0.028 | 0.794 | 26.404 | 0.000 |
| 2 | (Constant) | 2.477 | 0.368 | | 6.731 | 0.000 |
| | Gender | -0.986 | 0.229 | -0.448 | -4.315 | 0.000 |
| | SI | 0.416 | 0.084 | 0.454 | 4.928 | 0.000 |
| | SI_Gender | 0.211 | 0.054 | 0.457 | 3.896 | 0.000 |
| a. Dependent Variable: BI | | | | | | |

The above results (Table 68-72) depict that age and gender significantly moderate the effect between SI and BI as the value of change of R-square is significant [(Age, 0.014) & (Gender, 0.000)], which means that while including the moderating variables (age and gender), the relationship between SI and BI is significantly affected. Therefore, age and gender play a moderating role between SI and BI statistically, leading to the acceptance of hypothesis H6.

#### 4.8.2.13 H8: The association between Facilitating Condition and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

Table 4-73: Model Summary of Regression Analysis (FC and Age)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.577[a] | 0.333 | 0.330 | 0.79575 | 0.333 | 101.252 | 2 | 405 | 0.000 |
| 2 | 0.578[b] | 0.334 | 0.329 | 0.79640 | 0.001 | 0.339 | 1 | 404 | 0.561 |
| a. Predictors: (Constant), FC, Age | | | | | | | | | |
| b. Predictors: (Constant), FC, Age, FC_Age | | | | | | | | | |

Table 4-74: Analysis of Variance (FC and Age)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 128.230 | 2 | 64.115 | 101.252 | 0.000[b] |
| | Residual | 256.454 | 405 | 0.633 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 128.445 | 3 | 42.815 | 67.504 | 0.000[c] |
| | Residual | 256.239 | 404 | 0.634 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), FC, Age | | | | | | |
| c. Predictors: (Constant), FC, Age, FC Age | | | | | | |

Table 4-75: Coefficient for Regression (FC and Age)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.972 | 0.198 | | 9.972 | 0.000 |
| | Age | -0.051 | 0.040 | -0.052 | -1.271 | 0.205 |
| | FC | 0.551 | 0.040 | 0.566 | 13.706 | 0.000 |
| 2 | (Constant) | 2.168 | 0.390 | | 5.554 | 0.000 |
| | Age | -0.136 | 0.152 | -0.141 | -0.896 | 0.371 |
| | FC | 0.502 | 0.094 | 0.515 | 5.359 | 0.000 |
| | FC Age | 0.022 | 0.038 | 0.096 | 0.582 | 0.561 |
| a. Dependent Variable: BI | | | | | | |

Table 4-76: Model Summary of Regression Analysis (FC and Gender)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.577[a] | 0.333 | 0.330 | 0.79601 | 0.333 | 101.053 | 2 | 405 | 0.000 |
| 2 | 0.580[b] | 0.337 | 0.332 | 0.79478 | 0.004 | 2.260 | 1 | 404 | 0.134 |
| a. Predictors: (Constant), FC, Gender | | | | | | | | | |
| b. Predictors: (Constant), FC, Gender, FC_Gender | | | | | | | | | |

Table 4-77: Analysis of Variance (FC and Gender)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 128.062 | 2 | 64.031 | 101.053 | 0.000[b] |
| | Residual | 256.622 | 405 | 0.634 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 129.489 | 3 | 43.163 | 68.332 | 0.000[c] |
| | Residual | 255.194 | 404 | 0.632 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), FC, Gender | | | | | | |
| c. Predictors: (Constant), FC, Gender, FC_Gender | | | | | | |

Table 4-78: Coefficient for Regression (FC and Gender)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 2.052 | 0.251 | | 8.162 | 0.000 |
| | Gender | -0.113 | 0.097 | -0.051 | -1.161 | 0.246 |
| | FC | 0.540 | 0.043 | 0.555 | 12.558 | 0.000 |
| 2 | (Constant) | 1.312 | 0.553 | | 2.374 | 0.018 |
| | Gender | 0.375 | 0.339 | 0.170 | 1.107 | 0.269 |
| | FC | 0.730 | 0.133 | 0.749 | 5.489 | 0.000 |
| | FC_Gender | -0.130 | 0.086 | -0.238 | -1.503 | 0.134 |
| a. Dependent Variable: BI | | | | | | |

The above results (Table 73-78) depict that age and gender do not significantly moderate the effect between FC and BI as the value of change of R-square is insignificant [(Age, 0.561) & (Gender, 0.134)], which means that while including the moderating variables (age and gender), the relationship between FC and BI is not affected significantly. Therefore, age and gender do not play a moderating role between FC and BI statistically, leading to the rejection of hypothesis H8.

#### 4.8.2.14 H10: The association between Perceived Playfulness and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

Table 4-79: Model Summary of Regression Analysis (PP and Age)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.833[a] | 0.694 | 0.692 | 0.53911 | 0.694 | 459.285 | 2 | 405 | 0.000 |
| 2 | 0.834[b] | 0.696 | 0.694 | 0.53796 | 0.002 | 2.738 | 1 | 404 | 0.099 |
| a. Predictors: (Constant), PP, Age | | | | | | | | | |
| b. Predictors: (Constant), PP, Age, PP_Age | | | | | | | | | |

Table 4-80: Analysis of Variance (PP and Age)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 266.974 | 2 | 133.487 | 459.285 | 0.000[b] |
| | Residual | 117.710 | 405 | 0.291 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 267.766 | 3 | 89.255 | 308.416 | 0.000[c] |
| | Residual | 116.917 | 404 | 0.289 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), PP, Age | | | | | | |
| c. Predictors: (Constant), PP, Age, PP_Age | | | | | | |

