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The Impact of the Cloud Based M-Learning in Higher Education

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Abstract: Mobile learning (M-Learning) is a new learning mode and can bring learner higher learning efficiency and more flexibility. Aiming the problem of existing development technologies for mobile learning platform, a new mobile learning platform based on mobile cloud computing was proposed. The platform was abstracted several layers such as infrastructure layer, resource layer, service layer, middleware layer and client layer. By middleware layer, the platform can adapt different client access request. The communication between client and server is finished by instant message server and the task processing is finished by cloud application server. Many key technologies were taken in the cloud platform and the platform will provide a good and practical example for developing mobile learning platform by mobile cloud computing. Mobile learning (m-learning) environments open a wide range of new and exciting learning opportunities, and envision students who are continually on the move, learn across space and time, and move from topic to topic and in and out of interaction with technology. However m-learning lends itself to new methods of delivery that are highly suited to the 'just enough, just in time, and just for me' demands of twenty-first century learners.

Keyword- M-Learning, Cloud computing, WAP, Qos, Wifi

I. Introduction

Mobile learning, or m-learning, has been defined as learning that takes place via such wireless devices as mobile phones, personal digital assistants (PDAs), or laptop computers. In the different definitions encountered in the literature, it is only the employment of specific types of technology that seem to differentiate mobile learning from other forms of learning. Mobile learning, or m-learning, can be any educational interaction delivered through mobile technology and accessed at a student's convenience from any location.

A definition of mobile learning should therefore be widened to include:

Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies.

II. Related Work

In this paper, a new paradigm is highlighted in the educational area by introducing the cloud computing in the m-learning architecture in order to increase the scalability, flexibility, and availability of higher education systems by formulating a framework. In contrast, a cloud-based m-learning model introduced a scale efficiency mechanism, i.e., construction of m-learning system is entrusted to cloud computing suppliers, which can make providers and users achieve a win-win situation. The cloud-based environment supports the creation of new generation of m-learning systems, and runs on a wide range of hardware devices, while storing data inside the cloud. This paper also aims to investigate IT professionals' thoughts on cloud computing, and to explore the key factors that may influence the cloud adoption in higher education.

A Brief History of Learning Theories and Their Influence on Learning Technologies

Although the current interest in 'e-learning' and 'm-learning' is a relatively recent phenomenon, especially fuelled by developments in the Internet since the WWW was created in 1992, in fact the history of learning with technology goes back much further. In his book on the emergence of computer-supported collaborative learning (CSCL), Tim Koschmann (Koschmann, 1996.) suggests that a reasonable starting point is the development in 1960 of IBM's first courseware authoring system for CAL, Coursewriter I (Suppes & Macken, 1978). In the 40 years since there have obviously been huge changes in terms of technology and several just as significant changes in theories of effective learning and teaching. Koschmann suggests that there have been several 'paradigm shifts' occurring in roughly 10-year cycles. The Kuhnian term which Koschmann borrows implies radical shifts in ways of thinking about learning. However, this may be, on the one hand, an idealized view – much of the world of ICT in education still operates on primitive CAL models of the 1960s, even if the technology is new (e.g., the world wide web) – and some examples are, for all that, quite effective, in limited circumstances. It may also be a wrong way to think about science in this field – for example, the information processing approaches of the 1970s proved inadequate in capturing some features of learning, particularly issues of motivation and context/meaning. However, some of those theories have proved the most successful in developing tutoring systems, with a huge amount of empirical evidence for their effectiveness – this is particularly so of John Anderson's work with the ACT family of tutoring systems (see Anderson & Schunn, 2000, for example). However, they are, arguably, suited to a particular type of learning – that involving the acquisition of procedural rules and skill in well-structured domains. The systems are less suitable for learning involving conceptual change or more 'informal learning'.

Similarly, whilst the predominant paradigm in CSCL is based on socio-cultural theory of one form or another (situated learning, activity theory, distributed cognition, and so on), few would want to deny that learning also involves changes occurring at the level of the individual – there is still very much a place for talking about representational change in individual learners. In fact, activity theory was developed as a means of analyzing how individual representations could be changed and mediated by social and cultural artifacts', tools and signs. In the light of these remarks, what follows is a brief review of the major paradigms in terms of learning theory, not just as historiography, but as a synopsis of the strengths and weaknesses of particular approaches, how they have in the past been applied to learning technology, and how their may still be useful in thinking about mobile learning contexts, both in formal and informal settings.

