

A Technology-Acceptance-Model-Based Study of the Attitudes Towards Learning Management Systems Among Teachers During the COVID-19 Pandemic

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ABSTRACT

There is an emergent need to examine teachers' acceptance of distance education through LMS during emergencies to leverage online teaching and learning to enhance teachers' future readiness for digital transformation in education. This study explores Saudi teachers' perceptions of Madrasati (national e-learning system). It investigates its ease of use, usefulness, behavioural intention to use the system, and its actual use in association with external factors from teachers' perspective to identify the platform's most supportive elements during remote online teaching due to the COVID-19 pandemic. The findings from 197 participants show that teachers positively perceived Madrasati regarding the system's external variables, including content quality, teaching support, visual design, system navigation features, ease of access, system interactivity, and instructional assessment tools, and they positively perceived the system's learnability.

KEYWORDS

Emergency Remote Teaching, Learning Management System, Pandemic, Teachers' Attitudes, Technology Acceptance

INTRODUCTION

The outbreak of COVID-19 has had an unprecedented impact on education systems worldwide. There have been varied international responses to this public health crisis, mostly reactionary. According to a report by UNESCO (2020), the COVID-19 Pandemic has entailed the most extensive disruption to the education system in history, affecting 94% of the world's student population in more than 190 countries.

Given the rapidly evolving nature of the outbreak, governments must adapt their countries' responses continually and with little to no clarity on the duration for which the restrictions must be imposed. School closures since February 2020 due to Coronavirus (COVID-19) have affected students, teachers, and working parents. According to UNESCO (2020), more than 100 countries

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have implemented nationwide closures, negatively impacting more than half of the world's student population and their educational attainment. The closure resulted in an immediate and rapid transition to distance-learning solutions across most educational institutions all around the globe. Consequently, it is essential for school systems to quickly implement remote teaching and learning, which caused significant changes in the conventional instructional practices leading to the transition from traditional face-to-face learning to online learning from home.

One of the highly autonomous instructional contexts afforded to students and teachers during the Pandemic is Emergency Remote Teaching (ERT) (Hodges, Moore, Lockee, Trust & Bond, 2020), a temporary shift of instructional delivery to an alternate delivery model because of the COVID-19 crisis. In contrast to the learning experiences initially planned to be online, ERT involves using fully remote teaching solutions for instruction that would otherwise be delivered face-to-face or as blended or hybrid courses and is likely to switch over to the face-to-face format once the crisis or emergency has ended. The primary objective is to provide temporary access to instruction and instructional supports that can be quickly implemented and readily available during an emergency or crisis.

The shift to ERT requires that faculty to be more engaged in the course design, development, and implementation processes and that students learn independently, can manage learning resources, and strategize the learning process. The Pandemic's abrupt spread forced institutions to switch to distance education or postpone education indefinitely (Khanfar, 2020). In response to the sudden global health conditions, MOE in Saudi Arabia launched a virtual E-school platform called "Madrasati," or "My School" in Arabic, with a business model that highly simulates the in-person school model and provides teachers and students with a learning experience relatively comparable to the face-to-face experience.

LITERATURE REVIEW

Teachers' Usage of Distance Learning During the COVID-19 Pandemic

Teaching through Learning Management Systems (LMS) during the COVID-19 pandemic offered educators various experiences. Factors such as familiarity with digital platforms, the availability of resources, and institutional support greatly influenced these experiences (Trust & Whalen, 2020). A common issue was the challenge of the sudden transition from in-person to online instruction. For many educators, especially those with limited exposure to digital teaching tools and the need to quickly grasp the multifaceted functionalities of LMS platforms posed a significant challenge (Bozkurt et al., 2020). Mastering LMS was challenging for many educators, as these platforms incorporate many features, from discussion forums and grading tools to live video conferencing capabilities (Bozkurt et al., 2020).

Online assessment posed another significant challenge, with educators grappling with the intricacies of evaluating student progress, maintaining academic integrity, and providing constructive feedback within a virtual setting (Crawford et al., 2020). Teachers also faced the challenge of balancing synchronous and asynchronous learning modes, each with advantages and drawbacks (Hodges et al., 2020). In addition, teachers needed to adapt their curriculum to digital formats. This adaptation required restructuring lessons to maintain student engagement, creating new assignments and assessments suited to online learning, and developing proficiency with digital tools and resources (Hodges et al., 2020). This workload and time management surfaced as notable concerns. Teachers reported an increased workload due to the need to adapt lesson plans for online instruction, develop new digital materials, and manage online assessments. Blurring boundaries between personal and professional life also led to feelings of being constantly on duty (Crawford et al., 2020).

Maintaining student engagement and participation in a virtual setting emerged as another significant challenge. With absent physical cues, teachers had to develop innovative methods to ensure interactive lessons and gauge student comprehension (Bao, 2020). While LMS platforms facilitate communication and collaboration, many teachers need help leveraging these tools effectively to

engage with students and parents and foster student collaboration (Johnson et al., 2020). In an online learning environment, fostering a sense of community and connection among students often proves more challenging, requiring innovative approaches to foster class cohesion and facilitate peer-to-peer interactions (Bao, 2020). Yet, creative solutions have emerged to build class cohesion and encourage peer interactions (Boling et al., 2020).

Technological issues further complicated this challenge. Teachers and students faced connectivity problems, a lack of suitable devices, and varied levels of technical proficiency, leading to disruptions in teaching and learning (Hodges et al., 2020). Beyond the teaching realm, educators provided technical support to students and parents, an unfamiliar extension of their usual responsibilities (Trust & Whalen, 2020). Further, the pandemic underscored the stark digital divide in access to education. Not all students had equal access to stable internet or appropriate devices, significantly impacting their ability to participate in online learning (Hodges et al., 2020). Alongside these professional hurdles, the isolation and overall stress induced by the pandemic exerted an emotional toll on teachers, who had to devise strategies to manage their stress levels and maintain their mental well-being (Rapanta et al., 2020, Jandrić et al., 2020). An interesting observation was that students, out of necessity, improved their digital literacy skills, becoming proficient with various digital tools and online discussions (Hrastinski, 2019). Therefore, school administrators' support and clear communication became crucial, significantly influencing the teachers' experiences (Johnson et al., 2020) and providing much-needed support and clear communication to teachers (Bao, 2020).

