Role of the Learning Management System in Resilience during the COVID-19 Pandemic

Eiman Eissa

Abstract—**This study offers an analytical portrayal of the resilience that learning management systems (LMSs) provide to higher education institutions. It analyzes the previous literature on various educational settings during the COVID-19 pandemic to identify the LMS adoption process, followed by a focus on Qatar University's adoption of Blackboard and how this offered a smooth transition to online and blended learning during the pandemic. The main purpose of this research is to provide an overview of how the effective adoption of a LMS by higher education institutions can enhance the resilience of the teaching-learning process in a changing educational landscape. A qualitative case study is conducted to present the process Qatar University went through to adopt Blackboard in its educational system, followed by an examination of the impact of this adoption on resilience during the COVID-19 pandemic. This case study is conducted through a qualitative content analysis of the resources available on the official Qatar University website, including information from the Center for Excellence in Teaching and Learning (CETL) and Student Learning Support Center (SLSC), other sources on the website such as newsletters and announcements, and datasets provided by CETL. The research employs the theory of diffusion of innovation to evaluate the effectiveness of the adoption of Blackboard. The value of this paper lies in establishing a link between the LMS adoption process and its role in overcoming academic disturbances. The limitations and recommendations are considered.**

Index Terms—**Learning management system (LMS), COVID-19, diffusion of innovation, blackboard, resilience.**

I. INTRODUCTION

According to UNESCO, more than 1.6 billion students around the world have been or still are affected by the closure of academic institutions due to the COVID-19 pandemic [1]. While many higher education institutions turned to emergency online learning during the COVID-19 pandemic, most faced problems due to a lack of technological resources and digital literacy.

Since governments adopted measures to restrict movement and require social distancing during COVID-19, education relied on information systems and technology to continue teaching [2]. Lockdown and social distancing resulted in a dramatic shift in work patterns. Almost every employee was obliged to work from home, regardless of whether they had prior experience or preparedness for such arrangements. Similarly, most educational institutions made the transition to online learning [3]. "Learning management systems are

software systems designed to support student learning. They contain several presentations, assessments, communications, and management tools" [4]. The adoption of LMSs in higher education institutions is based on an organizational decision. The administration makes the decision and directs instructors and students to use them, known as authority innovation decisions [5]. The decision-making process "involves taking into account how much the institution expects to use the LMS in the learning and teaching processes, the interest of the students in using the LMS, as well as the abilities of the instructors to utilize the LMS to their full potential" [6]. As [7] point out, the main users of LMSs are the students and faculty members, but the selection of the system is usually made by the administration and experts in information technology. While IT experts evaluate the tools available, administrators of higher education institutions select the hardware and software to "optimize the benefits and costs," which includes selecting the LMS [6]. Optimizing investment in LMSs is important for higher education sustainability.

Many teachers were required to deal with emergency situations during the COVID-19 pandemic and found that they needed to design online courses and e-tutor the students, while most had not mastered these skills [8]. Online education means that there is an organizational infrastructure which supports the online teaching purposes, while emergency remote teaching is "rapidly improvised, without guaranteed or appropriate infrastructural support" [8]. "The importance of designing effective learning environments rests not only upon the shoulders of faculty but also upon institutions of higher education more generally in the form of support (funding) for faculty for professional development" [8]. The sudden adoption of a LMS might not be as effective as the prior adoption of a LMS, where the digital culture becomes a part of the educational system. Therefore, in this study, we investigate whether the effective adoption of a learning management system by a higher education institution can enhance the resilience of the teaching-learning process in the face of a changing educational landscape. The data is gathered from resources on the Qatar University (QU) website such as the faculty handbook, newsletters, announcements, and datasets from the CETL

The results of this study might be valuable to higher education institutions as it offers insight into how the adoption of LMSs needs to be integrated into the teaching-learning process to offer a smooth transition during difficult times or crisis situations, thus creating a resilient educational system. In the next section, we firstly present and analyze the previous literature on the LMS adoption process by higher education institutions, then offer a qualitative content analysis of QU's adoption of Blackboard at the

administrative, faculty and student levels, and the effect it had on the transition to online/blended learning during the COVID-19 pandemic. The data is analyzed through the theory of diffusion of innovation and digital resilience. The research question is: To what extent did the early adoption of Blackboard as a LMS at QU serve as a resilience tool during the COVID-19 pandemic?