Table 4-81: Coefficient for Regression (PP and Age)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 0.524 | 0.143 | | 3.654 | 0.000 |
| | Age | 0.035 | 0.027 | 0.036 | 1.263 | 0.207 |
| | PP | 0.835 | 0.028 | 0.840 | 29.777 | 0.000 |
| 2 | (Constant) | 0.971 | 0.306 | | 3.174 | 0.002 |
| | Age | -0.143 | 0.111 | -0.148 | -1.292 | 0.197 |
| | PP | 0.728 | 0.070 | 0.733 | 10.347 | 0.000 |
| | PP_Age | 0.044 | 0.026 | 0.196 | 1.655 | 0.099 |
| a. Dependent Variable: BI | | | | | | |

Table 4-82: Model Summary of Regression Analysis (PP and Gender)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.832[a] | 0.693 | 0.691 | 0.54011 | 0.693 | 456.840 | 2 | 405 | 0.000 |
| 2 | 0.836[b] | 0.699 | 0.697 | 0.53516 | 0.006 | 8.530 | 1 | 404 | 0.004 |
| a. Predictors: (Constant), PP, Gender | | | | | | | | | |
| b. Predictors: (Constant), PP, Gender, PP_Gender | | | | | | | | | |

Table 4-83: Analysis of Variance (PP and Gender)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 266.538 | 2 | 133.269 | 456.840 | 0.000[b] |
| | Residual | 118.146 | 405 | 0.292 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 268.980 | 3 | 89.660 | 313.066 | 0.000[c] |
| | Residual | 115.703 | 404 | 0.286 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), PP, Gender | | | | | | |
| c. Predictors: (Constant), PP, Gender, PP_Gender | | | | | | |

Table 4-84: Coefficient for Regression (PP and Gender)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 0.664 | 0.167 | | 3.983 | 0.000 |
| | Gender | -0.019 | 0.064 | -0.009 | -0.304 | 0.761 |
| | PP | 0.824 | 0.029 | 0.830 | 28.587 | 0.000 |
| 2 | (Constant) | 1.707 | 0.393 | | 4.339 | 0.000 |
| | Gender | -0.689 | 0.238 | -0.313 | -2.897 | 0.004 |
| | PP | 0.572 | 0.091 | 0.576 | 6.282 | 0.000 |
| | PP_Gender | 0.167 | 0.057 | 0.339 | 2.921 | 0.004 |
| a. Dependent Variable: BI | | | | | | |

The above results (Table 78-84) depict that gender significantly moderates the effect between PP and BI as the value of change of R-square is significant for gender, i.e. 0.004, which means that while including the moderating variables of gender, the relationship between PP and BI is significantly affected. However, the value of change of R-square for age is 0.099, which is greater than 0.05 indicating that age does not play a moderating role between PP and BI, leading to the rejection of hypothesis H10.

#### 4.8.2.15 H12: The association between Self-Management of Learning and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

Table 4-85: Model Summary of Regression Analysis (SML and Age)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.641[a] | 0.411 | 0.408 | 0.74773 | 0.411 | 141.516 | 2 | 405 | 0.000 |
| 2 | 0.642[b] | 0.412 | 0.407 | 0.74849 | 0.000 | 0.186 | 1 | 404 | 0.666 |
| a. Predictors: (Constant), SML, Age | | | | | | | | | |

| |
|---|
| b. Predictors: (Constant), SML, Age, SML_Age |

Table 4-86: Analysis of Variance (SML and Age)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 158.245 | 2 | 79.123 | 141.516 | 0.000[b] |
| | Residual | 226.438 | 405 | 0.559 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 158.350 | 3 | 52.783 | 94.217 | 0.000[c] |
| | Residual | 226.334 | 404 | 0.560 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), SML, Age | | | | | | |
| c. Predictors: (Constant), SML, Age, SML_Age | | | | | | |

Table 4-87: Coefficient for Regression (SML and Age)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.491 | 0.196 | | 7.592 | 0.000 |
| | Age | 0.011 | 0.038 | 0.011 | 0.278 | 0.782 |
| | SML | 0.632 | 0.039 | 0.644 | 16.323 | 0.000 |
| 2 | (Constant) | 1.645 | 0.406 | | 4.049 | 0.000 |
| | Age | -0.053 | 0.152 | -0.054 | -0.347 | 0.728 |
| | SML | 0.595 | 0.095 | 0.606 | 6.252 | 0.000 |
| | SML_Age | 0.016 | 0.037 | 0.069 | 0.431 | 0.666 |
| a. Dependent Variable: BI | | | | | | |

Table 4-91: Model Summary of Regression Analysis (SML and Gender)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.644[a] | 0.414 | 0.411 | 0.74591 | 0.414 | 143.203 | 2 | 405 | 0.000 |
| 2 | 0.644[b] | 0.415 | 0.411 | 0.74640 | 0.001 | 0.465 | 1 | 404 | 0.496 |
| a. Predictors: (Constant), SML, Gender | | | | | | | | | |
| b. Predictors: (Constant), SML, Gender, SML_Gender | | | | | | | | | |

Table 4-88: Analysis of Variance (SML and Gender)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 159.350 | 2 | 79.675 | 143.203 | 0.000[b] |
| | Residual | 225.333 | 405 | 0.556 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 159.609 | 3 | 53.203 | 95.498 | 0.000[c] |
| | Residual | 225.074 | 404 | 0.557 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), SML, Gender | | | | | | |
| c. Predictors: (Constant), SML, Gender, SML_Gender | | | | | | |