Nevertheless, the transition also brought about positive experiences and innovations. Customization of learning to cater to individual student needs to be became more feasible in an online setup, a flexibility that traditional classrooms often needed to improve. Moreover, teachers broadened their skill sets, discovering new resources, improving technological proficiency, and acquiring innovative pedagogical strategies (Hodges et al., 2020).

Further, the professional development and support received by teachers played a crucial role in shaping their experiences. Teachers who received adequate training in LMS and digital teaching methods generally reported a more positive experience (Jandrić et al., 2020). Many teachers reported professional growth as they gained new skills, became more comfortable with technology, and discovered new teaching methods (Trust & Whalen, 2020).

Increased parental involvement emerged as a significant trend in this online shift. While this added layer of engagement posed challenges, it also improved partnerships between teachers and parents, fostering a collaborative effort in student learning (Garbe et al., 2020). While it occasionally led to increased pressure, it also facilitated stronger partnerships between teachers and parents in supporting student learning (Bolstad et al., 2021).

The pandemic necessitated a significant shift in education, forcing educators to innovate and rethink traditional methods. Indeed, the experiences and lessons gleaned from this transition to online teaching via LMS during the COVID-19 crisis will likely influence educational practices in the post-pandemic era (Jandrić et al., 2020). Previous research has examined teachers' readiness for change and acceptance of technology. However, few studies have addressed the acceptance of technology by teachers in the context of emergency teaching during a pandemic or with handling technology-assisted teaching and the use of newly introduced

LMS for everyday distance teaching practices (Dindar et al., 2021).

Teachers' Acceptance of Distance Learning During the COVID-19 Pandemic

In the pivotal shift from traditional classroom education to distance learning during the COVID-19 pandemic, the preparedness of teachers to implement distance education plans is considered a key factor for success. Adapting to online teaching presented substantial challenges for educators, such as maintaining effective communication with students and facilitating their learning. The acceptance of technology by teachers can help overcome resistance to change, boost motivation, and contribute to positive long-term results (Kimmons, R., 2015). Educational institutions worldwide have seen a

paradigm shift from traditional classroom teaching to online teaching and learning, fueled mainly by the COVID-19 pandemic (Toquero, 2020) due to the abrupt schools' closure. Technology plays a crucial role in facilitating this transition. However, teachers' preparedness and acceptance of technology serve as critical factors in implementing successful online teaching (Trust & Whalen, 2020).

Few studies have addressed the acceptance of technology by teachers in the context of emergency teaching during a pandemic or with handling technology-assisted teaching and the use of newly introduced Learning Management Systems (LMS) for everyday distance teaching practices (Dindar, Suorsa, Hermes, Karppinen, Näykki, 2021). Empirical studies investigating teachers' acceptance of technology during the abrupt switch from traditional to fully remote learning, with technology integration, are still in their early stages. Therefore, there is a pressing need to study teachers' acceptance of distance education via LMS, to optimize the online teaching and learning processes, resources, and tools, and to prepare teachers for future digital transformation in education (Al-Fraihat, Joy, & Sinclair, 2020; Park, 2009; Sun, Tsai, Finger, Chen, & Yeh, 2008). One area that merits more focus is understanding how teachers cope with newly implemented LMS in their online teaching practices (Trust, Krutka, & Carpenter, 2020). While empirical studies have begun to investigate this area, there is a need for more research in this domain (König, Jäger-Biela, & Glutsch, 2020). This knowledge can help maximize the utility of online teaching and learning resources and better equip teachers for future digital transformations in education (Rasmitadila et al., 2020).

Technology Acceptance Model

The Technology Acceptance Model (TAM) has been widely used as the theoretical basis for many empirical studies on user technology acceptance and can help predict end-user acceptance of an e-learning system in an organization (Davis, Bagozzi, & Warshaw, 1989). The TAM can be developed based on its application to any specific domain of human-computer interactions (Davis, Bagozzi & Warshaw, 1989). It was employed to explore the acceptance of Information Technology (IT) use. According to TAM, individual user intention and behaviour are affected by two key variables: perceived ease of use and usefulness (Figure 1).

Davis (1989) developed the TAM to predict the factors affecting IT use, based on the Theory of Reasoned Action by Fishbein and Ajzen (Fishbein & Ajzen, 1975) and the Theory of Planned Behavior by Ajzen (Ajzen, 1991), in which the TAM was extended and developed based on the two components: perceived ease of use and perceived usefulness. The former referred to the ease of use of IT subjectively perceived by users based on the notion that the easier the use is perceived to be, the higher the level of acceptance of IT. The latter refers to the extent of use of IT subjectively perceived by the users. Perceived usefulness is defined as the "degree to which an individual believes that a particular system would enhance job performance" (Davis, 1989, p. 320). Perceived ease of use is the "degree to which an individual believes that using a particular system would be free of effort" (Davis, Bagozzi & Warshaw, 1989, p. 320). The TAM has been widely used to predict and explain user behaviour towards information technology. The model proposes that perceived ease of use and usefulness influence users' technology acceptance (Davis, 1989).

TAM questionnaires have been subjected to factor analysis to determine the content and construct validity of the usefulness and ease of use sub-scales and have demonstrated acceptable results (King & He, 2006). TAM has been used across various studies to measure technology diffusion through acceptance of new technology and has revealed a strong relationship between the key constructs of perceived usefulness, behavioural intention, and effects on learning performance (Al-Aulamie, 2013).

