CRITICAL FACTORS INFLUENCING FACULTY'S SWIFT TRANSITION EXPERIENCES TO VIRTUAL LEARNING ENVIRONMENTS DURING EMERGENCIES: A MIXED-METHODS STUDY OF A SEMI-GOVERNMENT EMIRATI UNIVERSITY

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ABSTRACT

The COVID-19 pandemic precipitated a rapid shift to virtual learning environments (VLEs) in higher education institutions (HEIs), presenting a complex array of challenges and opportunities. This study investigates the critical factors influencing faculty members' swift transition to VLEs during emergencies, focusing on a semi-government Emirati university. Using a concurrent mixed-methods approach for data collection, the analysis incorporates both descriptive statistics and Structural Equation Modeling (SEM) for quantitative data, as well as thematic analysis for qualitative data. The results reveal various challenges faculty face, including reduced student engagement, limited prior experience in online teaching, and technological barriers. However, the transition also unveiled opportunities to enhance teaching and learning through innovative pedagogical strategies and technology-enhanced platforms. The SEM analysis elucidated the effects of demographic variables such as gender, age, and years of experience on adopting e-learning tools and the support received during the transition. These insights are critical for HEIs, guiding strategic decision-making to optimize VLE implementation. The study offers several recommendations, including customized training programs, policy revisions, reduced teaching loads, enhanced technological support, and the incorporation of innovative teaching methods. These strategies are essential for strengthening VLE deployment in HEIs, enhancing resilience during emergencies, and fostering ongoing educational improvements.

Keywords: Virtual learning environments, higher education institutions, crisis situations, teaching and learning, structural equation modeling.

INTRODUCTION

During the COVID-19 pandemic, higher education institutions (HEIs) rapidly integrated virtual learning environments (VLEs) as part of a wider shift towards innovative pedagogies and advanced technological solutions. This transition, however, presented significant challenges including reduced student engagement, a deficiency in online teaching expertise, and pervasive technical issues (Mete et al., 2022; Maatuk et al., 2022; Shambour et al., 2022; Zhang et al., 2022). Despite these difficulties, the crisis also catalyzed the adoption of creative educational practices and technology-enhanced learning platforms, promoting faculty development in online pedagogies and tailored learning strategies that improve student learning outcomes (Svihus, 2023; Zhang et al., 2022; Shanableh et al., 2022; Karaca & Ilkim, 2021; Martin et al., 2021).

In the context of the UAE, the need to consolidate the advancements made through the adoption of VLEs and to enhance preparedness for future crises, including environmental disasters like floods, is pressing. Such events also demand robust and flexible educational strategies to ensure continuity in education. The literature indicates a growing exploration among HEIs of diverse platforms suitable for emergency scenarios, including both VLEs and social computing software, which could offer valuable insights into effective teaching and learning strategies during crises (Bawaneh & Malkawi, 2023; Moser et al., 2021; Hew & Cheung, 2014; Hodges et al., 2020). Documenting stakeholder experiences and perspectives on using VLEs during such emergencies is essential for identifying ongoing challenges and for developing strategies to improve educational processes (Joseph et al., 2022). This contextual data is crucial for enabling educational leaders and planners to manage HEIs effectively under various adverse conditions.

This study focuses on the enabling and hindering factors experienced by faculty members while swiftly transitioning to VLEs in UAE HEIs. By examining the barriers and facilitators of VLE adoption during the COVID-19 pandemic and considering implications for other emergencies such as floods, this research aims to deepen the understanding of how rapid transitions to online education can be effectively managed. The following sections will detail the related literature, methodology, findings, and conclude with a discussion that synthesizes insights from the UAE experience with broader implications for emergency preparedness in education.

LITERATURE REVIEW

Virtual Learning Environment

Within the higher education sector, crises and fluid situations, including COVID-19 and various natural disasters, have compelled institutions to revisit and refine their approaches to crisis management. Moreover, the impact of these challenging situations extends beyond immediate physical damage, disrupting operational continuity and academic scheduling within higher education. Cutter et al. (2010) stress the critical importance of readiness and resilience in educational frameworks, suggesting that universities play a pivotal role in the communal response and recovery processes. The onset of the COVID-19 pandemic has radically transformed the higher education landscape, accelerating the transition to Virtual Learning Environments (VLEs) and bringing several challenges and opportunities (Shanableh et al., 2022; Marinoni, Van't Land, & Jensen, 2020).

Virtual Learning Environments (VLEs) are web-based platforms that integrate a suite of tools for online communication, collaborative learning, content delivery, assessment, feedback, and course management. Dillenbourg et al. (2002) describe VLEs as online spaces crafted for information sharing, social interaction, active student engagement, and the deployment of innovative pedagogies through adaptive technologies. These platforms offer flexible and accessible learning experiences, designed to surmount the constraints of traditional classrooms and cater to the individualized needs of learners (Aderibigbe et al. 2023a; Yilmaz et al., 2022; Bashir et al., 2021; Gillett-Swan, 2017). For example, VLEs allow students to access educational materials and engage in learning activities at their convenience, transcending geographical and temporal boundaries to accommodate varied schedules and commitments (Hodges et al., 2020). Educators can leverage these platforms to provide tailored learning opportunities and feedback, responding to the unique needs and abilities of each student (Aderibigbe et al., 2023b; Becirovic & Dervic, 2023; Archambault et al., 2022). Furthermore, through the use of adaptive technologies, multimedia resources, and social computing tools, VLEs foster collaborative interactions and immersive simulations, enriching the educational experience for students from diverse backgrounds (Aderibigbe et al., 2023b; Almaiah et al., 2022; Conrad et al., 2022; Elshami et al., 2022; Joseph et al., 2022). Additionally, VLEs offer cost-effective means for resource sharing and remote class participation, eliminating travel requirements and physical infrastructural dependencies (Aderibigbe et al., 2023a). Moreover, the platforms' analytics capabilities enable educators and institutional leaders to formulate data-driven educational strategies and pedagogical approaches tailored to various student needs (Blessinger & Wankel, 2013).