Benefits

- **Leveraging extreme portability** – Mobile technologies are even easier and more convenient to carry around than laptop computers. And many students already own cell phones and other mobile technologies for work or personal uses.
- **Using mobile apps** – This kind of development makes use of cloud computing and allows students t to reach out from their mobile devices to access software and file storage without having to buy copies of software or store large amounts of data on the mobile devices themselves.
- **Encouraging interaction** – The combination of portability and well-designed mobile applications creates an environment that encourages online students to interact with the course content, as well as with classmates and instructors.

Challenges

- **Managing process** – Making the decision to add or move to mobile learning options across a school or program means a change in process for everyone involved, including students, faculty, and administrators. The transition needs to be well planned and coordinated before development begins.
- **Managing costs** – Will students provide their own mobile devices or will institutions provide them? Either way there are costs involved for both hardware and Internet access.
- **Consuming vs. Creating** – One of the most prevalent critiques of the iPad is that it is more useful for consuming content than creating content. For example, could you imagine typing a paper on a tablet or with a cell phone? Students, faculty, and administrators are also often used to using software packages such as Microsoft Office, that don't translate readily to mobile devices. Mobile technologies may be more effective for specific uses and learning goals.

Mobile learning in higher education

The most important yet sophisticated concepts for designing instruction in this context are identifying the technology, learner and learning material as well as mobile technology such as portable devices. It also involves identifying learners who are nomadic and able to understand and interpret learning materials. In general, mobile learning – or m-learning- can be viewed as any form of learning that happens when mediated through a mobile devices, and a form of learning that established the legitimacy of 'nomadic' learners (Alexander, 2004).

These are the developments that have made mobile devices strategic tools with the capacity to deliver higher education instruction in a way that was never anticipated when the first prototypes of these devices were designed and marketed. Designers can deliver successful higher education products to the present generation of learners, by means of a technology, distinctively adapted for its own personal (mostly social) purposes. This makes technology a particularly potent tool for the delivery and reinforcement of content that would otherwise be identified with the higher education "establishment". Devices "such as mobile phone and mp3 players have grown to such an extent over recent years and are gradually replacing personal computers in modern professional and social context" (Attewell & Savill-Smith, 2005). Modes of communication that were spontaneously developed by the younger generation have been subverted to serve the purposes of transmitting higher education. Such structural changes in the delivery of higher educational instruction add a powerful tool to the arsenal of available means that educators can use to make delivery more efficient, personal and culturally acceptable to those who pioneered these new modes of text delivery (Fullan, 2007).

These fundamental changes pose new problems to the designers. What new design paradigms and meanings can be attributed to the use of mobile technology? How can we appreciate their full significance within the context of traditional instructional design theory? Before the development of new forms of information and computer technology such as the current mobile "smart" cellular telephones, the design paradigms by means of which the delivery of higher education was understood remained essentially static. The extraordinary potential inherent in mobile devices, anticipate radical changes in the very structure of educational dynamics especially in the way in which people interact with one another in society.

The kind of informal learning through the use of mobile devices makes it an even more potent tool of educational communication than the customary forms and modes of traditional education. These revolutionary changes developed out of the unforeseen significance of human social life generally more "mobile", creative and opportunistic, than the formal modes of traditional education. Mobile Learning, or M-learning as it is often called, is a relatively new tool in the pedagogical arsenal to assist students and teachers as they navigate the options available in the expanding distance learning world.

III. An Architecture of M-learning Based on Cloud

This architecture is proposed for higher education in a cloud computing environment. The main objective of Mobile-Learning in the cloud environment is to provide learners with the knowledge from the centralized shared resources at anytime and anywhere. Our proposed architecture for Mobile Distance Learning as shown in Fig. 1 incorporates the

communication between end-user devices (terminals) and the Data Center in a cloud computing environment. The terminals can be connected to the Infrastructure inside the University Local Area Network (LAN), or they can be connected on external networks (the internet). The University Platform Server (Course Management System) [Masud & Huang (2010)] hosts educational resources and it is connected on the University LAN. A user may access the platform directly from the University LAN or through the Internet in order to collect learning materials. The user can access the Data center either from University LAN, or directly from the Internet. The authentication server manages the authorized access to the Data Center, and is directly connected on both passive and active servers as depicted in Fig 2.