Table 4-893: Coefficient for Regression (SML and Gender)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.765 | 0.229 | | 7.713 | 0.000 |
| | Gender | -0.128 | 0.089 | -0.058 | -1.436 | 0.152 |
| | SML | 0.610 | 0.040 | 0.621 | 15.357 | 0.000 |
| 2 | (Constant) | 2.086 | 0.523 | | 3.990 | 0.000 |
| | Gender | -0.337 | 0.320 | -0.153 | -1.055 | 0.292 |
| | SML | 0.530 | 0.124 | 0.540 | 4.260 | 0.000 |
| | SML_Gender | 0.054 | 0.080 | 0.105 | 0.682 | 0.496 |
| a. Dependent Variable: BI | | | | | | |

The above results (Table 85-93) depict that age and gender do not significantly moderate the effect between SML and BI as the value of change of R-square is insignificant [(Age, 0.666) & (Gender, 0.496)], which means that while including the moderating variables (age and gender), the relationship between SML and BI is not affected significantly. Therefore, age and gender do not play a moderating role between SML and BI statistically, leading to the rejection of hypothesis H8.

#### 4.8.2.16 H14: The association between Attitude towards technology and behavioral intentions to adopt M-learning will be significantly affected by gender and age.

Table 4-94: Model Summary of Regression Analysis (ATT and Age)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.736[a] | 0.542 | 0.540 | 0.65964 | 0.542 | 239.537 | 2 | 405 | 0.000 |
| 2 | 0.745 | 0.555 | 0.552 | 0.65089 | 0.013 | 11.959 | 1 | 40 | 0.001 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | b | | | | | | | 4 | |

a. Predictors: (Constant), ATT, Age

b. Predictors: (Constant), ATT, Age, ATT_Age

Table 4-95: Analysis of variance (ATT and Age)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 208.457 | 2 | 104.229 | 239.537 | 0.000[b] |
| | Residual | 176.226 | 405 | 0.435 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 213.524 | 3 | 71.175 | 167.999 | 0.000[c] |
| | Residual | 171.159 | 404 | 0.424 | | |
| | Total | 384.683 | 407 | | | |

a. Dependent Variable: BI

b. Predictors: (Constant), ATT, Age

c. Predictors: (Constant), ATT, Age, ATT_Age

Table 4-96: Coefficient for Regression (ATT and Age)

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.291 | 0.163 | | 7.932 | 0.000 |
| | Age | -0.051 | 0.033 | -0.053 | -1.557 | 0.120 |
| | ATT | 0.691 | 0.032 | 0.727 | 21.395 | 0.000 |
| 2 | (Constant) | 2.360 | 0.348 | | 6.773 | 0.000 |
| | Age | -0.514 | 0.138 | -0.529 | -3.733 | 0.000 |
| | ATT | 0.440 | 0.079 | 0.462 | 5.536 | 0.000 |
| | ATT_Age | 0.110 | 0.032 | 0.524 | 3.458 | 0.001 |

a. Dependent Variable: BI

Table. 4-90: Model Summary of Regression Analysis (ATT and Gender)

| Model Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | 0.747[a] | 0.558 | 0.556 | 0.64766 | 0.558 | 256.045 | 2 | 405 | 0.000 |
| 2 | 0.764[b] | 0.583 | 0.580 | 0.62979 | 0.025 | 24.308 | 1 | 404 | 0.000 |
| a. Predictors: (Constant), ATT, Gender | | | | | | | | | |
| b. Predictors: (Constant), ATT, Gender, ATT_Gender | | | | | | | | | |

Table 4-98: Analysis of Variance (ATT and Gender)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 214.802 | 2 | 107.401 | 256.045 | 0.000[b] |
| | Residual | 169.882 | 405 | 0.419 | | |
| | Total | 384.683 | 407 | | | |
| 2 | Regression | 224.443 | 3 | 74.814 | 188.623 | 0.000[c] |
| | Residual | 160.240 | 404 | 0.397 | | |
| | Total | 384.683 | 407 | | | |
| a. Dependent Variable: BI | | | | | | |
| b. Predictors: (Constant), ATT, Gender | | | | | | |
| c. Predictors: (Constant), ATT, Gender, ATT_Gender | | | | | | |

Table 4-91: Coefficient for Regression (ATT and Gender)

| **Coefficients[a]** | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.651 | 0.179 | | 9.203 | 0.000 |
| | Gender | -0.310 | 0.074 | -0.141 | -4.200 | 0.000 |
| | ATT | 0.674 | 0.032 | 0.709 | 21.095 | 0.000 |
| 2 | (Constant) | 3.473 | 0.409 | | 8.499 | 0.000 |
| | Gender | -1.564 | 0.264 | -0.711 | -5.919 | 0.000 |
| | ATT | 0.232 | 0.095 | 0.244 | 2.449 | 0.015 |
| | ATT_Gender | 0.310 | 0.063 | 0.685 | 4.930 | 0.000 |
| a. Dependent Variable: BI | | | | | | |

The above results (Table 94-99) depict that age and gender significantly moderate the effect between ATT and BI as the value of change of R-square is significant [(Age, 0.001) & (Gender, 0.000)], which means that while including the moderating variables (age and gender), the relationship between ATT and BI is significantly affected. Therefore, age and gender play a moderating role between ATT and BI statistically, leading to the acceptance of hypothesis H14.