Despite their transformative potential, faculty may encounter several challenges while navigating VLEs and utilizing their integrated tools. Technical difficulties such as internet connectivity issues, device compatibility problems, and resource shortages during peak demand periods are commonly reported (Hodges et al., 2020; Mishra et al., 2020; Joseph et al., 2022; Almaiah et al., 2022; Conrad et al., 2022; Elshami et al., 2022). A lack of familiarity with new VLE features can hinder the development of engaging content and effective assessment methods, particularly in the early stages of adoption (Bao, 2020; Hew & Cheung, 2014; Hodges et al., 2020; Mishra et al., 2020). Additionally, limited capabilities in leveraging collaborative tools and social computing software can affect student engagement and learning outcomes. Faculty may also feel overwhelmed by the demands of managing online learning, which can be more time-intensive than traditional methods (Hew & Cheung, 2014). Concerns about maintaining academic integrity and the lack of social interaction compared to face-to-face environments further complicate the use of VLEs (Hew & Cheung, 2014; Hodges et al., 2020; Mishra et al., 2020).

The ease with which faculty transition to VLEs during emergencies can depend on factors such as readiness and institutional support (Pham et al., 2022; Puskulluoglu et al., 2022). Faculty with proficiency in technology and social computing are typically more adaptable to new VLEs (Bao, 2020). The quality and comprehensiveness of training support offered by institutions are crucial in building faculty confidence and effectiveness in these environments (Aderibigbe et al., 2023a; Marey et al., 2022; Mncube et al., 2021). The availability of necessary resources, pedagogical adaptability, and collegial support also significantly impact faculty's transition to VLEs under challenging conditions (Li et al., 2023; Luebstorf et al., 2023; Gasmalla et al., 2022; Joseph et al., 2022). Workload management and supportive workplace cultures that promote collaboration are additional determinants of educators' successful adaptation to VLEs (Bates, 2019; Trust

& Horrocks, 2017). Faculty experiences with VLEs, including both challenges and opportunities, may also vary based on demographic factors such as gender, age, and specialization (Becirovic & Dervic, 2023; Archambault et al., 2022; Hradecky et al., 2022; Treve, 2021; Liu et al., 2020).

Theoretical Framework for VLE Adoption

In the existing body of research, numerous theoretical frameworks are proposed for effectively integrating VLEs and online education systems. Some of these frameworks are summarized in Table 1:

Table 1. Theoretical frameworks for VLE adoption

S/N	Theoretical Framework	Assumptions
1	Technology Acceptance Model (TAM) (Davis, 1989)	It pays attention to the factors influencing individuals' acceptance and utilization of technology. It identifies two main factors that significantly determine whether someone will embrace a new tool or technology: perceived usefulness (PU) and perceived ease of use (PEOU).
2	Community of Inquiry (CoI) (Garrison, Anderson, & Archer, 2000)	It emphasizes the need to maintain three types of presence when adopting VLEs for effective teaching and learning: social presence, cognitive presence, and teaching presence
3	Activity Theory (Engestrom, 1987)	It emphasizes the need for activities fostering interaction between individuals, tools, and learning environment as essential for effective teaching and learning in VLEs
4	Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006)	For effective transition to VLEs and adoption of technology, it proposes that educators need to be equipped with knowledge and skills in three key: emphasizes need for educators to possess knowledge and skills in three key areas: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). Educators must understand how to effectively use technology tools (TK) to deliver instruction and support student learning. They should also apply pedagogical approaches (PK) suitable for online environments, such as collaborative learning, project-based learning, or flipped classroom models. Also, instructors must ensure their content knowledge (CK) is crafted in line with online formats, learning objectives, curriculum standards, and the technological tools employed requirements.
5	Diffusion of Innovations Theory (Rogers, 1995)	It focuses on the process of adopting and diffusing new technologies innovatively with five main areas for consideration: relative advantage (over approaches), compatibility (with the teaching goals), complexity (of technology integrity is addressed), trialability (in the form of experiment and piloting schemes), and observability (by sharing data related to desired results and best practices).

The theoretical frameworks detailed in the preceding table offer a systematic methodology for the effective adoption of VLEs during emergencies. These frameworks are instrumental in assessing faculty acceptance and ensuring their proactive engagement with well-defined roles. The application of these theories aids in designing interactive activities that are supported by necessary technical, pedagogical, and content knowledge. Utilizing these theoretical perspectives facilitates strategic planning and the deliberate implementation of VLEs in crisis contexts, including essential steps like piloting and thorough evaluation of the adoption process. Consequently, the following research questions guide the data collection and analysis in this study:

1. What are the hindering conditions for faculty adoption of VLEs during crises?
2. What are the major enabling factors for rapid transition and effective integration of VLEs by faculty during emergencies?
3. To what extent do the hindering and enabling factors experienced by faculty vary across different academic disciplines, age groups, and genders?
4. How can institutions enhance the teaching and learning process within VLEs during and after crises?