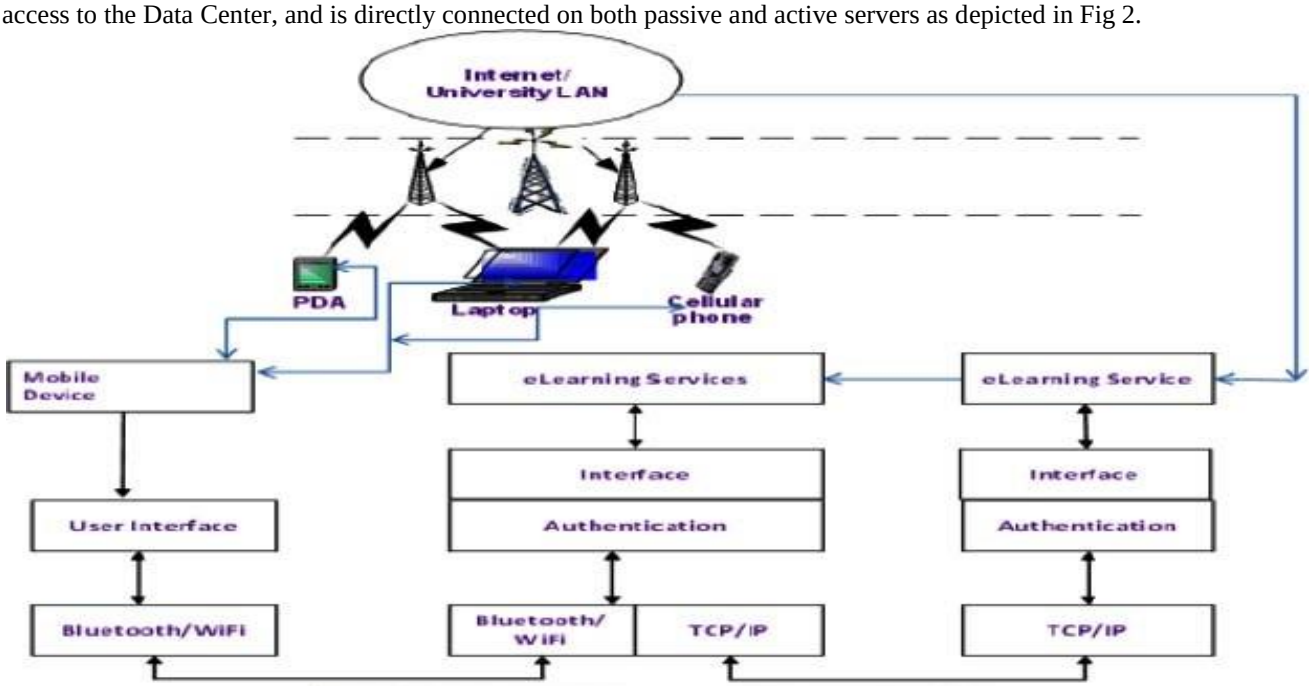

Fig-1 Proposed Architecture for Cloud based m-learning.