# CHAPTER 5

# FINDINGS, RECOMMENDATIONS AND CONCLUSION

## 5.0 Findings

In this chapter, the findings and results from the various statistical tests carried out in chapter four will be discussed. This chapter will comprise of the summary of descriptive analysis, summary of inferential analysis, important findings and implications, recommendation and conclusion.

## 5.1 Summary of Descriptive Analysis

Table 5-1: Summary of Demographic profiles

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| **Gender** | | | | |
| **Male** | 300 | 73.0 | 73.5 | 73.0 |
| **Female** | 108 | 26.5 | 26.5 | 100.0 |
| **Age** | | | | |
| **Less than 20 years** | 150 | 36.8 | 36.8 | 36.8 |
| **20 to 24 years** | 131 | 32.1 | 32.1 | 68.9 |
| **25 to 30 years** | 83 | 20.3 | 20.3 | 89.2 |
| **Above 30 years** | 44 | 10.8 | 10.8 | 100.0 |
| **Qualification** | | | | |
| **Under Graduate** | 220 | 53.9 | 53.9 | 53.9 |
| **Graduate** | 146 | 35.8 | 35.8 | 89.7 |
| **Post Graduate** | 42 | 10.3 | 10.3 | 100.0 |
| **Mobile Classification** | | | | |
| **Call & Text** | 103 | 25.2 | 25.2 | 25.2 |
| **Smart phone – Connectivity** | 193 | 47.3 | 47.3 | 72.5 |
| **PDA** | 51 | 12.5 | 12.5 | 85.5 |
| **Tablet PC** | 45 | 11.0 | 11.0 | 96.1 |
| **Other devices** | 16 | 3.9 | 3.9 | 100.0 |
| **Mobile Usage** | | | | |
| **Daily** | 247 | 60.5 | 60.5 | 60.5 |
| **Weekly** | 107 | 26.2 | 26.2 | 86.8 |
| **Monthly** | 42 | 10.3 | 10.3 | 97.1 |
| **Rarely** | 12 | 2.9 | 2.9 | 100.0 |
| **Internet Access via Mobile Device** | | | | |
| **Yes** | 263 | 64.5 | 64.5 | 64.5 |
| **No** | 145 | 35.5 | 35.5 | 100.0 |
| **Educational Application** | | | | |
| **Yes** | 319 | 78.2 | 78.2 | 78.2 |
| **No** | 89 | 21.8 | 21.8 | 100.0 |
| **Educational Content** | | | | |
| **Yes** | 186 | 45.6 | 45.6 | 45.6 |
| **No** | 222 | 54.4 | 54.4 | 100.0 |
| **M Learning Heard** | | | | |
| **Yes** | 280 | 68.6 | 68.6 | 68.6 |
| **No** | 128 | 31.4 | 31.4 | 100.0 |
| **M Learning Opinion** | | | | |
| **Good idea and like to use** | 297 | 72.8 | 72.8 | 72.8 |

| | | | | |
|---|---|---|---|---|
| **Good idea and not like to use** | 57 | 14.0 | 14.0 | 86.8 |
| **Think not a good idea** | 25 | 6.1 | 6.1 | 92.9 |
| **Others** | 29 | 7.1 | 7.1 | 100.0 |

The above table pertains to the various frequencies of the demographic variables (Institutes, Gender, Age, Qualification, Mobile classification, Mobile usage, Internet Access, Educational application, Educational content, Mobile learning Heard and Mobile learning Opinion). The results showed that the data has been collected from a total of 408 respondents, out of which 300 were males and the remaining 108 were females. Furthermore, the respondents belonged to different age groups, with 150 respondents belonging to an age group of less than 20 years, 131 respondents having their ages between 20 to 24 years, 83 respondents having their ages between 25 to 30 years and remaining belonged to the age group of above 30 years. The above table also elaborates the information of institutions of the twin cities from where the data has been gathered. The maximum number of responses, i.e. 58 were taken from College of EME, while the least number were taken from FAST Islamabad. Most of the respondents were undergraduate students, belonging to the age groups of under 20. This is because according to the statistics obtained from HEC, the highest ratio of students in Pakistan belong to the undergraduate group, which will be affected the most by the introduction of m-learning in Pakistan. Thus, it was evidently important to cater to their responses.

The maximum number of respondents are using smart phones. Smartphones are now available in cheap prices and have become affordable for students, enabling them to perform various computational functions. This can lead to more users incorporating m-learning in their education, as they can easily access educational content through their mobiles. A number of users also has access to PDAs and other similar devices that support the use of m-learning. This shows that most of the students studying the higher institutes of Pakistan have the required resources to support m-learning.

According to the results, the greatest number of students use their mobile phones daily. This means that if they are offered m-learning, they would be able to use it very frequently. Around 263 respondents i.e 65% have the facility to access internet through their mobile phones. This shows that majority of the students can access educational material through their mobile phones, anytime, anywhere, which is the main idea behind m-learning. Thus

according to these results, students are well equipped with the facilities required to use m-learning on their own.

A large number of respondents, i.e. 78.2% are already accessing educational applications through their mobile devices. This means that they are already in a habit of using various educations apps for their studies. Moreover, this shows that students are already accessing especially designed educational software or apps for Android or Apple mobile devices. Thus if they are offered the opportunity to learn through their mobile devices, they will be able to excel in this field easily.