METHOD METHODOLOGY

Research Approach

This study employed a concurrent mixed methods approach involving quantitative and qualitative data from a survey questionnaire. This approach was adopted to delve deeply into the complex issues surrounding the faculty experience of both enabling and hindering factors during the transition to VLEs within challenging and emergency educational environments. Quantitative data provided structured numerical insights, offering statistical validation and clarity on various aspects of the transition process. On the other hand, qualitative data offered rich contextual understanding and diverse perspectives, capturing the subtleties and complexities of faculty experiences. So, combining quantitative and qualitative data allowed for robustly comprehensive, shared, and nuanced results to explore complex issues (Shorte & Smith, 2017).

Participants and Data Collection

In this study, 142 faculty members participated, consisting predominantly of males (70%), with the remainder being females. The demographic variables collected included age, years of experience, and academic college affiliation, which were categorized into three groups for analytical clarity: Medical, Science, and Social Sciences. Detailed demographic data of the respondents are presented in Figure 1. Data collection commenced after receiving approval from the University Research Board (VCRG/R438/2020). All faculty members from the study context were invited to complete an online questionnaire. Following three reminders over five months, the participating sample provided consent and completed the questionnaire. This procedure, using a self-selected non-probability sampling technique, allowed faculty to voluntarily choose whether to participate in the study (Etikan et al., 2016).

Data Validity and Credibility

The reliability of the questionnaire results was assessed using Cronbach's Alpha (α), a measure of internal consistency reliability (Tavakol & Dennick, 2011). This method evaluates the homogeneity of measurement items within a domain by determining the extent to which they are correlated, thereby providing an estimate of the consistency of the scale. Reliable responses are indicated by a high α value, approaching 1.0. A threshold α value of 0.7 is generally considered acceptable for deeming the responses reliable (Tavakol & Dennick, 2011). The qualitative data were subjected to an iterative process of validation through thorough evaluation and feedback sharing by the authors, thereby lending credibility to the results (Lincoln and Guba, 1985). Essentially, the authors' discussion about the research process and emerging themes ensured the data's validity (Bryman, 2016) and trustworthiness (Morse et al., 2002). Moreover, robust discussion drawing on quantitative and qualitative data further strengthened the outcomes of the study (Bryman, 2016).

Data Analyses

Data collection and analysis procedures should be clearly explained with a reference to the role and competency of the researcher(s). The quantitative data in this study were analyzed using descriptive statistics and structural equation modeling (SEM). SEM was chosen due to its capability to construct latent variables from observed indicators, providing a robust framework for testing theoretical models (Ahmad et al., 2017). Specifically, the Partial Least Squares (PLS) approach to SEM was employed to examine the interrelationships among variables (Bang et al., 2000). Additionally, PLS computations were segmented by target categories (binary and categorical) in a Multigroup Analysis (MGA). This analysis facilitated the examination of significant differences across predefined data groups, assessing group-specific parameter estimates (Hair et al., 2017). The SEM-PLS MGA was conducted using SmartPLS 4.0 software (Ringle et al., 2015). Complementing the quantitative analysis, qualitative data were inductively subjected to thematic analysis. This approach allowed for the identification of themes directly from the participants' responses, highlighting common patterns in their perspectives (Braun & Clarke, 2006). This procedure involved a deep engagement with the data through extensive reading, a crucial step in developing initial and significant codes Throughout the process, themes were carefully crafted and scrutinized to accurately reflect the data set, thus ensuring the reliability of the emerging themes and supporting vignettes (Braun & Clarke, 2006).

RESULTS

Quantitative Data

Frequency Analysis

The survey results were systematically analyzed to discern trends within the responses collected. The subcategories defined for this study are summarized and coded, as illustrated in Table 2, to facilitate detailed discussion and elaboration. The average count of "yes" responses in these subcategories was computed and compared across different respondent groups:

- Which of the following was challenging and uncomfortable in transition to the VLE? (Out of 10)
- Which of these e-learning tools enhanced the teaching experience? (Out of 9)
- What do you think assisted you in the process of moving to VLE? (Out of 10)

Table 2. Code categories and descriptions

Code	Description
A	What do you think assisted you in the process of moving to VLE?
A1	Experience with online education and learning tools.
A2	Institutional support such as clear guidelines, access to high-speed internet, available information technology staff, e-books, and e-service deliveries by different units.
A3	Orientation and training about the online platform by university.
A4	High level of students' participation and commitment to the learning process.
A5	Open and effective means of communication with appropriate tools, e.g. MS Team, Avaya, Zoom, etc.
A6	Collaboration and knowledge sharing activities with local and international institutions.
A7	Family support and cooperation, such as quite space to teach and hold meetings.
A8	Cooperation, collaboration and understanding of colleagues at workplace.
A9	Government support, including funding, high speed internet, free vaccination and PCR.
A10	Institutional leadership support, including effective Covid-19 crisis management, and open door policy.
B	Which of these e-learning tools enhanced the teaching experience?
B1	Online class and laboratory (through Bb Collaborate, MS Team or Skype)
B2	Whiteboard
B3	Video and audio podcasts
B4	E-books and open educational resources
B5	Email
B6	Online discussion forum
B7	Breakout rooms
B8	Assignment feedback
B9	Polling
C	Which of the following was challenging and uncomfortable in transition to the VLE?
C1	Personal and family issues such as loss of job by spouse, COVID-19 related sickness, and inadequate space for online learning activities.
C2	Health issues due to longer hours spent sitting down and remaining at a spot.
C3	Inadequate level of participation and cooperation of students in class activities and grades tasks.
C4	Psychological, wellbeing and mental health problems including apprehension, sense of isolation, insomnia, anxiety, and depression.
C5	Lack of collaboration and knowledge sharing opportunities with local and international institutions.
C6	Outdated teaching and learning resources, including technology and furniture.
C7	Constant technical problems during the online classes, presentations and examinations.
C8	Inadequate support from institutional leadership and line managers, e.g. not willing to give extensions for due assignments, not available for office hour, and non-provision of e-resources.

