Mobile Learning Effectiveness in Higher Education

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2010-06-08
Subject: Informatics
Level: Second Level
Course code: 4IK00E
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ABSTRACT
This research investigates mobile learning effectiveness in higher education. Mobile learning is composition of two words Mobile and Learning. In simple words mobile learning is mobility of learners by using mobile technologies in learning environment. Many researches addressed mobile learning but few of them covered mobile learning effectiveness. This study explores mobile learning effectiveness with the help of learning theories and models. Behaviorist, cognitive, humanistic, situational, and mobile learning theories are discussed that elaborate social, psychological, and philosophical aspects of learning. Detailed evolution of learning is also part of this report that covers the literature of distance learning, electronic learning as well as formal and informal learning. Three effective learning models are taken in consideration: the Garrison’s Community of Inquiry, the Swan’s Interactivity and Online Learning, and the Danaher and his colleagues’ model of mobile learning and teaching evaluation model. Danaher’s model is selected as a conceptual framework of the study that is composed of three elements that are engagement, presence and flexibility. Engagement is the active participation of the learner in learning activities. Presence means being there, physically or mentally, in learning activity or place. Flexibility is how easy and facilitative the system is for teachers and students. These three elements are used to determine mobile learning effectiveness. Survey method was used as our research approach. Empirical data was collected from Linnaeus University (prev. Växjö University) Sweden, by using two separate questionnaires for students and teachers. Collected data was analyzed with respect to learning theories and the theoretical model. The result reveals the potential of mobile learning as an effective mode of learning in terms of engagement and presence but flexibility approved to be weaker in mobile learning.

Keywords: Mobile learning; Mobile learning effectiveness; Formal and Informal learning; Distance learning; Electronic learning; Learning evolution; Learning theories.
ACKNOWLEDGEMENT

This thesis was written to partially fulfill the requirements for Master program in information system, School of Computer Science, Physics and Mathematics, Linnaeus University, Sweden during the spring of 2010. During this tenure, many people have helped and supported us with the completion of this study and made this work possible. These words are being written to convey our gratitude for all of them.

First of all, we would like to express our sincere gratitude to our supervisor, PhD student Miranda Kajtazi at the Linnaeus University department of Information Systems for her valuable supervision and intelligent guidance during the whole process of this research work. Second, we would like to express our thankful feelings for Professor Anita Mirijamdotter in Linnaeus University, for her strong support, encouragement and her helpful comments on our thesis. We would specially thank CeLeKT (Center for Learning and Knowledge Technologies) Group, School of Computer Science, Physics and Mathematics, who helped us during this research and give their valuable comments. We cordially thank Osama Mansour and Linda Askenas, the co-supervisors, for their useful suggestions and help.

We wish to take this opportunity to express our deepest thanks to our dearest parents for their unconditional love, support and encouragement throughout the study. We would also like to express our thanks to our brothers, sisters and classmates for their continuous support during our study.

Special thanks to the participants (Teachers and students of Linnaeus University, Sweden) who spent their valuable time for us to complete the questionnaire of the study.

Finally, very warm thanks go to our friends and all others who supported us during this period.

Atif Iqbal & Naveed Yaqub
June 2010
Växjö, Sweden
CHAPTER 1: INTRODUCTION

1.1 Introduction

Mobile learning (m-learning) is an emerging research field of learning, which uses mobile technologies as key components in a learning environment (Kukulska-Hulme and Traxler, 2005; Sharples et al, 2005; Danaher et al, 2009). Mobile technologies are one of the most rapidly growing technologies, which have and continue to gain popularity for the last few decades. Educators, researchers, and organizations are interested in using mobile technologies to educate students and increase their workforce in the field (Uzunboylu et al, 2009). Learning is a continuous process throughout one’s lifecycle, without the limitation of age or gender. Through learning one can improve one’s knowledge and information. Different kinds of learning processes provide different opportunities and variety of knowledge. The learning process itself benefits from the advancements of technology as we are provided with improved means to educate people in variety of ways.

Mobile learning is understood as a concept that facilitates the learners to learn through their mobile devices. According to Kukulska-Hulme et al (2005) when we talk about mobile learning we think about the mobility of learners. Learning through the use of mobile facilitates, learning at any space and time (while traveling, walking etc.). Mobile learning is a novel technique for education and can play a significant role for educational institutes. According to Nyiri (2003), quoted by Uzunboylu et al (2009) mobile learning can be very useful because mobile devices are small and user-friendly and do not require any advanced technological training. Mobile technology can speed up the process of learning in a quite effective way as students can learn when and where they want (Moura and Carvalho, 2008).

According to Nelson (1999) changes in education are a result of changes in technology. The concept of distance learning was born with industrial revolution in late 18th and early 19th centuries (Keegan, 2002 p.10). According to Keegan (1986) cited by Moore and Thompson (1990, p.1) distance learning is a form of teaching-learning arrangement in which the learner and teacher are normally geographically separated. In distance learning, the material is delivered to students in form of broadcasts, printed books, recoded lectures, CD’s / DVD’s etc (Moore and Thompson, 1990 p.1). In 1980s Internet and World Wide Web were introduced, which caused the Electronic revolution that brought forward the electronic learning concept (Keegan, 2002 p.11). Electronic learning is the use of Internet and digital technologies to create experiences that educate our fellow human beings (Horton, 2001 p.1). In the traditional way of education and schooling, the students have to be present in one location and are taught by teachers using board and markers. However the same purpose can be achieved using computer technology, remotely over the Internet where all the students do not have to be present at one location. According to Spodick (1995) electronic learning has widened the boundaries of universities across the borders and doors of knowledge are now opened for those who want to learn at distance. With the invention of mobile phones, researchers are constantly challenged with devising new ways to utilize mobile technology as a resource to provide quality education in a fast, remotely accessible and better way to the learners.

Mobile learning is a new concept that emerged about a decade ago when MLEARN, the first dedicated conference for mobile learning was held in 2002 and has become a regular annual event since then. It shows the recognition of mobile learning as a new research field. International Workshop on Mobile and Wireless Technologies in Education (WMTE), The National Workshop and Tutorial on Handheld Computers in Universities and Colleges (held in UK), The Social Science of Mobile Learning (held in Hungary), and International Conference on Mobile Learning (ICML): New Frontiers and
Challenges (held in Malaysia) are some of the most popular international events on mobile learning. Mobile learning has also become a regular topic in other generalist conferences such as Online Educa Berlin (the world’s largest E-learning conference) and ED-MEDIA, the world conference on educational multimedia, hypermedia and telecommunication. Mobile learning is not only the topic of special interest in conferences but practically it is showing consistent growth forward, since it is moving beyond short term, small-scale pilot projects and now ready to tackle different issues like scale, sustainability, evaluation and quality etc. in mainstream of education and training (Kukulska-Hulme and Traxler, 2005 pp.1-4).

All these efforts show that lot of research work has been done in the field of mobile learning, but still there are several issues related to mobile learning effectiveness, which need further explorations, especially in the domain of educational context (Danaher et al, 2009). In this research work the investigation is concentrated to see whether mobile technologies can actually become handy tools for teachers and students in existing traditional education settings. Our main focus is to examine if mobile learning is capable to be an effective way of learning in accordance with key educational principles.

1.2 Problem Domain

Learning can be achieved through different ways like traditional learning (a typical classroom environment), distance learning (D-Learning), and electronic learning (E-Learning). Traditional or classroom learning environment allows teachers to teach students directly at a predefined, structured and scheduled time and place. In this type of learning students and teachers are bound to time and place and they have to be at the same place and at the same time. It has its limitations in terms of number of students that can be accommodated at one time in one place. The solution for this problem can be distance learning that represents a tremendous change how people get educated, being able to organize their plans, without being bound to a specific time and place. Distance learning allows the teachers and students to carry out the learning process remotely without face-to-face daily meetings. Distance learning has been considered a good way of learning for a long time but the main problem with this type of learning was the lack of communication and less teacher-student interaction (Galusha, 1997). This one-way communication is a disadvantage. But, with the invention of Internet and World Wide Web, electronic learning concept was introduces, which is considered as a better alternative to distance learning. In fact, electronic learning is an extension of distance learning which allows people to learn and communicate via Internet.

Electronic learning provides greater opportunity for students and teachers to communicate and share knowledge more frequently than distance learning. The student can get lecture from a computer through Internet. Although electronic learning is an excellent way to learn, but it bounds the students to be stuck with their computer all the time and students cannot get information at anytime and anywhere. Non availability of information at anytime, anywhere forced to search new technology that can overcome such problems. Now mobile devices are used for mobile learning concept, which seems to improve the educational process. Thus, in this study we investigate the following research question “how can mobile learning provide improvements in education for a better, easier and faster learning?”

With the help of mobile learning, students can get information at anytime and anywhere. We consider this a better way of interaction hence our focus in this study is to investigate how mobile learning can help to improve the quality of education. We aim to achieve that by examining the ideas and understandings of teachers and students through, that by introducing the survey, with which we intended to see if mobile technologies are appreciated tools to learn better and to keep the knowledge long-lasting.

The problem domain for this study is to find out how does mobile learning affect education, and how useful it intends to be.
1.3 Aim and Objective
The aim of this study is to investigate the effectiveness of mobile learning in future learning environments that is more demanding in terms of accessibility, easiness, flexibility, engagement and usability. Also, we aim to explore and try to understand whether mobile learning improves the learning process in the higher educational settings, and if learning through mobile is made easier, more interesting, more attractive and more accessible. The main objective of this study is to investigate the student-teacher interactions, student participation, and student’s social contact with other students. All these factors have a strong impact on the learning process and degree of these elements determines the effectiveness of learning. It is very important to discuss the current system of education and figure out the existing problems within the system. For that purpose a good understanding of the philosophy of learnings, background theories, study of current system, formal and informal provisions of learning, and the connection between learning and technology is required. We will construct a theoretical background that covers these aspects and choose a framework that will assist us to determine the effectiveness of the mobile learning.

1.4 Topic Justification
Education is considered as the most important elements for human development and success. The purpose of education is to develop good behavior, which normally covers the whole conduct of life. Education is not just to adopt good moral qualities like punctuality, obedience, respect for elders and concern about the feelings of others, but also the way in which a person lives, the part he plays in public life and spends his leisure time (Nabeel, 2009). Furthermore, the focus of education now is to prepare dynamic and productive members of the state for an ever changing progressive and pragmatic world (Nabeel, 2009).

Education has become even more essential as world’s population has reached its peak of developments. Poverty is a big problem for the whole world and almost everyone has to start work in his very young age. It is also noticed that because of poverty people force their children to start work even in their juvenile years for their survival. The situation is worst in third world countries. In these circumstances a big population is unable to go to school or college. The current system is not so helpful and does not offer a practical and workable solution for that sort of problems. To improve education on a wider scale, it is required to develop such an effective system in which learners don’t have to go far away to get education, and secondly it should be financially affordable for the students. For this purpose informal ways of learning are being searched. (Nabeel, 2009)

Information and communication technology is playing a big role to shaping the learning process, by providing the facility to learn at distance. Electronic learning and Distance Education are highly used as an effective way of learning all around the world (Harman and Koohang, 2007 p.03). Blogs, discussion forums and groups are some informal way of learning and very helpful to educate the people at the distance.

Mobile technology was introduced in 1990s and become the most popular way of communication. According to Wray (2008), an article published in English daily Guardian, half of the world population will have the mobile at the end of the year 2008. The high adoption rate, mobility and availability of established networks and infrastructure are the reasons to use mobile devices as a learning tool. The concept of mobile learning has emerged tremendously in education (Goggin, 2005; Grohmann, Hofer & Martin, 2005; cited by Danaher et al, 2009) but its effectiveness is still in doubt as Hodas (1993), cited by Danaher et al (2009), expressed his concern about student-teacher relationship when new technology is involved in learning.

The importance of education and the condition of mobile learning effectiveness appealed us to carry our research on this particular topic. We argue that the results of this
research will be helpful to determine the effectiveness of mobile learning and that will provide a glimpse on the future of mobile learning.

1.5 Scope and Limitation
Mobile learning is a very broad field of research that needs a comprehensive and detailed investigation. Mobile learning is quite a new field, which is not yet completely implemented in its true form, so it is hard to collect the real reflection about the mobile learning system. Different pilot projects are in testing phases so we have to be contend with the data available by the teachers and students associated with these projects.

The issues which are not considered within the scope of this study are as follows: mobile devices have several limitations, for example: small display, limited keyboard, small memory, difficult navigation, operating system etc. Moreover different devices have different features to support network services and sometimes certain services are unavailable on some specific devices. Similarly, mobile networks are also of different types and offer different services. Some features may vary from network to network and it creates problem while talking about mobile learning. But all these problems are out of our scope and we will only discuss the importance of the mobile learning and its impacts on the learning system within the specific subject.

1.6 Disposition
This research work is divided into seven different parts for better understanding and structural view. Figure 1 shows the name and flow of this research. Chapter 1, the Introduction chapter, gives an overview of the topic and the problem domain. Furthermore, it gives some background information, and it introduces aims and objective of this research, justification, scope and limitation. Chapter 2 gives a detailed discussion on mobile learning, its advantages, and mobile devices. Mobile learning architecture and different types of wireless connections are also described in detail in this chapter.

Chapter 3 deals with the theoretical framework and explains the different learning processes, such as: traditional learning, distance learning, electronic learning, and mobile learning. Theoretical model of this research is also part of this section. Chapter 4 contains the methodological review of this study along with empirical data collection method and its reliability and validity concerns. Chapter 5 presents the empirical findings of the data collected and chapter six describes the analysis and discussion of the findings. At the end of this report, the conclusions are presented along with implications for future research.
Figure 1: Flow chart of research work
CHAPTER 2: BACKGROUND INFORMATION

The purpose of this chapter is to give an introduction about the advantages of mobile learning. We build up our arguments on previous knowledge, hence the reader can benefit greatly to understand the purpose of mobile learning more effectively. This also helps to grasp the idea of our initiative. Different mobile devices that can be used in mobile learning along with their characteristics will also be described. Further on, to understand how mobile devices connect with a network, and how information travels within the network, we discuss the mobile architecture that illustrates these aspects. At the end of this chapter the different network connections are introduced, in order to better understand the connectivity of mobile devices to different network environments. Moreover, different technical aspect are also highlighted, that give the knowledge and better understanding of mobile devices along with the mobile learning architecture and the network used.

2.1 Background of Mobile Learning

Mobile learning is the concept that represents how to learn and gain new knowledge while moving around in your routine life. As the world is moving rapidly due to the growth and development of fast and fascinating technology, the pace of mobile technology development seems to have gained the momentum more than ever before. In this technological era it is important to manage the time for maximum utilization of the available resources and reaping the benefits from the available pool of technological innovations. In educational environment students frequently move from one place to another in their daily life for different activities (Muhlhauser and Trompler, 2002) but they can easily carry and access the mobile phone all the time and everywhere (Cereijo-Roibas and Arnedillo-Sanchez, 2002). Mobile learning gives the added advantage, because it allows learning the knowledge remotely and at your own pace. Mobile learning is a relatively new term and nowadays researchers are trying to explore more ways to explore and extract greater advantages from this area of research, which has immense potentials, from which can benefit both the academia and the industry.

According to Pinkwart et al (2003) electronic learning is ‘learning supported by digital “electronic” tools and media’, and by analogy, mobile learning is as ‘electronic learning that uses mobile devices and wireless transmission’. Georgiev et al (2004) describes that mobile learning is the enhanced form of electronic or digital learning and distance learning. He also gives detail of this idea in the form of following figure.

![Figure 2: Place of M-Learning as a part of E-Learning and D-Learning](image-url)
The above figure shows that the electronic and mobile learning are parts of distance learning. Further in this figure mobile learning is part of electronic learning because of mobile is an advanced electronic device like other electronic devices. The only difference is that it provides the flexibility for connection from possibly anywhere and it is easy to carry. Mobile learning is the combination of two concepts that is ‘Mobile’ and ‘Learning’ and while describing the ‘Mobile’ one should not ignore the ‘Learning’ as well.

Brown (2003) defines that mobile learning is the subset of electronic learning whereas the online learning and mobile learning are the macro concepts of electronic learning. Quin (2001), cited by Brown (2003) also defines the concept of mobile learning in simple but comprehensive way that “mobile learning is electronic learning through mobile computational devices: Palms, Windows CE machines, and even your digital cell phones”. Brown’s concepts of subset can also be depicted by the following figure.

![Figure 3: The subsets of flexible learning](Brown 2003, p.5)

In the above figure different learning types are shown. They are divided into two main categories, which are contact learning and distance learning. Contact learning means the simple traditional learning of classroom environment, whereas distance learning means the process of learning that have no physical appearance of teacher-student interactions, such as in traditional ways of learning. Distance learning has further types that are electronic learning and paper-based learning. In this figure it shows that mobile and online learning is a kind of an electronic learning, but the only difference is of devices used for learning process.

With the enhancement of technology the learning techniques are also changed from distance to electronic and then mobile learning. The major change in this formation is from distance learning to electronic learning. With the use of several electronic devices in learning process we bring in the change and distance learning forms a new shape of electronic learning. As compared to distance and electronic learning, mobile learning does not include
such a major change. Laouris and Eteokleous (2005) described that electronic learning and mobile learning are relatively same with the transition by changing the terminology. For example, the dominant terms in the electronic learning era were: multimedia, interactive, hyperlinked, media-rich environment, etc. In the mobile learning era terms like spontaneous, intimate, situated, connected, informal, lightweight, private, personal etc. are used to characterize the context. In the table below Laouris and Eteokleous (2005) list down the transformation of the different terms in electronic learning and mobile learning is shown.

<table>
<thead>
<tr>
<th><strong>e-learning</strong></th>
<th><strong>m-learning</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>Mobile</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>GPRS, G3, Bluetooth</td>
</tr>
<tr>
<td>Multimedia</td>
<td>Objects</td>
</tr>
<tr>
<td>Interactive</td>
<td>Spontaneous</td>
</tr>
<tr>
<td>Hyperlinked</td>
<td>Connected</td>
</tr>
<tr>
<td>Collaborative</td>
<td>Networked</td>
</tr>
<tr>
<td>Media-rich</td>
<td>Lightweight</td>
</tr>
<tr>
<td>Distance learning</td>
<td>Situated learning</td>
</tr>
<tr>
<td>More formal</td>
<td>Informal</td>
</tr>
<tr>
<td>Simulated situation</td>
<td>Realistic situation</td>
</tr>
<tr>
<td>Hyperlearning</td>
<td>Constructivism, situationism, collaborative</td>
</tr>
</tbody>
</table>

Table 1: Terminology comparisons between electronic and mobile learning  
(Laouris and Eteokleous 2005, p.3)

According to Klopfer et al (2002) mobility presents a new extent to support and promote meaningful learning activity, social interactivity and context sensitivity. Sharples (2005) defined learning “as a process of coming to know, by which learners in cooperation with their peers and teachers, construct transiently stable interpretations of their world.” Nyiri (2002) proposed a general definition which covers the learning and mobile devices in quite comprehensive manner. According to Nyiri (2002) learning is something “that arises in the course of person-to-person mobile communication.” According to Laouris and Eteokleous (2005) the definition of Nyiri stimulates the role of philosophical consideration of mobile phones because usage of mobile is increased in everyday communication; and just as our everyday conversation is indifferent towards disciplinary boundaries, so, too, is mobile learning.

Mobile learning is a multi dimensional concept, which can be implemented in numerous ways and in different settings. According to Chen et al (2008), who examined several projects of mobile learning for the research, there exist several mobile learning projects like Voting System, Game System, Mobile phone for language learning, Examination System, Remote Laboratory System, Student Partner System, Museum Visiting, Mobile Blogging etc. that are serving in educational setting. These systems, working in educational process, can play a vital role to improve the learning capacity and knowledge, and at the same time can be more effective than traditional ways of learning (Chen et al, 2008).

2.2 Advantages of Mobile Learning
There are a lot of advantages for mobile learning as it provides variety of ways for learning especially in educational settings. According to Klopfer et al (2002) the following are the major benefits for using the mobile technologies for learning process.
Portability – This is the main feature for mobile learning that allows easy mobility of mobile devices, which is to be everywhere at anytime without any limitation. Due to small in size and less in weight mobile devices can be easygoing learning tool for students which they can carry with them everywhere.

