Mobile Devices for Digital Learning in Context of Higher Education

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Abstract— **Increasing popularity, easy accessibility and improved capabilities of portable devices like laptops, notebooks, tablets and smartphones among students has inspired new approaches to learning, collaboration and communication in modern education system. Usability of mobile technologies and applications in supporting the learning process should consider perception and opinion of students. The purpose of this study is to explore level of readiness and interest of college students in mobile learning. Furthermore, perception of students about possible challenges and impact of mobile devices for learning purposes were also examined. The questionnaire and personal interviews have been used to gather primary data for this research. The results of study concluded that students are ready and keen to adopt mobile learning with a positive attitude. Students mentioned advantages and challenges they expect to face about the implementation of mobile learning. The study concluded with recommendations to university administration for better implementation of mobile learning.**

Keywords— **digital learning, higher education, mobile devices**

I. INTRODUCTION

Digital learning strengthens and enhances student's learning experience by making effective use of technology in instructional practices. It encompasses a wide spectrum of practices including: online learning (e-learning), Mobile learning (m-learning), blended learning (flipped learning), virtual learning. Mobile learning is a concept that describes the process of learning by using mobile devices [1]. Several researchers have defined mobile learning as an extension or subset of e-learning [2]. Similarly, e-learning is part of modern digital learning. This type of learning is one of the kinds of ubiquitous learning.

Mobile learning can be achieved by using portable mobile devices such as laptops, notebooks, PDAs, tablets, and smartphones. Acquisition of any kind of knowledge and abilities by using of mobile technology, anytime, anywhere through wireless network is represented as mobile learning [3]. Mobile learning can be used to deliver courses, lecture notes and assignments, tutorials, quizzes and useful references for a comprehensive and up-to-date learning process. Moving with the developments in hand held devices, mobile learning technologies have also enhanced learning materials by using multimedia formats to create interests of learners. It is expected that use of mobile technologies and applications improves student performance and quality of learning experience through facilitating the access to educational resources and services [4]. Although, most previous studies in this area focused on technical aspects, adoption and implementation, prospects, possibilities and problems for mobile learning, there are few studies in context of Indian higher education system that assess the level of students' interest, views and readiness to participate in mobile learning activities.

The Indian telecom market, the second-largest in the world after China in terms of subscriber base, has nearly 1,187 million wireless subscribers as of June, 2017 [5]. Rapid evolution in computer and emerging mobile technologies, network infrastructure, intelligent user interfaces, context modelling applications and recent developments in the field of information and communication technologies, have created a wide array of new possibilities for technology users. India has one of the largest higher education systems in the world

with 895 degree awarding universities / institutions and 42,338 colleges as per the recent statistics published on university grant commission website. Indian online education market is currently stands at USD 247 million and is expected to have eight times growth to reach the USD 1.96 billion mark in 2021 [6]. With the increase in online competitive exams (like GRE, GMAT, IIT-JEE, NEET, CAT, TOEFL), the experts feel that m-learning market will have a good growth. Ease of accessibility and efficiency of mobile devices and its use as educational resources will continue to rise sharply in India. Higher education institutions should not overlook the opportunities that could be provided via this type of learning for students.

Policy formulators at universities and educational institutions have lack of availability of data regarding the extent of student's acceptance and readiness towards the use of m-learning techniques, in order to better planning to provide the required infrastructure and ensure success of mobile learning experience. A systematic study to gain insights into student's understanding and perceptions toward use mobile learning technologies could inform decision makers and instructors about the students' attitude and readiness for these technologies. Therefore, scientific research in this area is critical and required in order to get a clearer picture for the decision makers in higher education institutions about the expected benefits of investment in this type of digital learning technologies. This study explores student's readiness, attitude and views about the contribution of mobile learning in teaching and learning processes.

