

Readiness of Higher Education Institutions for e-learning: A Case Study of Saudi Universities During the COVID-19 Pandemic

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Abstract

The COVID-19 pandemic has affected all sectors across the globe. The education sector is one of the critical sectors that have been affected on all continents. Educational institutions, including universities, are struggling as they had no time to manage their learning system to encounter the sudden shock of COVID-19. The purpose of this study is to explore and examine the readiness of higher education institutes for e-learning. A case study of Saudi Arabia universities during the COVID-19 pandemic is considered. Our analysis focused on measuring the level of readiness between public and private universities. The results show that universities adopting blended learning systems among both public and private universities managed to reduce the negative impact of the epidemic much better than traditional universities.

Keywords: *E-Learning, Higher Education, COVID-19 Epidemic, Education.*

1 Introduction

Learners are generally heterogeneous in nature. They have different intellectual capabilities, learning pace, and preferences [1]. Delivering knowledge for a wide range of learners is challenging in a normal situation, so how do higher education learners react during complicated situations as in the COVID-19 pandemic? The COVID-19 pandemic shows the importance of shifting the learning paradigm from conventional learning to e-learning. Conventional higher education institutions across the globe are forced to shift their teaching methods to e-learning within days. This shift requires great capabilities in terms of IT infrastructure, tutors, and learners. However, higher education institutions with a solid IT infrastructure, and have concrete experience in deploying e-learning tools

in their teaching paradigm, are found to be more capable in overcoming the initial shock.

One more factor that affects the smoothness of transition to e-learning, is the readiness of the academic staff and the students in interacting with e-learning tools effectively. Neither academic staff nor the students have had enough time to get training on how to use these tools effectively during COVID-19. As moving from conventional learning to e-learning is not only about how far you are from the campus, but it also depends on the capabilities of the e-learning system to produce active learners. This is possible through discussions, collaborations, critical thinking, and problem solving.

The first decision made by all governments across the world was to close the schools and the universities and shift the education paradigms to e-learning systems. Educational institutions faced many obstacles to perform such shifting properly. Several challenges are reported by academicians and students in terms of the effectiveness of the e-learning tools and methods in enhancing their educational levels and satisfying the required learning outcomes.

In this research, we study the challenges and obstacles that higher education institutions face during the sudden shift from conventional learning to e-learning. In particular, our research considers the higher education institutions in Saudi Arabia as a case study. Our contribution in this area of research is the analysis of readiness of higher education for e-learning systems. We study the challenges that arise during COVID-19, and what strategies and procedures are used to overcome these challenges.

2 E-learning Versus Traditional Learning During an Epidemic

When comparing traditional learning with e-learning, we find that e-learning suffers from several issues that were not problematic to traditional learning. It includes the absence of regulations and laws governing the e-learning process, especially since many countries did not acknowledge them until recently. E-learning also suffers from the absence of an electronic culture that deals with this kind of learning, a lack of reliable internet facilities for some students, resistance to change in some societies, a lack of the standards of evaluating the published information electronically, and finally, the absence of a reliable electronic library and international quality standards for the curricula used in the e-learning process.

The official acknowledgment and social/public acceptance of distance e-learning were the most important challenges that we had to overcome from previous times. Furthermore, it is necessary to enact regulations, laws, and standards that can control the process of e-learning remotely. The culture of distance learning is known to all and it has become a necessity now that the official institutions and

the different social media have to be part of it. The minimum capabilities required for this type of education should be provided, which includes offering the students a computer station and a reliable internet connection.

The world is currently witnessing a significant event that may threaten education with a global crisis, perhaps the most dangerous in our time. Since February 2020, the COVID-19 pandemic has caused more than 1.6 billion children and young adults to drop out of education in 161 countries, nearly 80% of all students enrolled in schools worldwide. This came at a time when we were already suffering from a global education crisis. The COVID-19 pandemic will lead to a change in the way the world looks at e-learning. Despite some of its disadvantages, observers believe that they are only temporary and will be overcome in the future. E-learning systems remain an alternative to traditional education in critical situations. Traditional education, in turn, consists of many of the disadvantages that COVID-19 may further push it to think deeply about.

COVID-19 forced educational institutions to make a sudden shift towards distance education. The concerned ministries tried to facilitate the process by creating e-learning platforms. However, working on these platforms sometimes has many problems. The most important problem is how to ensure basic levels of interactivities between learners and teachers using such platforms. In addition to other obstacles facing e-learning systems including curricula follow up, weak internet speed, and security threats in some critical applications similar to the security threats found in Zoom application, which has been criticized by a claim that it has a lack of privacy.

