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Smart Learning Gateways for Omani HEIs Towards Educational Technology: Benefits, Challenges and solutions

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Abstract. Globally, higher education institutions (HEIs) is completely transformed with the growth of information and communication technology. This change is due to the advancement of information technology in the world, which has led to the creation of conceptual frameworks that design the smart learning environment across the globe for Educational Technology. Therefore, a great deal of today's teachings relies heavily on the information and technology resources where most HEIs are starting to digitize their courses curriculum. The smart learning matter has gained a global trend for the past few years but still did not discuss thoroughly in the Omani environment. This research aims at providing innovative ways of using information and technology in higher education learning. The purpose of this study is to investigate the challenges that higher learning students encounter in higher education institutions with the implementation of technology-enhanced learning, the benefits of the smart learning environment in Oman, and to identify the solutions for the smart learning environment in students of high education Oman. Finally, this paper gives recommendations on how the universities in Omani HEIs can minimize and conquer the challenges that higher education' students in Oman face in becoming a smart learning environment.

Keywords: *Smart Learning; E-Learning; Educational Technology; Higher Education Institutions.*

1. Introduction

In the whole world today, the education environment is going mobile. Smart learning is advancing to the use of information and communication technology as a learning method in re-shaping the traditional cultures and societies (Al-Emran and Teo 2019). Mobile devices in smart learning are useful in transforming learning methodologies by connecting students to vast information and communication technologies. Information communication technologies (ICT) have increased the advancement of smart education because many students have improved their mobility from their different individual capabilities (AlFalahi Manal 2019) towards educational technology. In Oman, many people are engaged with their own different abilities, which makes it vital for the education sector to advance in technology and communication through mobile learning (Siemens 2013). Therefore, smart learning is complete and successful if teachers, instructors, and students are well conversant with the mobile devices used for communication purposes. However, traditional methods of learning are becoming extinct because information communication and technology learning are increasing for the development of internet learning (Al-Qaysi et al. 2019). The reshaping of higher education in Oman is rapidly changing from traditional learning to the increase of internet-based teaching (Sarrab, Al-Shih, and Rehman 2013; Alajmi et al. 2017). Consequently, in the last decade, the development of information technology involved both software and hardware devices that led to the concept of anywhere and anytime higher learning education.

For higher education to use information communication technologies, e-learning or internet education is to be available in mobile devices (Mufadhal, Sahabudin, and Al-Sharafi 2018). Therefore, the integration between the wireless networks and mobile devices technologies created a transparent platform for facilitating and refining the education process. An introduction of dramatic changes in the higher education sector in Oman with new advanced technologies such as mobile devices and computers enables learners to have a more efficient, effective, comfortable, and flexible way of learning (Lee, Zo, and Lee 2014). Through wireless networks, learners can access digital data from their instructors and tutors through smart digital devices (Atkins et al. 2010; Alajmi et al. 2018). For smart learning to have a more positive effect on the higher education learners, proper interactive methods are necessary between the teachers, learners, and the environment.

However, smart learning is not without limitations in the learning atmosphere and educational technology. The access to E-learning or smart education can only be from an area with an available network and terminal. Consequently, the use of smart learning shifted the concept of E-learning to M-learning where the use of mobile devices and a wireless network occurred in the education system in Oman. Students of higher learning institutions use handheld information technology devices such as mobile phones, laptops, PDAs, and tablets (Kobayashi et al. 2017; Qasim Alajmi 2019).

The remainder of the paper is organized into five sections: Section 2 illustrates the research background followed by the research methodology in Section 3. In section 4, the results of this study are provided. Finally, this study concludes the benefits, challenges, and solutions of smart e-learning and provides recommendations.

2. Research Background

Over the year's education is advancing with the increase of new educational models and intelligent technologies. During the last decade, technology-enhanced learning has been implemented and utilized throughout the learning environment as a model of flexible learning. In developing countries, many people are engaged with different occupations that prevent total dedication to lesson classes in higher learning institutions. Therefore, technology-enhanced learning is introduced as the media tool for accessing learning contents quickly, and communication, inquiry, and evaluation of studies (AlFalahi Manal 2019). Consequently, with the fast development of mobile devices, the technology-enhanced learning paradigm is the primary beneficiary.