Social interactivity – By using the mobile devices one can interact with teacher and other peer students for exchange of information and other activities which increase the social interactivity of the students.

Context sensitivity – It can help the students to collect the unique information from one location which may not be available longer. This kind of data can be collected from particular site, environment, and time which including both real and simulated data.

Connectivity – Mobile devices provide easy connectivity to its network all the time and everywhere. This continuous connectivity allows the students to stay connected with other students and teachers for latest update and current activities. This connectivity enables the students to create a true shared environment.

2.3 Mobile Devices
While using the mobile learning one should understand that the features of the mobile devices could be very useful in distance-based learning process. Mobile devices are the major tools for the implementation of mobile learning, as the idea is to provide the mobility to the learner. The know-how about mobile devices can enable the learner to select the best suited devices for learning point of view. To have some basic idea about mobile devices makes it easier for selection of mobile device among the wide range and verity that is offered by today’s competitive market. Many types of mobile devices are available in the market for the purpose of mobile learning that is discussed further in this section. Mobile learning can be achieved through different devices in different environments. According to Keegan (2005) there are two different schools of thoughts regarding mobile components that can be used for mobile learning and both have their own views and ideas in this regard. One group includes all the electronic media and ranges from desktop computers to laptop computers to PDAs or handhelds or palmtops to smart phones to mobile phones. Many, especially in the United States of America, include laptop computers in their definition of mobile learning.

The other group focuses on mobility of a person in mobile learning process. According to them, mobile learning should be restricted to learning on devices, which are easy to carry. In this context Keegan (2005, p.3) defines mobile learning as ‘the provision of education and training on PDAs/palmtops/handhelds, smart phones and mobile phones.’ According to his definition he excludes laptops from the list and focuses only on mobile or handheld devices. He also adds the following characteristics of mobile devices as something that:

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

Telecommunication industries nowadays offer large number of mobile devices such as Cellular Phones, PDA’s (Personal Digital Assistant), Tablet PC, Smart phones etc. These small devices can be easily moved and almost every time one can keep them with
him/herself. According to Trinder (2005) there are many handheld device types that share their characteristic in size, form or functions. These devices can be simple single-purpose devices like audio players, to multipurpose devices that typically combine a PDA or phone with other functionality such as cameras and MP3 players. As this research is based on mobile technology that includes vast range from laptop to mobile phone. Our focus will be on mobile phone instead of laptops as mobile phone provides more flexibility than that of others. Although laptops also provides the functionality such as wireless network connection but mobile phones are easy to carry, have more battery time, more connection availability, and small in size and less in weight, that all advantages are enables us to continue research with mobile phones instead of laptops. Since mobile devices are many, our focus is on two major types that are Mobile phones and PDA’s. A little description of these devices is given below.

2.3.1 Mobile Phones

Mobile phones are popular and the most common used devices nowadays. According to Trinder (2005) mobile phones are probably the most popular and widely owned handheld device that may have a wide range of functionalities. A lot of research work has already been done on mobile phones for the use of mobile learning. Keegan (2002) describes the mobile learning on personal digital assistant (Compaq iPaq) and mobile learning on smart phones (Ericsson R380). CeLekt group of Linnaeus University is also working on mobile learning using Nokia 6630. A simple mobile phone can provide basic functionality like Personal Information Management tools like Address Book and Calendars whereas advance mobile phones may have sophisticated technologies like Camera, Infrared, Bluetooth, etc. to exchange contents and information with other devices that can be mobile phone, PDA or laptop. A mobile phone may incorporate several features like e-mail, games, movie player, audio / video recorder, web surfing, e-books, GPS compass, music or MP3 player etc (Trinder, 2005).

Another valuable feature of mobile phone is messaging service. It can be Short Messaging Service (SMS) or Multimedia Messaging Service (MMS). Through SMS short text messages of 160 characters and small bitmap image can be sent to others. MMS provides the facility to send multimedia contents such as photographs, audio / video clips etc. to be sent to other devices (Trinder, 2005).

2.3.2 Personal Digital Assistants (PDA)

Personal digital assistants or PDA is a computing devices used for the organization of personal and business information. This small device is now very popular among the businessmen and individuals due to rapidly expanding its capability in terms of small size, increasing battery life, multimedia functions, and special purpose applications like barcode reading, credit card transactions, and most importantly, wireless/mobile internet access. The Palm Operating System, Windows Pocket PC Operating System, and the two-way pagers-based PDAs are common nowadays (Metcalf and De Marco 2006, p.7).

A basic PDA provides the functionality of personal organizer. A PDA is a combination of three main components that is hardware, operating system, and application program. Several hardware manufacturers are available while Palm, Microsoft, and Symbian are the three most popular operating system providers in the market. Currently PDA’s are available with processing speed range from 105 to 400 MHz with 21 to 64 MB of RAM. Usually PDAs have a wired interface but modern versions of PDAs are also equipped with Infrared, Bluetooth, and Wireless Fidelity (Wi-Fi) to communicate and exchange of information with other devices. PDAs have battery timing varies from 5 to 15 days, claimed by manufacturers though it looks a bit unrealistic since they consider only 30 minutes usage per day. Different application software such as office applications, internet applications, and
e-book readers etc. are available for different PDAs model by different software providers (Trinder, 2005). The following diagram provides a brief outlook of an advance PDA or a mobile phone.

![Diagram of mobile device functionality](image)

**Figure 4: Functionality of mobile devices**
(Trinder 2005, p.23)

In the diagram presented in Figure 4, the assistance provided by PDAs and Smartphone is depicted. These devices provide communication services i.e. phone, email, SMS. It can provide information with the help of GPS, web browser, dictionaries and news channels. Different software can be installed like office, e-book readers etc., to get extra features. The devices facilitate with organizing activities and offer calendars, memos, address books, diary, to-do list etc. These devices also provide functionalities like camera, music player, video, audio etc that can be enjoyed at leisure.

### 2.4 Mobile Learning Architecture

Mobile learning architecture can give the logical movement of data and its transmission through different media by using different network connections. By having the understanding with mobile learning architecture, it helps to know about different tiers that involved in this process like client, devices server and repositories. One can understand network connection between mobile devices and server, and from where and how the requested information is responded. Mobile learning architecture describes the way of communication of mobile devices with server by using different media and channels. The communication media depends upon different types of devices and they have different architectures and type of
connectivity. The mobile learning architecture should also have the capacity for different types of data on different types of mobile devices as some devices accept graphical data while other could not work with flash contents. The architecture facilitates a centralized control over administration and configuration of the application, as well as, it eases the process of updating and upgrading the application. Different mobile learning architecture is defined by different researchers and Basaeed et al (2007) also gives its mobile learning web-based three-tier architecture.

Mobile learning has three tier architecture, which includes the client tier, middle tier, and third tier as described by Basaeed et al (2007). All these three tiers are connected through communication channel. Client tier and middle tier are connected through different medias like GSM, GRPS, 3G, WiFi, and EGSM and the mobile devices that have capability of any of these facilities can be used for mobile learning. As different devices can be used for the purpose of sharing anywhere, anytime, the middle tier is responsible to provide the different content for different type of devices according to its nature. The third tier in this architecture is to store the data repository and information that can provide according to client request. Mobile learning architecture of Basaeed et al (2007) is further described in detail below.

Figure 5: Mobile learning system architecture
(Basaeed et al, 2007)
2.4.1 Client Tier
The client tier consists of mobile devices that allow the user to be movable without any limitation. These mobile devices are enable users to connect with wireless network for communication with other peers or instructor. Different type of communication media like GSM, EGSM, 3G, WiFi, etc. are allows mobile devices to share knowledge and information for learning perspective. Mobile phone, Pocket PC, Palm top, Laptop, PDA’s, smart phones, and other handhelds communication devices are the example of the mobile devices. At client tier the users can send and receive information by using the mobile devices without any limitation of time and place.

2.4.2 Middle Tier
The middle tier is responsible to provide the logical connectivity of user with the resources. Middle tier is connected to resources using web services. It consists of three modules; context sensing, context reasoning, and context-aware delivery.

**Context sensing** – The context sensing module is responsible for retrieving the basic information about the type of device, connection type, user information, and type of data requested. For sensing device context different alternatives are used like WURFL (Wireless Universal Resource File) using the “HTTP-user agent header”. The properties of mobile devices can be obtained by using the WURFL which is an open source XML document. For second alternative the system search the operating system of the device.

**Context reasoning** – After sensing the context, the next stage is to select the particular contents for the recognized request. The objective of this module is to set variables that control the content selection process from the data repositories. Different types of rules are defined for different types of requests, for example, images are reproduced (their formats are changed) in order to match one of the supported image formats by the mobile device being used. At the end of this stage, all delivery variables are set and passed to the last module where the actual processing is done.

**Context-aware delivery** – After sensing the context and setting the parameters for that particular context, this module provides the graphical user interface (GUI) to the user. The information provided by previous module, it adjust the content, navigation, and presentation before its delivery to the user.

2.4.3 Third Tier
The third tier consists of resources that from which the information is delivered to user. These resources are includes repositories, namely, learner profile, device profile, connectivity profile, ontologies, and learning objects. These resources could be store in once or different servers. Short description of these resources is given as under. **Learner profile** contains the personal information of users or client that can be used for authentication purpose. **Connectivity profile** contains the different types of wireless connection such as GSM, GRPS, 3G, WiFi, and EGSM. Connection types depend upon type of device as different devices required different connectivity. Different types of wireless connection have different features to transfer data and information; some of them are fast in connectivity while others are fast in data transfer. **Device profile** stores the information about devices that can connect. First of all device type is identify then according to device type the data is shared. The content of the system is stored in ontologies and Learning Objects repository. Main domain of the data that store in learning objects contains in Ontologies.
2.5 Types of Wireless Connections

Wireless connection provides the connectivity between mobile devices and server, which helps to understand the mobile devices association. One should have knowledge of wireless connection to connect their device with network for interaction. Mobile learning is the concept of learning with mobility and network technologies enable the mobile devices to stay connected with network through different wireless connections like GSM, GRPS, 3G, WiFi, and EGSM. Different type of device have different network connection through which user can obtained information. These wireless network connections are different in type and nature for different devices to transfer data and information, some of them are fast in connectivity while others are fast in data transfer. It shows the diverse range of networks available to facilitate learner and depicts that mobile connectivity is available at any level of network i.e. WAN (Wide Area Network), MAN (Metropolitan Area Network), LAN (Local Area Network), and PAN (Personal Area Network) are discussed in detail in the next section.

2.5.1 Wide Area Network (WAN)

The network where large number of devices is connected with each other by using some media is called Wide Area Network. These devices can be placed at different location. Smart phones, cellular devices, cellular modems, pager network, the internet backbone, and even satellite systems are devices that can be used for WAN. The high speed access by using the latest generation cellular infrastructure is known as xG (1G, 2G, 2.5G, 3G, 4G). United State is currently using the 2.5G range whereas in some part of Europe and Asia 3G technology is deployed (Metcalf 2006, p.12).

Furthermore, Metcalf (2006, p.13) defines the term xG and its different category in detail. The old analog cellular technology is equal to 1G. The existing digital network for only voice is equal to 2G and General Packet Radio Service (GPRS) is based on technology of 2.5G. And Universal Mobile Telecommunications System (UMTS) are based on 3G technology. The concept of 4G is also emerging and will be allow the devices to take anywhere in the country or world. A new technology like satellite transmission for satellite phone and high-speed internet data transmission is also introduced. This is also a type of WAN (Metcalf 2006, p.13).

2.5.2 Metropolitan Area Network (MAN)

The technologies that cover the different regions within the country or geography but it may consist between different offices at different places is called Metropolitan Area Network (MAN). It is hard to classify the MANs than WANs or LANs. Fixed wireless technology, lasers, and microcellular systems are includes in this category. At beginning MAN technologies was introduce to make a connection between LAN and WAN technologies but know a day’s MAN and LAN technologies are increasing bandwidth and extending range respectively to cover the MAN area (Metcalf 2006, p.14).

Fixed Wireless

There exist many types of fixed wireless technologies that are used for different purposes. Some cable operators are used fixed wireless technology for sending cable television channels to a wireless receiver. This technology is also being used for sending the data across the wireless connection of high speed internet similar to as cable modem or DSL line (Metcalf 2006, p.14).

2.5.3 Local Area Network (LAN)

Local Area Network (LAN) is the network of computers within a same geographical area or same building. With the improvement and introduction of new technology many wireless
LAN technologies are also available in its mature form. Wireless Fidelity (WiFi) is the most commonly used wireless technology. WiFi enables someone to connect to the internet without any cable connection, and it is just like a cellular phones connection. WiFi has the capacity to transmit and received the data within the limited range from its base station radius. WiFi devices like laptops can send and receive that data more quickly than that of cable modem connection (Metcalf 2006, p.15).

According to (Metcalf 2006, p.15) LAN allows the users to connect their devices without having any cable connection. The user can feel easy to get anytime connectivity within the small and limited area. The speed of the internet connection for greater transfer rate of data over the internet is possible with the help of WiFi as it allows to connect and share information with the speed of up to 54 Mbps which is many time faster than that of typical cable modem connection. Higher data transfer rate minimize the time for information sharing and allow the user to finish their work without wasting the time for waiting the information as in case of low connectivity.

2.5.4 Personal Area Network (PAN)

Personal Area Network (PAN) is the network type that allows a person to connect its different devices while sitting in office or during traveling. Cell phones are good example of personal area network as the cell phone can be connected with laptop for transferring information and different contents by using Bluetooth technology. Cell phone can also be use as modem via using the Bluetooth or infrared connection for communication back to a laptop, PDA, pocket PC, etc. Bluetooth and infrared technology now make it possible to connect the PDAs with cell phones as they also have the facility of Bluetooth and infrared. Even some of the latest models of scanners and printers also have such connectivity for wireless connection. Bluetooth and infrared technology enabled devices around someone in office make it possible to create wireless network. Some of the wireless headsets allow the cell phone to be connected and access while remaining inside the pocket (Metcalf 2006, p.16).

Bluetooth provide the new dimension to wireless connection and initially it was introduce with the intermediate speed of 15 Mbps. Most of the today life commonly used devices like PDA’s, printers, scanners, biometric devices, headsets, and speaker phones are contain Bluetooth technology and make it easier for communication.

A new technology for data transfer is also discussed by Metcalf (2006, p.18). The laser technology allows transmit the data by using the pulses of light or laser and this technology are just in its initial process of exploration.
CHAPTER 3: THEORETICAL FRAMEWORK

In this chapter the literature review and theoretical framework are presented. This chapter is composed of several parts. In the beginning the concept of learning is described, in order to highlight the focal point of our research work. In this part, theories of learning are presented that cover social, philosophical and psychological aspects of learning. It is very important to understand these theories as fundamental explanations of mobile learning. These theories provide insightful knowledge for learning from different perspectives that helps to understand the mobile learning basis. The next part comprises the discussion on formal and informal learning. In this part we discussed some critical issues in formal learning and why informal ways of learning are also important to facilitate the learners. The next part deals with the evolution of learning with respect to technology. In this segment we discussed different eras in learning and talked about how learning is conjugated with technology. In the end the theoretical model is presented that will be used in this study to investigate the effectiveness of mobile learning.

3.1 Learning

This part is dedicated to the concept of learning, theories, history and evolution of learning. Before moving into the great details of mobile learning it is very important to understand the concept of learning and its different approaches. We describe the learning from different viewpoints because the learning has different dimensions i.e. social, cognitive, and behavior etc. It is of prime importance to know about learning theories and the history of learning as these all have contributed to construct the theme of mobile learning since its inception.

3.1.1 What is learning?

Learning is a simple word but hard to define. There are several definitions by different researchers with respect to different philosophies and backgrounds. The simple definition of learning, fetched from Dictionary of Human Resource Management (2008) is “Learning is the process through which individuals acquire knowledge, skills, and attitudes. It may be achieved through experience, reflection, study, or instruction.” Another good definition is from World Encyclopedia (2009) “Acquisition of skills and concepts by a variety of processes. The oldest theories hold learning to be an associative process by which ideas; images and events become linked in the mind.” According to Brown and Duguid (2000), cited by Kurti et al (2007) “Learning is a social process; it happens in collaboration between people and together with technology. So when introducing technology the view should be shifted from seeing it as a cognitive delivery system to considering it as means to support collaborative conversations about a topic.” These definitions construct the understanding that learning is a multidimensional term that has roots from several disciplines.

Different theories have been presented by the researchers to define and elaborate learning to cover philosophical, psychological and social expressions of learning. Smith (2009a) have done marvelous work to review and explain different theories of learning and tried to answer critical questions about learning, for example, what is learning? Is it a change in behavior or understanding? Is it a process? To explain what is the learning Smith (2009a) cites Rogers (1983) who explains the learning in these words “I want to talk about learning. But not the lifeless, sterile, futile, quickly forgotten stuff that is crammed in to the mind of the poor helpless individual tied into his seat by ironclad bonds of conformity! I am talking about LEARNING - the insatiable curiosity that drives the adolescent boy to absorb everything he can see or hear or read about gasoline engines in order to improve the efficiency and speed of
his 'cruiser'. I am talking about the student who says, "I am discovering, drawing in from the outside, and making that which is drawn in a real part of me." I am talking about any learning in which the experience of the learner progresses along this line: "No, no, that's not what I want"; "Wait! This is closer to what I am interested in, what I need"; "Ah, here it is! Now I'm grasping and comprehending what I need and what I want to know!" These words help to understand the complex notion of learning. Learning is not the process to impose some irrelevant material into the learner’s mind in a closed environment but learning is to provide such a practical environment that motivate and encourage the learner for taking initiatives by his own will that takes him towards learning. This is exactly the same idea what mobile learning wants to achieve.

3.2 Learning Theories

It is always a big debate among research community that is learning a product or process. Some believe that learning is the outcome of some process but others consider learning as process itself (Smith 2009a). This is a pretty interesting discussion that reveals different expressions of learning. In the following section we first discuss learning as product and then learning as process.

3.2.1 Learning as a Product of Action

In psychology, especially the psychologists from 1960 to 1980, defined learning as a change in behavior. In other words it is a result or consequence of some action or more specifically the product of some action that can be identified or noticed. According to this theory the most important virtue of learning is change (Smith 2009a). Rogers (2003), cited by (Smith 2009a) further categories this concept into two categories i.e. Task-conscious or acquisition learning and Learning-conscious or formalized learning. Following are the little details of each of these concepts.

Task-Conscious or Acquisition Learning: Acquisition learning is defined as continuous learning or it can be seen as going on all the time. According to Rogers (2003), cited by Smith (2009a) this type of learning is concrete, immediate and confined to a specific activity; it is not concerned with general principles. According to Smith (2009a) some researchers think this type of learning as unconscious because the intention of the learner is to complete the task not clearly to learn the things but eventually he learns something new on the completion of the task. But Rogers (2003), quoted by Smith (2009a) suggest that in this type of learning the learner most of the time aware of task or more precisely has task consciousness. Examples include much of the learning involved in parenting or with running a home. Some have referred to this kind of learning as unconscious or implicit. In other words, whilst the learner may not be conscious of learning, they are usually aware of the specific task in hand.

Learning-Conscious or Formalized Learning: As name implies, the learners’ intentions are to learn and they clearly know that all these practices are for learning in this type of learning. According to Rogers (2003), cited by Smith (2009a) Learning-conscious or formalized learning is educative learning in which the involved learner clearly aware of the learning. This learning type is to facilitate the learner and provide them the opportunities to learn. The people involved in this process are well aware that the tasks they are engaged in entail learning. Rogers (2003), as quoted by Smith (2009a) further adds that learning itself is the task. He claims that formalized learning is to enhance the learning by making learning conscious for learners. This type of learning usually done in the form of guided episodes of learning.
These learning types look very contrasting to each other but use of both in the same context can be very handy to improve the learning. According to Smith (2009a) both approaches looks quite different but may present in the same context, for example in the school both types of learning present. It could be better to blend both of these learning types to enhance the learning.