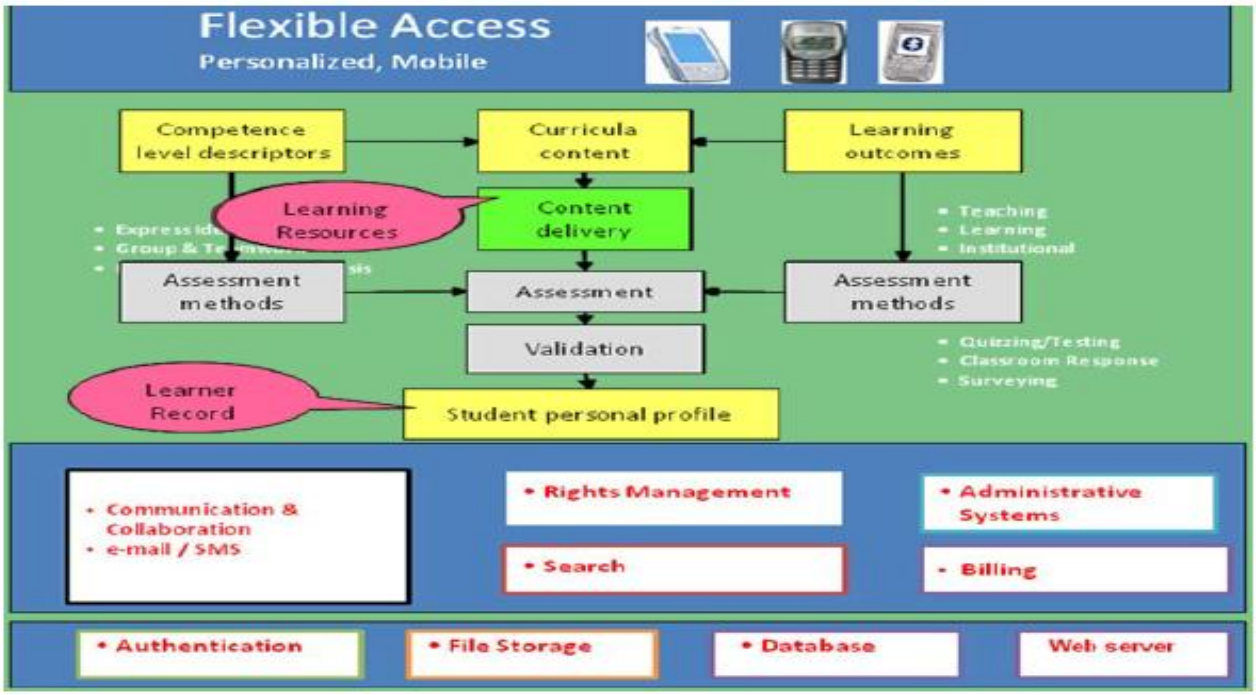

Fig-2 Detail Components of the Architecture

The passive and the active servers need to be connected to the Load Balancer, determining which server is active. The Load Balancer determines which server needs to manage the load (either the active, or both), i.e. the incoming service request from the user. Both active and passive servers can be connected to a storage area network and the network infrastructure. The server takes additional data from the storage area network that needs to be processed. The advantage of this architecture is that it offers an interactive mode on mobile devices, as a special benefit from using the Data center within the mobile cloud environment.

