WHAT DRIVES SUCCESSFUL E-LEARNING? AN EMPIRICAL INVESTIGATION OF THE KEY TECHNICAL ISSUES IN SAUDI ARABIAN UNIVERSITIES

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ABSTRACT

In the new era of learning, electronic learning (e-learning) has become a vital strategy for the vast majority of educational organizations across the world. This has instigated a fundamental change in the whole education sector's structure, values, culture and the ways in which learning is conducted. The worldwide e-learning market has grown considerably, but failures are still occurring. While technology is the enabler of e-learning, in many institutions it is also an obstacle affecting the full utilization of its own potential. This paper investigates the major technical issues that impact on e-learning delivery in Saudi Arabian universities. The study identified four major technical issues: information communication technology (ICT) infrastructures, security, access (on-site and off-site) and information technology (IT) support. The various technical issues were investigated through the use of empirical case studies from the Kingdom of Saudi Arabia. This research also presents several recommendations which could be enforced to aid the implementation of e-learning systems at universities in Saudi Arabia. This research therefore has relevance for researchers, educational leaders and developers. Finally, a number of possible further research directions are discussed.

Keywords: *E-learning, communication technologies, information security, empirical studies*

1. INTRODUCTION

With the innovation of the internet in the 21st century, outstanding changes have occurred across various aspects of our lives [1]. The internet has produced vast opportunities as well as threats for institutions across various industries; in short, all institutions are compelled to either willingly or reluctantly support their products or present their services online, using the internet as a distribution channel [2,3]. This advanced technology has become a vital instrument of communication and information, therefore providing distinctive benefits to both learners and educators [1]; as such, there is an international drive, across educational institutions, to offer learning environments that meet the requirements of the 21st century [4].

E-learning is now of vital strategic importance to the majority of educational organizations [5] as such it provides various opportunities organizationally and individually around the globe [6]. Accordingly, individuals can access the education they require on nearly an "anytime and anywhere" basis. More and more organizations, around the world, are therefore pursuing this phenomenon as a means to reduce costs, improve services for students and to increase effectiveness and efficiency in the education sector. Ultimately, e-learning represents a fundamental change within this sector, affecting the structure, values, culture and the ways in which learning is conducted [7].

The Ambient Insight report from 2010 indicated that the global market for e-learning attained $27.1 billion ($ refers to US dollars) in 2009 and its demand is rising by a five year compounded annual increase rate of 12.8%; thus indicating that revenues are likely to reach $49.6 billion by 2014. However, the development of e-learning systems is not easy, especially in developing countries such as Saudi Arabia. E-learning has to be carefully implemented within an institution [7] and the implementation needs to incorporate the appropriate cultural, organizational and technological issues which should to be recognized and attended to in order to facilitate successful transformation. While technology is the enabler of e-learning, for many institutions it is also a hurdle to the full utilization of its own potential [8]. This paper therefore aims to investigate the major technical issues that impact on e-learning delivery in Saudi Arabian universities.

These issues will be grouped into four main categories namely: information and communications technology (ICT) infrastructures, security, access (on- and off-site) and information technology (IT) support.

2. LITERATURE REVIEW

Before investigating the key technical issues that impact on e-learning delivery, it is necessary to firstly define what e-learning actually is. Darab and Montazer [9] referred to e-learning as "an innovative approach for facilitating well designed, media-equipped, interactive and learner-friendly education for anybody, anywhere and at anytime, applying various digital sources along with other educational methods, provided through open, flexible and well distributed educational systems". Holmes and Gardner [10], in contrast, defined e-learning as the use of new multimedia technologies and the internet to enhance the quality of learning by enabling access to services and resources. Ultimately this will allow for exchanges and distance collaboration. According to [11], e-learning refers to "a learning process in which learners can communicate with their instructors and their peers, and access learning materials, over the internet or other computer networks".