Smart learning is emerging from different intelligent technologies such as cloud computing, data analysis, the internet of things, and learning analytics. In cloud computing, learners can capture learning data from any location. Big data and data analytics focuses on analysis and directing data in improving learning and teaching techniques through the development of personalized learning (Riffai et al. 2016). Subsequently, the internet of things connects people and the devices in smart learning where learners can receive related information with their environment. Wearable technology is an intelligent technology that incorporates different information from different locations where visual reality tools are converted into learning (Zhu, Yu, and Riezebos 2016). Therefore, the fast growth of a smart learning environment is vital in providing connectivity to the less developed areas of study. The smart learning environment has no clear, unified definition or description. Many educational professionals and researchers are concerned with how higher education conceptualizes smart learning. Different concepts are proposed in using smart learning. The first concept is: does smart learning environment focus solely on learners, teachers, and data more than the devices used; Secondly, is the creative and active smart learning designed only based on the advanced information communication and technology infrastructure.

The main issue that the research focuses on is the role technology plays in supporting a smart learning environment (Sarrab and Elgamel 2013). Smart learning should not only focus on how the devices are utilized but on universal learning and social learning educational model. Smart learning features different learning techniques such as formal and informal learning, personalized and positioned learning, application and content learning, and social and collective leaning. Globally, the world today is changing the way of higher education from the traditional model to smart learning. The mobile devices in smart learning in information communication technologies are used to communicate leaning techniques with the embedded technology-enhanced learning environment (Picciano 2012). The literature reveals that despite the new educational paradigm in smart learning, the promotion of smart learning from the traditional mode of teaching receives many challenges from other developing countries, and very little is

known on the perception of the student, teachers, and service providers on smart learning (Picciano 2012; Riffai et al. 2016).

3. Research Methodology

Research design is a general plan that illustrates what the researcher is required to do to answer the research questions. The study employed a descriptive research method with quantitative techniques. According to (Low, Chen, and Wu 2011), the descriptive research design describes the relationship between the research proposal and the existing characteristics. A descriptive design is responsible for providing accurate population research with the advantage of being able to investigate the subjects in an unchanged environment. The target population consists of higher education students in Omani HEIs. This target population includes students who specifically undertake their studies in the smart learning environment somehow. Students in colleges/universities were chosen to participate in the study by providing information through different statistical methods. Also, stratified random sampling was used to select the students who were directly involved with the use of smart learning.

3.1 Research instruments- Questionnaire

A research instrument is a tool that is used to gather information from a research (Al-Sharafi, Arshah, and Abu-Shanab 2019). There are different types of research instruments that a researcher can use to gather information, for instance: interviews, questionnaires, telephone calls, and observations (Teater et al. 2016). A questionnaire is the most suitable instrument that was used to collect data in this study. Churchill and Iacobucci (2006) describe a questionnaire as a research instrument that has structured questions that invoke participants to provide answers. This response rate was quite impressive. According to Dörnyei (2007), research validity is described as the extent to which the statistical test done evaluates the intention of the researcher. The research instrument is valid as long as the extent to which it measures is what it is designed to measure. However, validity cannot be measured but can be achieved through judging. According to Lee (2016), they defined reliability as the criteria by which the researcher determines whether the results of the statistical test are consistent with one another. Therefore, to determine the research instruments reliability in the current study, Cronbach's alpha was used. The five-point Likert scale was adopted in the developed questionnaire. These grading provided different answers as shown below.1= strongly disagree, 2= disagree, 3= uncertain, 4=agree, 5 strongly agree.

3.2 Data collection and Sampling Techniques

Because the researcher could not collect all the data from the entire institution, the sampling technique was used to get the appropriate number of respondents who will provide information on a smart learning environment. The sampling technique used provided procedures and methods to choose the participants(Creswell and Creswell 2017). For this study, the chosen sampling technique used was the stratified random sampling technique. This method divided the research population into various strata and random samples which described different characteristics. The questionnaire was the tool used to gather information from 300 students in Omani HEIs. For easy response and privacy, the questionnaires were emailed to the respondents in the smart environment. According to (Bernard and Bernard 2012) the use of email is the most convenient and quicker method of obtaining data and receiving responses. The phases of data collection used were before and after the use of smart learning in Oman. The questionnaires were sent through email to the students in the high education schools so that they can receive and respond to the questionnaires at a faster rate.

4. Results

In this section, the researcher provides details of the statistical method that was used to collect data to answer the research questions. The primary method was employed in this study is a descriptive analysis. With this method, the researcher can rearrange and reorder the data to make it easily understandable (Teater et al. 2016). Descriptive analysis is categorized into a measure of dispersion and measure of central tendency. The measure of dispersion uses variance, standard deviation, maximum, and minimum, while the measure of central tendency includes the use of mean, frequency medium, and mode.