UNESCO indicates [2] that the wealth of digital educational resources introduces new demands for higher education systems and institutions, which include developing innovative curriculums, educational programs, alternative educational paths, and higher education methods, all of which can be facilitated via the Internet and distance education. The UNESCO organization has adopted a set of programs that help with distance learning, including the "Blackboard" application, which helps with designing courses, assignments, homework, tests with features of electronic correction or grading, and communicating with students through a virtual environment and many more applications can be downloaded via smartphones. Furthermore, the "Edmodo" platform [3] is a free social platform that provides teachers and students with a safe environment for communication and cooperation, and the exchange of educational content and digital applications, in addition to homework, grades, and discussions. "Google Classroom" [4] is also an application that facilitates communication between teachers and students both inside and outside school. "Seesaw" [5] is a digital application that helps students document what they learn in school and share it with teachers, parents, and classmates, and even to the world. The "Mindspark" [6] application is based on an adaptive online learning system, which helps students practice and learn mathematics.

However, we note that e-learning helped to reduce the catastrophic effects on the education sector that would have stopped it for a longer period of time. As for traditional education, it may not struggle from the mentioned information above, but it has some problems characterized by the limitations of some physical matters and the lack of necessary flexibility in some emergency conditions such as disasters and pandemics.

3 Effective e-Learning Systems

The success of any educational system is related to the set of regulations and procedures governing that system, in addition to the set of tools supporting the system. Since e-learning systems are related to technology and virtual interaction, this requires several characteristics that must be provided in the e-learning system to be more effective. In this research, we define “effectiveness” as the ability of the educational system to provide the requirements of the educational process according to the educational framework specified by the educational institution to ensure the achievement of the desired standards with specific learning outcomes. Achieving learning outcomes relate to the student, teacher, methods of interaction, and assessment. Therefore, it is necessary to provide a complete system that ensures the best connection of all these basic components. Figure 1 illustrates the most important characteristics that should be available in an effective e-learning system.

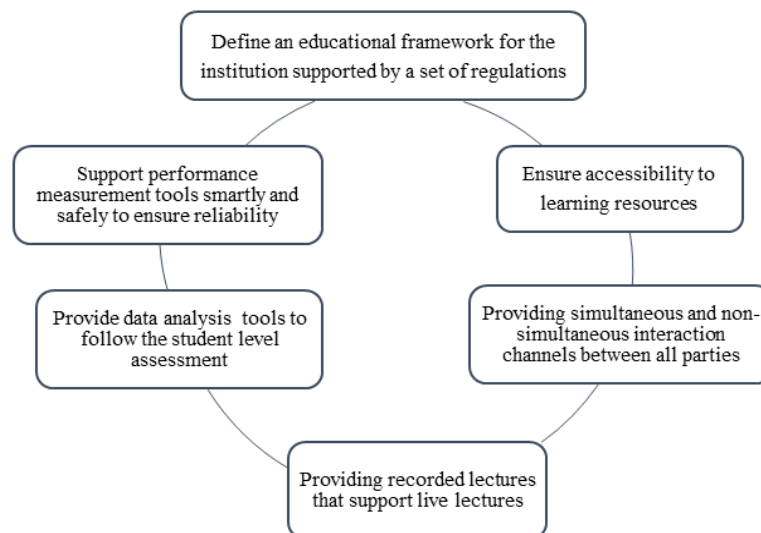


Figure 1. Fundamental Characteristics of an Effective e-Learning System

One of the characteristics of the effective e-learning system is the availability of a comprehensive set of systems compatible with the approved education framework for the educational institution where it is provided to the student and the teacher before starting the educational process. The existence of these systems helps the

user to better interact with the educational system and ensures the achievement of fairness among all groups of students. These regulations and educational frameworks form the basis for the infrastructure of the e-learning system.

As for the technical aspect, the educational system must be able to provide all possible means to access educational resources electronically, at any time, and without geographical obstacles. Additionally, the electronic system must provide access to educational material through all computer devices such as personal computers, laptops, smartphones, and others.

To ensure constructive interaction, the online system must provide live and direct conversations between the teacher and the student, and between the student and his classmates. Having such conversations motivates students to share their experiences and develop their various skills. At the same line, the interaction should be present in the regular classroom meetings that the teacher holds with his students, supported by the recorded educational material that the student can refer to at any time.