3.2.2 Learning as a Process

A large group of researchers sees learning as a process. A prominent research work in this field is done by the Smith (2009a) who explains different theories in his well know research. There are four learning theories discussed by Smith (2009a) where three of them taken from the study of Merriam and Cafferela (1991) to elaborate learning as process. These Theories are as follow:

- The behaviorist theory
- The cognitive theory
- The humanistic theory
- The social/ situational theory

3.2.2.1 The Behavior Orientation to Learning

In psychology, the behaviorist approach refers to the use of experimental procedures to study behaviors in relation to the environment (Smith 2009b). The behaviorist orientation to learning is generally considered the effort of John B. Watson, who is credited as the first behaviorist. According to Watson (1913), referred by Smith (2009b), the inner experiences are very hard to observe and urges the need of lab experiments for behavioral studies. After the lab experiments the stimulus- response model was generated by Watson. According to this model the environment is stimulus for individual response. It means that the behavior of individuals is highly affected by the environment (Watson, 1913; cited by Smith 2009b).

After the Watson’s Stimulus- Response Model many researchers worked on that particular model. One most prominent name is Edward L. Thorndike who built S-R (Stimulus-Response) theory on the basis of Watson’s Model. He describes that the responses (or behaviors) can be strengthened or weakened by the consequences of behavior. (Smith 2009b) The idea further polished by Skinner (1973), cited by Smith (2009b), who develop the operant conditioning formula. According to the formula, people are encouraged or rewarded to repeat the acceptable behavior and punished to stop unacceptable behavior. Hartley (1998), quoted by Smith (2009b) defines four key principles for the learning, in the terms of behaviorist approach. These principles are considered very important in the learning setting and are as follows:

**Activity:** Learning is improved when the learner is active rather than passive. Participation is highly encouraged to motivate learner to actively participate in the process.

**Repetition:** Practice is very important for the learning. Repeated exercises and practice in different environments are essential for learning. Skills can not be acquired without practice.

**Reinforcement:** Reinforcement is good for learning. Positive behavior or success should be rewarded and encouraged, whereas negative behavior or failure should be discouraged and punished.

**Clarity:** In behaviorism clarity of objectives are also very important in teaching. The teacher designs the activities by putting special emphasis on the objectives. Usually learners are informed prior to the activity about its behavioral objective by telling them the expected
outcomes of the activity. For example statements like “By the end of this session participants will be able to...” are used to make objective clear.

3.2.2.2 The Cognitive Orientation to Learning

Unlike behaviorism the main focus of this school of philosophy is on cognition of individuals rather than the environment. Now it is very important to know the notion of cognition. According to Smith (2009c) cognition is the act of process of knowing. Smith (2009c) argues, while explaining the cognitive orientation to learning that many psychologists were not satisfied with behaviorism. They object that there was too much focus on single events, stimuli and overt behavior. Another research group opposed behaviorism because they believe that perceptions or images should be approached as a pattern or a whole rather than as a sum of the component parts. In cognition the focus is on the individual’s mental process instead of behavior. In other words, they were concerned with cognition - the act or process of knowing (Smith 2009c).

Many researchers (Piaget, Bruner, Gagné; cited by Smith 2009c) played a vital role to develop theories and models to support the concept, as described by Smith (2009c). Piaget (1926), quoted by Smith (2009c), describes four different stages of mental growth and names them sensorimotor, preoperational, concrete operational and formal operational respectively in his renowned book “The Child’s Conception of the World”. Bruner (1966) explains in his book “Toward a Theory of Instruction” the idea to use pictures for better understandings of different concepts. The word picture here does not mean only still photographs but the motion, images and language to make things more clear and understandable (Presno, 1997). According to Bruner (1966), cited by Presno (1997), there are three ways in which individuals represent the real world around them. These ways are action, icons and symbol. Bruner (1966) sees these three as three ways of learning also that are interconnected with each other. For example, action (doing) is good for learning physical activities like skiing or swimming because in such type of learning doing (practice) is more important than words. Iconic form is summary image or mental picture of path or pattern. It is actually an outline of what is the result of a completed task. The third form is symbols that consist of language, including both numbers and words. Individuals use these form to make declarative and hypothetical propositions. Gagné (1985) quoted by Smith (2009c) presents a model that highlights eight different forms of learning and argues that behaviorists identifying only a fragment of human capabilities. Hartley (1998), cited by Smith (2009c), describes the key principles of learning associated with cognitive psychology. According to Hartley (1998), cited by Smith (2009c), learning is the result from inferences, expectations and making connections. Instead of acquiring habits, learners acquire plans and strategies, and prior knowledge is important. Hartley’s defined principles are as follow:

**Well-organized instruction:** The learning material should be well-organized as it is easier to learn and to remember.

**Clearly-structured instruction:** The learning material should be well-structured. Logical relationships between concepts are essential. It makes it easy to link the parts together.

**Perceptual features:** The perceptual features of the task are vital. Learners’ concentration varies from person to person. They see environment differently. For that reason, the way to display the problem is very important to make it understandable for the learners.

**Prior knowledge:** Prior knowledge is important for learning. Things must fit with what the learner already know for new things to be learnt.
Differences between individuals: Different individuals have different cognitive styles and approaches. Learning is very much dependent on these cognitive styles that vary from individual to individual.

Cognitive feedback: Cognitive feedback gives information to learners about their success or failure concerning the task at hand. Reinforcement can come through giving information - a 'knowledge of results' - rather than simply a reward.

3.2.2.3 The Humanistic Orientations to Learning

The basic concern of humanistic approach is human growth. The humanistic approach originated in 70s and 80s when adult education was the point of great interest of psychologists. The main focus of all these studies was human potential for growth. According to Tennant (1997), quoted by Smith (2009d) the key feature of humanistic approach is human’s concern about himself. Self is the focal point of humanistic psychology. Actually humanistic approach was the reaction against purely scientific methodologies in psychology where human are treated as objects. Instead of scientific reductionism where objective and subjective things are discussed, humanistic approach advocates personal feelings, motivations, choice, freedom etc. (Smith 2009d).

Smith (2009d) quotes the theory of hierarchy of motivation presented by Maslow (1968) for better elaboration of the humanistic concept. According to the theory lower level needs have stronger motives than the higher level needs. Humans move towards higher level only when they achieve the lower level of needs. Tenant (1997), quoted by Smith (2009d) summaries this theory and classifies the different levels as follows:

Level one: These are basic physiological needs such as hunger, thirst, sex, sleep, relaxation. A human requires these needs must to be satisfied before moving to higher level.

Level two: The second level of needs have the needs like protection, safety, and security. Humans must look for these issues before advancing to the next level. If these needs are not satisfied their priority is to organize their world to provide greatest degree of safety and security. If satisfied, people will come under the force of level three.

Level three: The third level of need involves emotional needs i.e. love and belongingness. These needs cause people to seek warm and friendly relationships.

Level four: The forth level has Self-esteem needs involve the desire for strength, achievement, adequacy, mastery and competence. They also involve confidence, independence, reputation and prestige.

Level five: The fifth and higher most level in the hierarchy is Self-actualization. It is the full use and expression of talents, capacities and potentialities of an individual.

Many researchers, for example Maslow (1970), Sahakian (1984), Merriam and Caffarella (1991) and Tennant (1997) have put their efforts to develop and advocate this view of learning but Rogers (1983) is more prominent for his development in this field (Smith 2009d). According to Smith (2009d) Rogers (1983) has the passion for education that engaged with the whole person with their experiences; for learning that combines the logical and intuitive, the intellect and feelings; found a ready audience. Rogers (1983), cited by Smith (2009d) explains his concept as “when we learn in that way, we are whole, utilizing all our
masculine and feminine capacities”. He further defines the following characteristics of humanistic learning.

- **Involvement**: In this learning the learner is fully involved in the learning process. This quality of personal involvement engages both feeling and cognitive aspects in the learning event.

- **Self-initiated**: The learning process is self-initiated. Even if learner is stimulated by some external factors, the urge to learn and explore comes from inside.

- **Pervasive**: It is pervasive because it makes a difference in the behavior, the attitudes, perhaps even the personality of the learner.

- **Self-evaluated**: It is evaluated by the learner. The learner knows whether it is meeting her need or not. She can evaluate whether it leads toward what she wants to know. The locus of evaluation, we might say, resides definitely in the learner.

- **Meaningfulness**: The essence of this learning is Meaningfulness. When such learning takes place, the element of meaning to the learner is built into the whole experience.

### 3.2.2.4 The Social/Situational Orientation to Learning

Learning in social learning theory is to participate in a community of practice. According to the theory learning is to learn by observing others behavior. According to Merriam and Caffarella (1991), cited by Smith (2009e), learning is a social observation where people learn by observing others. Bandura (1977), quoted by Smith (2009e), explains the social learning that learning would be difficult and risky if people totally rely on their own actions and experiences. Humans learn from others actions and form new models how to act and behave in those situations.

Lave and Wenger (2009e) introduce the term situated learning that is more concrete model of social learning. The idea of situated learning is not to acquisition of certain form of knowledge but the social relationships where learner is co-participate in the situations. It means that it is not enough to understand the world but it is also crucial to participate in a community of practice. Lave and Wenger (2009e) developed this theory by observing different communities. They observed midwives, tailors, US Navy, meat-cutter and non-drinking alcoholics’ communities for development of the theory. They observed that in the beginning people join the group and learn what others do and practice. After some time and learning certain things, they become the center of attraction in the group. It depicts that learning is not only to attain the knowledge but to participate in social activities. They also claim that the learning process has impacts of nature of the situation.

It is essential for learner to participate in communities of practitioners. In such communities a newcomer is required the skill and knowledge for fully participation of in the socio-cultural practices of the community. Legitimate peripheral participation is the term to define the relation between newcomers and experienced one, activities, identities, artifacts and community. In situated learning person’s intention is full participation in socio-cultural activities and for that he learns the required skills and knowledge. These skills and knowledge are to speak, act and improvisation in such manners that make sense for that community. It is very important for learner because it is concerned with his identity in the community (Lave and Wenger 1991; cited by Smith 2009e).

Smith (2009e) concludes social/ situational learning in three points:

1. Learning is in the relationships between people
2. Educators work so that people can become participants in communities of practice
3. There is an intimate connection between knowledge and activity

Smith (2009a) believes that the learning theories are very important in educational policymaking but usually ignored during educational policymaking. He indicates the gap of policies and practices that are being used where theories of learning do not figure strongly in professional education programs for teachers and those within different arenas of informal education. He further adds this gap of theory and practice can lead to a poor learning.

### 3.3 Types of Learning

Learning is classified into formal, informal and sometimes non-formal learning (Colley, 2002). It is hard to draw a clear boundary between these types since many of researchers use these terms without any clear definition. Another considerable point is that in some research (Eurat, 2000) learning is classified into only two types that are formal and non-formal but others (Livingstone, 2001) see it as formal, informal and non-formal. Informal and non-formal learning are much similar and difficult separate precisely (Colley, 2002). Here we discuss these three types of learning.

#### 3.3.1 Formal Learning

Formal learning can be defined as a structured and defined mode of learning in controlled environment like schools. It is more popular and practiced way of learning and education all over the world as most of educational and learning activities are still performed in the schools, colleges and universities or other educational institutes. According to European Commission report published in (2001) the formal learning is defined as “learning typically provided by an education or training institution, structured (in terms of learning objectives, learning time or learning support) and leading to certification.  Formal learning is intentional from the learner’s perspective”. Eraut (2000, p.12) cited by Colley et al (2002) specifies formal learning with these five characteristics.

- a prescribed learning framework
- an organized learning event or package
- the presence of a designated teacher or trainer
- the award of a qualification or credit
- the external specification of outcomes

Livingstone (2001, p.2) who is famous for his work in adult and continuing education presents his definition of formal education in terms of adult education. He describes that formal education occurs “when a teacher has the authority to determine that people designated as requiring knowledge effectively learn a curriculum taken from a pre-established body of knowledge...whether in the form of age-graded and bureaucratic modern school systems or elders initiating youths into traditional bodies of knowledge” (Colley et al, 2002).

#### 3.3.2 Non-Formal Learning

Non-formal learning can be defined as the structured learning without teachers, institute and degree certificate. According to European Commission (2001) non-formal learning can be defined as the learning that is not provided by an educator or institute and does not lead to degree of certification. The learning is structured (contents, timetable, learning support). The learning is intentional where learner’s clear motive is to learn. Livingstone (2001) has a little bit different point of view of non-formal and describes non-formal learning where learner voluntary wants to gain further knowledge or skills in area of his personal interest with
teacher’s assistance and organized curriculum. Non-formal learning is commonly used in adult education courses and workshops. (Colley et al, 2002).

3.3.3 Informal Learning

Informal learning can be defined as the unstructured learning with or without the help of an instructor and that does not lead to any certification. According to European Commission (2001; cited by Colley et al, 2002) “learning resulting from daily life activities related to work, family or leisure”. It is not structured (in terms of learning objectives, learning time or learning support) and typically does not lead to certification. Informal learning may be intentional but in most cases it is non-intentional.” Another definition given by Livingstone (2000; cited by Colley et al, 2002) is “any activity involving the pursuit of understanding knowledge or skill which occurs without the presence of externally imposed curricular criteria…in any context outside the pre-established curricula of educative institutions”.

Although non-formal and informal learning is defined separately here but sometimes non-formal and informal learning is defined in the same context that is not formal. Eraut (2000) divides learning in only two type formal and non-formal (informal). He differentiate non-formal (informal) learning from formal on the basis of stimulus time (past, current, future) and the extent to which learning is tacit (tacit, deliberative). He further divide non-formal learning as either individual or social, and either implicit or explicit. (Colley et al, 2002)

The following table presents the ideal forms of formal and informal learning. The table also reflects the main differences of both of the types.

<table>
<thead>
<tr>
<th>Formal</th>
<th>Informal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher as authority</td>
<td>No teacher involved</td>
</tr>
<tr>
<td>Educational premises</td>
<td>Non-educational premises</td>
</tr>
<tr>
<td>Teacher control</td>
<td>Learner control</td>
</tr>
<tr>
<td>Planned and structured</td>
<td>Organic and evolving</td>
</tr>
<tr>
<td>Summative assessment/accrreditation</td>
<td>No assessment</td>
</tr>
<tr>
<td>Externally determined objectives / outcomes</td>
<td>Internally determined objectives</td>
</tr>
<tr>
<td>Interests of powerful and dominant groups</td>
<td>Interests of oppressed groups</td>
</tr>
<tr>
<td>Open to all groups, according to published criteria</td>
<td>Preserves inequality and sponsorship</td>
</tr>
<tr>
<td>Propositional knowledge</td>
<td>Practical and process knowledge</td>
</tr>
<tr>
<td>High status</td>
<td>Low status</td>
</tr>
<tr>
<td>Education</td>
<td>Not education</td>
</tr>
<tr>
<td>Measured outcomes</td>
<td>Outcomes imprecise/immeasurable</td>
</tr>
<tr>
<td>Learning predominantly individual</td>
<td>Learning predominantly communal</td>
</tr>
<tr>
<td>Learning to preserve status quo</td>
<td>Learning for resistance &amp; empowerment</td>
</tr>
<tr>
<td>Pedagogy of transmission &amp; control</td>
<td>Learner-centered, negotiated pedagogy</td>
</tr>
<tr>
<td>Learning mediated through agents of authority</td>
<td>Learning mediated through learner democracy</td>
</tr>
<tr>
<td>Fixed and limited time-frame</td>
<td>Open-ended engagement</td>
</tr>
</tbody>
</table>
Learning is the main explicit purpose
Learning is applicable in a range of contexts

Learning is either of secondary significance or is implicit
Learning is context-specific

Table 2: Possible ideal-types of formal and informal learning
(Colley et al, 2002)

3.4 Formal and Informal Learning as Competing Paradigms

The comparison between formal and informal learning is a major topic in educational research world for quite a long time. Our intention is to find which of these two paradigms are more effective and efficient for the process of enhanced learning, and what advantages has one over the other. Colley et al (2002) quote Scribner and Cole (1973) who describe that the advanced industrial societies were more in favor of formal learning. They describe that in these societies majority of researchers claimed that if formal learning is provided effectively, it has clear advantages over other. It opened up the accumulated wisdom of humankind, held in the universities. This accumulated, recorded and propositional knowledge makes it easy and possible for each generation to know more and better than their predecessors, as science (or art) advanced. It was also considered that this knowledge is more generalisable and applicable as it can be used and applied in variety of context and circumstances. In contrast, the informal way of everyday knowledge is not that effective as it is context-specific and not so generalisable. For example a mathematical formula can easily be applied in any context where numerical values are relevant but learning to play parts only equips a person to use numbers in that very restricted setting. Bernstein (1971), cited by Colley et al (2002), also firmly believes that formal learning is at top and it opens up high status knowledge.

In contrast, the paper written by Scribner and Cole (1973), cited by Colley et al (2002), is considered as a great contribution in socio-cultural or situated perspectives on learning. In the paper Scribner and Cole (1973), quoted by Colley et al (2002), strongly advocate the superiority of informal learning. They claim that many things are learned more effectively through informal processes. To support this they present the example of language learning that is much easier through informal learning. Lave and Wenger (1991) cited by Colley et al (2002), also confirm this claim and argue that sophisticated learning took place in communities without formal learning provision. Some researchers (Brown et al, 1989; Lave, 1996; cited by Colley et al, 2002) argue that formal learning is not context free as claimed and have different forms in different societies and cultures. They also show their reservation about is generalisability of formally acquired knowledge and object that the ‘transfer’ of learning is not simple but difficult and complex. As Lave (1996, p151; cited by Colley et al, 2002) argued, “Learning transfer is an extraordinarily narrow and barren account of how knowledgeable persons make their way among multiply interrelated settings.” Therefore this school of thought considers informal learning superior to the formal.

The impact of these debates can be observed in today’s educational system and policymaking. Informal learning is being adopted widely all over the world. For example, the United Kingdom has changed its regulation and now special funds are allocated for informal learning especially for adult education (Colley et al, 2002). European Union, on the other hand, is also very much concerned about informal way in learning. Several projects have been started to support informal learning and heavy funds are allocated for that purpose. The major stress has given to learning at workplace. New policies and frameworks for lifelong and informal learning are also being introduced (Bjornavold, 2000; EC, 2001; cited by Colley et al, 2002).
3.5 Downsides of Formal Learning

According to Beveridge (1942), cited by Bentley (2000), ignorance is one of the five major evils government must fight against. Education has been taken as a measure of economical and social progress for two centuries. It is even more important in today’s knowledge economy in which workers that has the ability to create and communicate knowledge are more valued than machines in industrial economies of last century. Education has become vital not only for individuals but the institutions and the society. It has big impact on our individual life-chances and quality of life. The increasing and demanding pressure for innovations and productivity in organizations is another factor that makes education more important. The rule is not only for the organization but also for government because people are more demanding in term of facilities but resisting about taxes. In such situation government needs more innovative and productive employees who have the abilities to deliver more. This trend can also be seen in business where creation and innovation in working methods and production is highly influenced by technology. About 90 percent of newly launched products are no longer in market after two years just because of rapid advancement in the technology (Bentley, 2000).

These new and demanding trends in business, industry and government require new ways and systems for knowledge and learning. Persistent change in technology and applied knowledge pushes the individual to learn new technology and methods. It means that people need to return to formal education again and again in their whole life that is very difficult. The formal mode of education and learning is unable to solve this sort or problem. This situation requires new modes and methods of access and creation of knowledge but the existing educational system seems to be unable and is facing many challenges (Bentley, 2000).

The core issue in education is to teach students how they can learn by themselves, but most of existing education systems worldwide, are neglecting this issue and are more focused delivering knowledge in the formal way (Bentley, 2000). Bentley (2000) quotes the example of 17 years old English student who complains about the system in these words “I think a lot of the time at school . . . they teach you knowledge but they never teach you how to learn.” The situation indicates the gaps in educational system that should be covered. Since education is an important issue, governments are trying to improve educational system. They have realized that education is essential for economic development, social unity and risk reduction (Bentley, 2000). In spite of these efforts, youth is still having problems in transition to adulthood because of constant and unpredictable changes in economy, technology, culture and values and it is a big question-mark on the productivity of our educational institutes.