This study was conducted to the students of higher education in Oman with the program of a smart learning environment where the students were introduced to similar educational programs but with the use of handheld information technology devices. A questionnaire was developed with 12 questions that were used to collect the student' responses towards smart learning. In relation to smart learning five major domains were discovered. These domains include:

How do the students perceive the smart learning environment? What kind of challenges do higher learning students encounter in higher learning institutions with the implementation of technology-enhanced learning? What are the benefits of smart learning environment in Oman? And what are the solutions for smart learning environment in students of high education Oman? Below is the summary of their responses; Table 1 shows the overview of the responses in terms of Mean and STD.

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Mean	4.0167	4.0133	4.0400	3.9967	4.0433	4.0000	3.8800	4.0633	4.0900	4.1033	4.1167	3.8367
Std. Deviation	.68651	.66931	.66825	.66694	.69503	.68914	.80483	.87285	.83919	.86901	.86345	.71533

Table 1. The responses statistics.

From the responses as shown in table 3, it was discovered that the use of smart learning was very flexible because the students in high education can learn from different forms of media. That is through photos, videos, graphs, and animated videos which offer pictorial data that remains in their mind (Sarrab, Elgamel, and Aldabbas 2012). However, the teaching and learning experience is at its lowest because the students require more transparency and direct communication with the teachers in specific assignments (Ercan 2010). Consequently, with the teachers experience a slow pace of growth because the understanding of students is different from each other. Table 2 present the benefits of smart learning.

Item	Strongly Disagree	Disagree	Natural	Agree	Strongly agree
I think smart learning is flexible.	0.0%	4.0%	22.7%	49.0%	24.3%
I think smart learning has a good teaching and learning experience.	0.0%	0.0%	21.7%	55.3%	23.0%
Smart learning is environmentally friendly.	0.5%	2%	20.3%	55.0%	22.1%
Smart learning increases the growth pace of learning.	0.0%	0.0%	22.3%	55.7%	22.0%

Table 2. The benefits of smart learning.

From the responses as shown in table 4, it was discovered dependency on E-learning was high. The students depended so much on technology, and they were unable to depend on their teachers for personal tutoring (Riffai et al. 2016). However, the upgrading of mobile devices was cumbersome. A workforce is needed for the whole ICT infrastructure to make it efficient. Consequently, on the teachers' side, the diversion rate was high because many students divert their attention when using mobile devices. It was difficult for the teachers to understand whether the students are using mobile devices for learning purposes or otherwise. The upgrading was not cumbersome on the teachers' perspective because they used the gadgets in a web-based environment (Sarrab, Al-Shih, and Rehman 2013). The respondents' perceptions of smart learning challenges have been tabulated in Table 3.

Item	Strongly Disagree	Disagree	Natural	Agree	Strongly agree
Smart learning has a cumbersome upgrading system.	0.7%	0.0%	22.0%	51.0%	26.3%
Smart learning has a good teaching and learning experience.	0.0%	1.2%	23.0%	52.2%	23.7%
Smart Learning has a transformation issue.	0.0%	0.0%	39.0%	34.0%	27.0%
Smart learning is dependent on E-learning.	0.0%	1.0%	35.0%	23.0%	41.0%

Table 3. Smart Learning Challenges.

From the responses as shown in table 5. hybrid learning assistance was seen to be the best solution because the students can connect the learning environment with the recommender system that personalizes the learning processes. However, the didactical diversity solution was rated at the lowest because the students do not see the need for switching the tools and combine digital and physical means

(Riffai et al. 2016). From the teachers' pie chart, they rated didactical diversity as the best solution and corporate culture as the least solution. With the didactical solution, the learners can switch in between digital to physical tools, which make it easier for students to record and analyze data. The solutions of smart learning were tabled in Table 4.

Item	Strongly Disagree	Disagree	natural	Agree	Strongly agree
Corporate culture help transform the company into a learning organization.	0.0%	0.0%	31.0%	29.0%	40.0%
Smart learning need tools for learning.	0.3%	0.7%	33.0%	23.0%	43.0%
The physical environment ability to have sensors and beacons to create support learning efforts.	0.7%	2.0%	32.0%	22.3%	43.0%
Smart learning connects with personalized learning process.	0.4%	4.0%	35.0%	42.3%	18.3%

Table 4. The solutions of smart learning.

5. Conclusion and recommendation

In conclusion, the students in Oman who were in the smart learning environment had encouraging results and positive attitudes to the various subjects taught in the school. Globally, the world is advancing in technology, and many high school institutions are embracing smart learning environments to help students understand better and course materials. Also, the mode of education is changing and becoming more efficient with the presence of long-distance learning. However, face to discussions and instructions can highly impact the rate of learning and understanding of the students, because the students can easily express their understanding of the different tasks given in classes. Many students preferred the use of E-learning, M-learning, and face to face approach of studying because they are able to understand more what they are learning. Therefore, we recommend the use of both traditional learning method and smart learning in the high school environments.

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