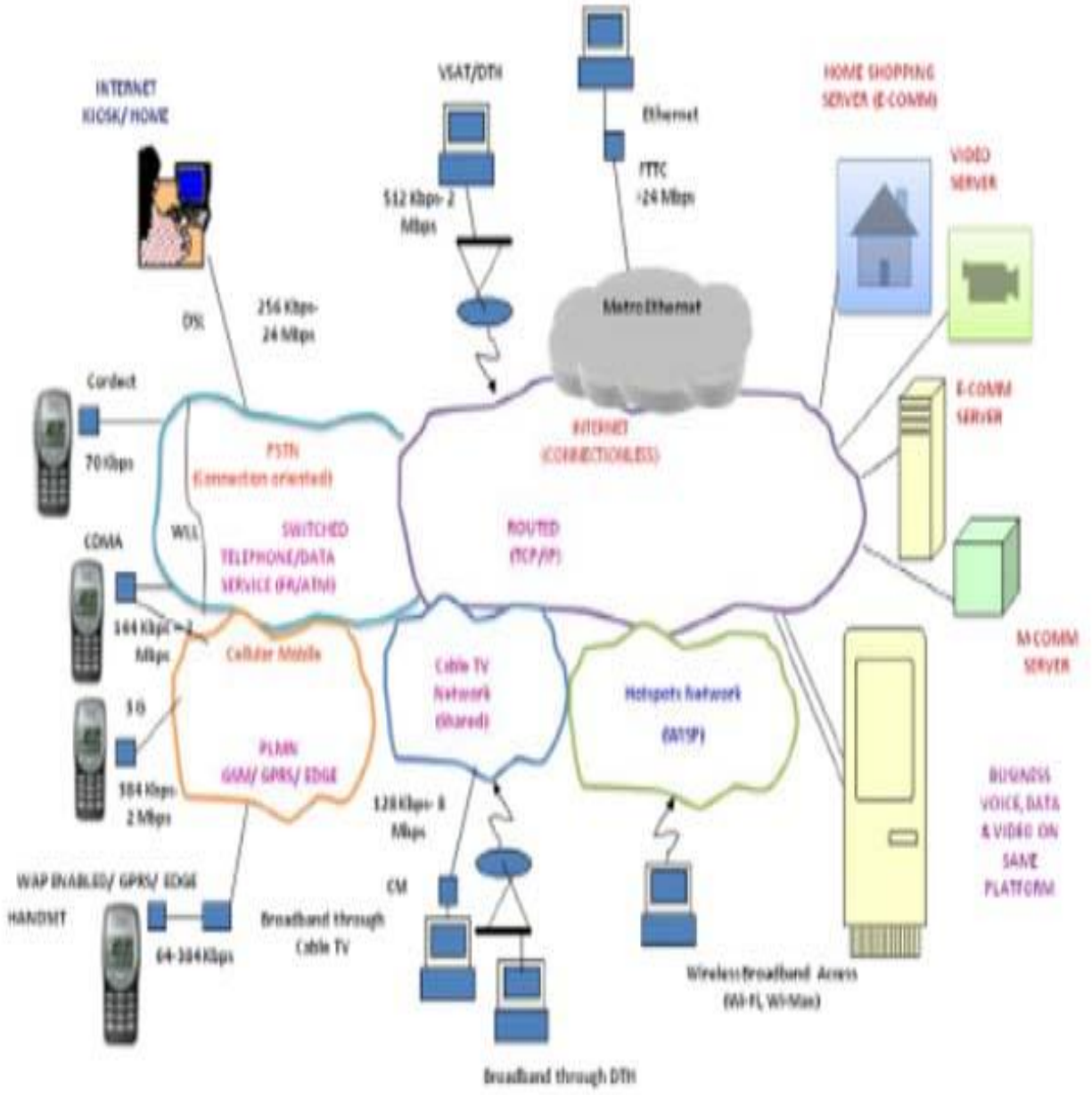

Fig-3, Connectivity Scenario of Mobile/Wireless Devices

In our case, another advantage of this model is that it can provide service continuity, or seamless mobility as the user handovers from the external network to the University Local area network. According to this architecture, the University classrooms are connected to the Server Platform and the Internet. The University Classroom usually should have the following equipments: A PC, or laptop, microphone, speakers, tablet, webcam, projector, and a monitor, or screen. At a University Classroom, a lecturer presents and delivers the content of learning materials to the students in a classical manner, or via the Internet to the students at home, at work, or simply they are mobile (on the road). The students at home, or at work can access to the course by using their PCs, or laptops using the high speed Internet from their homes, or their offices. On the other hand, the mobile students (students on the road) use their mobile devices (mobile smart phones, or tablets) to connect to the course via their mobile networks (such as GPRS, UMTS, HSPA, WiFi, WiMAX or LTE) which is shown in Fig 2. According to the technology development trend, increased speed and density of Integrated Circuits, Enhanced Transmission capacities on Optic Fibre Networks and Networking Flexibility, Distributed and Open Platform-based Communication Software, Capacity Growth and new Application Services on Wireless, Emergence of Next-Generation Networks (IP-based), Delivering QOS for Real time services, Ubiquity of networks through RFID & IPv6 (Next Generation Internet) are the demand of the age. In continuation to that use of Coaxial Cable for Telecom Services (Cable TV Network for Broadband and telephony local loop), Use of DSL technology on traditional Copper Loops, Wireless Access Service for Fixed and Mobile communication, VSAT-based Access in remote areas, Power line based Access (BPL), Free Space Optics (FSO) are also the continuation of the service trend.