As for performance follow-up, the system must provide accurate and comprehensive data and statistics on student performance in all matters related to its academic, interactive, and skill level. Measuring the development of student performance during the semester needs to understand the student's behavior in interacting with electronic systems and tools in general. Hence the importance of having comprehensive data for analysis that helps the teacher to direct students to the appropriate educational path.

Finally, all educational institutions in the world encountered a problem of dealing with performance assessment tools. As for the sudden transition from traditional education to e-learning, it did not leave these institutions with enough time to find ways to evaluate students' learning outcomes as a substitute for traditional paper or computerized tests held on campus. These institutions have looked for performance evaluation systems (tests) that are reliable and have a high level of security. The role of modern technology has emerged a lot in this field, specifically in the role of artificial intelligence in an attempt to solve the reliability problem of dealing with electronic tests remotely. However, most of these systems have not reached the required effectiveness in terms of privacy and high accuracy in ensuring reliability. Through the above, the existence of an effective e-learning system is linked to the support of this system for a variety of measuring tools that rely on the latest technologies to ensure the highest level of protection, safety, and reliability.

4 Readiness of Saudi Universities During the COVID-19 Pandemic

Prior to the COVID-19 pandemic, the Ministry of Education (MoE) in Saudi Arabia had invested millions of US dollars in information technology. Public

universities are equipped with the latest technology and systems to support the education process as part of Saudi Arabia’s vision 2030 [7]. The majority of universities in Saudi Arabia have invested intensively in several areas that support digital transformation, including digitizing learning resources, supporting mobile learning, and developing learning portals and platforms.

However, the sudden shock of COVID-19 was greater than the capabilities of any university in the world. Upon announcing the epidemic, the universities in Saudi Arabia were coordinated and orchestrated properly by the Ministry of Education starting from early March 2020 until the end of the Spring semester, which usually ends by mid-May. Universities were asked to use many available tools and technologies to support the educational process. According to a published report by MoE [8], the platforms and tools that are illustrated in Figure 2 were utilized during the COVID-19 pandemic. Additionally, the MoE has supported all students across the kingdom with free access to the learning platforms of all universities through mobile networks.

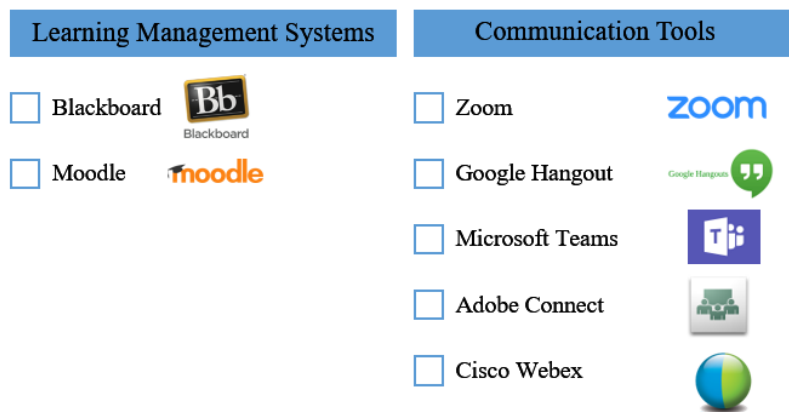


Figure 2. E-learning systems and tools used to support the education process in Saudi Arabia’s Universities

Using such technologies has prepared the universities to continue the educational process properly. However, judging the readiness of higher education adopting the e-learning systems depends on several factors, including the teaching system used by the institution (traditional vs. blended learning), the availability of e-learning resources, the accessibility of the system, interactivity between learners, student engagement, and ability to assess the learning outcomes.

As this study focuses on local universities in Saudi Arabia, we included some of the well-known universities in the region. The list of the chosen universities includes public and private universities, as well as universities adopting traditional and blended learning systems as presented in Table 1.

Table 1: List of Saudi Arabia Universities included in the study

Universities	Public/Private	Number of Students	Traditional/Blended
King Abdulaziz University (KAU)	Public	120,000	Traditional
Taif University (TU)	Public	42,765	Traditional
King Faisal University (KFU)	Public	58,976	Traditional
Saudi Electronic University (SEU)	Public	25,220	<i>Blended</i>
Qassim University (QA)	Public	68,080	Traditional
Arab Open University (AOU)	<i>Private</i>	13,700	<i>Blended</i>
Prince Sultan University (PSU)	<i>Private</i>	4,469	Traditional

5 Results and Discussions

As stated earlier, our analysis aims to study how efficient the universities in Saudi Arabia were in reacting to the unexpected crisis of COVID-19 during 45 days of education. We have collected our data from the officially published reports of these universities as found in [9-15]. The collected data are described in Table 2.