Perceived ease of use is a fundamental construct in the TAM (Davis, 1989) that has been highlighted by multiple technology-acceptance theories, such as the TAM (Davis, 1989); A-TAM (Taylor & Todd, 1995); TAM2 (Venkatesh & Davis, 2000); and TAM3 (Venkatesh & Bala, 2008). Ease of use was theorized as a factor that likely increased the likelihood of using the system (Abdullah et al., 2016; Yoon, 2016) and conceptualized as an antecedent to perceived usefulness and behavioural intention to use the system. Perceived usefulness is a critical construct in the TAM (Davis, 1989).

In the context of LMS, Jong (2009) found that the relationship between behavioural intention and actual use is the strongest of the relationships in his model. There is a significant relationship between behavioural intention and actual use based on the TAM (Alenezi, 2012; Alenezi et al., 2011), and the actual use of LMS is positively influenced by behavioural intention to use the system (Baleghi-Zadeh et al., 2017; Mohammadi, 2015; Tarhini, 2013). However, some researchers have argued for including additional factors in the model, such as social influence, to more accurately reflect the complexity of teachers' technology acceptance (Dwivedi et al., 2019). Indeed, expanding the TAM could help better understand and promote technology adoption in education in the future.

Zaharias and Poylymenakou (2009) proposed eight usability attributes as external variables that could affect perceived usefulness and ease of use that have been discussed and added to the revised TAM model (Binyamin, Rutter & Smith 2019). These attributes include content quality, teaching support, visual design, system navigation, ease of access, system interactivity, instructional assessment, and system learnability. The rationale behind their inclusion is to identify critical factors affecting perceived ease of use and perceived usefulness to predict acceptance, such as system features and design that can potentially enhance the explanatory power of TAM and improve the explained variance of constructs (Abdullah & Ward, 2016; Davies, 1989; Nikou & Economides, 2017). The first factor, 'content quality', refers to the e-learning system's quality of information, accuracy, content sufficiency, and organization (Al-Ammari & Hamad, 2008; Junus et al., 2015; Zaharias, 2009). The second factor is the 'teaching support' needed in the learning environment, such as providing guiding documents and high-quality communication tools (Binyamin, Rutter & Smith, 2019; Zaharias & Poylymenakou, 2009). The third is the 'visual design' of the LMS, which refers to the user interface and layout design that can affect perceptions of system usefulness and ease of use (Al-Aulamie, 2013; Khedr et al., 2012). An appealing visual design supports comprehension, reduces cognitive load, and enhances users' satisfaction and positive attitude regarding e-learning (Sánchez-Franco et al., 2013; Scholtz et al., 2016). System navigation is another essential element in designing e-learning systems, referring to the system's learning curve and understandability. System navigation is essential for LMS effectiveness and positively influences system usability and ease of use (Khan & Qutab, 2016).

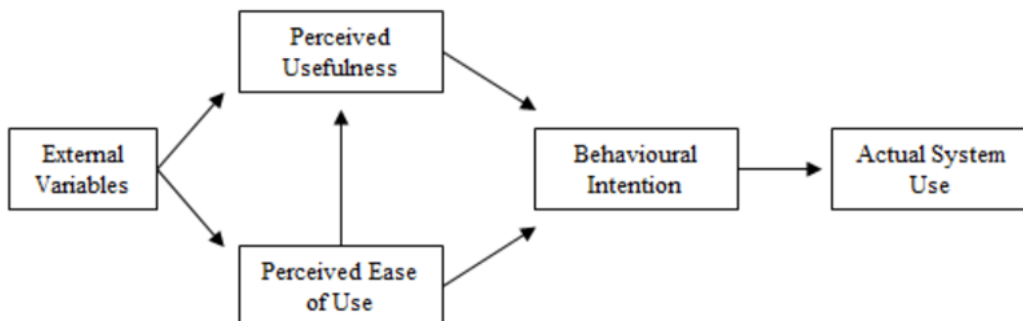
Ease of access refers to the degree of flexibility and ease of access to the system features, functions, content, and services without difficulty starting from the log-in process to the course content (Park, 2009). Ease of access is considered a critical success factor for e-learning systems (Alhabeeb & Rowley, 2018; Salloum, 2018; Tran, 2016). System interactivity is another crucial factor in the success of e-learning systems. It reflects students' engagement with the system and learning by interacting with their peers, teachers, and the content (Junus et al., 2015). System interactivity positively affects users' perceptions of system usability, ease of use (Althobaiti & Mayhew, 2016; Junus et al., 2015), students' intention to use the system and their success in learning. Instructional assessment is another critical component of effective LMS that can provide indicators of students' performance and feedback for instructors after formative and summative feedback on students' attainment of learning outcomes, ultimately improving their academic achievement (Uribe, 2014; Wang, 2014). Instructional assessment tools positively impact users' perceptions of the system's usability and ease of use (Binyamin, Rutter & Smith 2019). System learnability is a crucial aspect of the effectiveness of LMS that indicates the capability of an e-learning system to support users in using the system and interacting with it effectively. System learnability reflects the system's potential to provide easy learnable system features through integrated tutorials, orientation, supportive chatbots, and system messages to lessen the system's potential learning curve (Jabar et al., 2013). Therefore, system learnability positively impacts the system's perceived ease of use (Aziz & Kamaludin, 2014).

In education, numerous studies have confirmed the TAM model's validity in predicting teachers' acceptance and use of technology. For example, Teo (2011) study found that perceived ease of use and usefulness were significant predictors of teachers' intentions to use technology.

With the rise of distance learning during the COVID-19 pandemic, the TAM has been used to examine educators' adoption of digital tools. Yıldırım and Dursun (2020) applied the TAM to

Figure 1. Revised technology acceptance model

Source: Davis et al. (1989)



investigate teachers' acceptance of cloud-based digital platforms. Their findings indicated that perceived usefulness, ease of use, and attitude towards use significantly affected the behavioural intention to use these platforms.