Bentley (2000) describes that normal mode of education has always been controlled and restricted in the institutions, libraries, schools, factories, and universities. But knowledge is more accessible outside these institutions because people contain more practical and valuable knowledge. Internet is the best example that is not like these delimited institutes but people can learn more recent and applicable knowledge. The true sense of knowledge is its practical implementation in real life scenarios but unfortunately the formal educations is unable to deliver such knowledge because of continuous changing environment. For example, after the completion of four years degree, the contents of first year’s course are mostly out of date and not implementable. Another problem with the formal educational system is its ineffectiveness in teaching and learning. Kaufhold (2002, pp.3-11) describes that different student learns from different ways. In this context, the unidirectional formal system appears ineffective to deliver what and how the student of current age wants to learn.

Unfortunately the step has been taken so far to address these problems are just to expand the role of formal educational institutes and extension in time duration for learners especially for young they spend in the school. This trend lasted in the whole 20th century in
UK and other developed countries but now under extreme pressure. The strong vertical hierarchies in educational institutes and strict environments are another big issue. The aim of school is to develop personal abilities of the learner but also to produce standardized and desired results. To this effect, schools promote identical response but neglect some very critical choices of the learners. (Bentley, 2000)

Current educational systems provide a good level of knowledge, by preparing and advancing the youngsters for the adulthood than ever before, but unfortunately the knowledge is symbolic and not that much practical. The increasing tension can be noticed between formal and informal mode of learning. The formal system tries to deliver education according to designed set of rules and structured school times for education with a preplanned knowledge and standards. This approach symbolized guardian syndrome where society restricts and control young for their own and whole society’s interest and through a predesigned and under practice system.

The outcome of these deficiencies in formal system is critical since it involves emotional and psychological pressure on youth. For example suicide is the second biggest reason of death for youth (18-24 years old) in the UK (Bentley, 2000). British economy bears £8 billion as a cost of unemployment every year. Another important factor is parents are facing problem to guide their children about their study plans for their future occupation because of rapidly changing nature of job market (Bentley, 2000). Most of the young don’t have enough saving for secure future that causes serious financial problem for them. Bentley (2000) believes that such circumstances lead to severe relationship, moral and behavioral problems and it is all because of formal and preprogrammed curriculum, which is not capable to prepare youth to meet the challenges. He also adds that the dilemma not only applicable for average student but good and successful student also find it hard to implement in the working environment what they have learnt from schools and fail to deliver what is expected from them. It does not depend of any particular subject, university or locality but common with every subject, school, university or locality. He argued that correct answering the question in examination does not guaranty that the person is capable of facing working environmental problem. (Bentley, 2000)

On the other hand, the informal system allows individuals to pick the services and tools independently for their learning needs and requirement for their and society’s best interest. It symbolized trade syndrome where people are free to search new solution for their problem rather to follow the existing routines for the problem. It makes individuals more active, dynamic, creative and selective. Usually it is assumed that educated adults are well prepared to face the challenges of their future life but infect it is not. The problem with the learning system is the controlled learning environment does not prepare the youth to face and work in ever-changing and harder working environment. In short the existing school based system has many deficiencies to produce youth who are equipped to become successful lifelong learners. (Bentley, 2000)

No doubt, the things we learn from schools and universities help us to gain status, job chances and income, but are not so helpful in problem solving and to meet job responsibilities. Because of restrictions and dissatisfaction of the educational environment thousands of young leave the schools. Another evidence of dissatisfaction is some 50,000 students in UK now learn at home and the figures are much higher for US. Now the time has come to change the learning environment and to make it more flexible and practical for the learners. (Bentley, 2000)

Bentley (2000) strongly recommends a parallel infrastructure of education that is independent of limitations of bounded or control educational system that can address and resolve the current problems of formal educational model. To support his arguments, Bentley (2000) quotes several examples of the institutions that are adopting informal approaches for
learning and education. The Open University UK is one of them where students are allowed to choose the learning approach that best suits their learning styles. University of Phoenix USA, University for Industry (Ufi), Spring and Nord Anglia are few examples of informal and flexible learning.

3.6 The Solution: Technology Enhanced Learning

The remedy suggested by Bentley (2000) for such problem is de-schooling. He thinks school not the place to learn read, write and count only but a place where youth must be prepared to meet the future challenges. Bentley (2000) puts forward the idea presented by Illich in 1973 to de-school the society. Illich (1973), cited by Bentley (2000) insists to search for new ways that use full resources not only public but private investments, culture, physical, human and social capital to educate the youth that is more skilled, responsible and creative.

In the next segment of our work, we present the different epochs of learning and education in connection with technology. It starts from distance learning and end up mobile learning. It is important to describe predecessor i.e. distance learning and electronic learning and their success to elaborate their acceptance and usefulness in educational system. The higher level of acceptance and success encourages moving further toward the new concept of mobile learning and its implementation.

3.6.1 Distance and Open Learning

Distance learning is the term used for unique way of teaching and learning in which the teacher and learner are far away to each other and presence of both is not a compulsion, unlike to the formal model of learning. According to Keegan (1986), cited by Moore and Thompson (1990) the term distance learning is borrowed from some European terms (Fernunterricht, Tele-enseignement, Educacion a Distancia) to describe the arrangement of teaching and learning in which the teacher and learner are geographically separated by keeping focus on the course design, learning and instruction under such circumstances.

Print and writing media or electronic media are commonly used in all types of distance education such as recordings, broadcasts, narrowcasts by cable to special group of people, satellite, fiber transmission, audio/video conferencing. Currently these technologies are used in combination of each other to enhance the effectiveness of the process (Moore and Thomson, 1990).

3.6.1.1 Distance Educational Evolutions

According to Keegan (2002, p. 10) the evolution of distance learning can be divided into three different eras that are distance learning (dLearning), electronic learning (eLearning) and mobile learning (mLearning). These three stages are connected to three revolutions where dLearning represents industrial revolution of 18th and 19th centuries, eLearning is connected to electronic revolution of the 1980’s and mLearning is with wireless revolution of end of 20th century.

The Industrial Revolution:

Distance learning was started when new technologies were introduces for postal communication and transport during the industrial revolution in Europe and America in 18th and 19th century. It is very interesting that first train and first correspondence course started at the same time. This connection can be observed in the countries that do not have enough industrialization also do not have distance learning. In Germany, the Open University was built in Hagen, an industrialized town with wire and needle making industries and was the centre of industrial revolution from 1680s and onward. Peters (1994) who was the first rector
also presented the popular theory of distance training as the most industrialized form of teaching and learning. (Keegan 2002, p. 10)

**Electronics Revolution:**
The electronic revolution started in the 1980s when there were major changes occurred in telecommunication sector. There were three major factors behind this revolution:

- an urge to deregulate
- speeding up of chips
- introduction of broadband technologies.

Telecommunication sector was purely under control of the governments and was linked to defense installations. Therefore, governments and military polices were strict about telecommunications. In UK and US, Thatcher and Reagan governments took initiatives towards deregulation and issued new licenses for cellular networks. With these steps telecommunications became consumer driven rather than government driven (Keegan 2002, p. 11).

In 1960s first time computing technology was introduced into telecommunications and that was the starting point of the digitalization of the telecommunication industry. In 1980s the concept of Integrated Services Digitalised Networking (ISDN) was introduced and developed. Seamless digital and wireless was connections technology was quite matured in the 1990s. All these developments in the industry were fairly dependent upon the development of high speed data processing chips. In the start of 2000s new nano-chip technology started to replace silicon chips (Keegan 2002, p. 11).

Broadband technology also played a key role in distance training and made it possible to deliver pictures, audio, video and virtual realities to the learner. Broadband is usually defined as rates of more than 2 Mbps over a public switched network. Interactive multimedia, image processing, data and video need more bandwidth and are large consumers of bandwidth. (Keegan 2002, p. 11)

The electronics revolution of the 1980s opened the doors for group-based distance training through the internet and the worldwide web.

**Mobile Revolution:**
The mobile revolution started in late 1990s. In the end of 1999, Nokia and Eriksson announced that there were 500 million mobile phones in the world and predicted that the number would be one billion by 2004. The main feature of electronic learning was the restoration of face-to-face interaction and eye-to-eye contact of tutor and learner at distance that facilitates group as well as individual learning. The expectation from mobile revolution of the late 1990s is that it will change the citizens into distance students who choose not only to go to college but is moving at a distance from the college. It is also expected that mobile revolution will change the didactic structure of open universities and distance training institutes as more student will choose to enjoy mobile experience (Keegan 2002, p. 12).

Keegan (2002, p. 12) believes that common availability of technologies is also an important rule for success of distance education technology. There is no any example of such penetration of technology in the society like mobile technology. Another notable point is the growth and acceptance of mobile technology is almost same in both developed and developing world. According to telecommunication industry the internet and World Wide Web are not enough since wireless access is independent of location and available for internet services anywhere. This is reasons behind the shift from wire interface to air interface. Keegan (2002, pp.12-13) predicts a wireless information society in very near future giving the high importance to Bluetooth, GPRS, and WAP as the key protocols of wireless information society.
Bluetooth has become the universal radio interface for wireless connectivity. Infrared was previously used for this purpose but has several limitations like limited to 2 meter, sensitive to direction, direct line-of-sight and also limited to two devices at a time. But blue tooth uses radio waves that are much powerful and have greater range, pass through obstacles and can connect more than two devices at the same time. General packet radio system (GPRS) also provides features of great importance like internet connectivity that is instant, transparent, IP access with no call set up time. It brings the official data to the mobile terminals. Wireless access protocol (WAP) provides web browser usability of the Internet to mobile terminals. The main feature of WAP is to provide data-oriented and non-voice services to mobile terminals at anywhere, any time. Code Division Multiple Access (CDMA) is another radio based wideband technology third generation mobile systems (Keegan 2002, pp. 12-13).

Keegan (2002, p.13) urges to develop new didactic environments for mobile to make it a viable medium of distances education and considers it a big responsibility distance learning researchers. Moreover, he considers mobile phones good learning tools as the phones equipped with internet access, card reading, and computing capabilities. Such feature can be very helpful to keep distance student closer to the instructor, learning material and student support services while at home, at work or commuting.

3.6.1.2 Distance Learning

Distance learning refers to teaching-learning arrangement in which the learner and teacher are separated by geographically and by time. It is started in mid19th century when correspondence study started in higher education. In 1972 international council for correspondence Education (ICCE) coined the term distance education to describe the family of the educational practices that had sprung up through the year around correspondence education (Moore, 1990). According to Nabeel (2009) the term distances education denotes the form of study not led by teachers present in classrooms but supported by tutors (full time or part time) and an organization at a distance from the student. This generic term includes range of teaching and learning strategies referred as Correspondence Education, Independent Study and distance learning. But The World Bank, cited by Keegan (2002, p.20), differentiates between distance education and distance learning and defines different definitions for each. According to definition distance education is teaching and learning in which learning normally occurs in a different place from teaching whereas distance learning is learning only that not includes teaching but these terms are usually mixed.

Rashid (1998), cited by Nabeel (2009), says that the main characteristic of distance education is that it provides planning, guidance and tuition through tutorial organization rather to immediate and continuous supervision of tutor. In distance education, usually there is fairly a noticeable distance between the learner and the teacher. In such education teaching and learning is not bounded within four walls of the classroom. This mode of education is very flexible in terms of mobility and facilitates the process by crossing the barriers of time, space, sex, creed, community and religion (Nabeel, 2009).

Distance education is a planned and regular methodology of educating people that is very helpful when there is a distance between teacher and student. Distance learning is a provision of adding knowledge by extensive use of technical media, particularly for the reproduction of high quality teaching materials. This reproduction makes it feasible to instruct great number of students at the same time. The main features of distance education include great efficiency, flexibility and capability to deal with different educational needs vary from student to student. Distance education is a good blend of mass media (radio and television), correspondence material (audio, visual aids), study centers and distant tutors. This combination enhances the opportunities for the students at distance. Student support services
i.e. the help which a distant learner receives along with the learning materials is major factor in success and effectiveness of distance education. This support can be face to face teaching, computer mediated communication, workshops, tutorials and counseling sessions (Nabeel, 2002).

Distance education gives the student authority to choose the methods, timings and locality of their own convenience. It allows students to continue their studies without quitting their jobs, expecting the institutional learning at their own home. The ideology of Von Humboldt, Norman and Newman, cited by Keegan (2002, p. 20), that considers university as a place where student come together for learning is fainting in 21st century. Keegan (2002, pp. 20-21) describes three characteristics of conventional education i.e. face-to-face provision, between learner and teacher in learning group and based on interpersonal communication. But distance education has brought out education from these provisions by separating learner and teacher from learning groups. It is really obliging for student as it frees them by strict timetable and place. Distance education can be individual or group based, part-time or full-time, with pre-prepared or without pre-prepared materials. These different flavors of distance education give independence to learner to choose combination for desired learning.

Distance education has proved itself as a valid provision of education and millions of student has been enjoying this mode of education for decades all over the world. Central Chinese Radio and Television University (CRTVU) in Beijing, Schools of the Air for outback children in Australia, Centre National d'Enseignement à Distance (CNED) in France, University of London, Wolsely Hall College, University of Queensland in Australia, The Open University of the United Kingdom, Universidade Nacional de Educacion a Distancia at Madrid, United States Distance Learning Association (USDLA) are some of the prestigious examples of distant educational institutes and organizations. Another evidence of distance education success is acceptance of the degrees and certificates earned by distance education are highly acceptable in the world. By the end of last century distance learning had set the stage for emerging electronic learning that eventually laid the foundation of mobile learning. (Keegan 2002, pp.20-31)

3.6.1.3 Electronic Learning

In simplest words the learning involves computer and network technology for education purpose is electronic learning (E-learning). According to Horton (2006, p.1) electronic learning is the use of information and computer technologies to create learning experience. Keegan (2002, p.32) describes that the term electronic learning includes online learning, virtual universities, web-bases learning and training, digital collaborated and technology assisted distance learning. Horton (2006, p.2) denotes and explains some forms of electronic learning as follows:

**Standalone courses:** It is solo learning without interaction with teacher and classmates.

**Virtual classroom courses:** It is similar to a classroom course but held online. Synchronous online meetings may or may not be included.

**Learning games and simulation:** In this learning, learner participates in simulated activities designed for exploration and lead to discoveries.

**Embedded e-learning:** It is to learn with computer programs, diagnostic tools, and online help etc. It can be seen indirect learning where learning is included in other systems.

**Blended learning:** includes various form of learning to achieve particular goal. It can be a mix of conventional learning and electronic learning or some form of electronic learning.

**Mobile learning:** Horton (2006, p. 2) includes mobile learning in electronic learning and defines it as learning from the world while moving about in the world. It could be done by smart phones, PDAs and other mobile devices.
Knowledge management: It is for broader use of electronic learning, online documents and conventional media to educated masses than individuals.

Electronic learning represents the mode of learning where learner spends all or some of his study period in front of computer screen. This learning leads to university degree, college diploma or training certificate. The computer screen works as lecture theatre, classroom or practical lab in educational institute of conventional education, or student’s home in distance education. The course contents are provided on computer screen and student support services like feedbacks, results, and answers of student’s queries are provided electronically. Internet and World Wide Web facilitate the student to access other external resources like electronic library. The learning material can be in form of CDs, floppy disk, audio video tapes or paper based. Email is used mostly for communication between student to student and student to teacher. Bulletin boards and chat rooms are also very helpful for that purpose. (Keegan 2002, pp. 35-36)

According to Keegan (2002, p.28) it is evidenced that World Wide Web is the most successful tool to educate people as it can combine different learning materials such as text, audio, video and interactive material. The best feature is that it is be used globally. It is platform independent and can be used for both synchronous and asynchronous learning events. Collis (1996), cited by Keegan (2002, p. 30), believe that World Wide Web can be innovate learning media worldwide and it will facilitate school going children to learn through web instead of learning theatre and classrooms. It would also be an approval for the people who work and don’t go to universities. They can also enjoy electronic learning and World Wide Web for their education.

Electronic learning has proven as popular approach of learning. In 2000, one million online courses were available from the universities around the globe. The success can be measured that on WebCT, one of many electronic learning management application, was used by more than 5 million students, in 123,000 courses and 33,000 university and college faculty at 1,100 institutes in 48 countries. CISCO forecasted in 2000, that in 2003 most of the technical training will be done by electronic learning. Electronic learning has a big share in the income of vocational education and training (Keegan 2002, pp. 32-35).

According to TeleEducation New Brunswick, quoted by Keegan (2002, pp. 34-35), an online course that can be followed completely online. It is not essential that all the material must be online. The learning material like books, tapes, CDs etc could be sent directly to the student and examination may be taken at local testing centers or institutes. America has the biggest share in online course and its share is 75%, Canada is on second place with 16% and Australia is third with 5% in online courses worldwide. Scandinavian countries Sweden, Norway and Finland are also providing online courses.

Keegan (2002, p.36) claims that, with reference of newspapers of 1998, that web-based training is better than traditional training. Professor Schutte of California State University, quoted by Keegan (2002, p.36), had proved that the score of students on web is 20% better than the students in traditional universities. Keegan (2002, pp. 37-39) also admits that at the time of his writing though traditional education and paper based distance learning are primarily used educational provisions but electronic education is most discussed issue in educational journals and conferences. Another success indicator is more than 50 Learning Management Systems (LMSs) are commercially available for web-based learning. WebCT, Blackboard, Learning Space, IntraLearn, Top Class, eCollege, Click2learn are some from the list of applications commercially used by universities and institutes for web-based learning.
3.6.1.4 Mobile Learning

In the second half of 1990s electronic learning had got full recognition all over the world. Many people thought that electronic learning is the ultimate solution for learning but they were unaware of another learning revolution waiting at start of new millennium. In the start of 2000, wired phone and computer were started to be replaced with wireless ones. Now, according to The Millennium Development Report, published by United Nation Organization (2008), mobile technology has the fastest growth around the globe. The facts and figures presented in the report clearly shows that mobile technology is well ahead of its rival technologies.

“The number of fixed and mobile telephone subscribers jumped from 530 million in 1990 to over 4 billion by the end of 2006. Mobile phone use soared, with more than 500 million subscribers added since 2005, bringing the total to more than 2.7 billion by the end of 2006. Growth has been strongest in regions with few fixed telephone lines. In Africa, over 60 million new mobile subscribers were added in 2006, and almost every country now has more mobile than fixed telephone subscribers. With around 200 million subscribers by the end of 2006, 22 per cent of Africa’s population had a mobile phone, compared to 3 per cent with fixed telephone lines and 5 per cent who are Internet users. With technological developments and the deployment of wireless broadband technologies, there are new opportunities to close the communications gap between developing and developed countries.”

Figure 6: No. of telephone and Internet subscriptions per 100, 1990-2006
(UNO, 2008 p.50)

The high penetration rate of mobile technologies added a new revolution in didactics to free the students who sit in front of wired computer screens for educational purpose. In 2001 more than 30 initiatives were taken where new projects were announced and started for mobile learning (Keegan 2002, pp. 44-45).

Mobile learning is the main issue in this research; a whole chapter is dedicated for the topic. Further details of the topic can be found in the relevant chapter. It was new revolution in didactics to free the students who sit in front of wired computer screens for educational purpose. In 2001 more than 30 initiatives were taken where new projects were announced and started for mobile learning (Keegan 2002, pp. 44-45).
3.7 Mobile Learning Theory

Technology has a major impact on learning. Every innovation and development of technology during the last decades, has transformed the classic image of education into an image related to creativity and interactivity. The textbooks were the major medium of instruction in the era of mass print literacy. During the last fifty years by the invention of the computer, information processing, modeling and interaction have become important notions in education. In this era of mobile technology education may conceived as conversation in context, enabled by continual interaction through and with personal and mobile technology (Sharples et al, 2005).

According to Sharples et al (2005) there are many theories of learning developed during the last 2500 years between Confucius and the present day. In these theories it is mostly assumed that learning occurs only in schools and mediated by trained teachers. Although there are some researchers (Argyris & Schön, 1996; Freire, 1972; Illich, 1971; Knowles et al, 1984) who worked on the learning outside the classroom but no any major contribution have been made in mobility of learners and learning even Encyclopedia of Informal Learning (www.infed.co.uk, accessed June 2005) that is considered most authentic resource for informal learning contains no any reference to mobile learning (Sharples et al, 2005).