II. LITERATURE REVIEW

Evolution and increasing availability of low-cost mobile and wireless devices, and associated infrastructure has revolutionized education. Use of mobile devices is growing exponentially and it has now become indispensible to modern life. Nowadays, younger generations daily life is heavily influenced by smartphones which are truly a personal digital assistant i.e. companion to them.

These web enabled mobile devices are becoming ubiquitous and overtaking desktop PCs in popularity and personalization [7]. Smartphone is a mobile phone that performs many functions of a computer, typically having a touch-screen interface, information storage, ease of internet access, and an operating system capable of installing and running downloaded specialized apps. The key advantage of smartphones is that many young learners today already own these devices and carry them wherever they go [8]. Beside affordability, there are seven other features of using mobile device within educational institutions and beyond: small size and portability, small screens, computing power, access to diverse communication networks, access to a broad range of multipurpose applications, data synchronization across computers, and stylus input device [9]. Specifically, "portability, social interactivity, context, and individuality" are frequently cited features for affordances of mobile learning [10].

Mobile devices are associated with few limitations and usability problems, when evaluated in the context of learning and teaching: physical attributes of mobile devices, such as small screen size, heavy weight to carry continuously, inadequate memory, and short battery life. Further, limitation and usability of software applications and contents due to lack of built-in functions. There are compatibility issues between applications and difficulties of adding of applications and challenges in learning how to work with them. The network speed and reliability are other limiting factors. There are also physical environment issues such as problems with using the device outdoors, excessive screen brightness, difficulty of reading the screen in daylight, concerns about personal security, and possible radiation exposure from devices using radio frequencies, the need for rain covers in rainy or humid conditions [11]. It is important to consider these issues while designing the digital learning environment by using mobile devices.

Previous studies have shown a number of obstacles that face may higher education institutions and students in

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the adoption of mobile learning technologies. Success of digital learning in higher education is dependent on the acceptance and positive attitude of the students. A group of obstacles that limit the widespread adoption of mobile learning, including the distractions that mobile devices can cause within a teaching classroom; lack of research support regarding their effectiveness in the teaching class that could inspire teachers to integrate them in their own classrooms; the lack of efficient models in m-learning for accomplishing the aims of the today's learner; and resistance of some teachers to educational innovations [12]. The most important tasks that must be completed before proceeding with the design of curricula and instruction environments that rely on mobile learning techniques are: to identify the nature and characteristics and the tendencies of the audience of these technologies [13].

III. METHODOLOGY

Learners' perspectives and behavioural intentions on m-learning in a developing country like India can never be underestimated. Thus, the primary purpose of this study is to assess the use of mobile device in higher education based on students' perceptions.

This empirical research made use of the descriptive analytical methodology, in order to describe students' attitudes and the extent of their acceptance to use mobile learning systems. The random sample population of the study includes students from colleges in Udaipur, Rajasthan (India). The questionnaires were distributed to 300 randomly selected participants, after obtaining ethical consent for the survey through the concerned authorities of respective colleges, while the respondents were assured anonymity. Total 280 of the filled questionnaires were collected back, remaining 20 were not considered due to various anomalies. Majority of respondents were undergraduate students, with a small 14% studying for a Masters' degree. Also, a number of students have been interviewed based on their consent to participate in the study in order to explore the

obstacles they may face in the adoption of mobile learning technologies, and attitudes towards this type of learning. Students were asked to write down the advantages, limitations and the expected obstacles that might face the application of m-learning technology.

IV. RESULTS AND DISCUSSION

The study seeks to gather data on readiness, acceptability and attitude of students about mobile learning, by assessing responses to the following research questions:

Research Question 1: What is the interest level of the college students for mobile learning?

Almost 88% of the participating sample showed high desire to learn using mobile technology. Only 4% of the students were not interested for m-learning. Personal interviews of students indicate that preferred tool for mobile learning is presently laptop.

Research Question 2: To what extent, m-learning tools and technologies are accessible?