II. BACKGROUND TO THE STUDY

The background of the study entails an overview of the digitalization conditions in Qatar prior to the COVID-19 pandemic. Thereafter the educational conditions during the pandemic will be discussed.

A. Overview of the Digitalization Conditions in Qatar

Most people living in Qatar have access to basic technology, as there is free access to computers in public libraries, free internet in most public places, a strong infrastructure for stable internet connections and reliable electricity, leading to the highest internet penetration in the world [9]. According to Qatar's 2020 Census, carried out by the Planning and Statistics Authority of Qatar, 99% of children aged 4 to 14 years use the internet, as do 98% of those between the ages of 15 and 64, and 62.2% of those 65 and older [10]. Thus, the growth of internet use has reached almost complete penetration in the Qatari population. This shows that the Qatari community is digitally literate, and able to adopt technology and use it effectively.

Qatar's 2030 National Vision establishes human development as one of its pillars, specifying that the population should be educated and healthy and that the workforce should be capable and motivated. Qatar's 2020 e-Government strategy sets e-learning as its contribution to the 2030 National Vision, stating in the executive summary that it will "improve the population's digital awareness and skills through the delivery of exemplary online services" [11].

B. COVID-19 Pandemic Educational Conditions in Qatar

QU sent out the first announcement of COVID-19 cases on March 5, 2020 [12]. The COVID-19 pandemic caused schools and universities in Qatar to switch between online and blended teaching, depending on the law. Blended learning in this study is defined as "a systematic mix of e-learning and learning in face-to-face contexts, in which coherence across the two contexts from a student perspective is achieved by focusing on the same intended learning outcomes" [4].

III. REVIEW OF THE LITERATURE

The focus of the literature review will firstly be on the use of the Internet in pedagogical practices. Then the effects of the COVID-19 pandemic on education worldwide will be discussed. The resistance to change as highlighted by the pandemic and the opportunities to demonstrate digital resilience will also be confirmed by the literature.

A. Internet and Pedagogical Practices

According to the Pew Research Center [13], there have been three recent technology revolutions, starting with the rise of the internet (broadband) which changed the way people receive and send information, thus affecting the way they socialize, work, learn and self-care, and enabling them to become content creators. Next, mobile connectivity enabled people to access the internet anytime and anywhere. Thirdly, social media enabled people to take part in bigger and more diverse social networks. Further technological revolutions are expected to occur [13].

The internet has enabled the education industry to use information and communication technologies (ICTs) to improve pedagogical practices. According to [14], huge progress was made in online learning in 1995 with WebCT (the predecessor of Blackboard), massive open online courses (MOOC) in 2008, and the later inclusion of YouTube Education and other social media applications such as Twitter. These social media applications are being used in both formal and informal education [14]. The use of digital technologies to enhance the educational process is important, since most students today were born and raised in the age of technology, making them digital natives, and their day-to-day habits involve the use of various digital media forms [15]. There is a "positive relationship between students' digital literacy and digital resilience" [15]. Therefore, an effective adaptation to new technologies in the educational process could improve the teaching/learning environment.

E-learning is defined as learning that uses ICT, and can "improve teaching and learning activities and be more efficient" [16]. According to [17], Middle Eastern countries such as Egypt, Kuwait, and Lebanon, instill lifelong learning concepts and move toward advanced infrastructure, modern pedagogical methods, and new specializations, by expanding access to online education, especially open learning universities. Innovation in e-learning strategies are key to the ambitious goals of educational institutions and universities. One example of an e-learning tool that universities use is a learning management system (LMS).