IV. Research Data from the Survey

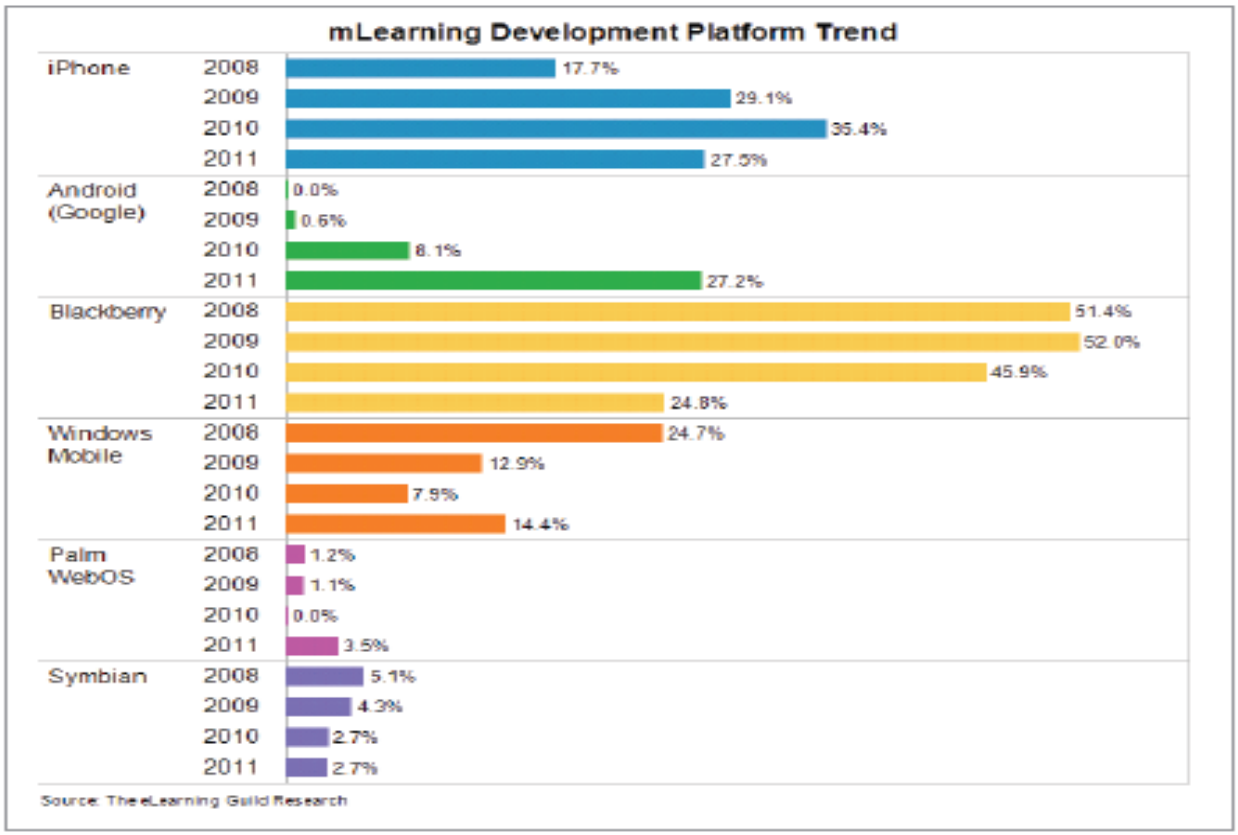

Fig-4 M-Learning Develpoment platform trend.

V. Conclusions

The digital revolution today has carried education into a completely new era where teaching and learning take place not only at schools, but at homes and in the workplace. Electronic Learning provides the ability to harvest the power of technologies to make the learning experience more effective and enjoyable. Today, we are witnessing the emergence of a connected, mobile society, with a variety of information sources and means of communication available at anywhere. Within this context, wireless mobile technologies are also adopted in educational fields. M-learning is not only a matter of learning or mobility, but a totally different concept, which is part of a new conception of mobility of a connected society. E-learning has taken learning away from classrooms, and yet m-learning takes learning away anywhere and anytime. While e-learning is an alternative to classroom learning, m-learning is the complementary activity to both e-learning and traditional learning. Nowadays technology allows users to carry the large numbers of resources in their pockets and to access them wherever they find it convenient in ways of using portable devices such as PCs, smart phones and hand-held. While the chances supplied from the use of portable devices for m-learning are completely new, the challenges as a consequence of the small screens, limited processing power, inputting capabilities, resources and small memory capacity, etc. are still prevalent.

This paper has presented a new architecture of a mobile learning system in a Cloud Computing environment enriched with mobile and wireless devices. An interactive mobile learning system in a cloud environment has provided a practical and cost-efficient solution. Mobile devices nowadays are widespread and provide great multimedia capabilities, which makes the delivery of mobile learning a more realistic approach since it can provide just in time learning on the move.

The adoption or shift to a cloud based M-learning environment by an organization, however, is not straight forward and poses several challenges (e.g. security, privacy, and interoperability). The development of a gradual and iterative systematic cloud adoption and improvement approach may prove to be more helpful, less risky and highly appropriate under a variety of circumstances. This paper has represented an important development in the area of cloud based m-learning adoption process, investigating IT professionals' thoughts on cloud based higher education systems in M-learning arena and exploring the key factors that may influence cloud based solution adoption in Higher Educational Institutes.

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