C9	Insufficient support from the non-academic staff and ineffective service deliveries.
C10	Lack of orientation and training about online learning platforms and their features.
C11	Personal and family issues such as loss of job by spouse, COVID-19 related sickness, and inadequate space for online learning activities.
C12	Health issues due to longer hours spent sitting down and remaining at a spot.

Individual Assessment

The analysis of survey results, detailed in Figures 1 and 2, reveals distinct trends for individual groups and combined demographics. Figure 1 illustrates the influence of gender on the challenges and opportunities associated with transitioning to VLE. Specifically, Figure 1a indicates that females experienced 22.4% more challenges (average score 2.40) compared to males (average score 1.96), which correspondingly led to females utilizing 20.9% more eLearning tools (average score 4.91) than males (average score 4.06).

Furthermore, the data suggest a correlation between age, years of experience, and the adoption of eLearning tools. As shown in Figure 1b, the adoption rates and the number of factors facilitating the transition to VLE increase with age and years of experience, peaking within the 45-54 age group and the 11-15 years of experience bracket. After these peaks, both measures start to decline, potentially due to increased resistance to new teaching methods among older faculty and those with more than 21 years of experience.

Lastly, the impact of the teaching field on the challenges faced, the number of eLearning tools used, and the ease of transition to VLE was minimal, as illustrated in Figure 1c. This suggests that while personal and experiential factors significantly influence the adaptation to VLE, disciplinary differences are less impactful.

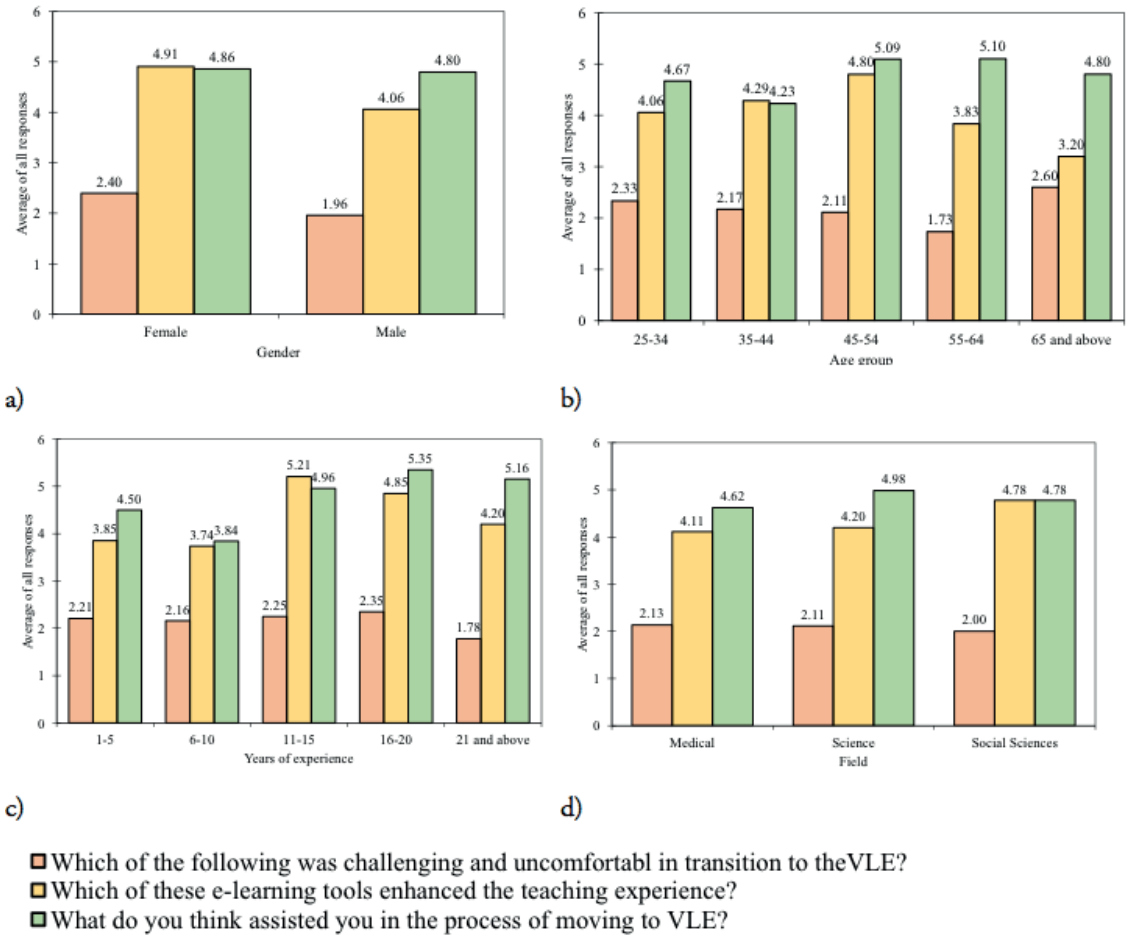

Figure 1. Average responses on number of challenges and opportunities in transferring to VLE in terms of a) gender, b) age group, c) years of experience, and d) field, individually

Combined Assessment

The combined effects of demographic groups on the adoption and utilization of eLearning tools in VLEs are presented in Figure 2. This analysis explores the interplay between gender, years of experience, and field orientation. Figure 2a highlights those females consistently exhibit a higher adoption rate of eLearning tools across all years of experience, particularly beyond six years, with a noticeable peak at 11-15 years. Additionally, females with 11-15 years of experience also utilized a greater number of assisted tools in the VLE transition.