RESEARCH PROBLEM

This research explores teachers' perceptions of the ease of use of the national LMS, Madrasati, its utility in the future for teaching, teachers' intention to use it in the future, and its actual use, according to the Technology Acceptance Model TAM proposed by Davis, Bagozzi, and Warshaw (1989). Teachers' perceptions are linked to another purpose of this study; to examine their attitudes toward external variables related to technology acceptance (Binyamin, Rutter & Smith 2019). The Ministry of Education (MOE) announced that Madrasati plans to provide a strategic direction for educational change and innovation in Saudi Arabia rather than substitute formal schooling during emergency remote teaching (ERT). Therefore, exploring teachers' perceptions of the Madrasati platform's usage is crucial. Indeed, teachers are the leading agents of change and one of the most critical assets to facilitate macro strategic goals for educational transformation. Therefore, this study aims to examine teachers' perceptions of the usefulness and ease of use of Madrasati and to explore their attitudes toward using the platform in their future teaching, behavioural intention, and actual use by answering the following questions:

1. What are teachers' perceptions of the external variables of usability of Madrasati platform?
2. What are teachers' perceptions of the usability and ease of use attributes of the Madrasati Platform?
3. What are the main supports and challenges of the Madrasati platform from teachers' perspectives?

METHODOLOGY

Research Design

This quantitative study examines Saudi Arabian teachers' perceptions of Madrasati at a regional educational administration in Saudi Arabia regarding the variables that can significantly influence their perception of the ease of use of LMS, its usefulness, and their intention to use the system and their actual use. It also highlights the direct support and challenges of the Madrasati platform from teachers' perspectives. The participants were male and female teachers in K-12 schools supervised by Riyadh Educational Administration. Saudi MOE services are distributed in 47 educational administrations covering different regions of Saudi Arabia. The largest K-12 population in Saudi

Arabia is Riyadh, with 122 thousand teachers (Ministry of Education, 2023). Teachers across Saudi Arabia were mandated to immediately shift to distance education and use Madrasati as the e-learning platform for all educational and administrative processes after the outbreak of the COVID-19 Pandemic in March 2020.

Madrasati Platform

According to Madrasati (2020), Madrasati is a new national e-learning Platform (<https://schools.madrasati.sa/>) in Saudi Arabia that was launched in 2020 for all K-12 schools to be accessed freely and easily for students, teachers, educational administrators, and parents. Madrasati was provided to all the beneficiaries as an LMS solution and as a substitute for traditional classrooms offering offline classes during COVID-19 due to the closure of schools (Figures 2-5).

Madrasati provides multiple interactive instructional tools, such as a scheduling feature that facilitates an interactive daily schedule and links students and teachers to virtual classrooms where the principal can adjust the scheduling options (time, day, breaks) (Figures 6-9). Virtual Classrooms provides a synchronized virtual collaboration tool to launch virtual classes and meetings using the Microsoft TEAMS collaboration tool. E-Exams support launching electronic exams assigned to students by their teachers where teachers can create questions or choose from the platform's Test Bank. Resources Bank offers a repository of interactive educational digital content that allows the teacher to upload enriching content for lesson planning. Attendance Monitoring tool, which facilitates monitoring and recording students' attendance. E-Homework can be generated from the questions

Figure 2. Student tools



Figure 3. Student courses

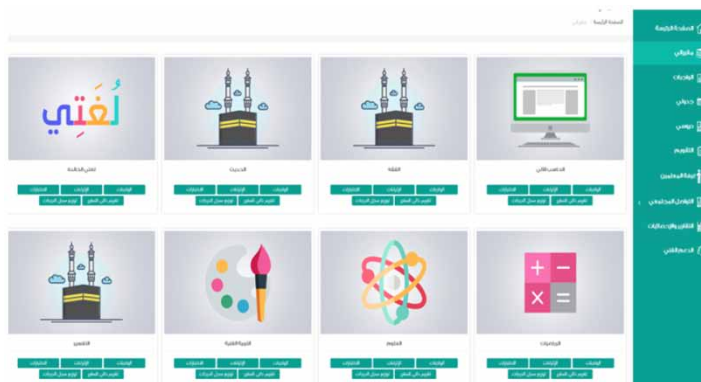


Figure 4. E-homework

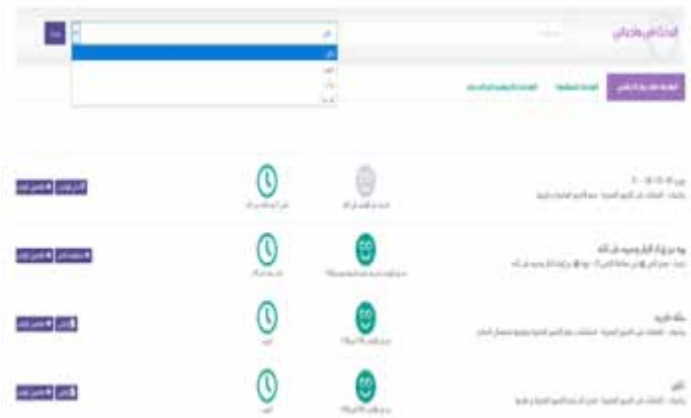


Figure 5. E-learning resources



Figure 6. Teacher's tools



Figure 7. Class scheduling

[illegible]

Figure 8. E-assessment

[illegible]

Figure 9. Teachers' room

bank, the textbook, or by uploading a file. Learning Resources Room provides extra-curricular enrichment resources such as educational games, interactive activities, learning experiences, and a reading club. Virtual Laboratories and computer-based activities simulating real-life science labs, are available for students to practice and for teachers to conduct science experiments. Learning Paths include customized learning paths created and assigned by the teacher to meet students' learning needs. Students' progress is tracked and measured according to the teacher's specific learning goals.