The results showed that nearly 90% of the surveyed students have the ability to access to Internet services through their mobile phones. This is due to availability of Wi-Fi campus and affordable mobile data plans. Overall, the survey results showed that the majority of the students have enough technical and financial readiness and positive attitude to participate in the mobile learning services.

Research Question 3: How much experience in digital learning do the college students have?

The results of the questionnaire and interviews showed that students use digital learning services are searching the Internet for articles and topics that may help them in their study courses. There are few students (nearly 40%) who communicate with their classmates or teachers using e-mail or mobile messages for academic purposes. Perhaps the reluctance of students on the use of communication methods and digital learning can be attributed to the lack of their teacher's encouragement to do so.

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Research Question 4: Does having study materials on a mobile device make learning easier?

An overwhelming 88% of the participants agreed that by having online learning resources repository, which is accessible through mobile devices, makes learning easier. A very low percentage (4%) of the disagreed or strongly disagreed while 8% of the participants are neutral on this statement.

Research Question 5: How does students' academic performance is improved by using a mobile device?

Some digital learning activities were listed in the questionnaire (table 1) to determine students' engagement, which may eventually led to improved performance.

Table 1. m-learning activities

S. No.	Description
1	Taking and studying class notes
2	Downloading, sharing and storing learning material
3	Online exercises and evaluation
4	Communicating with peer groups

The result of the analysis showed most of the students were involved in downloading, sharing and storing learning material, followed by communicating with fellow students and then practising online exercises that are related to their courses. Majority of the students (94%) think that their academic performance is likely to improve by using their mobile device for learning purposes.

Research Question 6: What are the advantages and motivations do the college students expect to have when applying mobile learning?

In this study, the advantages of m-learning were surveyed through interviewing and inquiring students about them. The students stated following benefits of mobile learning: flexible usage of mobile devices with possibility of learning outside the classroom, anywhere, anytime; enhancing the effectiveness of learning through access to information and interacting with peers; increased motivation due to daily interaction and comfort

with mobile technologies; and the high reputation of the University for using this advanced learning methods for preparing technical future of students. It indicates a paradigm shift in favour of efficient inclusion of emerging digital learning technologies in educational processes that are globalized and personalized.

Research Question 7: What are the limitations and obstacles do the college students expect to have when applying mobile learning?

Out of many disadvantages and obstacles of m-learning, perceived by students, the most important ones were: mobile device may be distraction tools rather than learning tools; physical attributes of mobile devices such as slow speed, less battery life, multiple operating system are obstacle in mobile learning; information overload may create confusion. Beside this, some of the participants believe that receiving messages from their teachers and peer group at any time of day is annoying. The students mentioned that there may be reluctance from faculty and students alike towards the use of mobile learning technologies.

V. LIMITATION OF STUDY

Participants were advised to answer the questionnaires and respond to queries in interviews from their personal experience about using their mobile device for learning. Still, some form of subjectivity in the responses by participants may be found due to their dependency on theoretical knowledge rather than practical experience.

As the study included students (mainly from the age group of 18 – 25 years) pursuing professional courses from urban area, inferences from this study cannot be generalized due to limited and specific sample size. Future research could include different demography of participants and other stakeholders like decision makers at educational institutions, parents and teachers. Nevertheless, inferences observed by this study are very close and consistent with similar studies conducted in other parts of the world, in the field of digital learning using mobile devices.

VI. CONCLUSION AND FUTURE WORK

The study assess that digital learning through mobile devices will spread rapidly and likely to become one of the most efficient ways of delivering higher education instruction in the future. Main reason for this is the students' positive attitude and perceptions about mobile learning. It is recommended that more similar research should be conducted in other parts of country in order to better understand the utility of mobile device in education. Educational institutes are urged to intensify wireless network so that digital learning is easily implemented and adopted. Most of the teachers are not exposed to teaching methodologies of digital learning. There is need to educate faculty members for implementing digital learning.

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