In terms of the relationship between gender and field orientation shown in Figure 2b, it appears that the field itself does not significantly influence the assisted tools or the challenges experienced during the transition to VLE. Notably, males in the social sciences reported approximately 30% fewer challenges compared to their counterparts in other fields, both male and female. However, there are distinct differences within the female group based on field orientation; females in the social sciences adopted eLearning tools at rates 7.5% and 46.1% higher than those in the science and medical fields, respectively. This trend may be attributed to the increased necessity for diverse e-communication tools to effectively replicate interpersonal interactions and socialization inherent in teaching social science-related courses.

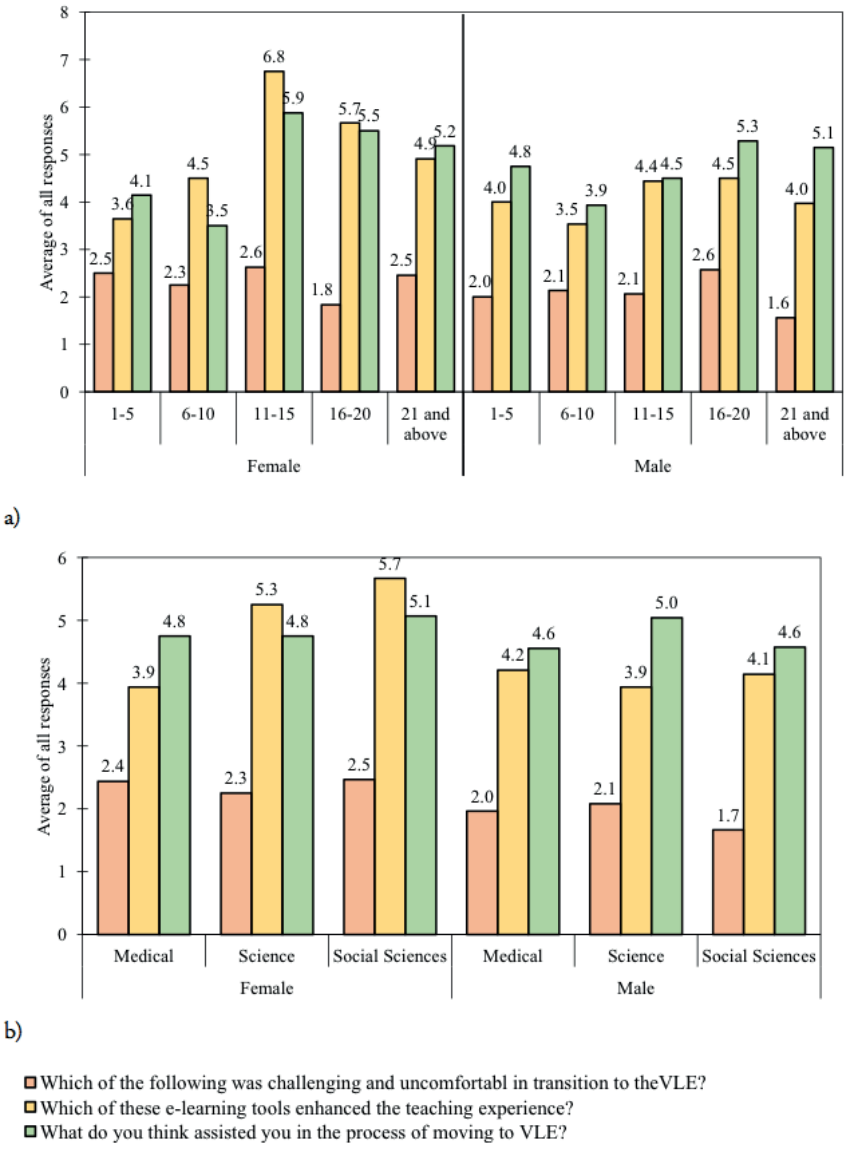

Figure 2. Average responses on number of challenges and opportunities in transferring to VLE in terms of combination between gender and: a) years of experience, and b) field.

Detailed Frequency Analysis

From the analysis presented in Figures 1 and 2, further examination was conducted to understand the relationship between the use of eLearning tools and the ease of transition to VLEs. The average responses regarding the enhancement of the teaching experience by eLearning tools and the assistance provided in transitioning to VLEs were collated and displayed in Figure 3. This figure shows a relatively strong linear correlation between these two variables, with a squared correlation coefficient (R^2) of 0.7699. This substantial correlation indicates that a higher adoption of eLearning tools is likely to significantly enhance the factors that facilitate the transition to VLE, suggesting that investing in eLearning technologies can be crucial in smoothing the transition process and improving the overall teaching experience.