Moreover, about 45.6% of the respondents access educational content through their mobile devices. This includes searching online, reading e-books or papers online, viewing educational lectures and videos, and doing other kinds of educational work such as storing and saving information on their mobile devices. Being already in a habit of reading educational content using mobile technology for educational purposes, if students are offered m-learning, they will accept it enthusiastically.

Moreover, 68.6% of the respondents have already heard about m-learning and know about its requirements and procedures. This large value can also be because of the explanation of m-learning given in the beginning of the questionnaire which has enabled the respondents to gain knowledge about the subject.

This is further supported by the result of 72.8% respondents having the opinion that mobile learning is an appealing concept and they will be willing to use it in the future because students consider technology to play an important role in their education and find using m-learning tool as exciting and flexible. Thus according to the demographic results, we can deduce that most of the students, especially the students belonging to the undergraduate group, have the required resources e.g. smart phones and PDAs with internet access, and are of the opinion that they would like to use m-learning as they are already accessing educational contents through their mobile devices.

## 5.2 Summary of Inferential Analysis

### 5.2.1 Main Effect

In order to investigate the student’s intentions to adopt m-learning, this study was conducted using the UTAUT model, by incorporating three additional constructs to the traditional

model, i.e. Perceived Playfulness, Self-Management of learning and Attitude towards the use of Technology. This study is amongst ones conducted in Pakistan to analyze the students' behavioral intentions to adopt m-learning in the higher education sector of Pakistan. According to the results achieved, Effort Expectancy, Performance Expectancy, Social Influence, Perceived Playfulness and Attitude towards the use of Technology were positively related to behavioral intention to adopt mobile learning, while Facilitating conditions and Self-Management of Learning were found to have no profound relationship with Behavioral Intentions. The results acquired from this study revealed several important findings for the successful acceptance and employment of mobile learning in the higher institutes of Pakistan.

Consistent with the findings of Jairak et al. (2009) and Wang et al. (2009), it was found that performance expectancy has a positive relationship ($\beta = 0.133$) with behavioral intentions. This means that students with greater level of performance expectancy are expected more to adopt mobile learning (Omar et al., 2014; Joongkak Kook, 2014, Venkatesh et al., 2003). Thus students are ready to accept and adopt m-learning because they believe that mobile learning is convenient and will help them to complete their tasks quickly and more competently. Students are also of the opinion that m-learning will enable them to improve their learning productivity and achieve better results (Joel et al., 2014). Thus to promote performance expectancy, it is important for educators to design m-learning tools that facilitate students in learning, are convenient and efficient to use, are less costly, and enable the students to complete important tasks in less time. Moreover, the developers should incorporate the demands and suggestions of the students while designing m-learning tools and facilities in order to meet their performance expectations.

Effort expectancy also had a positive effect ($\beta = 0.176$) on behavioral intentions to adopt m-learning (Omar et al., 2014; Ayman, 2013; Joel et al., 2014 Venkatesh et al., 2003), consistent with the findings of past studies. This indicates that most of the students are of the opinion that mobile learning systems should be convenient to use and should be comprehensible (Abu-al-aish & Love, 2013) and the students have the skills required to use m-learning. As indicated by Wang et al. (2009), mobiles devices have the limitations of a smaller screen size, less memory, limited computational power, short battery life and smaller keyboards which may cause difficulties for users. So if the students perceive m-learning systems as complicated and difficult to use, they may feel discouraged to use them. Thus in order to effectively meet the effort expectancy of the students, developers should create user-

friendly, easy to use m-learning interfaces that are simple to understand and require least amount of storage space so that students become more willing to accept them.

Social influence also had a positive relationship ($\beta = 0.187$) with behavioral intention to use m-learning (Joel et al., 2014; Omar et al., 2014; Jairak et al., 2009; Venkatesh et al., 2003). The adoption of m-learning by peers and educators can persuade students to accept its usefulness and ease of use, motivating them to adopt m-learning as well. Thus it's imperative for mobile learning practitioners to motivate their peers and friends to adopt m-learning, as the opinions of the early adopters will positively encourage other users as well. Moreover, according to previous literature, if the number of users reach a critical mass point, m-learning adopters will then start increasing rapidly (Rogers, 2003).

According to the results of this study, Facilitating Conditions does not have a significant effect on the behavioral intention to use m-learning. This insignificant effect is not a new concept as past literature also illustrates varying findings with reference to the effect of facilitating conditions on the adoption of m-learning (Dwivedi et al., 2011; Omar et al., 2014). This concept was originally presented by Venkatesh et al. (2003), as he claimed that the effect of facilitating conditions becomes insignificant on behavioral intentions, when the determinants of performance expectancy and effort expectancy are present. The main reason behind this concept is that facilitating conditions when considered in the light of providing access, technical sustenance or other issues would affect the frequency of use but not the behavioral intention to adopt mobile learning. This is also reinforced by other studies (e.g. Datta, 2011) that explain that the effect of facilitating conditions on the adoption of technology is not direct in developing countries. This is mainly because of the fact that that technology users in developing countries are mostly late in the adoption of new technologies such as m-learning, whereas users in developed countries are quick in the adoption of new and pioneering technologies. However, the research regarding the effect of facilitating conditions on behavioral intentions requires further work, as this relationship has been found to be positive in some past studies (e.g. Iqbal & Qureshi, 2012; Jairak et al., 2009), although it is inconsistent with the original UTAUT model presented by Venkatesh et al. (2003).