Madrasati's Communication Tools include direct message features and represent a two-way communication system between teachers and parents. Announcements Wall is a tool that allows the school's leader or his/her representative to create and deliver messages to the entire school or specific classes—virtual meetings is a tool that supports the school's staff and parents' meetings. Teachers Virtual Room provides a communication tool that allows students to send queries and questions to their teachers and receive a response. Furthermore, the platform includes a professional development resources website, "Back to School" to enhance teachers' and other stakeholders' knowledge, skills, and values on e-learning, instructional design, and digital citizenship.

Instrument

The survey instrument consisted of four sections. The first section has four questions regarding the demographic characteristics of the participants: gender, academic degree, specialization, and teaching experience. This section aimed to ensure that teachers from different backgrounds were included in this study. The following section included a revised TAM survey with two key groups of constructs (Binyamin, Rutter & Smith, 2019). The first subsection consists of eight usability constructs with 34 positive statements. The second subsection consists of the original TAM survey instrument, consisting of four constructs with 17 positive statements, four items for perceived ease of use, five for perceived usefulness, four for intention to use, and four for actual use. Following the previous literature regarding e-learning acceptance (Alkhalaf, 2013; Almarashdeh & Alsmadi, 2016; Ghazal et al., 2018; Kanwal & Rehman, 2017; Khedr et al., 2012; Majdalawi et al., 2014), the statements were scored on a five-point Likert scale.

For each statement, the participants were asked to select the answer that best represented their level of agreement on a five-point Likert scale in which 1 = *strongly disagree* and 5 = *strongly agree* as a useful measure of the attitude and perceptions of respondents (Sue & Ritter, 2012). According to Davies (1998), these usability constructs have high reliability and validity for measuring the intended constructs and are widely adopted in measuring usability and technology acceptance.

The instrument used in this study, TAM attributes in Madrasati, was subjected to rigorous reliability and validity testing. The tool's validity was evaluated by a panel of seven field experts consisting of three e-learning specialists, two teachers, a supervisor, and an educational administrator. They reviewed and examined the instrument for content and construct validity, ensuring that it accurately measures what it intends to measure and appropriately represents the construct under study. The instrument's reliability was established using Cronbach's alpha coefficient, which yielded a high value of 0.957, suggesting strong internal consistency among the items in the instrument. The instrument is multi-sectional, with the fourth section containing two open-ended questions that aim to gather teacher perspectives on critical support available and challenges encountered in using Madrasati. The responses to these open-ended questions were analyzed qualitatively to provide nuanced insights into the research topic. The careful validation and reliability testing of the TAM attributes in Madrasati ensures that it is a reliable tool for this study.

Data Collection

Ethics approval and permission for this study were obtained from the institutional review board at the Deanship of Scientific Research. Data were collected through a questionnaire distributed to the teachers via e-mail invitations in April 2020 (shortly after the schools closed in Saudi Arabia) and

during the transition to online teaching due to the Pandemic. One reminder was sent three weeks after sending an initial invitation to participate in this study.

Participants

For this study, school teachers in Saudi Arabia teaching at public schools and using Madrasati were the target population. According to the MOE, there are 47 Educational Administrations with 6 million students and 600 teachers (Ministry of Education). The probability sampling approach was randomly selected for sampling (Sue & Ritter, 2012). Each unit in the population has a known probability of being chosen (Bryman, 2016). A total of 197 valid responses were received from teachers who completed the questionnaire distributed via teachers' e-mails with participants' informed consent to participate in the study through signing a participation confirmation letter.

Data Analysis

A total of 197 individuals completed the online survey based on Binyamin, Rutter, and Smith's (2019) revised TAM Model. None of the cases had missing data. Frequencies and descriptive statistics for items and sub-scales were calculated. Internal reliability coefficients for the total scale and its three sub-scales were determined, yielding a high total value of 0.957. Kraemer, Mintz, Noda, Tinklenberg, and Yesavage (2006) discuss that pilot studies typically involve smaller sample sizes to inform larger research projects. The authors acknowledge the valuable role of such research studies in exploring research questions, testing procedures, and determining feasibility. In this way, smaller sample sizes are appropriate or sufficient for these specific purposes. Responses to open-ended questions for their themes and frequencies were analyzed for common themes (Creswell, 2014). The supports and challenges of Madrasati platform were collected and analyzed through a coding process through labelled data segments that represented distinct themes of supports and challenges to ensure a balanced interpretation of the data. Post-coding potential themes were identified that symbolized more significant ideas. A thorough review and refinement of these themes were conducted to refine some themes based on the relevance of the data they encompass (Braun & Clarke, 2006). The identified themes were illustrated through verbatim quotes from the data to provide more in-depth emphasis on teachers' voices.

RESULTS

A total of 197 responses were received; most participants were women, 126 (64%), while 71 participants (36%) were men. Most participants, 163 (82.7%), had a bachelor's degree, 18 (9.1%) had a certificate degree, 12 participants (6.1%) had a master's degree, and 4 (2%) had a doctoral degree. Further, the highest percentage of the study sample (18.8%) participants was science teachers, and the lowest percentage was physical education and arts teachers. Finally, most participants (70.6%) had more than six years of teaching experience, and only 3% had three to four years of teaching experience (Table 1).

1. What are teachers' perceptions of the external variables of usability of Madrasati platform?

The descriptive statistics (i.e., mean [M] and standard deviation [SD]) were calculated to answer the first research question guiding this study. For each indicator, the respondents were asked to select the answer that best represented their level of agreement based on a five-point Likert scale (See Table 2).