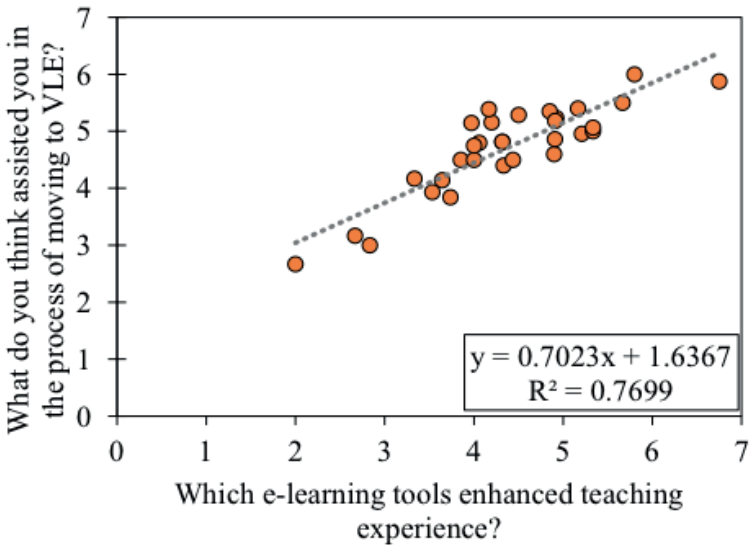

Figure 3. Correlation between number of eLearning tools and assistance in transformation process to VLE

Furthermore, the survey explored faculty preferences for various teaching methods both during and post the COVID-19 pandemic, with the findings succinctly represented in Figure 4. This figure contrasts the preferences during (left side) and after (right side) the pandemic. During the pandemic, the least favored teaching method was face-to-face, at only 12%, while blended teaching was the most preferred, at 35%. Post-pandemic, preference for face-to-face teaching increased to 24%, and preference for the blended mode decreased slightly to 27%. Notably, much of the increase in face-to-face preference post-pandemic was shifted from hybrid-flexible (8.5%) and blended modes (7.0%).

Moreover, the preference for fully online teaching dropped to 12% post-pandemic from 27% during the pandemic, with significant transitions to blended and hybrid-flexible modes. These results indicate a clear preference among faculty members for hybrid-flexible and blended teaching modes over strictly face-to-face or fully online methods, both during and after the pandemic. This suggests that the faculty values the flexibility and the combination of online and in-person elements that these modes offer.

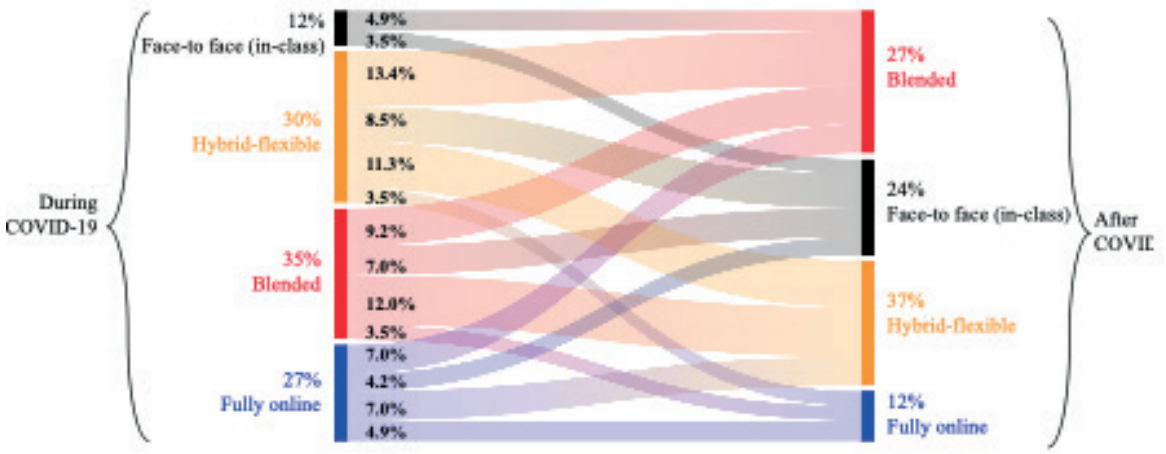

Figure 4. Preference of teaching mode during and after COVID-19

Validity of Collected Responses

The reliability of the current survey data was assessed by calculating Cronbach's alpha (α), a measure of internal consistency, for the survey responses. The analysis yielded an average alpha value of 0.82, indicating a relatively high level of reliability. To further evaluate the robustness of the survey's components, a series of item elimination tests were conducted. Each item was sequentially removed from the dataset, and Cronbach's alpha was recalculated for each modified dataset. The results demonstrated that the overall alpha value was not significantly impacted by the removal of any single item, suggesting a consistent correlation among the survey responses. The lowest alpha value recorded was 0.73, which occurred upon the elimination of item B6, "Online discussion forum." This suggests that while the item contributes to the overall consistency, its impact is not critical to the integrity of the survey's reliability.

General SEM Model Development

The validity and reliability processes in data collection and analyses should be described sufficiently. A Structural Equation Modeling (SEM) approach was employed to analyze the factors influencing the transition to VLEs, as depicted in Figure 3. The SEM model was designed to include multiple interconnected nodes, representing the variables to underscore the interrelated effects among them. Additionally, the subcategories listed in Table 1 were linked to their respective main variables within the model. This setup facilitated a comprehensive analysis of both direct and indirect relationships, providing a nuanced understanding of how various factors collectively impact the transition process to VLE.