According to [16], a successful LMS includes media and material functions. The media functions of the LMS include the usability, functionality, and visual communication domains, while the material functions include the design, content, language, and communication domains [16]. LMSs should include a variety of features to facilitate educational settings. These features include access to course materials, video conferencing lectures and their recordings, assessment tools (assignments, tests, etc.). In addition to tools such as discussion platforms and multimedia that can be used to facilitate interaction. Reports on the students' performance and feedback tools are also imperative to provide information on the achievement of learning outcomes. Additional classroom management features include communicating with students (announcements, emails, and comments on their work), gradebook, attendance log. The features needed differ from course to course, depending on subject, age group, technological literacy, and, of course, the cost of the LMS in relation to the budget allocated by the educational institution.

B. COVID-19 Pandemic's Effects on Education

The highly infectious virus SARS-CoV-2 coronavirus was

first detected on 31 December 2019 and declared a global COVID-19 pandemic in March 2020 by the World Health Organization (WHO) [18]. This review of the literature offers an overview of the research related to the spread of technologies during this period. COVID-19 had a direct effect on global education, which caused researchers to strive to explain trends, evaluate learning systems, and analyze the effects of online learning on student performance. "The global disruption in education caused by the COVID-19 pandemic constitutes the worst education crisis on record. Most countries in the world closed schools and higher education institutions as part of their strategies to combat the pandemic" [1]. [19] investigates the challenges that emerged in online teaching in higher education in Kuwait during COVID-19. Several universities began to use e-learning after on-campus lectures were suspended, pushing faculty members to offer virtual lectures in a very limited time. Information and technology problems were the main challenges facing instructors in online teaching, as well as regulation, control, and course management [19]. [19] recommends that online teaching systems focus on resilience in order to be sustainable. Also, [20] examines the use of a LMS during COVID-19 by conducting a survey on a sample of 471 LMS student users from King Saud University. The results show that the use of these systems had a positive impact on learning as it sustained engagement during the pandemic. In general, students engaged in these learning technologies, which they perceived as useful and easy to use [20]. Furthermore, [21] conducted a survey of a convenience sample of aerospace engineering students at a technological university in Spain in order to assess whether blended learning offers higher education institutions resilience and sustainability. Using LMS systems such as Microsoft Teams and PoliformaT before the pandemic offered students a smooth transition to online learning, and allowed them to learn at their own pace, which they saw as a "benefit that should be maintained within a culture of long-term learning" even after the pandemic [21].

C. Resistance to Change

Teachers may "reject technology and resist change," but sometimes directives from the education ministry force teachers to adopt them [22]. During COVID-19, the need to adopt instructional technologies appeared, especially when online and blended learning policies were applied. So, the question for educational institutions was not whether they would adopt instructional technologies, but which instructional technologies to adopt. Here, decisions were made mainly by the educational institutions, and sometimes by teachers if the institutions offered access to more than one platform. [8] points out that adoption can be implemented at an organizational level, saying "universities, now more than ever, should invest in teacher professional development of their faculty, for them to be updated on effective pedagogical methods with or without the use of online technologies".

According to [23], flexible adjustments in education and the transition to online learning created a perception that online learning had developed an innovative hybrid education model for the digital and pandemic world. Moreover, [24] argues that human development, through the mobilization of educational and sustainable resources, is achieved by building community awareness of the importance of improving student skills, training teachers, and building an educated and resilient workforce. [8] add that "the importance of designing effective learning environments rests not only upon the shoulders of faculty but also upon institutions of higher education more generally in the form of support (funding) for faculty professional development". "Campus-level educational leaders can showcase priority practices by developing their digital capabilities and modeling technological innovations as well as a LMS during daily faculty operations" [20].