Consistent with the studies conducted in the past (e.g. Moon & Kim, 2001; Iqbal & Qureshi, 2012; Wang et al, 2009; Hadi Z.F. & Dr Kishik, 2014), Perceived playfulness was found to be the strongest predictor ($\beta = 0.265$) of m-learning, as it has a positive association with

behavioral intention to use mobile learning. If the students enjoy m-learning, then they will be motivated more to use it. Thus in order to attract a large number of users, it is important for developers to design m-learning in such a way that it is enjoyable and fun to use for the students. Being the strongest predictor of adoption of m-learning amongst students, it is imperative that more stress should be laid on making m-learning interface such that it is enjoyable, leading to increased curiosity and exploration of the students, enabling them to spend extensive time learning while enjoying the activity.

The results of this study indicated that there is no significant relationship between Self-Management of learning and behavioral intention to use M-learning inconsistent with past study (Lownthal, 2010). This additional construct has also been used in past studies as well (Wang Wu Wang,2009; Hadi Z.F. & Dr Kishik, 2014, Ali A et al., 2013). This non-significant relationship can be due to the fact that Pakistan, being a developing country, mostly comprises of students that are in favor of traditional classroom environment and perceive that it will be difficult for them to set their own pace without any supervision or guidance from any teachers. M-learning can be incorporated together with traditional methods of learning such as a blended education system (Matheos et al., 2005) by introducing mobile devices in traditional classroom environment to promote the concept of self-management.

According to the findings of this study, Attitude towards the use of the technology for learning was found to be positively related to behavioral intention, which is in consistency with other studies conducted in the past (e.g. Jairak et al., 2009; Jangkak Kook, 2014). However, this result contradicts with the original model presented by Venkatesh et al. (2003) that predicts that when a strong relationship exists between performance expectancy and intention and effort expectancy and intention to adopt new technology, then attitude towards the use of technology will not have significant relationship with behavioral intention to adopt mobile learning. The positive relationship found in this study can be because of the fact that most of the students perceive m-learning as fun to use (leading to the positive relationship between perceived playfulness and behavioral intention to adopt m-learning), and are motivated towards using m-learning.

### 5.2.2 Moderation Effect

The results of this study establish that m-learning is perceived as an important tool by students, aimed towards learning through new modes of technology and the determinants included in this study predict that m-learning will be readily accepted by students in HEIs of Pakistan. It was further found that age and gender play a moderating role between most of the determinants of m-learning and the behavioral intention to adopt m-learning in Pakistan. According to the results, Performance expectancy and Effort expectancy are moderated by the effects of age and gender leading to the fact that the students belonging to different age groups, whether they are males or females, perceive that their performance will increase and it will be easy for them to use m-learning. This means that age differences will be taken into account while designing the m-learning systems. This is further supported by previous researches (Kiili, 2005) that identify that a person will perform his best, and enjoy his experience if he meets challenges that are matched according to his age capacity. Similarly, Social influence and Attitude towards the use of technology are both moderated by age and gender, signifying that students belonging to different ages, both males and females, will be affected by the opinion of others to adopt m-learning and their aptitude towards the use of technology will play an important role in their adoption of m-learning. Facilitating conditions and self-management of learning were both found to be insignificant, thus no moderating effect was found on their relationships with behavioral intention to adopt m-learning. However, the relationship of perceived playfulness with behavioral intention to adopt m-learning was found to be moderated by age but not by gender.

Thus it is imperative for m-learning developers and educators to design m-learning programs that are easy to use, matched according to the educational level of the students, providing contents that match the user's needs and requirements, leading to increased performance and greater satisfaction of students making m-learning an enjoyable experience.

Table 5-2: Summary of Inferential Analysis

| Hypothesis | Results |
|---|---|
| **$H_{01}$: Performance Expectancy has no relationship with behavioral intention to use M-learning.** | Not Supported |
| **H1: Performance expectancy has a positive relationship with behavioral intention to use M-learning.** | Supported |
| **H2: The association between Performance Expectancy and behavioral intentions to adopt M-learning will be significantly affected by gender and age.** | Supported |
| **$H_{02}$: Effort Expectancy has no relationship with behavioral intention to use M-learning.** | Not Supported |
| **H3: Effort expectancy has a positive relationship with behavioral intention to use M-learning.** | Supported |
| **H4: The association between Effort Expectancy and behavioral intentions to adopt M-learning will be significantly affected by gender and age.** | Supported |
| **$H_{03}$: Social Influence has no relationship with behavioral intention to use M-learning.** | Not Supported |
| **H5: Social influence has a positive relationship on behavioral intention** | Supported |

| | |
|---|---|
| **to use M-learning.** | |
| **H6: The association between Social Influence and behavioral intentions to adopt M-learning will be significantly affected by gender and age.** | Supported |
| **$H_{04}$: Facilitating Conditions has no relationship with behavioral intention to use M-learning** | Supported |
| **H7: Facilitating conditions has a positive relationship on behavioral intention to use M-learning.** | Not Supported |
| **H8: The association between Facilitating Conditions and behavioral intentions to adopt M-learning will be significantly affected by gender and age.** | Not Supported |
| **$H_{05}$: Perceived Playfulness has no relationship with behavioral intention to use M-learning** | Not Supported |
| **H9: Perceived playfulness has a positive relationship with behavioral intention to use M- learning.** | Supported |
| **H10: The association between Perceived Playfulness and behavioral intentions to adopt M-learning will be significantly affected by gender and age.** | Not Supported |
| **$H_{06}$: Self-Management of learning has no relationship with behavioral intention to use M-learning** | Supported |
| **H11: Self-management of learning has a positive relationship with behavioral intention to use M-learning.** | Not Supported |
| **H12: The association between Self-Management of Learning and behavioral intentions to adopt M-learning will be significantly affected by gender and age.** | Not Supported |
| **$H_{07}$: Attitude towards Technology has no relationship with behavioral intention to use M-learning** | Not Supported |

| | |
|---|---|
| **H13: Attitude towards the use of the technologies for learning is positively related to behavioral intention.** | Supported |
| **H14: The association between Attitude towards technology and behavioral intentions to adopt M-learning will be significantly affected by gender and age.** | Supported |

## 5.3 Recommendations and Future Research Work

Mobile learning is a new emerging field in Pakistan. This study contributed towards the investigation to determine the acceptance of mobile learning amongst students of higher education institutions of Pakistan, with the help of past empirical studies. The following research work can be carried out in the future to extend the work of this study.