It is very important to know what makes mobile learning different from other types of learning while developing the theory for mobile learning. The most important and very basic assumption about mobile learning is that learners are continually on the move (Sharples et al, 2005). This very rule applies on time, location, topics, context, technology etc. For example, we learn at one location and apply our knowledge on other location; we learn earlier and apply our knowledge later. Similarly this mobility rule applies on topics, context and technology etc. According to Sharples et al (2005) mobile learning is not that far from other learning activities as mobility of learners can be observed in formal learning when they move from one room to another or from one topic to another. In informal learning mobility of learner can also be seen at workplace. So when we talk about the theory of mobile learning intentions are not to separate it from formal and informal learning activities but to focus on the mobility of learners to understand better how knowledge and skills can be transferred across contexts such as home and school, how learning can be managed across life transitions, and how new technologies can be designed to support a society in which people on the move increasingly try to learn during daily life (Sharples et al, 2005).

Secondly, mobile learning is not necessarily associated with the physical moment of learners but it must deal with the significant learning that occurs outside classrooms and lecture halls. In this learning people initiate and manage their activities by their own to enable educational processes and outcomes. According to Vavoula (2005), cited by Sharples et al (2005) 51% of everyday adult learning place at learners routine environment i.e. home or in the learner’s workplace whereas only 1% of the self-reported learning occurred on transport. This trend also requires designing new technology that supports learning during the growing amounts of time that people spend traveling. It is also important to know how people use the surrounding environment to engage in learning and create learning environment. For example, three children with handheld wireless computers disappear under a school table to create a private learning space (Sharples et al, 2005).

Thirdly, a theory of learning must be based on contemporary issues involved in successful learning. According to US National Research Council (1999), quoted by Sharples et al (2005), the effective learning is learner centered, knowledge centered, assessment centered and community centered. These attributes mostly match with social-constructivist approach, which views learning as an active process of building knowledge and skills through practice within a supportive community (Sharples et al, 2005).
Lastly, a theory of mobile learning must be fully aware of the ubiquitous use of personal and shared technology. In the UK, over 75% of the general population and 90% of young adults own mobile phones (Crabtree, 2003; cited by Sharples et al, 2005). Another trend relevant to a theory of learning in the mobile world is by-passing the fixed-line telephone networks to install cellular networks especially at rural areas in some developing countries, particularly in Africa. These cellular services offer the opportunity for people not only to make phone calls, but to gain the other benefits of mobile technology such as text and multimedia messaging (Sharples et al, 2005).

By concluding and analyzing the discussion Sharples et al (2005) present their theory of mobile learning. Though some of the attributes are more likely to informal and everyday learning, the distinctive aspects of mobile learning are its mobility, the informally arranged and distributed participants, and the interaction between learning and portable technology. The main features of the theory are as follows;

It is the learner that is mobile, rather than the technology: Earlier the technology was considered as mobile and the main focus was to design specific portable technologies. But after several studies for MOBIlearn project it is conclude that it is the learner who is mobile rather the technology. Learner moves between different setting such as mobile and fixed phone, computers, books, notepads etc (Sharples et al, 2005).

Learning is interwoven with other activities as part of everyday life: Learning is very much interrelated with everyday life activities and cannot be easily separated from these activities. For example the daily life activities like conversation, reading, watching television etc can be resources and contexts for learning (Vavoula, 2004; cited by Sharples et al, 2005).

Learning can generate as well as satisfy goals: Learning can be initiated by learners own intentions (such as learner’s needs and problems) or by external goals (such as a curriculum or study plan). Learner’s curiosity or serendipity may also introduce new goals which may be explored through formal or informal study.

The control and management of learning can be distributed: In mobile learning the control and management of learning activities can be distributed across learners, teachers, guides, technology and other different resources whereas in classroom the authority of all learning activities remain with teacher only.

Context is constructed by learners through interaction: The context in which mobile learning is occurred is very important to understand the complexity of mobile learning. Context is not only the surrounding environment and time but it should be seen as a dynamic entity that is constructed by the interactions between learners and their environment. For example, visitors to an art gallery continually create contexts for learning from their paths through the paintings, their goals and interests, and the available resources including curators and other visitors.

Mobile learning can both complement and conflict with formal education: In mobile learning, learners has the choice to extend classroom learning to homework, field trips, and museum visits where they can review teaching material on or collect and analyze information using their mobile devices. Multimedia phones and wireless games machines carried by the learners for communication within and outside the school could disrupt the controlled environment of the classroom (Sharples, 2002; cited by Sharples et al, 2005).

Mobile learning raises deep ethical issues of privacy and ownership: Many systems such as myLifeBits (Gemmell, Williams, Wood, Bell, & Lueder, 2004; cited by Sharples et al, 2005) and tagging devices raise deep ethical and privacy issues. myLifeBits is a recording system known as ‘experience organisers’ that allows people to record their everyday life as sounds and pictures. These recordings have the potential to be powerful tools for lifelong learning and aids for those with failing memories. They may also allow parents and teachers to monitor the learner’s activity that could be seen as a deeply disturbing vision of childhood
without privacy. The electronic tagging devices can also be used to track the location of the children (Sharples et al, 2005).

### 3.8 Conceptual Framework for Mobile Learning Evaluation

This section consists of three different models of effective learning. First model is Community of inquiry and presented by Garrison et al in 2000. Second one is presented by Swan in 2003 and third one is presented by Danaher et al in 2009. Following are the brief descriptions of each of them.

#### 3.8.1 Community of Inquiry

In 2000, Garrison et al presented the concept of community of inquiry. The community of Inquiry consists of teachers and students and creates a worthwhile educational experience. Garrison et al (2000) express that computer-mediated communication (CMC) is increasingly being used in higher educational setting and present the model to explore its effectiveness in higher educational context. The model of Community of Inquiry assumes that learning occurs within the Community through the interaction of three core elements. These three essential elements are cognitive presence, social presence, and teaching presence. The model presented by Garrison et al (2000) is shown below.

![Figure 7: Elements of an educational experience (Garrison et al, 2000)](image)

The first and most important element for higher education success in this model is cognitive presence. Cognitive presence means the extent to which the participants in any sort of a community of inquiry are able to construct meaning through sustained communication. It is even not too simple in face-to-face communication that is easy and simple in traditional educational setting but it is important to know when the medium of communication changes that is computer-mediated communication for higher education. Cognitive presence is also crucial for critical thinking, a process and outcome, frequently presented as the perceived goal of all higher education (Garrison et al, 2000).

The second major element in the model is social presence. According to Garrison et al (2000) social presence is the ability to participate in the Community of Inquiry to project their personal characteristics into the community. It is to present yourself to the other participants as “real people”. The social presence is very important in the sense that it supports and facilitates cognitive presence that leads to critical thinking carried on by the community of learners.
The third element of the model, teaching presence, consists of two general functions. The first one is to design the educational experience. It means that the teacher selects, organizes, and primarily presents the course content. Moreover, teacher also takes care about designing and development of learning activities and assessment. The second function of teaching presence is facilitation. It is a responsibility that may be shared among the teacher and some or all of the other participants or students. These both functions in teaching presence are to support and enhance social and cognitive presence for better and improved outcomes of learning process (Garrison et al., 2000).

### 3.8.2 Swan’s Model

In 2003, another model for online learning effectiveness was presented by Karen Swan. The Swan’s model is based on the community of inquiry model and has three elements also. Swan (2003) sees these three elements as interaction with contents (cognitive presence), interaction with peers (social presence) and interaction with instructor (teaching presence).

**Interaction with contents:** Interaction with contents means learners' interaction with the knowledge, skills and attitudes which are being studied. In simple words interaction with content is learners' interaction with the course materials. Measurement of online content learning has been undertaken in terms of performance (course grades, exams, written assignments, etc.) and perceptions of learning by students and faculty.

**Interaction with instructor:** The second type of interaction is between learner and instructor. In any sort of educational it is very important since the one who arrange the instruction to stimulate students interests, motivates their participation in the learning process, and facilitates their learning is instructor. A good relationship between instructor and student and their interactions is very important for the learning in traditional classrooms environment (Madden and Carli, 1981, Powers and Rossman, 1985; cited by Swan, 2003). Similarly, student instructor interaction has the same importance for online learning. Shea et al (2001) cited by Swan (2003), present the correlation between perceived learning and student/instructor interaction. They claim that if the interaction level is high the perceived learning would be high and the learning would be low if the interaction is low.

**Interaction with classmates:** The third type of interaction is interaction with classmates. This type of interaction also has the prime importance for effective learning. Socio-cognitive theories of learning present the idea that learning is social process and the knowledge is acquired through social interactions (Harasim, 1990; cited by Swan, 2003). According to Wells (1992), quoted by Swan (2003) online education is comparatively good to support
social learning because it provides the equal opportunity to the student to have a voice in the discussion and no student can dominate the conversation. The online discussion also makes it impossible for even an instructor to control.

### 3.8.3 Danaher et al Model

Danaher et al (2009) present the model for learning effectiveness that consists of three most important elements of learning and teaching. The three elements that construct the model are engagement, presence and flexibility. Each of the elements is of same importance as have shown in the model. These elements are the major factors which makes the learning more easy and meaningful for teacher and students. To elaborate the relation and importance each of these elements discussed below.

![Conceptual framework for evaluating mobile learning](image)

**Figure 9:** Conceptual framework for evaluating mobile learning (Danaher et al, 2009 p. 23)

#### 3.8.3.1 Engagement

In general engagement means one’s commitment and involvement in the activity. In mobile learning perspective, Danaher et al (2009) defines engagement as the active participation of the learner in the learning activities in mobile learning and teaching environment. Since learner, teacher and technology are the building blocks of mobile learning environment, the engagement of teacher and technology is also crucial. The advanced technologies help to narrow the gap between in the classroom and out the classroom learning experiences. The new development in ICT helps to improve teachers and learners’ activities associated with learning process especially wireless technologies and other LMSs improve such activities for students by actively engaging them in an interactive environment. To achieve these objectives and the content to reach the student, their active participation is crucial. For the learning environments in which the ICT tools are used for learning purpose, it is very important for the learners to take part actively in the process on their own initiative (Danaher et al, 2009). In this way the learner can interact with co-learners and peers, instructor and technology efficiently. For example, on LMS or other learning tools, a learner can share the work done by him to his co-learners and instructor, can assess and comment on others work and get feedbacks form instructor. This active participation in the process is seen as the engagement of the learner in the learning process. For an effective learning the active engagement of all three components are highly required.
3.8.3.2 Presence

Presence is the second element of mobile learning evaluation model. In general, presence means being there, physically or mentally, in some activity or place or state of being present. Mobile learning exempts the learner from physical presence and makes it possible for the learner to be virtually (mentally) present in the learning environment. According to Danaher et al (2009) the term presence, in context of mobile learning, refers to a simultaneous awareness and locatedness of self and others in learning and teaching environment. According to Danaher et al (2007, p.211), cited by Danaher et al (2009), the “presence evokes the engagement and interaction assumed to lie at the centre of the learner-educator relationship, whether face-to-face or mediated by space and/or time" (Danaher, Hickey, Brown & Conway, 2007, p. 211). They further add that, "Presence also betokens the empathy, encouragement, interest, and support and the emotional dimension of being human on which that relationship is presumed to be based". So presence is very important and crucial for the learning process.

Anderson (2004), quoted by Danaher et al (2009), defines three types of presence, first one is Cognitive that is linked with student-Content interactions, the second one is Social which is based on interaction between student to student, and the third one is teaching which is related with student-teacher interactions.

3.8.3.3 Flexibility

The third element in the model is flexibility which means how easy and facilitative the system is for teachers and students. Flexibility is an important element and plays a major role in learning as described by different researchers. According to Dimitrova et al (2003) and Payne, Ball and Snow (2000), cited by Danaher et al (2009), the flexible learning facilitates different
modes of interaction between teacher and student. The flexibility can be observed in e-learning that provides facility to learners with access to suitable ICT tools to experience learning that suits their personal needs (Dimitrova et al., 2003; Goodison, 2001; cited by Danaher et al., 2009). It is very important in current educational environment to define the ways with increased flexibility and mobility for student and teachers. Students use different means and learning resources depending on their style and strategy of learning hence mobility and flexibility are vital for learning. (Dimitrova et al., 2003; cited by Danaher et al., 2009). Kaufhold (2002, pp.3-11) explains that different students have different learning needs and they learn from the way that most suits their learning styles. Hence, the current educational system is inflexible in this connection that it does not provide the appropriate tools for learning to individuals. Van Meel (1992), cited by Danaher et al (2009), and also believes that the inflexible learning environment is more problematic while flexibility can improve the learning environment. Johnston (1999), quoted by Danaher et al (2009), also advocates the flexibility and considers flexibility an effective strategy of improving equality in learning environments. These all arguments show the importance of flexibility to accommodate the diverse range of student and their needs. Flexibility should be in learning activities, teaching activities and in assessment activities to facilitate teacher and learners. Since mobile learning is an extension of electronic learning (Keegan 2002, p. 17, Metcalf and De Marco 2006, p.4) it shares almost same infrastructure and ICT tools used in electronic learning. To be an effective mode of learning, mobile learning should be flexible in ICT tools that it offers to the learner.

3.8.4 Model Comparison and Selection

There are three models for effective learning presented above. Main features of each of them are presented in the following table. The table also provides the comparative view of all the models and shows the similarities and dissimilarities in the models. It is clearly evident from the table that presence is element that is presented in all models. The presentation of community of inquiry and Swan’s model is different but the concept is same. Danaher et al’s model is more comprehensive as it contains what other two models have and it also contains extra elements to investigate learning effectiveness. It is one of the main reasons to select this model for our study.

<table>
<thead>
<tr>
<th>Community of inquiry</th>
<th>Swan’s Model</th>
<th>Danaher et al’s Model</th>
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<tbody>
<tr>
<td></td>
<td>Social Presence</td>
<td>Interaction with peers (Social Presence)</td>
</tr>
<tr>
<td></td>
<td>Teaching Presence</td>
<td>Interaction with instructor (Teaching presence)</td>
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</tbody>
</table>
Another reason to select this model for this study is that it is the most recent (presented in 2009) and specially designed model for mobile learning. According to Danaher et al (2009) the model is based on a comprehensive pedagogical research. Moreover, this model does not restrict us only to presence issue but also provides us the scope to extend our research to engagement and flexibility issues. Since our research problem is effectiveness of mobile learning, this model is more suitable for this study because it investigates from different angles and multiple aspects that will make our research worthwhile. The model helped us in building our research instruments i.e. questionnaire to gather the empirical data. Our questionnaires are based on these three elements and sub-elements in this model and then we drew the results on the basis of these elements.

| Engagement | N/A | N/A | Technology  
|            |    |    | Student  
|            |    |    | Teacher  
| Flexibility | N/A | N/A | Learning Flexibility  
|            |    |    | Teaching Flexibility  
|            |    |    | Assessment Flexibility  

Table 3: Comparison of three models
CHAPTER 4: METHODOLOGICAL OVERVIEW

4.1 Research Method
To explore the new ideas and improving the existing ones, there is a need to conduct research, which would analyze, compare and evaluate existing knowledge, frameworks and systems, by advancing them innovatively. Every research activity has an idea to be carried out and that by two purposes: first to make improvement in knowledge within the existing field, and second to improve knowledge within oneself as a professional consumer of research to understand new developments within the discipline (Gliner and Morgan, 2000 p.5). Research is the only way to introduce the new dimension and prove it with the help of facts and figures collected and analyzed by using different analysis methods. Kumar (2005, p.2) defines the research as “research is the way of thinking, examining critically the various aspects of day to day professional work, understanding and formulating guiding principles that govern a particular procedure, and developing and testing new theories for the enhancement of practice”. Research study is usually carried out to find the answer of the question. There are many steps like research approach; research method; data collection and analysis are involved in this process. According to Myers and Avison (2004, p.5) a research method is a strategy of enquiry which moves from the underlying philosophical assumptions to research design and data collection. The choice of research method influences the way in which the researcher collects data. Validity and reliability improve the level of confidence for the research result.

There are two types of research available i.e. quantitative and qualitative research. According to Myers and Avison (2004, p.2) quantitative research method is used to study the natural phenomena in natural settings. Quantitative method can also be used in social sciences up to certain limits. Survey methods, laboratory experiments, formal methods and numerical methods are the examples of quantitative research. Whereas qualitative research method is used to study social and cultural phenomena and helps to understand people and their culture in real life context. In this research we use quantitative research because it allows studying natural phenomena in natural settings. In view of Muijs (2004, p.1) quantitative research method is to explain phenomena with numerical data for analysis using mathematical methods. In mobile learning, people use mobile for the purpose of learning in routine life since it does not require any special arrangement to learn by using mobile phones. For this scenario, we use the quantitative research because it allows collecting the empirical data in numbers and figures which are easy to analyze statistically and help to produce a meaningful structured result.

4.2 Research Approach
According to Galliers and Land (1987) to first consider the nature of information system and then look at the expected results and then decide the research method. The information system field suggested using “idiographic” research strategies instead of “nomothetic”. Since this research is to test the single entity or particular event, we used the idiographic research because it allows understanding a phenomenon in its context and investigator intensely examines a single entity or event. Whereas nomothetic research strategy seeks general laws and draw solely on procedures used in the exact sciences (Weick, 1984).

4.3 Research Strategy
Quantitative research method is now also used in social settings. A variety of different research strategies are available in quantitative research, like survey methods, laboratory experiments, formal methods, and numerical methods etc. These different kinds of methods
are used for different types of research according to different initiatives. We use survey as our research strategy because survey research allows making analysis with numerical figures and enables to generalize the results of the whole population by studying a group of selected people of the population called sample.

According to Yin (2003) different research strategies can be selected depending upon the research question being asked. The research question is most important, while choosing the research strategies. As our research aims to find out mobile learning influence in educational setting, the improvement of learning process in higher education, the suitable research strategy of this kind of questions is survey. Survey strategy is selected because the study focuses on contemporary events; it does not require control over behavioral events. So according to Yin (2003) the most appropriate strategy to understand a phenomenon, which in our case is the role of mobile learning in learning environments, would be best explained using a survey.

In survey strategy the information is collected from a group of randomly selected peoples from a large number of populations by using the technique of questionnaire (Yin, 2003). In a short time research, the survey is useful to collect the large number of data and to find answers to its research problem, and questionnaire are helpful to collect the data by providing the alternatives for answering.

4.4 Sample Selection

Before making the sample selection we have selected the population for which research result will be valid. To test the effectiveness of mobile learning in higher education, teachers and students from different study field were selected from Linnaeus University, Sweden. While selecting the population we consider the students that are from undergraduate and higher level. Same levels for teachers are also considered at the time of selecting the population. Sampling is a key feature of survey approach. Due to different factors like time, expenses, and accessibility it is not possible to collect the data from whole population, for this purpose sampling is helpful to collect the data from randomly selected people. While doing a sample selection, the consideration is made that the selected sample will represent the whole population instead of smaller group of people. The research results are based upon the sample selection and wrong sample selection may lead to inappropriate results. The result of this sampling will then be generalized to the whole population that is teacher and student from Linnaeus University for undergraduate and higher level.

This research is about the influence of mobile in educational process, so the teachers and students both are included as respondents. For the purpose of empirical data collection a sample of fifty (50) teachers and fifty (50) students is made. While selecting the sample, ultimate care has taken to obtain accurate results. A random sampling technique is used for sample selection. The survey is conducted within the Linnaeus University with the help of CeLeKT. Moreover, some teachers from Växjö Kommun are also included for teacher’s questionnaires. The effectiveness of this research is totally dependent upon the results of questions that are included in questionnaires.

4.5 Data Collection Method

According to Saunders and Thornhill (2007) data collection is an important step for research and highly influenced by the selected research methodology. In this research we use questionnaires as a data collection technique. While designing the questionnaire for both students and teachers the consideration has been given to factors discussed in theoretical framework i.e. presence, engagement and flexibility. The questionnaire is divided into three parts accordingly. Different types of questionnaire are used for empirical data collection that
has different types of questions. Usually two types of questions, close-ended and open ended are mostly used for data collection. In this research, closed-ended questions are used for data collection. Closed-ended questions allow the person to select the answer from given possible answers. Moreover, these kinds of questions are easy to analyze statistically. Likert scaling is used in questionnaires to restrict the respondent answers. According to Trochim (2006) “Likert Scaling” is a uni-dimensional method in which answers are given by using scale. In this research 6 following scales are used to measure the respondent views:

1. Extremely satisfied
2. Satisfied
3. Somewhat satisfied
4. Somewhat dissatisfied
5. Dissatisfied
6. Extremely dissatisfied

As our research is to investigate mobile learning effectiveness in higher education and for this purpose we design questionnaires. The educational process involved two types of respondents such as teachers and students and for this purpose we designed separate questionnaire for both. The questionnaire is designed by considering different prospective that are enough to collect the empirical data for this research. The formation of questionnaire has been done after comprehensive review of literature, pilot study, and help and support of CeLeKT Group that enables us to finalize the questionnaire for this study.