For the purpose of this study, e-learning refers to the employment of any of the new applications or technologies that are applied electronically to provide the service of learning or learner support [12]. E-learning includes all forms of electronically supported teaching and learning [13]. As such, according to Laurillard [12]: "The range and scale of possible applications of new technologies in HE [higher education] is almost beyond imagining because, while we try to cope with what is possible now, another technological application is becoming available that will extend those possibilities even further". E-learning systems utilize altered structures that are continually changing in order to merge with the new technologies [14]. Figure 1, below, illustrates the most recent trends, in technological terms, in which educational organizations are incorporating and adopting within their educational strategies or by producing materials that can be used electronically as part of their strategy.
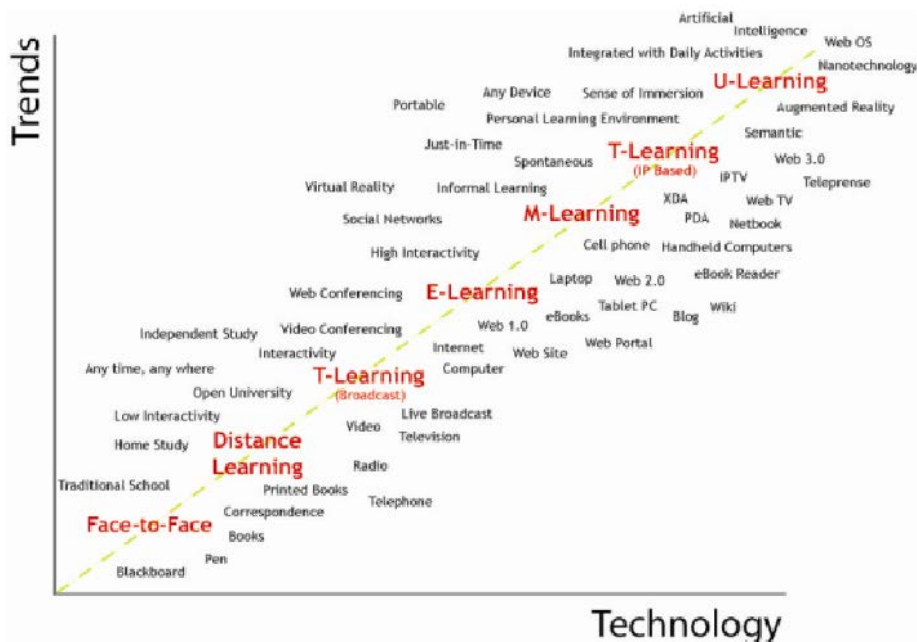
3. E-LEARNING IN SAUDI ARABIA

The Kingdom of Saudi Arabia is the largest country on the Arabian Peninsula, it encompasses 2,240,000 square kilometers and it occupies around 80% of the Arabian Peninsula [15. Saudi Arabia is constituted of 13 different regions and the Kingdom, as a whole, is known to hold the largest reserves of petroleum in the world. It is ranked as the largest exporter of petroleum [16] and its economy is deemed to be stable based on these reserves which represent around a quarter of the world's reserves. Saudi Arabia has placed ICT as its priority in strategy formulation and implementation and ICT has subsequently entered various functional and organizational areas. However, in relative terms, the Kingdom is lagging behind the level of ICT development in developed nations such as Japan, Canada, the UK and the USA. Saudi Arabian ICT progress is relatively small and it is still in its infancy [17]. However, it is worth comparing the Kingdom within the regional context. Relative to the region, Saudi Arabia is the biggest ICT market in terms of its size and growth; as such, the Saudi ICT sector represents between 55% and 51% of the entire Middle Eastern markets [18]. Internet services in Saudi Arabia were first introduced in March 1997. Today, the internet penetration within Saudi Arabia is one of the highest in the region. Table 1 presents the statistics of internet penetration from the Internet World Statistics [19]. It is foreseen that internet usage will continue to rapidly grow as the infrastructure develops and as access costs decrease across the Arab states. The Ministry of Higher Education realizes the requirement and potential of a coordinated and collaborative approach to e-learning in the universities [18]. The universities have IT facilities, however they need to be better utilized in order to provide equitable and quality education [20]. As a result, in 2006, the Ministry of Higher Education created the National Centre for E-Learning and Distance Education; this centre would be responsible for delivering countrywide e-learning development [21]. However, the universities in Saudi Arabia are still facing a number of issues that are impeding its success [18]. Al-Harbi [1] provided a useful summary to this by stating that "successful implementation of e-learning requires an understanding of the issues that promote the effective use of the technologies".

Table 1. Statistics of internet penetration from the Internet World Statistics [19]

Country	Population (2012 Est.)	Users, in Dec/2000	Internet Usage 30-June-2012	% Population (Penetration)	Internet % Users
Bahrain	1,248,348	40,000	961,228	77.0 %	2.3 %
Iraq	31,129,225	12,500	2,211,860	7.1 %	5.2 %
Jordan	6,508,887	127,300	2,481,940	38.1 %	5.8 %
Kuwait	2,646,314	150,000	1,963,565	74.2 %	4.6 %
Lebanon	4,140,289	300,000	2,152,950	52.0 %	5.0 %
Oman	3,090,150	90,000	2,101,302	68.8 %	4.9 %
Palestine	2,622,544	35,000	1,512,273	57.7 %	3.5 %
Qatar	1,951,591	30,000	1,682,271	86.2 %	3.9 %
Saudi Arabia	26,534,504	200,000	13,000,000	49.0 %	30.5 %
Syria	22,530,746	30,000	5,069,418	22.5 %	11.9 %
United Arab Emirates	8,264,070	735,000	5,859,118	70.9 %	13.7 %
Yemen	24,771,809	15,000	3,691,000	14.9 %	8.7 %
TOTAL	223,608,203	3,284,800	42686,925	40.2 %	100.0 %