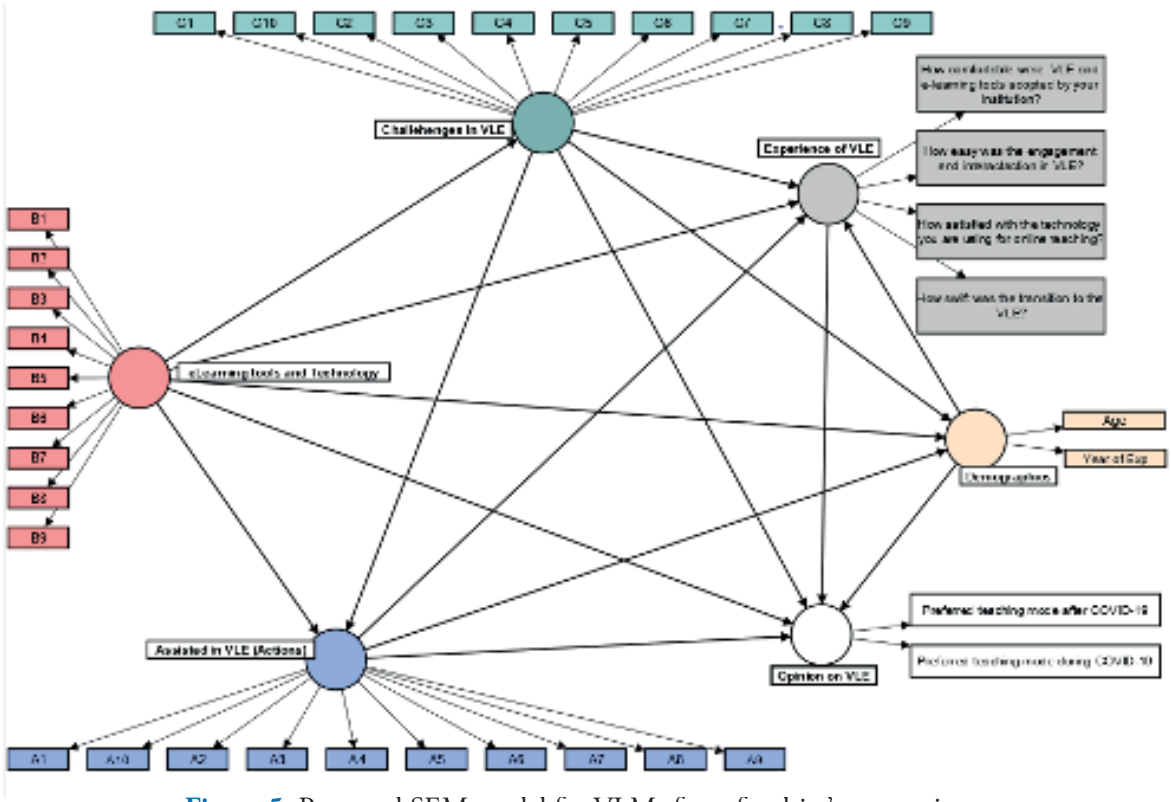

Figure 5. Proposed SEM model for VLMs from faculties' perspectives

Results of the Whole SEM Model

The validity and reliability processes in data collection and analyses should be described sufficiently. The comprehensive analysis of the SEM for the transition to VLEs incorporated all collected responses, along with a focused examination of categorical variables such as gender and field. The summarized results of this comprehensive SEM analysis are presented in Figure 6, where the significance of the relationships is indicated by t-values marked on the paths (arrows) between variables. The line thickness on these paths visually represents the t-value; thicker lines denote higher t-values, indicating stronger effects within the model.

The model demonstrates a strong correlation between the use of eLearning tools and assisted actions in VLE, with a notably high t-value, reinforcing the correlation observed in Figure 3. This strong linkage validates the underlying assumptions of the developed model, confirming its robustness in reflecting the dynamics of eLearning adoption. Moreover, the analysis highlighted several significant relationships highlighted as follows:

- The highest impact observed was from experience in VLE affecting opinions about VLE, with a t-value of 3.560.
- The influence of enabling conditions on VLE experiences recorded a t-value of 2.196, indicating a substantial positive effect.
- The effect of tools that enhance the VLE experience on enabling conditions showed a t-value of 1.867.
- Finally, challenging factors impacting VLE experience had the lowest among the noted significant effects, with a t-value of 1.080.

These results underline the complexity and interdependency of factors that influence the successful implementation and perception of VLE, highlighting the importance of both experiential and enabling factors in shaping effective VLEs.