4.6 Pilot Study

After completion of questionnaire design, a pilot study was made in two stages, first those who know about mobile learning and have preliminary knowledge and usage of mobile in education up to certain limits, and secondly those who don’t know about this new dimension of learning and still willing to know and utilize this technology. For pilot study randomly 5 students and teachers of Linnaeus University were selected to ensure that the questionnaire is appropriate and understandable for respondents.

After the pilot study, all problems such as misunderstanding and ambiguities in questionnaire was elaborate for better understanding. A revised questionnaire is designed with the help of CeLeKT (Center for Learning and Knowledge Technologies) before data collection. The satisfactory result of pilot study gives more confidence for further data collection. Random sample selection technique is used for empirical data collection and questionnaire is distributed both by hand and through Internet in Linnaeus University.

4.7 Data Analysis Method

After collection of empirical data it needs to be analyzed to produce meaningful results. The collected data can be analyzed in different prospective for making the sense of information into knowledge. The analysis is actually different types of representation of data that can be helpful for further decision making. A data analysis is conducted to analyze the questionnaire responses and to evaluate mobile learning influence in education.

During data analysis the frequencies and percentages of the respondents divided according to gender, age, education level, and their position as teachers or students. Then different questions in questionnaire will be analyzed such as usage of mobile in education, mobile adaptation, and willingness of mobile usage for education. The results of analyses will be presented in different charts and graphs by using Microsoft Excel for better understanding of produced results.
4.8 Reliability and Validity

4.8.1 Reliability
Reliability refers to the consistency of a measure. A test is considered reliable if the same result repeatedly produced. The purpose of reliability is to minimize the errors and biases in a research work. Reliability demonstrates that the operations of the study, such as the data collection procedures can be repeated with the same result (Yin, 2003). Reliability of the research can be improved by taking some measures to reduce the chance of error that may lead towards inappropriate results. Questionnaire for empirical data collection are done at the same time for avoiding different results. The questionnaires are distributed only within the domain of interest, i.e. teachers and students instead of general population. To facilitate the respondents, an introduction of mobile learning is also included at the start of both questionnaires.

Comprehensive literature of mobile learning is reviewed during the study to reduce the biasness and misunderstanding. Multiple sources with different authors made it possible to review the literature in depth. It helped us to minimize the level of error because the higher level of reliability can only be achieved by reducing the error.

4.8.2 Validity
Validity is the extent to which a test measures what it claims to measure. It is vital for a test to be valid in order for the results to be accurately applied and interpreted. The term validity is referred to the quality of empirical data collection and its analysis. The results of a research work heavily depend upon the quality of work and accurate data collection for analysis. During this research following steps are taken to ensure the validity of results. Questionnaire is the main source for data collection for this research and while designing the questionnaire both for teachers and students, relevant literature review has been made. In questionnaire special focus was given on engagement, presence, and flexibility. These are the related factors influencing the use of mobile for educational purpose by teachers and students to ensure validity of results.

After designing the questionnaire, they were forwarded to CeLeKT Group of Linnaeus University for the expert opinion. A meeting was arranged with CeLeKT for their valuable suggestions and discussion. Since mobile learning is a new idea that is not very common and sometimes it is difficult for the respondent to understand the question, a one page introduction of mobile learning was also included in questionnaire to make it more understandable. It helps respondents to fill out questionnaire more effectively. In this way more valid results can be produced. Moreover, Pilot study was conducted with coordination of CeLeKT Group to ensure the quality and validity of questionnaire and to make it sure that the questions being asked are appropriate and are easily understandable for respondents.

4.9 Ethical Considerations
Ethical considerations are very important for any research. It is really important for researcher to have impartial eye, be unbiased and honest. The results of the research should be harmless and beneficial for humanity. We tried our best that our research should not harm ethically any individual, group or organization. For this purpose, we consulted different code of ethics, developed by different professional organizations like Association of Computing Machinery (ACM, 2009) and IEEE Code of Ethics (IEEE, 2009) to avoid any ethical offence. The following are the codes we observed strictly during this research work.

**Bestow to society and human well-being** – This principal deals with the quality of life of all people and the researcher is responsible to protect fundamental human rights and to respect
the diversity of all cultures. The research must ensure that while using their developed products or systems, there will be socially responsible and accepted ways, meet social needs, and it should avoid harmful effects to health and welfare. The research and computer professional must aware any damage to local and global environment and should responsible for protection of human well-being includes a safe natural environment. We observed these rules while choosing the research topic and strive to work on human wellbeing. We hope our research will be helpful to create a better learning environment that will ease the learning process and help the mankind.

**Harmless to others** – We ensured that our research will not harm any individual, culture, race, and organization. Harm means any physical injury or negative consequences such as undesirable loss of information, loss of property, property damage, or unwanted environmental impacts. This principle prohibits use of computing technology in ways that result in harm to any of users, the general public, employees, and employers. We tried that our research will be harmless to any other unless used in inappropriate way. The research results have been generated from true facts and known figures.

**Honest and trustworthy** – Honesty is the most important feature of any kind of research. The true results or desired output can never be obtained without factual and accurate data. Honesty is an essential component of trust and without trust an organization cannot function effectively. As true computing professionals we strived avoiding deliberately false or deceptive claims about mobile learning, but tried to provide full disclosure of all pertinent limitations and problems of mobile learning. The results of our research confirm our claim.

**Fair and take action not to discriminate** – The values of equality, tolerance, respect for others, and the principles of equal justice govern this imperative. Discrimination on the basis of race, sex, religion, age, disability, national origin, or other such factors is an explicit violation and will not be tolerated. We assure that our research will not violate any kind of discrimination of the society or human beings. The wrong perception of the research result which may leads the results to such unfair action which is strongly discouraged. We tried to create the balance in our research and tried to avoid inequities between different groups of people. In a fair society, all individuals would have equal opportunity to participate in, or benefit from, the use of computer resources regardless of race, sex, religion, age, disability, national origin or other such similar factors. And our research will respect all these kind of issues to divide the society. We made special efforts to include people from all around the world and did our sample selection keeping in mind this principle.

**Honor property rights, copyrights, and patent** – We assure that we avoided unauthorized use of resources without prior permission or rights. Piracy is one of the most major issues which are legally prohibited. Violation of copyrights, patents, trade secrets and the terms of license agreements are prohibited by law in most circumstances. Copies of software should be made only with proper authorization. Unauthorized duplication of materials must not be condoned. We took special care to avoid piracy and copyrights during our research.

**Proper acknowledgement for intellectual property** – Intellectual property is the ideas of specific person and the use of such a material is also leads towards misconduct. We tried our best to protect the integrity of intellectual property. We ensured giving credit to the original author or producer of any contents we used in our research. Proper referencing system has been used to avoid illegal reproduction of genuine material and to give credit to the author/publisher or producer of the contents explicitly protected by copyright, patent, etc.
Respect the privacy of others – Privacy of individual, group, and organization is now a big challenge and peoples avoid sharing their information due to privacy. It is the responsibility of researcher to maintain the privacy and integrity of the data collected. We assured every respondent to keep his personal information and reflections about the mobile learning private and confidential and we have not disclose any personal information in our research of any individual who participated in the research.

Honor confidentiality – We also make sure the confidentiality of data or information, which we have collected and the knowledge which we have gained during our research. The ethical concern is to respect all obligations of confidentiality to employers, clients, and users unless discharged from such obligations by requirements of the law or other principles of this Code.

Avoid bribery – Bribery is the worst conditions which influence the result of research or other decisions. According to Rossi and Berk (1997, p.132) bribery is offering of rewards to a person in a decision making position for making a decision favoring the briber. In both the cases either offer bribes or acceptance of bribery is illegal. Though it was not the case in this research work but we promise to observe this code during our life endeavor.
CHAPTER 5: EMPIRICAL FINDINGS

This chapter contains the abstract of data gathered for this research. The empirical data for the research has been gathered through specially designed instruments for this research i.e., questionnaire for students and teachers. A questionnaire contains different questions concerning the parameters of evaluation framework i.e., presence, flexibility, and engagement. In the following sections the empirical findings extracted from the collected data are presented. The first section explains the percentage of the responses received from the respondents. In the next section the data collected from teachers is being discussed and categorized by gender, age, departments and experience etc. Moreover, the percentage of agreed and disagreed responses is also presented. The next section consists of students’ data where empirical findings from students’ data is presented and discussed.

5.1 Demographic Data

The empirical data for the research was collected by using questionnaire from both teachers and students. For the purpose of empirical data collection fifty (50) copies of questionnaire for students and fifty (50) copies of questionnaire for teachers are distributed during May 2009. Out of 100 distributed copies of questionnaire only 70 were received with an overall response rate of 70 percent. Out of 50 copies of questionnaire of students the response of 48 were received with 96 percent response rate whereas response of 22 copies of teachers’ questionnaire with 44 percent, which is comparatively low, was recorded. The overall response rate was 70%, which is considered acceptable in social sciences. This high response rate is an evidence of quality and understandability of questionnaire. The profile of the respondents is shown below in the table.

<table>
<thead>
<tr>
<th>Survey</th>
<th>Questionnaires Distributed</th>
<th>Response received</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>50</td>
<td>22</td>
<td>44.00%</td>
</tr>
<tr>
<td>Students</td>
<td>50</td>
<td>48</td>
<td>96.00%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>70</td>
<td>70.00%</td>
</tr>
</tbody>
</table>

Table 4: Questionnaires response rate

50 22
50 48

Table 4: Questionnaires response rate

47
While collecting the empirical data, special consideration was made to collect the data from both genders. In students data 35% are females and 65% are male and in case of teachers 55% are male and 45% are females. Females are 39% of total data collected as compared with male that are 61% of total data collected for this research.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Students</th>
<th>Teachers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Numbers</td>
<td>Percentage</td>
<td>Numbers</td>
</tr>
<tr>
<td>Male</td>
<td>31</td>
<td>65%</td>
<td>12</td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>35%</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>100%</td>
<td>22</td>
</tr>
</tbody>
</table>

Table 5: Gender wise response for teacher and students

5.2 Synopsis of Teachers Response

The focus of this research work is mobile learning in educational process that involves two major stakeholders, and empirical data is collected from teachers to know their viewpoint regarding mobile learning. To get the diverse range of data from teachers the questionnaire were forwarded to teachers working in different departments having different gender, age group, and teaching experience. Since mobile learning is new idea that is recently introduced, therefore, low response rate from teachers is received. The collected data is analyzed from different aspects that include gender, age, teaching experience, and teaching area as shown in following table.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Responses obtained</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12</td>
<td>55%</td>
</tr>
<tr>
<td>Female</td>
<td>10</td>
<td>45%</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>100%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 25</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>25 – 35</td>
<td>3</td>
<td>14%</td>
</tr>
<tr>
<td>35 – 45</td>
<td>8</td>
<td>36%</td>
</tr>
<tr>
<td>45 – 55</td>
<td>5</td>
<td>23%</td>
</tr>
<tr>
<td>55 – 65</td>
<td>6</td>
<td>27%</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>100%</td>
</tr>
<tr>
<td>Teaching experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 1 years</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>1 - 3 Years</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>4 - 6 Years</td>
<td>3</td>
<td>14%</td>
</tr>
<tr>
<td>7 - 10 Years</td>
<td>5</td>
<td>23%</td>
</tr>
<tr>
<td>More than 10 years</td>
<td>14</td>
<td>64%</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>100%</td>
</tr>
<tr>
<td>Teaching area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media studies</td>
<td>2</td>
<td>9%</td>
</tr>
</tbody>
</table>
Political science 1 5%
Social science 6 27%
Mathematics 5 23%
Natural sciences 3 14%
Sports 2 9%
Economic 1 5%
Law 1 5%
Psychology 1 5%
Total 22 100%

Table 6: Teachers demographic data

The questionnaire was distributed to the teachers of Linnaeus University in different departments, 22 responses were received from 50 delivered questionnaire with the response rate of 44%. Due to non-availability of most of the teachers, responses remained lower than our expectation. Almost equal number of responses was received from both genders that indicate the fairness of results in both genders, male response rate was 55% as compared with females response rate was 45% of the total responses received from teachers. Age group was also considered while collecting the data. 14% respondent was between 25 to 35 year, 36% was between 35 to 45, 23% was 45 to 55, and 27% was in age group of 55 to 65 years.

Teaching experience is another factor that can influence the results of this research, and while collecting the data consideration was given to collect the data from experienced teachers. 14% of respondent were having experience of 4 to 6 years, 23% were 7 to 10 years, and 64% were having experience of more than 10 years. Teaching area is another parameter that can be effective for acceptance of mobile learning in different study areas. Responses from different departments are received in the given percentages as; 9% from Media studies, 27% from social and 14% from natural sciences, 27% from Mathematics and 9% from sports. Only 5% response was received from the departments of Political science, Economic, Law, and Psychology.

The framework of this study has three major factors that are engagement, presence, and flexibility and each factor contains three sub factors. The likert scale ranking is converted into qualitative measures while compiling the results. Scaling is divided into two group that is ‘Disagreed’ and ‘Agreed’ and percentage is calculated for each factor and sub factors in teachers profile. Following table shows the detail of each factor.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Sub factors</th>
<th>Questions</th>
<th>Responses in % Disagreed</th>
<th>Agreed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engagement</td>
<td>Student</td>
<td>Mobile contents (SMS, MMS, Game etc) are more interesting for my student.</td>
<td>22.73%</td>
<td>77.27%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mobile learning suits well for today’s students style as most of them are fascinated by mobile.</td>
<td>27.27%</td>
<td>72.73%</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td></td>
<td>25.00%</td>
<td>75.00%</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>I am interested to use Mobile as teaching tool.</td>
<td>27.27%</td>
<td>72.73%</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td></td>
<td>27.27%</td>
<td>72.73%</td>
</tr>
<tr>
<td></td>
<td>Technology</td>
<td>Pedagogical methods should be aligned with new technologies.</td>
<td>13.64%</td>
<td>86.36%</td>
</tr>
</tbody>
</table>

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Table 7: Teachers questionnaire factor wise results

The factor-wise distribution of the results in percentage depicts the clear picture. From the responses received, 62.63% of the teachers agreed with the implementation and only 37.12% disagreed. The breakdown for engagement factor reveals that 25% were in disagreement while 75% agreed that mobile learning can improve engagement. 58.34% think that mobile learning can improve presence whereas 41.66% are against mobile learning with regards to presence. In terms of flexibility, 54.55% agreed and 44.70% disagreed with mobile learning. The detailed of questionnaire with percentage for each options of every questions are attached as APPENDIX - III.
5.3 Synopsis of Students Response

Students are the major stakeholders for this research as they are the integral part of any learning activity. The high percentage of response clearly evidences their active participation in the process. The Data has been collected randomly from the people with different backgrounds based on their age, gender, ethnicity and education (degree, department) to get a broader viewpoint of students. The statistics for the data collected is shown and discussed below.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Responses obtained</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>31</td>
<td>65%</td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>35%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>48</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-22</td>
<td>12</td>
<td>25%</td>
</tr>
<tr>
<td>22-30</td>
<td>33</td>
<td>69%</td>
</tr>
<tr>
<td>30-40</td>
<td>3</td>
<td>6%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>48</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Degree Program</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>14</td>
<td>29%</td>
</tr>
<tr>
<td>Graduate</td>
<td>23</td>
<td>48%</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>11</td>
<td>23%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>48</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European</td>
<td>28</td>
<td>58%</td>
</tr>
<tr>
<td>Asian</td>
<td>15</td>
<td>31%</td>
</tr>
<tr>
<td>African</td>
<td>4</td>
<td>9%</td>
</tr>
<tr>
<td>South American</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>48</td>
<td>100%</td>
</tr>
<tr>
<td><strong>School</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management &amp; Economics</td>
<td>15</td>
<td>31%</td>
</tr>
<tr>
<td>Humanities</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Technology and</td>
<td>6</td>
<td>13%</td>
</tr>
<tr>
<td>Education</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>10</td>
<td>21%</td>
</tr>
<tr>
<td>Health and Social</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Computer Science, Physics and Mathematics</td>
<td>11</td>
<td>23%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>48</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 8: Students demographic data
The total number of questionnaire delivered was 50 and we got 48 responses. The overall average of student response is 96% where 65% of answerers are male and 35% are female. In age groups, 25% of answerers are below 22 years, 69% are between 22 to 30 and 6% are of 30 to 40. In terms of the study program we have 29% undergraduate student, 48% of graduates and 23% of postgraduates. 58% students are from Europe, 31% are from Asia, 9% are from Africa and 2% of South America. The students from School of Management & Economics are 31%, from School of Humanities are 4%, from School of Technology and Design are 13%, School of Education shares 4 %, School of Social Sciences is represented by 21%, students from School of Health and Social work are 4% and the students from School of Computer Science, Physics and Mathematics that are 23% of the total.

Student questionnaire is also categorized into framework’s parameters. The detail of each factors and sub factors is shown in table below.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Sub factors</th>
<th>Questions</th>
<th>Responses in %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Disagreed</td>
</tr>
<tr>
<td>Engagement</td>
<td>Student</td>
<td>I use Mobile Devices (Phone, iPod, MP3 etc) to perform my daily life activities.</td>
<td>20.83%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With mobile technologies I can learn more easily since it is fun to use mobile for learning purpose.</td>
<td>50.00%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mobile devices (Cell Phone, iPod, MP3 players) can be useful for me because I do like to use them.</td>
<td>20.83%</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Average</strong></td>
<td><strong>30.55%</strong></td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td></td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Average</strong></td>
<td><strong>0.00%</strong></td>
</tr>
<tr>
<td></td>
<td>Technology</td>
<td>Mobile technologies should be introduced in learning environment.</td>
<td>25.00%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I highly recommend using this technology to improve the learning process.</td>
<td>20.83%</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Average</strong></td>
<td><strong>22.92%</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Factor Average</strong></td>
<td><strong>26.73%</strong></td>
</tr>
<tr>
<td>Presence</td>
<td>Student-Content</td>
<td>It can be more convenient for me to access learning material (Lecture, Audio/Video etc) through mobile technologies since mobile devices are always with me and I can use them any available free time (Travelling, Waiting for bus etc)</td>
<td>18.75%</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Average</strong></td>
<td><strong>18.75%</strong></td>
</tr>
<tr>
<td></td>
<td>Student-Student</td>
<td>I can share and discuss any information with my colleagues anytime, anywhere through mobile technologies to improve my learning.</td>
<td>16.67%</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Average</strong></td>
<td><strong>16.67%</strong></td>
</tr>
<tr>
<td></td>
<td>Student-Teacher</td>
<td>Mobile technologies can improve my off the school interaction with my teachers and other students.</td>
<td>20.83%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I feel closer connected to my teachers through mobile technologies.</td>
<td>52.08%</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Average</strong></td>
<td><strong>36.46%</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Factor Average</strong></td>
<td><strong>23.96%</strong></td>
</tr>
<tr>
<td>Flexibility</td>
<td>Learning Activities</td>
<td>I feel hesitation to ask the questions in the class but mobile communications (Conversation, SMS, MMS etc) can be an easy way to ask.</td>
<td>60.42%</td>
</tr>
</tbody>
</table>
Mobile technologies can be a faster and an easier way of communication and discussion with the teachers and other students. 6.25% 93.75%

Mobile technologies can help me in doing my homework and assignments by listening lecture recordings or accessing internet thorough these technologies. 22.92% 77.08%

Mobile learning/ technologies can help me to follow course contents easily. 29.17% 70.83%

Mobile learning can enhance my learning capabilities and can save my time. 27.09% 72.92%

<table>
<thead>
<tr>
<th>Teaching Activities</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.00%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment Activities</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile quizzes can be a good and easy way to take examinations.</td>
<td>50.00%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor Average</th>
<th>Overall Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>39.59%</td>
<td>30.09%</td>
</tr>
<tr>
<td>60.42%</td>
<td>69.91%</td>
</tr>
</tbody>
</table>

Table 9: Students questionnaires factor wise results

The overall 69.91% students are in agreement with the implementation of mobile learning whereas 30.09% of students disagreed with mobile learning concept. In engagement, 73.27% of the students agreed that mobile learning can be a good way for engagement of student and only 26.77% disagreed. 76.04% of students think that mobile learning can provide more presence in education whereas 23.94% are against this. According to 60.42% student’s mobile learning can be more flexible way of learning in education as compared to 39.59% students that disagreed. The detail of questionnaire with percentage for each option of every question is attached as APPENDIX - IV.
CHAPTER 6: ANALYSIS AND DISCUSSION

We have presented our empirical findings in the last chapter. In this chapter we are going to analyze and discuss those findings according to the framework for this study and derive the results from analysis and also provide the analysis of learning theories. First we discuss the framework for this study which consists of three main elements. These elements are engagement, presence and flexibility. The each element further has three sub-elements. In our analysis we will examine each sub-element also to provide the concrete results of the study. Further in this chapter we will analyze the empirical data with respect to learning theories.