The results show that the mean values of the constructs ranged between 4.20 (0.857) and 3.76 (1.031), which indicated that most respondents in this study had a positive attitude toward Madrasati's content quality, teaching support, visual design, system navigation, ease of access, system interactivity, instructional assessment, and system learnability. This result is consistent with prior research on

Table 1. Percentage and frequency of participants' specialization

Frequency	Percent	Specialization
20	10.2	Islamic Studies
26	13.2	Arabic
34	17.3	Math
18	9.1	English
37	18.8	Science
4	2.0	Arts
4	2.0	PE
9	4.6	Family Education
13	6.6	Computer Science
32	16.2	Other
Teaching Experience		
15	7.6	1–2 years
6	3.0	3–4 years
37	18.8	5–6 years
139	70.6	More than 6 years
197	100%	Total

Table 2. Means and standard deviation of external variables

External Variable	<i>M</i>	<i>SD</i>
Content Quality	4.13	0.903
Teaching Support	4.02	0.909
Visual Design	4.06	1.041
System Navigation	4.02	1.008
Ease of Access	3.44	1.196
System Interactivity	3.90	1.077
Instructional Assessment	3.76	1.031
System Learnability	4.20	0.857
Total	3.43	1.002

Saudi LMS (Al-Aulamie, 2013; Alenezi, 2011; Alshorman & Bawaneh, 2018). Furthermore, all indicators had small standard deviations (SD), implying that the scores on the responses were all close to the mean value.

2. What are teachers' perceptions of the usability and ease of use attributes of the Madrasati Platform?

The descriptive statistics (mean and standard deviation) were calculated to answer this question. For each indicator, the respondents were asked to select the answer that best represented their agreement level based on a five-point Likert scale (Table 3).

Table 3. Descriptive statistics of TAM attributes in Madrasati

Domain	Statement	SA	N	SD	Mean	Standard Deviation
Perceived Ease of Use	1. I find Madrasati flexible to interact with.	145	35	17	3.92	0.955
	2. It is easy for me to get Madrasati to do what I want it to do.	165	28	11	4.13	0.903
	3. It is easy for me to become skilful at using Madrsati.	155	28	14	4.02	0.909
	4. Overall, Madrasati is easy to use.	175	11	11	4.20	0.857
Perceived Usefulness	5. Madrasati enables me to accomplish teaching tasks more quickly.	144	28	25	3.87	1.030
	6. Madrasati improves my teaching performance.	138	21	38	3.82	1.211
	7. Madrsati helps me to teach effectively.	118	44	35	3.56	1.295
	8. Madrsati makes it easier for me to teach the course content.	119	25	53	3.46	1.412
	9. Overall, Madrasati is useful for my teaching.	170	15	12	4.18	0.871
Behavioural Intention to Use	10. I would like to use Madrsati in all future classes.	130	31	36	3.77	1.260
	11. I would recommend using Madrasati to others.	118	32	47	3.56	1.295
	12. I would encourage my colleagues to use Madrasati for course delivery.	170	18	9	4.21	0.810
	13. I will continue using Madrasati in the future.	151	21	25	3.92	1.108
Actual Use	14. I use Madrasati frequently.	170	18	9	4.20	0.806
	15. I tend to use Madrasati for as long as necessary.	114	35	48	3.44	1.196
	16. I have been using Madrasati regularly.	173	18	6	4.23	0.780
	17. I usually get involved with Madrasati.	129	24	44	3.64	1.211
Total					3.89	1.053

SA=Strongly Agree N=Neutral SD=Strongly Disagree

The results show that the mean values of the constructs and the standard deviation of Madrasati's perceived ease of use ranged between 4.20 (0.857) and 3.92 (0.955), which indicates that most respondents in this study believed that Madrasati was easy to use. The results are consistent with prior research on the use of LMS in Saudi Arabia (Al-Aulamie, 2013; Alenezi, 2011; Alshorman & Bawaneh, 2018). Furthermore, all indicators maintain small *SD* values, implying that the responses are close to the mean. The results show that the *M* values of the constructs of Madrasati's perceived usefulness ranged between 4.18 (0.871) and 3.46 (1.412), which indicates that most respondents in this study considered Madrasati useful. Further, the highest mean for behavioural intention to use Madrsati is 4.21 (0.810), and the lowest is 3.56 (1.295). For actual use of Madrsati, the mean values ranged from 4.23 (0.780) to 3.44 (1.196), which shows that participants intend to use Madrasati and are using it regularly.

3. What are the main supports and challenges of the Madrsati platform from teachers' perspectives?

Main Madrasati Supports

Teachers in this study discussed Madrasati's positive potential, including examples of ease of use and usability from their experience with Madrasati. Thirteen teachers stated that Madrasati is 'empowering'

them to apply new teaching strategies. One teacher wrote, “What I found most rewarding about using Madrasati during COVID was the centralized hub it provided for teachers and students. It made sharing resources, assignments, and feedback streamlined and efficient. It was also easily accessible for my students”. Also, 25 teachers discussed that it facilitates access to teaching tools and resources. One teacher wrote, “With Madasati, all course materials were stored in one place and were easily accessible. No more lost handouts or misplaced assignments. It brought a sense of order to the online learning chaos. Having extracurricular resources for extra enrichment for students’ experience was very important”, and 36 stated that Madrasati provides flexibility for any time usage; one teacher wrote, “Teaching through Madrasati helped me maintain clear and consistent communication with my students. It became a go-to place for updates, announcements, and class discussions”.

At the same time, 29 teachers indicated that it encourages student interaction and offers effective communication tools, homework, and assessment features; one teacher wrote in this regard, “Using Madrasati allowed me to give real-time feedback and facilitated communication with my students. This immediate response greatly benefited students, allowing them to learn and improve rapidly”.

Further, 34 teachers mentioned that Madrasati is easy to use and that they could immediately direct students to external resources. Among the participants, 53 stated that their positive perception regarding ease of usage of Madrasati is due to their ability to reach students at any time or anywhere, saving them time and effort and that it facilitates recording attendance in virtual synchronized sessions. In addition, 11 teachers stated that they noticed increased parents’ participation and engagement in their children’s schooling, and 38 teachers mentioned that they could apply diverse teaching strategies in multimodal information formats. They were able to share enrichment resources easily.