D. Digital Resilience

The use of technology to adapt practice to changing conditions while maintaining the fundamental function is known as digital resilience [9], which can be defined as the "utilization of technology to change practices in order to adapt to new circumstances while retaining the underlying function of the practices" [25]. According to [26], being digitally resilient in the higher education sector means that "universities and colleges are well-placed to adopt new systems and processes, ensuring continued competitiveness and survival especially when either internal or external interventions force them to undergo certain disruptions". In many institutions, the pre-pandemic use of blended learning enabled a smooth transition to online learning. As [21] explains, the previous adaptation of blended learning "worked like a vaccine, enabling university education resilience and facilitating the sustainability of the students' learning process".

Digital resilience refers to the undergoing of digital transformations to overcome disruptive events. The main requirement for digital resilience is access to technology, or, as [27] explains, the availability of resources for information communication technology resources for the individual to use. With this comes the need to use the available technological resources, which requires digital literacy. [28] define digital literacy as the skills to adopt a technology with relative ease.

In the context of digital resilience, the more exposure people have to technology, the more they are capable of using technology effectively to navigate disruptive times [29]. Therefore, higher education systems that had adopted blended learning before the pandemic had a higher degree of resilience to the pandemic conditions [30].

IV. THEORETICAL FRAMEWORK

The theoretical framework is based on the diffusion of innovation theory as described by Rogers [31]. The dissemination of newly-created ideas, associated with inventions or creations, among adopters or users is the process of diffusion of innovation [31]. A consumer adoption model is central to understanding consumer behavior in technological innovation. According to [32], there are five stages in the innovation-adoption process: awareness, interest, evaluation, trial, and adoption. An individual may complete all five stages and adopt the new technology, or stop the process in any of the first four stages, thus not

adopting it. The stages are explained as: awareness, when the individual has exposure to the innovation but a lack of information; interest, when individuals seek information about the innovation because they want to know more; evaluation, when individuals imagine using the innovation and assess whether they should try it; trial, when the individual tries the innovation; and adoption, when individual decides to continue using the innovation [32]. Roger's diffusion of innovation theory can be applied to technologies being considered for adoption in higher education, including LMS systems and the new features they have [33].

E-learning is evolving due to the diffusion and adoption of social and mobile technologies at various educational levels, including the individual level, organizational level, and society level [34]. While the development of technology leads to an ongoing growth in e-learning, COVID-19 had a sudden effect that pushed those resisting the adoption of technologies in education to finally realize their necessity. Suddenly, teachers who may have been aware of, and interested in, LMSs, were now forced to adopt them, either successfully or not. However, adopting a LMS can create a sustainable education environment, as it serves as a tool which complements traditional education in normal circumstances, used only when needed, such as during the COVID-19 pandemic [20]. This technology-assisted e-learning paradigm has created a more open environment for learning anytime and anywhere, promoting long-term sustainability through intergenerational education [35].

V. METHODOLOGY

A qualitative case study is conducted of the process Qatar University (QU) underwent to adopt Blackboard in its educational system during the COVID-19 pandemic, examining the effect of this adoption in terms of resilience. The content analysis focuses on the adoption of Blackboard at the administrative, faculty and student levels. The data sources used are the QU website and resources such as the faculty handbook, webpages for the Center for Excellence in Teaching and Learning (CETL) and the Student Learning Support Center (SLSC), other sources on the website such as newsletters and announcements, and datasets provided by CETL.

Focus is placed on a four-year time span, divided as follows: 1) the pre-COVID pandemic period, 2018 to 2019; 2) the transitional period, January and February 2020, when the COVID-19 virus was spreading globally but did not reach Qatar; and 3) the COVID-19 pandemic period, 2020 to 2021.

To respond to the research question and give an overview of the adoption process which QU underwent to enhance its digital educational system, the research is divided into three sections: firstly, the adoption decision made by the administration; secondly, the adoption of Blackboard by the faculty members; and finally, the adoption of Blackboard at the student level.

This qualitative case study is instrumental, offering an opportunity for other higher educational institutions to learn about the LMS adoption process and its role in resilience. "When the purpose of a case study is to go beyond the case, we call it 'instrumental' case study" [36].