6.1 Empirical Data Analysis with respect to Framework

This research is based on mobile learning in educational settings and to prove this concept the conceptual framework of Danaher et al (2009) is presented. The empirical data was collected keeping in mind the framework and its elements that are engagement, presence, and flexibility. The answer to the research question in terms of these elements is presented in this section for clear understanding. Each of these elements of the framework is discussed below separately.

6.1.1 Engagement Analysis

Engagement is first element in the framework that represents students, teachers as well as technology engagement in the learning process. In our research instruments we placed a total of 10 questions regarding engagement, 5 were asked from teachers and 5 from students. Following is the detail of each sub-element in the engagement.

![Bar Chart](image)

Figure 13: Engagement analysis

Student engagement towards mobile learning was asked from teachers and students both. 69.45% student agreed that mobile learning can engage them in learning, whereas 30.55% do not think so. The response from teachers’ side in the favor is 75%
whereas 25% of teachers disagreed. The overall agreed rate from both sides is 72.22%. Teachers engagements are asked only from teachers as students usually do not know about teachers’ position in such situations. 72.73 percent teachers want to be engaged in mobile learning environment and 27.27% refused for that.

Technology is the third element that requires to be engaged for effective learning. 77.09% students want the involvement of technology in the learning environment and 22.92% do not like technology involvement in learning. 77.27% teachers are in favor of technology to be used in education and 22.73% are against the use of technology in education. The overall result for this sub-element is 77.18% for acceptance and 22.12% for rejections. Overall agreed rate remains 72.22% for student, 72.73% for teachers and 77.81% for technology in engagement factor. The average of engagement factors is 74.04% that reflects both teachers and students think mobile learning can improve the engagement of students and teachers in learning process with the involvement of technology that leads towards effective learning.

By analyzing the responses received from all the respondents (students and teachers), it is clear that the engagement of the student and teacher can be improved by mobile learning. Most of the respondent highly agreed that the active participation from teacher and student can be increases. According to Danaher et al (2009) engagement means active participation of learner and teacher in learning and teaching activities with the involvement of technology. An effective learning environment helps the learner to interact with co-learners and peers, instructor and technology actively. The results show that most of the teachers and student believe that mobile learning can enhance their engagement in the learning environment with the help of mobile technologies. For example, one of the students expressed that “It’s good to have an opportunity to communicate with teachers and classmates”. Another student expresses his point of view in these words “Mobile learning can change the way of learning, it is properly implemented as it can enhance the interaction between the students and teachers”.

6.1.2 Presence Analysis

Presence is second from three of the elements in the framework. Presence depicts student-teacher, student-student, and student-contents interaction in learning environment. In our mobile learning investigation, our questionnaire for students contains 4 questions for presence whereas teachers’ questionnaire also has 4 questions. These are 8 questions in total to investigate presence factor in mobile learning.
Student-content presence is vital for effectiveness of learning. It shows that how accessible learning contents for the student. The questions were asked from the students and the highly appreciating response of 81.25% is obtained in favor and only few students, that are 18.75%, think that contents are not easy to access through mobile technologies. The teachers, on the other hand, responded 63.64% in its favor and 36.36% opposed it. The overall agreed percentage from both students’ and teachers’ side is 72.45%. Student-student interaction was investigated in both questionnaires for student and teachers and the following data is received accordingly. 83.33% student agreed that mobile technologies can improve their interaction with the peers; on the other hand 63.64% teachers are agreed that mobile learning can improve the interaction between students. 16.67% students and 36.36% teachers disagreed that it can improve the interaction. Overall 73.49% responses are in favor of student-student interaction and only 26.52% are against it.

Student-teacher presence is very important for effective learning. In mobile learning context it does not mean physical presence but the virtual. The feel to be closer and connected with teacher and vice versa is very important. 63.55% of students think that mobile learning can improve their interaction with the teacher when they are not physically present on the same place i.e. classroom. 36.46% of students disagree with that. Teachers percentage for this factor is 47.73% in the favor and 52.27% are against that. The overall acceptance percentage for this factor is 55.64. The three sub-elements investigated under presence head has following percentages for agreed response; student-content 72.45%, student-student 73.49% and student-teachers 55.64%. The overall acceptance for presence element is 67.19%.

Presence refers that the learner is physically or mentally present in different activities of teaching environment. According to the researchers (Garrison *et al.*, 2000; Swan, 2003; Danaher *et al.*, 2009), as discussed in chapter 3, presence is an important element in terms of learners to actively take part in educational activities, and mobile learning can be one of the tools that allow the learner to be there in learning activities at any time. Earlier research (Garrison *et al* 2000; Swan 2003; Danaher *et al.*, 2009) also claims that improved interaction of student with others students, contents, and teachers enhances the learning effectiveness. The analysis shows that both the stakeholders (students, teachers) are strongly agreed that
mobile devices can be a good tool to improve interaction of learners with students, content, and teachers. According to collected empirical data, the interaction between student to students and contents are more accepted as compared with student to teacher interaction. Privacy is the main reason for teachers as some of teachers showed their reservations that student may disturb them during off the job hours. However, the results towards student teacher interaction are also acceptable.

6.1.3 Flexibility Analysis

The last element in the framework is flexibility. There should be flexibility in learning, teaching and assessment activities to claim learning environment flexible and effective. The number of question dedicated for this element was 11. The question number mentioned for these questions are 6 and 5 in students and teachers questionnaire respectively.

![Figure 15: Flexibility analysis](image)

Flexibility in learning activities was inquired from teacher and students. The answer received from students is 70.83% and from teachers is 72.73% for agree whereas the answer for disagree is 29.18% and 27.28%. The overall average of agreed for this element is 71.78%. Teaching activities flexibility was asked only from teachers and the response received in favor is 38.64%. 61.37% teachers disagreed with learning flexibility.

Assement activities got 50.00% from student and 45.45% positive response from teachers. 50.00% students and 54.44% of teachers responded in negative. The three sub-elements inquired to determine flexibility are learning activities 71.78%, teaching activities 38.64% and assessment activities 52.28% positive response from respondents. The overall flexibility average is 54.23% in favor.

Flexibility is another important element that mobile learning offers, as evident in the analysis of collected data. Bentley (2000) emphasizes that different mode of interaction between student and teachers can provide more opportunity for both to be connected for learning. The analysis of the empirical data clearly shows that both types of respondents are agree that mobile learning can provide flexible way to interaction with learning, teaching, and assessment activities. However, most of the teacher respondents agree that mobile may not be
much helpful for teaching activity, whereas it would be more effective in case of learning and assessments.

Teachers and student both agree that by mobile learning more flexibility can be achieved in learning process. One on the student respondent argued “if mobile is used for learning, it could add some convenience to the learning process & makes teaching material more easily accessible” that reflects the respondents’ view about mobile learning flexibility.

6.2 Empirical Data Analysis with respect to Learning Theories
In this section we analyzed our empirical data on mobile learning, according to different learning theories presented in Chapter 3. The analysis shows that how mobile learning is effective with respect to learning theories and whether mobile learning complies with the learning theories or not. This analysis helps to determine if mobile learning is effective in the light of these learning theories. Moreover, in this analysis we have also shown that how mobile learning can be a solution for the problems existing in formal classroom learning systems.

6.2.1 Learning as a Product of Action
Learning is defined as a change in behavior. In other words it is a result or consequence of some action or more specifically the product of some action that can be identified. According to this theory the most important virtue of learning is change (Smith 2009a). Rogers (2003), cited by (Smith 2009a) further categorizes this concept into two categories i.e. Task-conscious or acquisition learning and Learning-conscious or formalized learning. In following sections we analyze our findings and check whether mobile learning satisfies these theories or not.

6.2.1.1 Task Conscious or Acquisition Learning
According to Smith (2009a) some researchers think this type of learning as unconscious because the intention of the learner is to complete the task not clearly to learn the things but eventually he learns something new on the completion of the task. According to Rogers (2003), cited by Smith (2009a) this type of learning is concrete, immediate and confined to a specific activity; it is not concerned with general principles. In our analysis we found that most of the students use their mobiles for their daily life activities and they like to use mobiles. Majority of teachers agree that mobile contents can be more interesting for the students because the new generations is more interested in mobile technology. Most of the student agreed that use mobile for learning purpose can be a fun. Contents like MMS, SMS, and games etc can be handy tools in learning process. Especially mobile games can be a good way to educate. In this scenario learning can be achieved as a product because in case of SMS, MMS and especially mobile games, learner’s intention is not to learn but it ends up with learning. Task oriented mobile games are being designed on the basis of this theory. It is not true that learners is totally unaware that the task is for learning but in fact his intentions are to complete the task as Rogers (2003), quoted by Smith (2009a) says that in this type of learning the learner most of the time aware of task or more precisely has task consciousness.

6.2.1.2 Learning-Conscious or Formalized Learning
Mobile learning can also be beneficial in this type of learning. According to Rogers (2003), cited by Smith (2009a) Learning-conscious or formalized learning is educative learning in which the involved learner clearly aware of the learning. In our analysis it is clearly evident that student in higher education are aware of mobile technologies and they also want to use it for learning purposes. Majority of students showed their interest in mobile technologies as learning tools. Same trend is observed at teachers’ side. Both of the sides consider that mobile technologies can improve their communication, off the school discussion, access to learning
materials and teacher-student relationship. All these trends are healthy sign for learning and can make the process easier and effective for both teachers and student.

In Smith’s (2009a) opinion though both approaches discussed above look quite different and contrasting but blend of these approaches is very beneficial for learning. As we see that mobile learning can either be used as “Acquisition learning” or “Formalized learning”. Another interpretation is to use mobile learning with the formal learning setting that is pure form of formalized learning. In this case learning process can be more effective and easy because learner would have more opportunities and possibilities to learn since some students responded that they feel more comfortable with face-to-face student-teacher interaction that is only possible in formal school settings.

6.2.2 Learning as a Process

A large group of researchers agrees that learning is a process. A prominent research work in this field is done by Smith (2009a) who explains different theories in his well know research. There are four learning theories discussed by Smith (2009a) where three of them are taken from the study of Merriam and Cafferela (1991) to elaborate learning as a process. These theories are as follow:

- The behaviorist theory
- The cognitive theory
- The humanistic theory
- The social/situational theory

In the following sections we analyze mobile learning according to these theories.

6.2.3 The Behavior Orientation to Learning

Mobile learning also has the potential to satisfy the Behaviorist Approach to learning and it complies with the basic rule of the philosophy. According to behaviorists, the environment is stimulus for individual response. It means that the behavior of individuals is highly affected by the environment (Watson, 1913; cited by Smith, 2009b). Now we see that mobile technologies are everywhere and are being used widely. The collected data for this research shows that the acquisition of mobile phone and other mobile devices is 100% in higher education institute (Linnaeus University). Students and teachers are well aware of usage of these devices. This mobile environment can be utilized to make learning easier and useful. According to Hartley (1998), quoted by Smith (2009b), who defined four key principles for the learning, activity is major factor in behaviorist approach. Activity means learning is improved when the learner is active rather than passive. Participation is highly encouraged to motivate learner to actively participate in the process. Mobile learning focuses on this approach very well. High percentage of students’ responses proves that they want mobile learning to be incorporated in higher education. They are keen to use mobile technologies for learning activities. In mobile learning students are on driving seat and have plenty of options for learning. Repetition is the second element defined by Hartley (1998), quoted by Smith (2009b), that means practice is very important for the learning. Repeated exercises and practice in different environments are essential for learning. Skills cannot be acquired without practice. In mobile learning repetition can be achieved by sending students the learning contents on regular basis. Another way of practice is mobile games in which student can perform different activities to achieve the goals. Clarity is another element in the model. It is very important that the learning activities should be very clear and the learner should be aware of the objective of the exercise. To make mobile learning effective it is very important to make deliverable contents easier and understandable. Reinforcement is the fourth element in Hartley’s model. It means positive behavior or success should be rewarded and encouraged,
whereas negative behavior or failure should be discouraged and punished. Though it looks more concerned with formal learning setting but it can also be done after completion of any mobile learning activity in the form of good or bad grades, certificates, and prizes etc.

6.2.4 The Cognitive Orientation to Learning

The cognitive learning theory mainly focuses on cognition of individuals rather than the environment as opposed to behaviorist approach. According to Smith (2009c) cognition is the act of process of knowing. The cognitive orientation is very psychological and looks like a set of guidelines that helps to prepare the effective learning contents. Though our instruments don’t have question related this learning orientation and our results have nothing to discuss with this approach but it is worthy to mention key principles, defined by Hartley (1998) cited by Smith (2009c) because it can work as the guidelines for the preparation of mobile learning content to make them more effective for students. Hartley’s (1998; cited by Smith 2009c) principles are as follows:

Well-organized instruction: The learning material should be well-organized as it is easier to learn and to remember.

Clearly-structured instruction: The learning material should be well-structured. Logical relationships between concepts are essential. It makes it easy to link the parts together.

Perceptual features: The perceptual features of the task are vital. Learners’ concentration varies from person to person. They see environment differently. For that reason, the way to display the problem is very important to make it understandable for the learners.

Prior knowledge: Prior knowledge is important for learning. Things must fit with what the learner already know for new things to be learnt.

Differences between individuals: Different individuals have different cognitive styles and approaches. Learning is very much dependent on these cognitive styles that vary from individual to individual.

Cognitive feedback: Cognitive feedback gives information to learners about their success or failure concerning the task at hand. Reinforcement can come through giving information - a 'knowledge of results' - rather than simply a reward.

6.2.5 The Humanistic Orientations to Learning

Mobile learning works well with the Humanistic orientation to learning. The main focus in this approach is human potential for growth. According to Tennant (1997), quoted by Smith (2009d) the key feature of humanistic approach is human’s concern about himself. Self is the focal point of humanistic psychology. Rogers (1983), cited by Smith (2009d) defines five characteristics of humanistic learning. According to him Involvement is very important for learning and learner should be fully involved in the learning process. Personal involvement engages both feeling and cognitive aspects of learner in the learning event. In our research instruments, there are many questions that address the learners’ involvements. The answers of the respondents clearly show that involvement is the key feature of mobile learning. Both students and teachers believe that in mobile learning involvement of learners’ in learning process is quite high. The survey shows that students in the university use mobile for their daily life activities and they want to use these devices more and more because these devices are easy-to-carry and easy-to-use. Moreover mobile contents are also highly attractive for students and our results confirm it. All these trends clearly show the tendency of the students towards mobile learning and higher level of their involvement in learning process. The next characteristic of Humanistic Approach is Self-initiative. Rogers (1983), cited by Smith (2009d), urges that learning process should be self-initiated. Even if learner is stimulated by some external factors, the urge to learn and explore comes from inside. Mobile learning has a lot of potential in this regards since it provides the learners facility to initiate learning
anytime, anywhere and everywhere. It frees the learners from classroom only environment and provides them the liberty to initiate the learning on their own will. Our results clearly support these arguments since majority of students agree that mobile learning can facilitate them to learn anytime from anywhere. The next characteristic of this philosophy of learning is *pervasiveness*. It means that learning makes a difference in the behavior, the attitudes, perhaps even the personality of the learner. It is obvious that effective learning creates a change in human behavior that leads towards change in personality. In our results, majority of learners recommend mobile learning to be introduced in higher education. So it can be claimed that mobile learning, along with traditional classroom learning, can make a big difference in the personality. *Self-evaluation* is another major characteristic of humanistic approach. *Self-evaluation* means learner evaluate that whether the learning contents and method meet her need or not. Mobile learning provides this evaluation to the students. They can choose what they consider is good for them. Another interpretation for *self-evaluation* is mobile learning can be good addition in the existing learning tools i.e. traditional classroom learning, distance learning, electronic learning. Learner can have another way to learn and has more choices. *Meaningfulness* is the last element in the list presented by Rogers (1983) cited by Smith (2009d). According to him learning experience should be meaningful. This feature can also be observed with mobile learning. Mobile technologies provide access to internet from handheld devices. Moreover, majority of our respondents agree that mobile contents (MMS, SMS, Games, Audio, and Video etc) are attractive for them. It raises the responsibility of the teachers to produce meaningful contents for the students to make learning improved and better.

6.2.6 The Social/Situational Orientation to Learning

Mobile learning best fits in this learning orientation. In social/ situational learning, participation in a community of practice is considered as learning. Lave and Wenger, cited by Smith (2009e) introduce the term situated learning that is more concrete model of social learning. They argued that learning is not only the acquisition of knowledge but it is social relationships where learner co-participates in different situations. It means that it is not enough to understand the world but it is also crucial to participate in a community of practice. Mobile learning focuses on this idea as it tries to create such communities where learner can participate. According to Smith (2009e) social/ situational learning has three major attributes. The first attribute he defines is that “learning is in the relationship between people”. It means that a learner with more relations with other students and teachers can learn more. Now if we look at our results, it can easily be observed that a vast majority of teachers and students thinks that mobile learning can improve their communication. They also agree that they can share their knowledge and discuss their problems with other students and teacher more easily by mobile technologies. The knowledge sharing and problem discussion depicts the stronger relationship between the learning entities and can be helpful to develop a community of practice. Smith (2009e) further argues that the role of educators is to work for learners’ participation in communities of practice. In our survey, teachers support to introduce new technologies for education and agree that pedagogical methods should be aligned with new technologies. They also think that mobile technologies can facilitates them to communicate with their students. This improved communication facilitates them to encourage students to actively participate in community of practice. As we discussed above mobile learning provide the environment where communities of practice can easily be created and exist. In this environment teacher can play his role quite easily. The last attribute of situated learning defined by Smith (2009e) is an intimate connection between knowledge and activity. It is discussed above how mobile learning is helpful to create and manage communities of practice. It is quite obvious that more active participant can learn more. Mobile learning
provides equal opportunities to all to participate in such communities and learn accordingly. All this discussion shows that how much mobile learning is connected with this particular orientation to learning.

6.2.7 Mobile Learning Theory
In this section we discussed Sharples’s mobile learning theory and argued that how our results validates this learning theory. This theory was presented in 2005 by Sharple and his colleagues and the focal point of this theory is mobility of learners. According to Sharples et al (2005) mobile learning is nothing but formal and informal learning activities. It is only to deal with mobility of learners and to see how new technologies can be designed to support a society in which people on the move increasingly try to learn during daily life. According to our results this argument is very true since mobile learning is somehow a new form of informal learning where learners have the facility while moving during their daily lives as most of our respondents agreed this. On the other hand mobile learning is also very much connected with the formal learning since it provides new ways to access formal learning contents. Here it is important to mention that some of our respondent agreed that mobile learning can be helpful for learning process but they also advocated the formal system.

Secondly, Sharples et al (2005) argue that mobile learning is not necessarily associated with the physical moment of learners but it must deal with the significant learning that occurs outside classrooms and lecture halls. In such learning, people initiate and manage their activities by their own to enable educational processes and outcomes. In our survey, the people’s responses also support these arguments. Most of the teachers think that mobile learning can improve their communication with the students and they can deliver more to the student while they are off the schools. Students also have the same thoughts and they have shown in the survey that they can discuss their knowledge and problem more easily with teachers and classmates. These sharing and discussion sessions open new channel for the learning that can help to learn more from out the class.