In addition, 45 teachers reported that the teaching tools and features were easy to use and that the platform facilitated effective communication with students’ family members and the school community. They also explained that it was a new motivating experience to break the routine of traditional face-to-face classes. Further, 25 teachers stated that it was a learning and discovery experience for their abilities to teach online and examine the effectiveness of the online teaching strategies every time they use the system. Further, 15 participating teachers preferred specific system features and resources such as question banks, model lessons, assignments, and enrichment lessons that can be easily linked to educational goals. Five teachers appreciated that the platform includes different motivational strategies and extra-curricular resources, interactive content, and classroom management tools such as attendance and follow-up tools. In addition, 18 teachers reported that Madrasati has the potential to support students’ development in self-regulated learning skills, leveraged students’ digital competency and digital citizenship knowledge, skills, and values and that students were able to gain research experience. One teacher wrote “The beauty of Madrasati is that it’s accessible 24/7. Students could learn whenever it suited them best, fostering a more self-directed learning approach. It was also easily used, and the teacher’s user experience was smooth and seamless”.

Main Madrasati Challenges

Participants discussed the potential downsides and challenges of using Madrasati in distance education. Of the participants, 22 teachers said they faced technical challenges such as interrupted Internet connections. One teacher mentioned, “One of the biggest challenges I faced teaching through Madrasati during COVID was the digital divide. Not all students had equal access to technology or reliable internet, which made it difficult for some to fully engage during the class”.

In addition, 11 mentioned technical difficulties, and eight expressed problems communicating with some students “Dealing with technical issues was a persistent challenge. There were times when Madrasati was down or certain features weren’t working as they should, disrupting the learning process”. In addition, five teachers shared that there is a need to include more videos or interactive content in some lessons. Seven teachers shared that they addressed the challenge of managing classes and lessons for elementary school students and following up with less active students. One teacher mentioned, “It was difficult to monitor student engagement through an Madrasati. You can’t see if a

student is paying attention, and sometimes it's hard to know if they're truly understanding the material". Additionally, 13 teachers noted that some students did not readily accept or were not highly motivated to use the platform, faced difficulty in interaction, and needed to be more committed. One teacher mentioned, "It was difficult to monitor student engagement through Madrasati. You can't see if a student is paying attention, and sometimes it's hard to know if they understand the material". Seven teachers also expressed concern that some students depended entirely on their parents and needed more self-regulated learning skills and that some parents needed to take online learning seriously. Nine teachers expressed that they could not fully know their students well enough and could not conduct an effective follow-up on their progress or address their learning difficulties during their online lessons. One teacher mentioned, "Despite the plethora of communication tools in Madrasati, nothing can truly replace face-to-face interaction. Building relationships and understanding students' non-verbal cues became more challenging".

DISCUSSION

The findings show that teachers positively perceived Madrasati regarding the system's external variables, including the content quality, teaching support, visual design, system navigation features, ease of access, system interactivity, instructional assessment tools, and they also positively perceived the system's learnability with a total mean of 3.43 for external variables. Further, teachers agreed that their experience with Madrasati was positive, as they could access the platform easily. They perceived it as a useful LMS, agreed that they had already used the system in their teaching, and expressed their intention to use it in the future.

The findings highlight that Madrasati has rich content that satisfies teachers' needs, and the finding conforms to the results of previous studies (Salloum, 2018), which highlights that content quality enhances the perceptions of the ease of use of e-learning systems. Moreover, content quality supports individuals' perception of the system's usefulness and, therefore, its usage and future implementation in teachers' practice, which aligns with the previous findings (Al-Aulamie, 2013; Binyamin, Rutter & Smith, 2019; Ghazal et al., 2018).

Regarding instructional support, teachers need to be provided with different levels and types of support in using LMS to make their teaching effective and facilitate the implementation of the best teaching strategies through well-planned professional development programs and various capacity-building programs. This study shows that the teachers perceived the importance of instructional support positively, corroborating previous findings (Bao, 2020, Binyamin, Rutter & Smith, 2019, Johnson et al., 2020). Hence, they positively perceived its ease of use and its usefulness. In addition, teachers are more likely to perceive the e-learning system as helpful if they find the most efficient tools to support their day-to-day teaching practices, such as content, lesson plans, communication tools, activities, and assessments sustained by professional development practices.

The visual design was perceived positively by teachers, which enhances the perceptions of the ease of use of e-learning systems in conformity with the findings of previous research (Al-Aulamie, 2013; Khedr et al., 2012). According to Cyr et al. (2006), visual design has a significant positive impact on the constructs of TAM and creates an enjoyable user experience. However, although Binyamin, Rutter & Smith (2019) did not find a relationship between visual design and perceived ease of use, some studies found a direct positive influence on the perceived usefulness of the system (Khedr et al., 2012). Further, this study revealed that teachers find Madrasati as an organized LMS with a convenient navigation structure. Teachers prefer systems where information can be found easily and links can be followed and navigated throughout the system and course elements to mitigate the technology usage learning curve (Johnson et al., 2020, Khan & Qutab, 2016; Theng & Sin, 2012). Therefore, according to Binyamin, Rutter & Smith (2019), this factor supports ease of use and system usefulness.