VI. RESULTS

According to the Digitally Enriched Education Booklet, by CETL, the LMS used at QU is Blackboard which is used to "support all on-campus and online courses at the university and contains many tools that instructors can use to enhance student learning. It allows instructors to disseminate class materials, keep students informed, and grade and return work" [37]. The use of Blackboard was not new, as faculty members had been required to use Blackboard for classes since 2010; "the use of Blackboard as a teaching tool is mandatory for all faculty members"[38]. Blackboard has features such as Collaborate Ultra, which enables the hosting of virtual classrooms, discussion boards, tests, surveys, a gradebook, SafeAssign, Turnitin, announcements, emails, and many other functions [39]. This showed that there was an early awareness by the QU administration on the importance of LMS systems in general and interest in Blackboard specifically.

A. Adoption of Blackboard on an Administrative Level

The period between 2010 and 2015 is an evaluation and trial period, as the QU community was using Blackboard, yet had not officially adopted it. In 2015, QU announced that it had "adopted the Blackboard Collaborate Tool to be used as a platform to facilitate blended/online sessions" [40]. According to their January 2018 newsletter, the Office of Faculty and Instructional Development (OFID) held the first Blackboard Academic Adoption Day on November 27, 2017. The Blackboard Customer Success Team and OFID organized this event with the aim of discussing the adoption of Blackboard and its best practice. According to OFID's Spring 2018 newsletter, Collaborate Ultra became available for faculty members to use in classes, as a "real-time web conferencing tool that allows users to meet in a virtual space. The Collaborate Ultra version is very easy to use and it runs directly in any web browser". So, the adoption of Blackboard in QU started with administrative decisions.

In order for the adoption of this LMS system to be successful, both faculty members and students needed to be involved. Firstly, faculty members were offered a laptop, with both hardware and software provided free of charge. These laptops were distributed years before the COVID-19 pandemic, and are maintained, updated, and changed as needed. The Information Technology Services (ITS) Department is responsible for the maintenance and replacing older models [41].

QU also has a Digital Hub, which is a digital collection operated and maintained by the Qatar University Library and supported by the ITS Department [42]. The QU administration established training centers for faculty and students, while the ITS Department provides hardware and software services, technical support, a helpdesk, on-site support and remote support.

QU's Office of Faculty and Instructional Development (OFID) became the Center of Excellence in Teaching and Learning (CETL) in 2019. CETL offers workshops throughout the academic year to develop the skills of the

faculty members; attendance for workshops and application of technology to "enhance teaching, assessment and research" is part of the faculty members' evaluation criteria [43]. Workshops are offered on a regular basis, which both new and current faculty members are encouraged to attend. Since this research focuses on Blackboard, only the Blackboard workshops are considered. According to the QU Fact Book 2020-2021, the ITS Department "supports the Blackboard Learning System to enable instructor/student interaction, share course materials, and interact through discussion rooms, virtual conversations, and e-evaluation" [44]. According to analysis of the documents reviewed from the QU website, and gathered from CETL, it is clear that, the QU administration made the decision to adopt Blackboard as a learning management system, and they provided hardware, software, and personal development support to the faculty members and students.