5.3.1 The scope of this study encompasses ten universities in the twin universities of Rawalpindi and Islamabad. Thus the results cannot be completely generalized to give the views of all the students of Pakistan. Therefore future researchers can include universities from different cities, other than the twin cities, to get more generalized results. Moreover, universities belonging to different fields of education, such as engineering, medicine, business administration and fine arts, can also be included to further advance this research.

5.3.2 The study has been carried out within stipulated timeframe and scope, thus making the current study cross-sectional. However, the perception of users alters as time goes by. Thus future research can include longitudinal study in which researchers will be able to identify changes and improvements in the behavior of the students instead of assessing at a single instant of time.

5.3.3 Since mobile learning is a new concept, the study does not investigate through the actual users and works on the users' prediction to accept the new system. However, past studies provide enough evidence to establish a causal relationship between intention and actual usage (Venkatesh & Davis, 2000; Venkatesh & Morris, 2000).

5.3.4 Only two demographic characteristics i.e. age and gender have been tested as moderator between the relationship of independent variables and dependent variable.

To further investigate the causal relationships depicted in the model, more moderating variables such as experience and voluntariness of use can be added to find out their effect on the behavioral intention to adopt m-learning.

5.3.5 Age and gender have found to play a moderating role in this study. However, additional research work can be carried out to identify the differences between the moderating effect of different age groups and different genders. This can help to aim at those specific age groups who are more motivated towards the use of m-learning, with respect to each determinant under study.

5.3.6 Since this study has focused upon the intention of students to accept mobile learning, further research can be done to find out about the perception of faculty and staff members regarding the usage of mobile learning.

5.3.7 Mobile devices are prone to security and privacy hazards this aspect was not covered in this study conducted therefore a future study can include these areas and investigate their impact on the acceptance of mobile learning.

5.3.8 The study can be extended to include the higher education institutes of other countries as well as the acceptance level of mobile devices varies from culture to culture and country to country.

5.3.9 Future studies can include the investigation of acceptance of mobile learning among students who are currently using D-learning or E-learning tools in their education.

5.3.10 The research work can be further extended to investigate the acceptance of m-learning in the private and government institutions of Pakistan. M-learning should then be incorporated in the respective sector that presents greater opportunity for the acceptance of m-learning.

5.3.11 Future research work can employ other technology acceptance models to investigate the determinants affecting the students' acceptance of m-learning.

## 5.4 Implications of Research

Any kind of technology transformation cannot be successful until the human mind perceives its advantages and becomes ready to accept it. This necessitates the need for evaluating the

factors affecting students' intentions to adopt m-learning. Therefore, this thesis was carried out in order to analyze and investigate the determinants influencing students' acceptance of mobile learning in higher educational institutes of Pakistan. HEC acts as an autonomous organization which has the responsibility of allocating and granting funds to different higher education institutions, and is accountable for safeguarding the content and quality of education being offered in HEIs of Pakistan. HEIs in turn have the responsibility of incorporating the policies set by HEC to ensure that the best possible modes of education are acquired to grant knowledge to the students. Based on the statistical inferences and hypothesis testing carried out, the following Macro and Micro level recommendations can be made to promote successful employment of m-learning in the HEIs of Pakistan.

### 5.4.1 Macro level

5.4.1.1 An educational policy should be chalked out by the government and implemented at the national level, compelling the higher education institutes of Pakistan to incorporate the latest technological modes of learning, such as m-learning, in their educational practices, enabling the educators and students to compete globally.

5.4.1.2 HEC being responsible for the implementation of strategic objectives should ensure that the HEIs follow the rules and policies set to incorporate the latest technological advancements in their modes of teachings and learnings.

5.4.1.3 HEC also has the privilege to allow grants and funds to HEIs. Therefore, HEC should adopt the policy of providing these grants to those HEIs that incorporate the above mentioned policies in their infrastructure, to promote latest educational programs such as m-learning in their institutions.

5.4.1.4 HEC should acknowledge the HEIs that are implementing the latest technologies and providing students the facility of m-learning by increasing their ranking and providing special funding for such developmental projects.

5.4.1.5 HEIs can promote m-learning amongst students by introducing special scholarship and loan programs aimed specifically for those students who choose m-learning programs.

5.4.1.6 M-learning should also be incorporated side by side along with traditional modes of learning or the classroom environment. This will be feasible for students as they can

view and share information online while in the classroom. Also, the video lectures can be made available for students to be viewed later on as well. In this way, students can attempt their assignments and quizzes online, get instant results, ask questions and get feedback directly at any time throughout the day, establishing direct contact with the instructors even when they are not present in the classroom, hence incorporating the idea of m-learning which stresses upon learning anytime, anywhere, beyond the traditional four walls.