Table 2: Description of collected data in this study

Item	Description
Number of Virtual Sessions	Total number of virtual sessions conducted over a particular communication system.
Cumulative Number of Participations	Cumulative number of participations from all users in virtual sessions (repeated participation by the same student is possible).
Number of Discussion Forums	Total number of discussion forums created for students' discussions.
Number of Viewed e-Documents	Total number of documents viewed on the corresponding learning management system (LMS).
Duration of Delivered Sessions	Duration (in hours) for all the delivered virtual sessions.

Starting with the students' engagement in virtual classes, Figure 3 shows how students were fully engaged in virtual classes. The average cumulative students' participation is found to be around 40 times the number of enrolled in the selected

universities as shown in Figure 4. Results show that cumulative participation is the highest at KAU, TU, and KFU. Nevertheless, with reference to the number of enrolled students in each university, we found that the participation level is more effective in AOU, PSU, and TU.

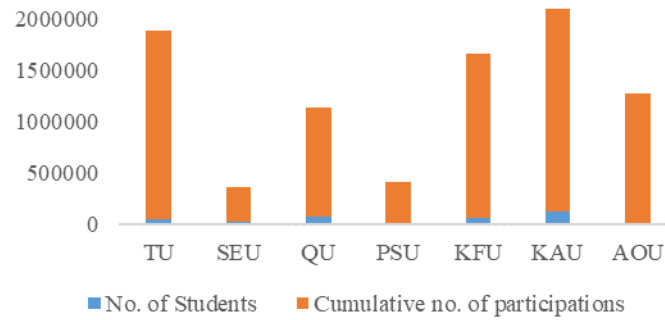


Figure 5. Student engagement in virtual classes

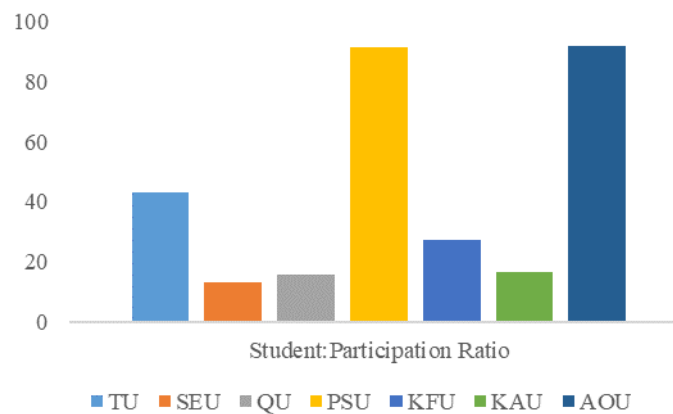


Figure 6. Ratio of students’ participation in virtual classes

The efficiency of an e-learning system is also measured by the students’ interaction with the LMS. This is possibly measured by the level of activation of discussion forums and the frequency of students viewing electronic learning resources. Figure 5 shows that each student is engaged with around 4 discussion forums. The highest level of efficiency of using discussion forums was found in SEU, AOU, and KFU.

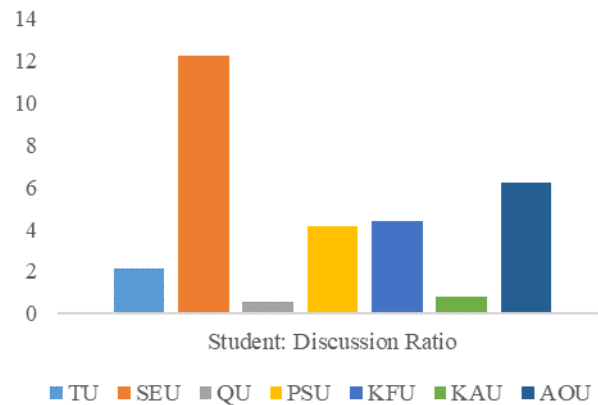


Figure 7. Ratio of students' participation in discussion forums

As for the frequency of viewing and interacting with electronic resources, we found that the average number of viewed e-documents is 23 documents per student. However, the highest ratio is found in SEU with 82.7 documents/student, AOU with 31.1 documents/student, and KFU with 30.1 documents/student as illustrated in Figure 6.