B. Adoption of Blackboard by Faculty Members

Although it is standard practice for faculty members to attend at least four of the Blackboard workshops offered by CETL (pre-pandemic, 2018-2019) during their first year at Qatar University, some new faculty members were caught off guard as they had not completed them when the pandemic started. Workshops started before the pandemic and continued during the pandemic through webinars and recorded sessions. During the pandemic, more advanced Blackboard workshops were offered such as: Building and using rubrics on Blackboard; Building learning modules in Blackboard; and managing student groups effectively in Blackboard. These workshops were offered free to all faculty members at QU. The faculty members were required to register beforehand to ensure places, especially before the COVID-19 virus reached Qatar, as the sessions were held in person (pre-pandemic and transition period). Faculty members were required to bring their laptops to the workshops to participate and get hands-on experience. However, after the virus reached Qatar, the sessions went online as webinars, which meant more faculty members could attend, this is seen in the increase in the numbers of attendees in the workshops that were offered in 2018 and/or 2019 and repeated in 2020. For example, the workshop *Collaborate Ultra- a virtual Classroom and web-conferencing tool in Blackboard* was held five times in 2018 and three times in 2019 with a total of 139 attendees, yet with the shift to online/blended learning the workshop was offered 12 times in 2020 with a total of 629 attendees. It is important to note that the dramatic increase in numbers of attendees in 2020 was due to the pandemic and the new topics offered during the pandemic, and that previous Blackboard sessions focused on the basics that the new faculty members needed to know in order to utilize this LMS, and of course other faculty members were able to register in them if they felt a need to refresh their knowledge or to learn the available updates. It is also important to note that the 1,041 faculty members who attended the Blackboard workshops offered by CETL at Qatar University during 2020 do not include the numbers of faculty members who may have watched recordings of previous sessions.

Although many teaching and learning workshops were presented, Table I shows only the workshops offered by CETL from 2018 to 2019 relating to Blackboard skills.

From the information in Table I, it is clear that a variety of workshops were presented in-person before the pandemic. Faculty members had ample opportunities to be aware of, take an interest in, evaluate, trial, and adopt Blackboard.

TABLE I: BLACKBOARD WORKSHOPS OFFERED BY CETL FOR FACULTY MEMBERS AT QU (2018-2019)

	2018		2019	
	No. of workshops	No. of attendees	No. of workshops	No. of attendees
Basics				
Blackboard Basics	4	43	6	82
Blackboard Content	3	44	4	66
What's new in Blackboard Update?	1	81	-	-
Qwickly Attendance tool in Blackboard	6	72	3	51
Total	**14**	**240**	**13**	**199**
Grading				
Grade Center in Blackboard	5	67	5	71
Advanced Blackboard Grade Center Advanced Techniques	-	-	1	12
Total	**5**	**67**	**6**	**83**
Assessment tools and anti-plagiarism tools				
Similarity Reports through Turnitin	-	-	4	84
Assignment and Pla	4	57	5	78
Blackboard Online Tests 1	4	53	3	47
Blackboard Online Tests 2	3	37	3	50
Blackboard Tests	2	28	-	-
Total	**13**	**175**	**15**	**259**
Virtual Classroom				
Collaborate Ultra- a virtual Classroom and web-conferencing tool in Blackboard	5	86	3	53
Total	**5**	**86**	**3**	**53**
Interactive tools				
Blackboard Discussion Boards	2	40	-	-
Total	**2**	**40**	**-**	**-**
Summary				
Total Blackboard workshop topics	11		37	
Total Blackboard workshop sessions	39 on campus		37 on campus	
Total attendees in Blackboard workshop	608		594	

Source: Center for Excellence in Teaching and Learning (CETL) 2022

Since the pandemic started mid-academic year (during the Spring semester of 2020), most faculty members would have already completed workshops focusing on the basics, and with the switch to online learning, there was a need to focus on more tools that can be utilized by faculty members. Focus was placed on offering the more-advanced sessions during 2020, with 10 new workshop topics, as presented in Table II.

CETL changed the topics of the workshops offered in

2020 to meet the new needs of the faculty members during the pandemic, as presented in Table II. During the pandemic, from 2020 to 2021, access to previous CETL workshops was made available on Blackboard for all faculty members. This included recorded workshops, distance learning webinars, and workshop materials. Finally, according to the CETL data set, two new Blackboard webinar topics were included in 2021, each of which was offered twice. *1) Digital Rubrics*, with a total of 76 participants; and 2) *Bb Annotate: A Tool for Providing Digital Feedback on Assignments (new tool)*, with a total of 103 participants. Offering these new topics, along with access to the other sessions and one-one-one sessions as needed, all reflect the adaptation of CETL to the developing conditions as well as the needs of the faculty members during these times in order to offer skills, knowledge, and support needed by faculty members to assist them in overcoming challenges they may face during the new teaching/learning environment [37].