### 5.4.2 Micro Level

5.4.2.1 Due to the fact that m-learning is still in its initial phases and needs to be promoted in order to increase its awareness and acceptance, different seminars and workshops should be conducted in order to motivate educators and students to integrate this new trend in their educational fields.

5.4.2.2 As m-learning depends on fast internet connectivity, in order to successfully implement m-learning programs, it is essential first that internet operators fully implement fast internet such as 3G/ 4G technology in all areas of Pakistan so that video lectures, material contents etc. can be easily viewed by users.

5.4.2.2 Mobile operators should offer special packages for students enrolled in m-learning to promote education through m-learning programs. Universities should gain access to special packages and programs that provide rebated rates for students opting for m-learning.

5.4.2.3 M-learning programs should be made affordable and should be accessible to the maximum number of users. This will be beneficial to the students of Pakistan as they can continue their studies even while doing their jobs as well, as m-learning will act as an extension to d-learning or e-learning allowing them to learn without being restricted to the four boundaries of the higher education institution.

5.4.2.4 M-learning programs should be made such that the users' performance, learning capabilities, efficiency and productivity increase through the use of m-learning. This means that the user should be able to gain access to the required knowledge in the least possible time, and should be curious enough to enjoy his learning process. The

m-learning programs formulated should be interactive and entertaining, maintaining and increasing the interest of the student.

5.4.2.5 HEIs should concentrate upon introducing m-learning programs specifically designed for the undergraduate programs as according to the results of this study, this category of students are the greatest in number that will be affected by the introduction of m-learning.

5.4.2.6 As the results of this study depict, the maximum amount of students in Pakistan possess smartphones and use them regularly. Thus developers should design m-learning applications that are easily run on smartphones, taking up least amount of space and battery consumption.

5.4.2.7 Proper training should be provided to the educators so that they can gain extensive know how of m-learning programs. Educators can then promote this to students as well and hence motivate others to use m-learning too. Training will also remove any kind of resistance from the lecturers' side, enabling them to visualize the benefits of m-learning.

5.4.2.8 Once the m-learning programs are implemented, it is important for HEC, and in turn the HEIs to continuously monitor their quality of service, and evaluate their usability and performance to increase the efficiency of the programs introduced.

## 5.5 Conclusions

This study was conducted to analyze the behavioral intentions of students to accept m-learning in Pakistan, based on the UTAUT model and the previous literature. According to the results, 76.4% of behavioral intention to accept m-learning has been explained through the model. Most of the determinants included in the study (i.e. performance expectancy, effort expectancy, social influence, perceived playfulness and attitude towards the use of technology) were found to be positively associated with the behavioral intention to adopt m-learning whereas facilitating conditions and self-management of learning were found to be negatively related to behavioral intention.

As m-learning is currently in its infancy as a new means of education, educators need to lay stress upon the factors that increase students' acceptance of the new mode of learning. Thus mobile learning programs need to be designed in such a way that they are easy and fun to use,

leading to increased curiosity and learning capability of the student. Faculty members and peers positively influence the students' perception. Therefore, they should emphasize upon the importance of m-learning, motivating their students to incorporate it in their daily lives as m-learning can be used together with traditional modes of learning to increase the learning effectiveness.

In today's ever changing environment, it is vital for every organization, including the educational sector to constantly upgrade to newer technologies to combat the requirements of the global market. M-learning presents an excellent opportunity for learners, especially in developing countries such as Pakistan, to adopt new modes of education which are convenient and easy to use, making the learning process pleasurable and motivating for students, increasing their yearning to learn constantly.

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## Appendix A: Survey items used in the study

***Performance expectancy***

PE1: I would find m-learning useful in my education.
PE2: Using m-learning enables me to accomplish learning activities more quickly.
PE3: Using m-learning increases my learning productivity.
PE4: If I use m-learning, I will increase my chances of getting better education.

***Effort expectancy***

EE1: My interaction with m-learning would be clear and understandable.
EE2: It would be easy for me to become skilful at using m-learning.
EE3: I would find m-learning easy to use.
EE4: Learning to operate m-learning is easy for me.

***Social influence***

SI1: People who influence my behaviour will think that I should use m-learning.
SI2: People who are important to me will think that I should use m-learning.
SI3: The lecturers and other staff at my institution will be helpful in the use of m-learning.
SI4: In general, my institution will support the use of m-learning.

***Facilitating Conditions***

FC1: I have the resources necessary to use m-learning
FC2: I have the knowledge necessary to use m-learning
FC3: The m-learning application are going to be similar to other systems use in mobile devices
FC4: I can get help from others when I have difficulties using m-learning

***Perceived playfulness***

PP1: When using m-learning, I will not realise the time elapsed.
PP2: When using m-learning, I will forget the work I must do.
PP3: Using m-learning will give enjoyment to me for my learning.

PP4: Using m-learning will stimulate my curiosity.
PP5: Using m-learning will lead to my exploration.

***Self-management of learning***

SL1: When it comes to learning and studying, I am a self-directed person.
SL2: In my studies, I am self-disciplined and find it easy to set aside reading and homework time.
SL3: I am able to manage my study time effectively and easily complete assignments on time.
SL4: In my studies, I set goals and have a high degree of initiative.

***Attitude towards use of Technology***

ATT1: Using m-Learning is good idea.
ATT2: I like to use m-Learning.
ATT3: Working with m-Learning is fun.

***Behavioral intention to use m-learning***

BI1: I intend to use m-learning in the future.

BI2: I predict I would use m-learning in the future.
BI3: I plan to use m-learning in the future.