4. TECHNICAL ISSUES FOR E-LEARNING IMPLEMENTATION IN SAUDI ARABIAN UNIVERSITIES

4.1. ICT infrastructure

The capability of the ICT infrastructure is one of the most crucial issues facing IT executives. ICT infrastructures are key determinants to the implementation of new technologies, such as e-learning. Inadequate ICT infrastructures will create barriers that would be capable of impeding the delivery of e-learning implementation [22]. Marfo and Okien [11] reported that insufficient ICT infrastructures will make e-learning extremely difficult as teaching and learning will not be transferred. In addition, Cech and Bures [7] acknowledge that "students as well as teachers must have easy access to online courses so that their efforts can be focused on fulfilling the tasks, not on finding a free computer". Successful e-learning entails a suitable ICT infrastructure; to illustrate, Selim [23] stated that "ensuring that the IT infrastructure is rich, reliable and capable of providing the courses with the necessary tools to make the delivery process as smooth as possible, is critical to the success of e-learning". Accordingly, IT tools include network bandwidth, audio and video plug-ins, courseware authoring applications, internet availability, instructional multimedia services, videoconferencing, course management systems and user interfaces.

4.2. Security

Security concepts, in general, are defined as the ability to protect against danger. However, in online environments, security is referring to as the capability of the online organisation's website to protect user information from potential threats. The importance of security has become significantly increased over recent years, as more organisational applications are being automated and as more and more essential and sensitive information is being stored electronically. With online education comes increasing problems with regards to security [24]. A poorly designed system invites security problems [25]. Security concerns might stop potential damages resulting from insecure transactions, hacking or poor access control to vital data [26]. But, the responsibility for security must move in line with the technological advances. It should be noted that many educators' and learners' behavioral intentions to use e-learning are significantly influenced by their perception of the level of security control that a system has. Thus, e-learning systems security is a significant determinant of educators and learners attitudes toward e-learning

usage [27, 23, 28]. It is therefore of essential significance that e-learning is developed with reliable security for the education files and records as this will assure the educators and learners that they are safe from security threats [27].

4.3. Access (on-site and off-site)

The use of e-learning is clearly affected by an individuals' access to technology, as such it can be an enabling or disabling element [29, 30]. Not all students have access to personal computers in their homes, as such they may be dependent on sharing computers at their local community or learning centres – if they even exist [31, 32]. It should be noted that when students have access to a computer at their residence, they access the internet for much more varied reasons [33]. Accordingly, "Here we get a rather equal distribution between the home, training institutes, internet cafes, university, work and parents offices" [33]. Indeed, poor internet connectivity proves to be a significant barrier to accessing e-learning [31,34], as such, access is also linked to the quality of the connectivity [33, 35]. To illustrate, Andersson 33] noted that "The reliability of this connection and the bandwidth will affect the users' ability to access the full range of the content needed". Many researchers have indicated that access to technology is crucial in the implementation of e-learning [23, 36,33,37].

4.4. IT support

Many universities fail to utilize e-learning effectively, due to a lack of IT support; Selim [23] supports this notion and reported that e-learning projects that failed to attain their objectives did not have access to technical advice and support. Accordingly it is deemed that when technical support is lacking, e-learning will not succeed. Many universities in the Arab regions are guilty of either not having an IT department in place or having an IT department that is low-skilled and inadequately equipped. Consequently, major issues occur with regards to the development and maintenance of these systems [38]. In Saudi Arabia, Al-Khalifa (2010) stated that "unreliable technology and infrastructure and poor maintenance and technical support could negatively affect the availability of, and accessibility to, online learning". An innovation such as e-learning, with considerable complexity, requires sufficient IT support in order to influence the likelihood of its successful delivery. IT support therefore provides educational institutions with the required knowledge to help them implement e-learning,

without hesitation or reluctance. Educators and learners should therefore have access to accurate and fast technical support services [39]. As such, IT support can either be a significant barrier or an enabler in the implementation of e-learning; furthermore, many researchers and practitioners identified IT support as being a vital element to e-learning implementation [23,36, 33, 40, 14, 37].

5. RESEARCH METHODOLOGY

This study focuses on the key technical issues that impact on e-learning implementation within universities in Saudi Arabia. As this study initially involves exploratory research, a qualitative approach was decided upon. A qualitative approach is appropriate as it can discover and gain in-depth understanding of the studied phenomena [41, 42]. The researcher undertook a series of case studies as a vehicle for the empirical research; the findings were then used to develop a theory concerning the implementation of e-learning. It is believed that multiple case studies might have been more appropriate, than a single case study, in generating a more diverse set of issues with regards to the factors impacting on e-learning implementation [43].