TABLE II: BLACKBOARD WORKSHOPS OFFERED BY CETL FOR FACULTY MEMBERS AT QU (2020)

	2020	
	No. of workshops	No. of attendees
Grading		
Building and Using Rubrics in Blackboard**	2*	45
Total	**2**	**45**
Assessment tools and anti-plagiarism tools		
Similarity Reports through Turnitin **	2	15
Q&A on Blackboard Assessment Tools and Grade Center **	2*	15
Blackboard Pools and Tests **	2*	65
Blackboard Tests	2*	81
Q&A on Blackboard Tests and Pools **	4*	46
Assignments Tool in Blackboard **	2*	12
Total	**14**	**234**
Virtual Classroom		
Collaborate Ultra- a virtual Classroom and web-conferencing tool in Blackboard	12	629
Managing students groups effectively in Blackboard (Groups, Group Assignments and Wikis) **	1	17
Building Learning Modules in Blackboard **	2*	45
Language Development through Blackboard **	1*	13
Total	**16**	**707**
Blogs and Journals in Blackboard **	2*	55
Total*	**2**	**55**
Total Blackboard workshop topics	12	
Total Blackboard workshop sessions ***	34	
Total attendees in Blackboard workshops***	1,041	

Source: Center for Excellence in Teaching and Learning (CETL) 2022
* Online sessions
** New topic
*** The total does not include the recorded sessions.

C. Adoption of Blackboard by Students

The QU administration set Blackboard skills as a requirement for students. They are first exposed to the LMS in the course First-Year Seminar (UNIV 100), which introduces them to the five excellence themes that QU applies to its educational system, including digitally enriched learning, which is the focus of this research, along with: learner-centric education, entrepreneurial education, experiential education, and research-informed education [45]. In this course, the students are introduced to Blackboard features and required to start using them; this prepares them for the rest of the course. These features include Blackboard records, breakout groups, collaborate, file exchange, wikis, ultra, polling, test/survey, discussion, blog, and ultra [45].

To make it possible for all students to access the LMS, QU offers laptop loans to those who apply for financial aid. If the student uses it for four years, it is considered a grant. If, for any reason, a student does not continue his/her studies for four years they have to return the laptop [46].

In response to the transition to distance learning, SLSC offers comprehensive learning support services and various resources on the Blackboard platform, available around the clock for students at their convenience. "Lectures are posted permanently, so students can refer back to a particular lecture at any time during their tenure at QU" [47]. Other resources available for QU faculty and students are a webpage that has Blackboard resources, and a Blackboard video library.

It is clear that students have the hardware (laptops), and software (Blackboard) to adopt the LMS. The Blackboard adoption by students goes hand in hand with how the faculty members use Blackboard. Using the LMS is a part of course requirements, since it is where students have their attendance taken, submit their work, have access to the course content, view their grades, attend online sessions, view class recordings, and more, depending on which tools each faculty member uses. So, the faculty adoption, along with the training offered to students and the provision of laptops, has increased student adoption of Blackboard. The awareness of, and interest in, Blackboard which existed before the pandemic, led to resilience when students had to transition from a blended to an online approach.

VII. DISCUSSION

QU was already undergoing a change in its educational process before the COVID-19 pandemic, developing five excellence themes. According to the QU 2018-2022 strategic plan, five excellence themes were required to be applied including digitally enriched education [48]. Therefore, in all cases, QU was set to digitally enhance its teaching and learning processes, which made its educational system more resilient than others.

The main purpose of building a resilient educational system is to withstand changing circumstances. QU mandated Blackboard as a teaching tool for faculty members in 2010 [38]. Workshops on Blackboard are offered by CETL (previously OFID). QU regularly offers updates to the LMS and both training and IT support for faculty members and students. These regulations, services and support all enabled the faculty members and students to withstand the changes, while the educational process was not stopped or paused hence the transition to online and blended learning was smooth.