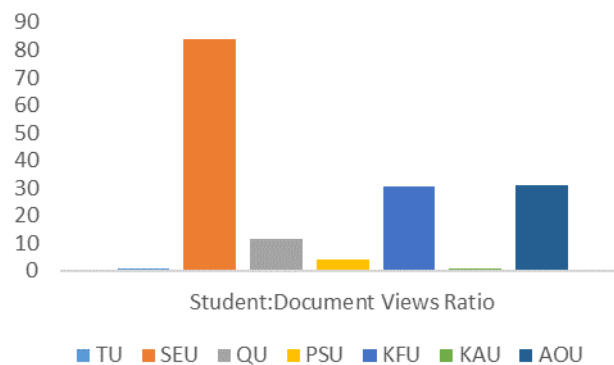


Figure 8. Ratio of documents viewed by students on LMS

It is worth mentioning that the average duration of each virtual session is found to be 1 hour and 38 minutes. However, the longest duration is found at QU of 2.2 hours/session, TU of 1.9 hours/session, and AOU of 1.6 hours/session as shown in Figure 7.

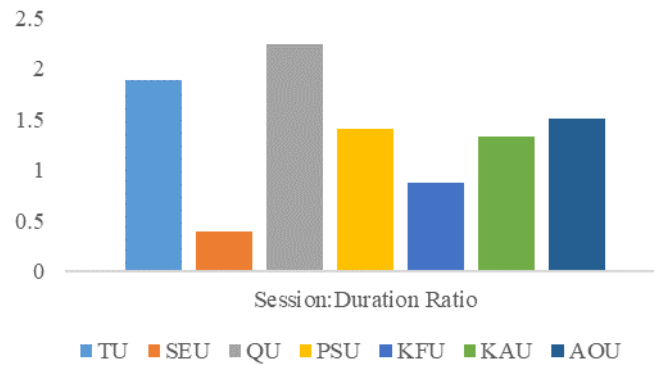


Figure 9. Duration of virtual sessions (in hours)

It is noticeable that these universities show a high level of readiness for using an e-learning system during 45 days of education. However, our analysis shows that universities like AOU and SEU outperform other universities in many factors. This is due to the adopted blended learning systems at these universities, where the students, academic staff, and university regulators are trained and ready for e-learning.

Generally, Saudi Arabia universities show a high level of readiness to encounter the crisis of COVID-19. There is clear evidence of the government's support for students and universities to overcome all the consequences that could result from e-learning, as the majority of students are not exposed enough to such educational systems.

6 Conclusion

The unexpected crisis of the COVID-19 pandemic has affected the educational sector massively, as governments are struggling to facilitate education for all students across the globe. Studies show that there was a clear impact on the process of delivering learning resources, assessing learning outcomes, and assuring students' engagement and interaction [16-20]. These issues are still challenging for several educational institutions in the world, as universities are considering e-learning systems and distance learning as alternatives to traditional education during a global epidemic and natural disasters.

In Saudi Arabia, and similarly, in many other counties, the education process continues to be distance education. Universities are becoming better experienced in managing the education process through e-learning systems, but this adds more pressure for these universities to enhance their services and assure higher quality in their systems.

One major issue facing the education system in general is performance assessments. The quality and integrity of the assessments play important roles in the education process. Universities in Saudi Arabia, for instance, have utilized a set of methods to evaluate their students as illustrated in Table 3. These methods are found suitable to encounter the critical situation resulting from COVID-19. But for the long-term, we think that new methods based on new technologies that rely on Artificial Intelligence (AI) are needed.

Table 3: Students' evaluation methods used by Saudi Arabia Universities

No.	Method Description
1	Accumulated performance during distance learning
2	A set of short online tests using LMS
3	Open book exams
4	Oral tests through any communication system
5	PowerPoint Presentation and participation during virtual classes
6	Homework
7	Discussion boards
8	E-Portfolios
9	Scientific research projects

The development of AI-based evaluation methods will extend the opportunities of e-learning systems in replacing traditional education systems. Integrating e-learning systems with reliable methods of assessments based on AI technology will provide universities with a concrete educational system that is secure, reliable, and trusted by students, employers, and the community.

The current epidemic of COVID-19 shows that the existing traditional educational system is not flexible and reliable enough to confront such crises. The impact of COVID-19 has negatively impacted universities in all parts of the world. In this study, we aimed to examine the level of readiness of higher education institutes to encounter the consequences of a crisis like COVID-19. In this study, we focused on Saudi Arabia Universities as a case study. We relied on several factors to examine how ready these universities were to immediately shift to e-learning. We collected our data for the educational process within 45 days from shutting down all the universities in Saudi Arabia. The results showed that Saudi Arabia Universities were ready to shift to e-learning systems. However, there was clear

evidence that universities originally adopting a blending learning system are more ready than their peers.

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