The case studies were employed with a particular focus on the top management, IT leaders and project managers from three significant universities in Saudi Arabia; all of these universities have made significant and noticeable progress in terms of their implementation of e-learning. In addition, semi-structured interviews were conducted as the primary data technique for this phase of study. This exploratory study utilised a practical approach to investigate the major technical issues that affect the implementation of e-learning in Saudi Arabian universities; thus, suitable methods were chosen and used to identify the relevant people involved – these people were deemed to have significant experience of working on e-learning initiatives.

6. RESULTS AND DISCUSSION

This study identified several technical issues that affect the e-learning implementation in Saudi Arabian universities. The study revealed that the reliability of the ICT infrastructure is significant for e-learning delivery. A project manager in one of the universities said: "The importance of ICT infrastructure in enabling educational institutions to

implement e-learning technologies is the major issue hindering many universities in Saudi Arabia… It's the prop for implementing new technologies". The study also revealed that only a few universities have the adequate ICT infrastructures to successfully develop and implement their own e-learning systems. The participants noted that the e-learning systems need to be integrated with the vital internal and external databases and applications. This study stresses the need for the universities to develop in order to reach an acceptable and capable level of ICT infrastructure as this will make the e-learning delivery process as smooth as possible.

In addition, this study revealed that it is supremely significant that e-learning systems should be developed with a reliable protection of education files and records to assure the users that they are safe from security threats. To illustrate, one IT manager highlighted: "With e-learning comes increasing issues with security and the validity of students work". The participants acknowledged that system security is a significant determinant of the educators' attitudes toward e-learning use. This study also revealed that security threats decrease after implementation, but they may subsequently rise or change in nature because after the e-learning system is implemented, high speed and greater volumes of data are exchanged through extended networks which may enhance existing threats and introduce new ones.

Moreover, this study revealed that e-learning implementation impacts not only on the educators and students on-site, but it also impacts on the range of institutional processes and services that support the educators and students off-site, 24 hours a day, 365 days a year. Participants noted that access to the e-learning system can either be a major barrier or an enabler in the implementation of e-learning. This study also revealed that internet services are not only costly but they also often have poor internet connectivity. One of the projects manager said "Commonly, it is the speed of the bandwidth that is the restraining element and even those who go to internet centres found the connection to be very slow for their needed coursework". This study has identified the need to raise the bandwidth speed; as such e-learning content could be changed and made using smaller graphics and multimedia elements in order to meet the current bandwidth limits, as suggested by many researchers and practitioners.

Additionally, this study indicated that there is a strong relationship between IT support and system delivery. It demonstrates that the universities with efficient IT support are more confident in implementing e-learning. One of the IT project managers said: "With inadequate IT support, faults will happen and systems will fail". Thus, the participants noted that the e-learning system must be monitored to ensure appropriate fulfilment and full utilisation. This study heavily emphasised the need for IT assistance, such as the availability of help desks; thus, suggesting the necessity of online IT support services which will ultimately ensure the system is used to its full potential.

7. CONCLUSIONS

E-learning is perceived across the world to be a requirement and an opportunity. Saudi Arabia is experiencing significant and essential dynamic growth in terms of noticeable human development. To illustrate, a set of reforms to modernise the Kingdom are underway in which human development, economic growth and employment promotion are incorporated. Many major programmes have been dedicated to human development, especially education. This paper has presented an overview of the technical issues influencing the implementation of e-learning in Saudi Arabia's universities. It highlighted the fact that universities wishing to embrace e-learning systems need to deal with several technical issues if they wish to successfully implement the system. The technical issues that impact on e-learning delivery also need to be considered and elaborated on. The findings are based on a wide review of literature and on the case studies conducted. The key findings have highlighted the technical issues affecting e-learning in Saudi Arabian universities. The findings showed that ICT infrastructures, security, access (on- and off-site) and IT support, all influence the implementation and diffusion of e-learning. Therefore, educational leaders and developers should pay particular attention to these issues and the Saudi universities should consider these issues seriously if they wish to successfully facilitate e-learning adoption in their institutions. The key findings are useful for both researchers and practitioners, as they provide a real understanding of the technical issues impacting on e-learning in Saudi Arabian universities. It should be noted that the total picture of e-learning implementation in the Kingdom of Saudi Arabia is still unclear as this study only focused on the technical issues. It is therefore recommended that further investigations should be conducted into the other dimensions, such as the organisational and environmental issues affecting e-learning.

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