During the COVID-19 pandemic, the administration

monitored the situation and announced updates to the educational system and attendance policies as needed, in line with government regulations and safety procedures [12]. On March 9, 2020, QU announced that "the university is in direct contact with the authorities and we will continue to update you on future measures as the situation dictates" [12].

During CETL's 12th Annual Excellence Day, held in January 2021, Dr. Omar Al Ansari, Vice President of Academic Affairs, announced that the "entire university was able to pivot to online teaching in one week and continue to educate its roughly 20,000 students throughout the pandemic" [49].

The early awareness of the importance of LMS systems by the QU administration raised their interest in Blackboard. QU then went through an evaluation period, where the technology was made available to its faculty members and their students, in turn. The trial period convinced the QU administration of the important role that Blackboard serves as an LMS and officially adopted it in 2017. Since then, QU has offered training and support services for both faculty members and students, this ensured that the new members of the QU community get accustomed to the adopted LMS, and also meant that others had access to learn the new tools available. Due to the prior knowledge and skills acquired on the use of Blackboard by the QU community, the transition to online learning was smooth. Therefore, the early adoption of Blackboard as a LMS in QU served as a resilience tool during the COVID-19 pandemic as it provided a smooth transition into online and blended learning.

VIII. CONCLUSIONS

Since QU faculty members and students were already required to use Blackboard in all their courses, and since they were already trained on most of its tools, the transition was smooth. QU continued to offer technical support, online-training, and guides for those who needed extra support. It shifted the topics of the training from basic skills to more advanced features during the COVID-19 period; although basic skills were still offered through recordings. The main strength that QU had during this process was consistency, as it had been using the LMS for many years before the pandemic, and everyone was required to use the same system, which ensured that the whole faculty and student body could work with it. However, it is important to note that this is not the only system that QU used, as other educational tools were made available, such as Microsoft Teams and WebEx. These other tools were available for those who wanted to make use of them, not to replace Blackboard. The unity of knowledge and skills on how to use Blackboard and its features was evident in the increase in attendance of the online training courses during the pandemic, strengthen the resilience. Therefore, as advocated by the diffusion innovation model, early awareness, interest, evaluation, trial and adoption of technology created a resilience that weathered the worldwide disruption of the COVID-19 pandemic. QU's education system was resilient during the COVID-19 pandemic, and the process was not disrupted as the students and faculty members had the equipment, skills, and connections to carry out their roles.

The results of this study are significant, as they offer higher education institutions insights into a successful LMS adoption process taking a case study of QU as a benchmark. Researchers interested in the adoption process of new educational technologies can build on these findings, or perform comparative analyses in other contexts.

A limitation of this study is the emphasis on the resilience of the education system in QU as a whole institution, not the personal implications of the pandemic for faculty members, administrators, and students. Moreover, this case is specific to QU, so it cannot be generalized to other higher educational institutions. However it can be used by other institutions as a benchmark of a successful case study, and they can adopt what they see as relevant to their particular cases.

We suggest that further research be done into the long-term implications of blended/online education on students, especially since they were placed in a position of limited social interaction. It would also be interesting to conduct comparative research between two higher education institutions which adopted different LMS, to evaluate the strengths and weaknesses associated with each, from the points of view of students and faculty members.

CONFLICTS OF INTEREST

The author declares that there are no conflicts of interest.

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Eiman A. Eissa is a lecturer in the Department of Mass Communication at Qatar University. She earned her Ph.D. from the Department of Public Relations and Advertising at Cairo University, and her MA and BA degrees from the American University in Cairo in the field of mass communication. Her publications and conference presentations focus on the portrayal of women in the media, advertising, and consumer behaviour. She has published a book on media convergence and another on public opinion. Her research interests include gender studies, consumer behaviour, advertising, educational media, public opinion, agenda setting, and media effects.