The results show that teachers find Madrasati easy to access, which directly impacts the perceived ease of use of the e-learning systems without direct impact on the perception of the system's usefulness

(Binyamin, Rutter, & Smith, 2019; Parsazadeh et al., 2017). However, teachers' perception of ease of use had the least mean value (3.44), which could be attributed to technical and internet issues they faced during distance teaching using Madrasati. This is consistent with previous studies highlighting how teachers and students faced connectivity problems, a lack of suitable devices, and varied levels of technical proficiency, leading to disruptions in teaching and learning (Hodges et al., 2020, Trust & Whalen, 2020). In addition, teachers perceived Madrasati as an interactive LMS with effective communication tools. Research shows that system interactivity supports the perception of the ease of use and usefulness of the system, and the finding of this study is consistent with previous findings on e-learning (Jandrić et al., 2020, Johnson et al., 2020, Parsazadeh et al., 2017; Theng & Sin, 2012).

Teachers agreed that Madrasati employs useful instructional assessment tools, directly influencing the perceived ease of use (Binyamin, Rutter & Smith 2019). According to Binyamin, Rutter & Smith (2019), system learnability has the strongest significant relationship with perceived ease of use of all external variables, and this could be attributed to the extensive professional development programs used for training teachers on how to use the system during school closure time due to the Pandemic, and due to the instructional and training materials provided to the teachers to enhance their knowledge, skills, and competency in how to teach online and use Madrasati portal through the Back to School portal. These materials were provided through easy-to-access links and video guides on the same portal associated with the log-in page. This finding is well-aligned with several empirical studies on information systems (Aziz & Kamaludin, 2014, Boling et al., 2020, Jandrić et al., 2020, Johnson et al., 2020,). Moreover, the systems' learnability supports the positive perception of system usefulness (Boling et al., 2020, Aziz & Kamaludin, 2014; Scholtz et al., 2016). Teachers perceived Madrasati as easy to use, which has been discussed as a significant indicator of the system's usefulness.

Madrasati can be accessed without time or effort and used for multiple teaching and learning purposes. The system features and services are provided through easy to navigate structure provided in the native language (Hakami, 2018). The finding is consistent with technology models, such as the TAM (Davis et al., 1989); the A-TAM (Taylor & Todd, 1995), the TAM2 (Venkatesh & Davis, 2000); the model of perceived ease of use determinants (Venkatesh, 2000), and the TAM3 (Venkatesh & Bala, 2008), as well as studies in e-learning in Saudi Arabia (Alenezi, 2012; Al-Gahtani, 2016). Furthermore, it was assumed that behavioural intention to use LMS is directly affected by the perceived ease of use of LMS (Abdullah et al., 2016). This highlights that a system should be easy to use and that this is a factor on which the adoption of an LMS is likely to depend.

Teachers perceived Madrasati as a useful LMS that has a positive effect on an individual's behavioural intention to use the platform, and this relationship is the strongest among the direct relationships between system usefulness and TAM variables (Al-Gahtani, 2016; Almazroi et al., 2016; Binyamin, Rutter & Smith, 2019; Davis, 1989; Davis et al., 1989). This result aligns with other studies on learning management systems and e-learning in Saudi Arabia (Al-Aulamie, 2013; Al-Gahtani, 2016). Perceived usefulness influences future system adoption and serves as a motivational factor. Teachers agreed that they intended to use Madrasati in their future teaching, which significantly affects the actual use of Madrasati. According to Binyamin, Rutter & Smith (2019), when users are strongly willing to use LMS, this enhances the actual usage, and this is consistent with technology models TRA, the TPB, the TAM, the A-TAM, the TAM2, as well as studies on e-learning (Alenezi, 2012; Alenezi, 2011; Baleghi-Zadeh et al., 2017).

CONCLUSION

The findings show that teachers positively perceive Madrasati in terms of external variables, including the content quality of the platform, teacher support, the visual design, system navigation features, ease of access, system interactivity, instructional assessment tools, and perceived system learnability. This study sheds light on the importance of specific external variables in LMS previously discussed in the literature as determinants of the system's usability and ease of use, according to TAM. These

variables apply to Madrasati LMS as well. Future studies can explore other variables that can influence LMS in general and Madrasati in specific that could potentially have a significant impact on teachers' acceptance of the system, such as students' self-paced digital courses' tools, including analytics, chatbots, adaptive content, courses, and gamification of the learning experience.

Future studies can also explore the significance of knowledge base materials and embedded professional development resources within the system to enhance teachers' instructional design skills and digital competencies within the e-learning system portal. Future studies can explore the role of demographical factors on the external variables and TAM of Madrasati, such as online teaching experience and instructional design skills. Further, the TAM of Madrasati can be linked to other essential theories on technology, pedagogy, and content knowledge and how these variables can influence technology acceptance. Further, teachers from different disciplines must participate in senior advisory boards at various educational leadership levels to provide their insights and recommendation for better teaching and learning experience using Madrasati to leverage its usability and ease of use. In addition, students and their parents' perspectives using Madrasati is another crucial area of research that can be further explored to compare student and teachers' perspectives about the use of the e-learning system during the Pandemic to facilitate improvement and teaching strategies keeping students' experience in mind while using the system.

However, this research had several limitations that might have impacted the results and conclusions of this study. First, there is a lack of prior studies on Madrasati and K-12 online education in Saudi Arabia due to the recent implementation of Madrasati and emergency remote education conditions in Saudi Arabia in response to COVID-19, which impacted the ability to link the study results to other related variables. However, this can be an important opportunity to identify literature gaps and include new research areas to improve Madrasati and e-learning for K-12 students. Further, the evaluation of Madrasati's usability and ease of use features was self-reported as the study is descriptive. Therefore, the results must be interpreted with caution. More in-depth statistical and qualitative investigations regarding the correlations between the system's key constructs with a larger sample size need to be conducted to extend the knowledge base on this new e-learning experience in Saudi Arabia and the new K-12 distance teaching. Finally, this study is limited in place, time, and scope, covering only the Saudi e-learning system. Future studies can focus on international K-12 teachers' response to using LMS for the first time during disruptive times. Other studies can explore teachers' attitudes toward Madrasati and their acceptance of the technology under normal schooling conditions.

COMPETING INTERESTS

The author of this publication declares there are no competing interests.

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