Furthermore US National Research Council (1999) research, quoted by Sharples et al (2005), describes that effective learning is learner centered, knowledge centered, assessment centered and community centered. These attributes mostly match with social-constructivist approach, which views learning as an active process of building knowledge and skills through practice within a supportive community (Sharples et al, 2005). These issues have been discussed in details in above sections and found to be true with mobile leaning in accordance with our results.

Sharples et al (2005) also describes social and privacy issue connected with mobile learning. In our survey, some teacher have shown their reservation about mobile learning that it could disturb their private since student may contact them through mobile technologies when they are off the school and busy in their personal life activities. It could be a major issue for mobile learning in the future.

6.2.8 Mobile Learning and Downsides of Formal Learning
In this section we analyzed the problems of formal learning discussed above chapters and see how mobile learning can be a remedy for most of these problems. According to Bentley (2000), persistent change in technology and applied knowledge requires the individuals back to the school to learn new technology and methods during their professional carriers. Mobile learning can be a good solution for this problem since it facilitates the learners to learn anytime from anywhere and everywhere. It also provides the facility to fetch learning material and contact the teachers by mobile technologies. Our results prove that it is quite possible and learning is more flexible through mobile technologies. Another major flaw in formal classroom system is this that it neglects that how students can learn by themselves (Bentley,
Mobile learning facilitates the learners to learn by themselves. As discussed in above sections the role of teacher in that case is as a motivator or facilitator. Moreover, most of the students agree in the survey that they do like to use mobile technologies for learning and teachers also think that mobile contents can be more attractive and enjoyable for the students. Mobile learning also relaxes the condition to come to classroom for learning so mobile learning can be a good solution for this problem along with distance and electronic learning. Bentley (2000) describes that normal mode of education has always been controlled and restricted in the institutions, libraries, schools, factories, and universities. But knowledge is more accessible outside these institutions because people contain more practical and valuable knowledge. He quotes the example of Internet that frees students from the delimited classroom environment. Here mobile learning again helps the students since it provides the access to the internet. Though it was not directly asked from the teachers and students but internet access is an obvious feature of mobile learning. Kaufhold (2002, pp.3-11) describes that different student learns from different ways. In this context, the unidirectional formal system appears ineffective to deliver what and how the student of current age wants to learn. As discussed above it is clearly evident from the results that mobile learning is a good solution for such problems. Teachers and students both agree that mobile learning is quite interesting way of learning. Though a few of students disagreed this and described that they are more comfortable with face-to-face learning environment.

In the end of his discussion, Bentley (2000) strongly recommends a parallel infrastructure of education that is independent of delimited educational system and can resolve the current problems in formal educational settings. Our results show that mobile learning has the potential to be an effective way of learning that can resolve many of the problems persist in formal classroom model.

6.3 Overall analysis and Discussion

Here we describe the composite analysis of the main elements of mobile learning that is presence, engagement, and flexibility for both teachers and students. This overall analysis makes the picture more clear by observing the integrated data collected. Whereas different aspects of the analyzed is discussed in discussion part. Further in this section we discuss the comments from teachers and students in connection with mobile learning as secondary findings. Secondary finding can be helpful for further exploration in this emerging field of mobile learning.

6.3.1 Overall Analysis

In the pervious section we analyzed and discussed the empirical data with two concepts that is framework for mobile learning and learning theories. This section contains the overall analysis with respect to both the framework and learning theories. In the analysis of each factor and three elements of the framework, separate results are clearly evident that how mobile learning is effective in higher education. The accumulative results of these factors are presented for better understanding.
From the graph presented above, three factors and their results are shown. The engagement factor has the highest agreed rate of 74.04% followed by presence 67.19% and flexibility 54.23%. Whereas the disagreed percentages are 25.96%, 32.81%, and 45.77% for engagement, presence and flexibility respectively. The average acceptance rate is 65.15% for the use of mobile as learning tool in higher education and 34.85% are against this technology. According to Danaher et al (2009) engagement, presence and flexibility are crucial for effective mobile learning. In our results we found that majority of the teachers and students are agreed that mobile learning can improve engagement and presence factor of learning. But when it comes to flexibility factor, a significant proportion thinks that it is not a very flexible way of learning, especially in term of assessment flexibility. But our all results satisfy that mobile learning can be a good and effective way of learning for higher education.

With respect to mobile learning theories, our results clearly show that mobile learning complies with most of the learning theories. It contains most of the features of these learning theories. Mobile learning best suits with Situated/ social theory of learning, though it has all what other theories present. Our results also validate Sharples’s mobile learning theory in which he discussed the mobility of learners. Our analysis also shows that mobile learning can deal with the problems that exist in formal learning system. Learning can be more effective and more easily achieved by introducing mobile learning with the existing modes of learning (classroom, distance, electronic learning etc) in higher education.

6.3.2 Discussion

The results for our three major elements show the higher percentage on positive side. That means mobile learning can be claimed as an effective mean of learning in higher education. But in our factor analysis we found that the proposition is not true for some sub-elements in the framework since the averages are not good for some factors. The engagement in general has a very good percentage (74.04%) that shows that student, teacher and technology can be well engaged to improve the learning by implementing mobile learning. The highest number of ownership of mobile devices (100%) is another evidence of students’ engagements with mobile technologies. It shows that students are already engaged with such devices and no further training is required to use such devices. The inclusion of mobile technology in
learning environment can improve students’ and teachers’ engagement. All sub-elements have good average also. Student engagement with 72.22%, teacher engagement with 72.73%, and technology with 77.18% is quite sufficient result to claim that mobile learning can provide sufficient level of engagement for effective learning.

The next element, presence also has the high accumulative result that is 67.19%. Student-contents presence is highly important for effective learning. If contents are not available to student, it causes ineffectiveness in the learning process. It is very hard for student to learn in the absence of learning material. Mobile learning proved good as 72.45% positive feedback is for this sub-element. Student-student presence has a 73.49% positive result that means mobile learning can make the connection stronger between students. The result depicts that students think that mobile technologies can improve their interaction with other student while out of the class. They can discuss the problem and share the knowledge of common interest with each others. This interaction makes learning more effective and student can learn more effectively in this fashion. Student-teacher presence is essence of the learning. Without teacher or instructor it is very hard to learn effectively. Mobile learning can also strengthen the connection between teachers and students. The interesting thing found in this element is that most of the students (63.55%) consider mobile learning as ‘good’, because it can be a good way for communication and interaction with the teacher during off the school hours but teachers think and respond differently. The response from teachers is 47.73%. It might be possible that there are some social issues like privacy (as discussed in our secondary findings) involved in this case. Overall the presence issue also satisfies the requirements of effective learning.

The third element flexibility is found weakest in our analysis with only 54.23% positive feedback. Although still more than fifty percent respondents are in favor of this factor but as compared to other two factors it seems weaker. The result for learning flexibility is excellent that is 71.78%. Both the teachers (72.73%) and student (70.83%) consider mobile learning can be good for learning activities. So we can say that mobile learning effective in the sense that it provides very flexible learning activities. But the results for teaching activities are very poor. The response from teachers about teaching activities is 38.64% positive. It means that majority of the teachers do not think that it can be a flexible way of teaching for them. The assessment flexibility is also found poor in the analysis, and both teachers and students marked it negatively in terms of assessment flexibility. 54.55% of the teachers do not consider mobile learning as a flexible way of assessment. On the other hand 45.45% consider it inflexible in terms of assessment.

On theoretical grounds, we see that mobile learning has solid theoretical background to be claimed as an effective mode of learning. Our findings clearly show that mobile learning complies with renowned, major learning and pedagogical theories. Though some of the features or theories are based on purely psychological and philosophical grounds and it is hard to observe and cover such topics with research instrument, still we see that mobile learning has good features, form different theories, which prove it as an effective way of learning. The most important features of mobile learning that were found in theoretical analysis are discussed below.

Mobile learning embeds learning activities with daily life activities. Mobile learning makes it possible to carry on learning activities while performing the daily life activities. Mobile services like SMS, MMS, and games can be very useful in such learning. Mobile learning can be task-conscious or learning conscious. Its effectiveness in both cases has been discussed and proved in previous chapter.

Mobile learning increases the active participation of learners in learning process. It leads towards effective learning and ends up with improved learning. Another important aspect of mobile learning is that it shifts the control from teacher to student. It enables the
student to initiate learning whenever he wants. It also empowers the students with the choice to select the methods that suits well to their learning styles and needs. These features improve the involvements of learner in the learning process. Moreover, learner can judge by himself whether he is successful what he wanted to learn.

Mobile learning also satisfies the features described in situated/social learning. It provides such learning environments that can help to build up community of practice and participate actively in these communities. In these communities learner can share the knowledge and help each other to solve the problem. The role of teacher in this scenario is just to facilitate and motivate the learners.

Mobile learning has the ability to overcome the problems that exist in the formal learning settings. It facilitates learning beyond the classroom and improves off the school communication between teachers and students. It can also be helpful for the individual that need newer knowledge but cannot attend the classes on regular basis. Moreover, different students have different learning styles and learning needs. Mobile learning provides different options to satisfy different students need.

By our analysis, it can be claimed that mobile learning is an effective way of learning for higher education in future’s learning settings. Though the data is collected from the teachers and student who are not using the mobile learning but these results show the trend about what they are thinking and looking for in mobile learning in the future.

6.3.3 Secondary Findings

In spite of primary findings some other factors are also identified. While these findings are not the primary objective of the study yet it is important to discuss them here, since these are related to some critical issues. The comments (written and oral) from teachers and students indicated some important social factors also. Some of mathematics and economics department (where calculation is involved in courses) teachers commented that physical personal contact is very important for such subjects. Though the video contents are ok but still mobile screen is too short to properly view mathematical notations. On the other hand the teachers from social sciences (descriptive courses) find it good for education and think it can be a good way to teach. Few comments emphasize the use of multiple sources for teaching and learning and they see mobile learning as a good tool in the learning kit. Lack of large scale learning application integration like Blackboard, privacy and cost are big issues in mobile learning, a firm comment by a teacher of School of Computer Science, Physics and Mathematics. Privacy is the issue teachers are mostly concerned when it comes in term of mobile learning. They argue that it can be a good channel between student and teacher that can improve off the school interaction but it may cause privacy problem.

In this study, it is highly observed that students are more interested in this sort of learning. The high response rate (96 %) also indicates the trend. The most students argued about the quality and the features of the mobile phone. They think that the variety in mobile phones models can affect the quality of learning material and accessibility. Price is another highly discussed issue during data collection as most of the students think that it is only possible on high priced mobile phones that are furnished with latest tools. Network service charges are also mentioned by some students. Ease of use is another factor students are concerned about. Some student asked though it is good idea but it will broaden the physical gap between student and teacher. These issues are really interesting and important also and require further exploration for the improvement in mobile learning.
CHAPTER 7: CONCLUSION

7.1 Conclusion

In this study we discussed the role of mobile technologies for learning and educational purposes. Learning and education has become one of the most important issues not only for the individuals but for organizations and governments around the world. Since the world is changing rapidly with the advancement in technology, only formal means of education seem not to be enough to meet the requirements of learning needs of present times. Informal ways of learning are also required for that purpose. Technology has played an important role to build and implement new solutions for informal learning. Distance education was introduced with industrial revolution that made it possible to learn and educate at distance. Electronic learning emerged with invention of computers and Internet. It revolutionized the learning with its several features that free the learners and teachers from the delimited learning place, structured timetable and physical presence. Distance and electronic learning has been used in educational setting with higher degree of flexibility and acceptance for the last few decades. Mobile learning can be seen as a new addition in the range.

This conducted study has investigated the effectiveness of mobile learning in higher education. Different learning theories and a framework are used for the study. The framework focuses on three major factors involved in the learning process and determine its effectiveness. These factors are engagement, presence and flexibility. Effective learning requires teacher, student and technology engagement in learning process. Presence of student, teacher and contents are also important for effective learning. Flexibility in learning, teaching and assessment activities is also vital to make learning effective. In this study we found that mobile learning has the potential to be an effective learning method for higher education. Mobile learning complies with main learning theories. It satisfies most of the rules and condition defined by different scholars and researchers. Mobile learning empowers the learner and shift control from teacher to student. Mobile learning has the ability to satisfy different needs of different student. It helps to create communities of practices, which improves and facilitates the learning process. Mobile learning can also be a remedy for the problems that exist in formal learning environment.

Mobile learning involves latest mobile technologies for learning purpose that engage students and teachers in the learning process. It is evident that the engagement is high enough to claim that mobile learning is good in terms of engagement. Presence is critical in effective learning process and mobile learning is found to be highly acceptable in this study. Mobile learning improves the sense of presence as it provides the access to teacher and learning contents anytime, anywhere and everywhere. The easy access to learning material and the feelings of to be connected with teacher can produce the efficient and effective learning. Another factor that confirms this claim is higher number of ownership of mobile devices in student and teacher community. In terms of flexibility, mobile learning can offer a lot to student for learning but it does not offer too much to teachers. Low assessment flexibility is also identified in this research. Teaching and assessment flexibilities are found weaker than other elements investigated in this research. Overall, we can conclude that mobile learning can play an important role in future’s higher educational setting but it has some flexibility issues that need to be fixed to achieve improved performance.

7.2 Future Research

Mobile learning is an emerging technology; therefore several areas in the field are yet to be explored. During this study, we found many contemporary issues that would be interesting for further investigations. The following are some issues that are of great interest to be explored...
during the researchers’ future endeavors. Effectiveness is one of the major issues for mobile learning that needs a detailed study for further exploration. The model used in this research contains three elements, but there are several other factors that determine the effectiveness of learning. Our intention would be to continue the research to identify these factors and investigate mobile learning effectiveness against these factors. Another line of direction for future study is competing pressure. Implementation of mobile learning will introduce new competing pressure on learners and teachers. It would be interesting to explore which competing pressures are placed on learners and teachers in mobile learning environments (Danaher et al, 2009). Moreover, there are many educational principles and strategies for effective learning. It is also another direction for future research to find educational principles and strategies that can validate and support mobile learning.
REFERENCES


Appendix – I (Questionnaire for Teachers)

About this Questionnaire

Topic: Mobile Learning

Authors:
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Atif Iqbal (aiqsr08@student.lnu.se)

We are students of Master Program in Information System in Linnaeus University. For completion of Master degree it required to have research work with some project, and we are also working with thesis and our research is about “Mobile Learning”. CeLeKT Group in School of Computer Science, Physics and Mathematics in Linnaeus University is also working on different projects of Mobile Learning. Here is the brief introduction of Mobile learning:

Mobile learning is an emerging research field that concerns to use mobile technologies in learning settings. Mobile learning is the concept to facilitate the user to learn on their mobile devices. When we talk about m-learning we think about the mobility of learners. Mobile learning provides the facility to learn while travelling, walking etc. M-Learning is a novel technique for education and can play a significant role for teacher and for educational institutes as well as students. Mobile learning can be very useful because mobile devices are small and familiar to students, user friendly, easy to carry, and do not require any technological training. Mobile technology can speed up the process of learning in quite effective way because through mobile leaning students can learn when and where they want.

There are several mobile learning projects like Voting System, Game System, Mobile phone for language learning, Examination System, Remote Laboratory System, Student Partner System, Museum Visiting, Mobile Blogging etc. are serving in educational setting. These systems in educational process can play a vital role to improve the learning capacity and knowledge and can be more effective than traditional ways.

For accurate and valid results of this project we require your cooperation for data collection. Your provided information will guide us to evaluate the effectiveness and adoption of this new way of learning. We assure you that all the information provided by you will be used only for this research and kept confidential. We also affirm that the results of this research will show the true reflections of the data collected and will be used for the improvement in learning process only. This data collection is only for research purpose, no any commercial or financial benefits will be taken from. We thank you in advance for your kind cooperation.
Questionnaire of M-Learning for Teacher

First Name:    Last Name:

Please Select your Age Group:

Under 25       25-35       35-45       45-55       More than 55

Teaching experience:

Less than 1 year 1-3 years 4-6 years 7-10 years More than 10 years

Gender:

Male       Female

Please indicate your main teaching area:

Note: Please write your choice in front of each question where ‘0’ indicates minimum and ‘5’ indicates maximum.

Selection scale 0 1 2 3 4 5

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<td>01</td>
<td>I am interested to use Mobile as teaching tool.</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Mobile contents (SMS, MMS, Game, etc) are more interesting for my student.</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Pedagogical methods should be aligned with new technologies.</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Mobile improves my dynamic interaction with the student.</td>
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</tr>
<tr>
<td>05</td>
<td>Students share any information, anytime, anywhere, everywhere with the peers through mobile to improve their learning.</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Mobile learning is convenient for student to communicate and share problems with teacher.</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>I can deliver more to my student anything, anytime, anywhere, everywhere through Mobile Learning (SMS, Lecture, Audio/Video, Games).</td>
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</tr>
<tr>
<td>08</td>
<td>Mobile learning suits well for today’s students style as most of them are fascinated by mobile.</td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>Mobile technologies help me to conduct the review and assess students work.</td>
<td></td>
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<tr>
<td>10</td>
<td>Mobile helps me to better perform my professional duties (Teaching, content management, scheduling etc.).</td>
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</tr>
<tr>
<td>11</td>
<td>I feel closer connected to my students through mobile technology.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Mobile learning helps students to follow course contents easily.</td>
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</tr>
<tr>
<td>13</td>
<td>Mobile learning efficiently improves my performance and saves my time.</td>
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</tr>
<tr>
<td>14</td>
<td>I highly recommend others to use this technology to improve the learning process.</td>
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Please write down your comments about Mobile Learning (if you have any):
Appendix – II (Questionnaire for Students)

Student Questionnaire for M-Learning Evaluation

First Name: _________________________ Last Name: ________________________

Please Select your Age Group:

Under 15  15-22  22-30  30-40  40-50

Please select your Level/Grade:

Primary  Secondary  Undergraduate  Graduate  Post Graduate

Gender:   Nationality: ________________________

☐ Male  ☐ Female

Please indicate your main area of studies:_______________________________________

Note: Please write your choice in front of each question where ‘0’ indicates minimum and ‘5’ indicates maximum.

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<th>Sr. No.</th>
<th>Questions</th>
<th>Write your choice</th>
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<tbody>
<tr>
<td>01</td>
<td>Do you have Mobile Devices (Phone, IPod, MP3 etc)?</td>
<td>☐ Yes  ☐ No</td>
</tr>
<tr>
<td>02</td>
<td>I use Mobile Devices (Phone, IPod, MP3 etc) to perform my daily life activities.</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Mobile technologies should be introduced in learning environment.</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Mobile technologies can improve my off the school interaction with my teachers and other students.</td>
<td></td>
</tr>
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<td></td>
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</tr>
<tr>
<td>05</td>
<td>I feel hesitation to ask the questions in the class but mobile communications (Conversation, SMS, MMS etc) can be an easy way to ask.</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>I can share and discuss any information with my colleagues anytime, anywhere through mobile technologies to improve my learning.</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>Mobile technologies can be a faster and an easier way of communication and discussion with the teachers and other students.</td>
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</tr>
<tr>
<td>08</td>
<td>With mobile technologies I can learn more easily since it is fun to use mobile for learning purpose.</td>
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<tr>
<td>09</td>
<td>It can be more convenient for me to access learning material (Lecture, Audio/Video etc) through mobile technologies since mobile devices are always with me and I can use them any available free time (Travelling, Waiting for bus etc)</td>
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<td>10</td>
<td>Mobile devices (Cell Phone, iPod, MP3 players) can be useful for learning because I do like to use them.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Mobile quizzes can be a good and easy way to take examinations.</td>
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</tr>
<tr>
<td>12</td>
<td>Mobile technologies can help me in doing my homework and assignments by listening lecture recordings or accessing internet thorough these technologies.</td>
<td></td>
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<tr>
<td>13</td>
<td>I feel closer connected to my teachers through mobile technologies.</td>
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<td>14</td>
<td>Mobile learning/technologies can help me to follow course contents easily.</td>
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<tr>
<td>15</td>
<td>Mobile learning can enhance my learning capabilities and can save my time.</td>
<td></td>
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<tr>
<td>16</td>
<td>I highly recommend using this technology to improve the learning process.</td>
<td></td>
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<tr>
<td>17</td>
<td>Your comments on Mobile Learning (if any):</td>
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## Appendix – III (Teachers Questionnaire analysis)

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