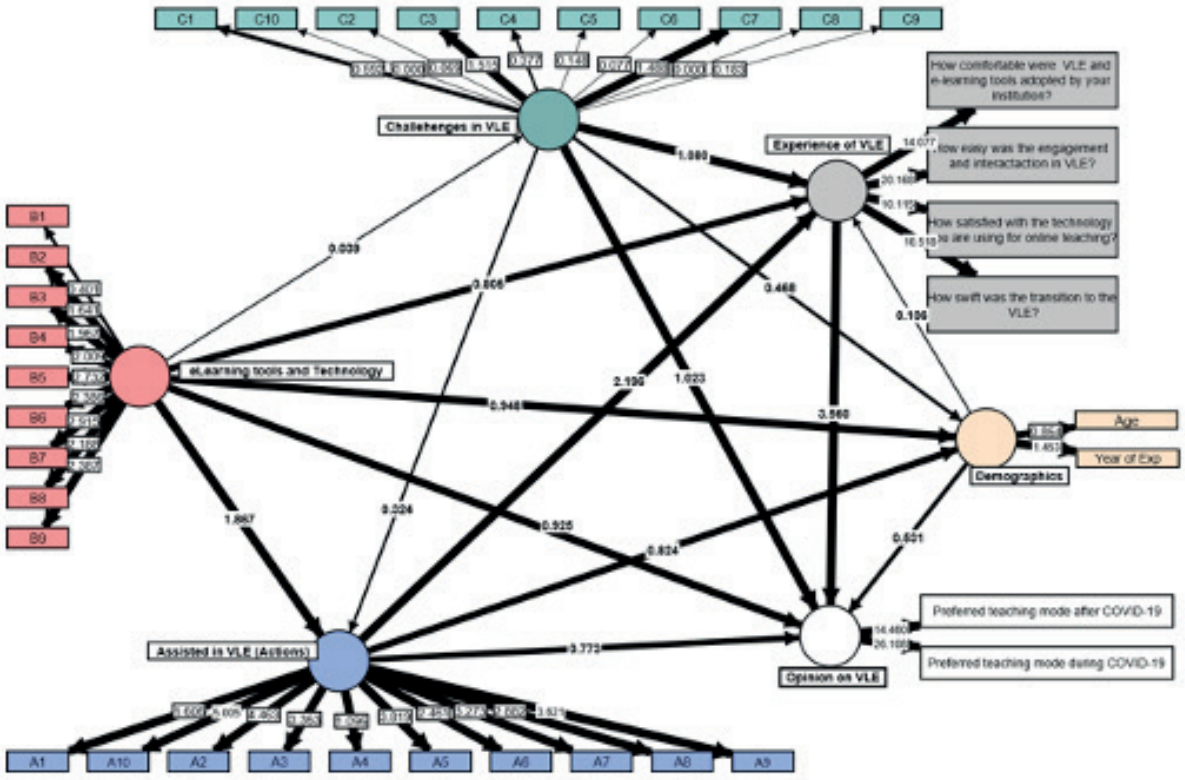

Figure 6. Results of the full SEM model regarding VLMs

Effect of Gender and Field

The SEM model was redeveloped by analyzing the responses of specific demographic groups, including females, males, and individuals from social science, science, and medical fields separately. The t-values representing the effects of each variable within these groups are summarized in Table 3, with colors ranging from green (indicating higher impact) to red (indicating lower impact).

Across all groups, the analysis consistently revealed that "Experience of VLE" had the most significant effect on "Opinion on VLE." However, noteworthy variations were observed among different groups:

- Females and individuals affiliated with the sciences demonstrated higher t-values of 2.861 and 2.283, respectively, indicating a stronger impact of "Experience of VLE" on "Opinion on VLE." In contrast, those affiliated with social sciences exhibited the lowest t-value of 1.032 for this relationship.
- For the relationship between "Assisted in VLE (Actions)" and "Opinion on VLE" and "Experience of VLE," the highest t-values were observed in the female and science models. This suggests that the teaching method selection for females is significantly influenced by "Assisted in VLE (Actions)" and "Experience of VLE."
- In contrast, for the male gender, "Experience of VLE" and demographic factors had the highest impact on "VLE Experience."

Furthermore, the results indicate that challenges in VLE have a significant impact on assisted VLE actions in the medical field. Unlike other fields and gender groups, individuals in the medical field tend not to recognize assisted VLE actions (such as fast internet connections and availability of technology staff) when faced with challenges in VLE. This highlights the unique challenges and perceptions within the medical field compared to other disciplines and gender groups.

Table 3. t-values for all groups (genders and college orientations) in SEM

Relation	t-value				
	Gender		College orientation		
	Female	Male	Medical	Science	Social Science
Assisted in VLE (Actions) → Demographics	0.952	0.625	0.169	1.055	0.62
Assisted in VLE (Actions) → Experience of VLE	2.036	0.546	0.686	2.205	0.02
Assisted in VLE (Actions) → Opinion on VLE	2.223	0.687	1.16	0.016	1.096
Challenges in VLE → Assisted in VLE (Actions)	0.1	1.416	1.432	0.714	0.33
Challenges in VLE → Demographics	0.19	1.357	0.501	0.6	1.397
Challenges in VLE → Experience of VLE	1.02	0.824	0.011	0.96	1.05
Challenges in VLE → Opinion on VLE	1.004	1.099	0.925	0.878	0.688
Demographics → Experience of VLE	0.182	1.635	1.076	0.22	0.231
Demographics → Opinion on VLE	1.048	0.141	0.053	0.377	0.691
Experience of VLE → Opinion on VLE	2.861	1.944	1.435	2.283	1.032
eLearning tools and Technology → Assisted in VLE (Actions)	1.385	1.094	0.448	0.854	1.076
eLearning tools and Technology → Challenges in VLE	0.421	0.891	0.46	0.706	0.421
eLearning tools and Technology → Demographics	0.598	1.401	0.197	0.782	0.251
eLearning tools and Technology → Experience of VLE	0.061	0.132	1.153	0.676	0.888
eLearning tools and Technology → Opinion on VLE	0.184	1.36	0.416	0.745	1.119

Qualitative Data

Issues and Challenges Experienced While Teaching on VLE Platforms

The qualitative data analysis highlighted two major themes that encapsulate the challenges faculty members faced while teaching using VLE platforms and tools during the pandemic. These themes, along with their supporting codes, are outlined in Table 4.

Table 4. Challenges experienced by faculty on VLE in an emergency

S/N	Themes	Codes
1	Engagement and Interaction issues	Online teaching has no soul, face to face make me vibrant, active, motivated. Online teaching kills interaction.
		Always very hard to monitor students' activities during the lectures and labs. Students are not getting involved. Students were less attentive with closed cameras and constant excuses such as "got disconnected" or "no internet", when in reality they were in a public venue attending an online class.
2	Hard and software issues	Network is constantly disconnected even using from home or university office.
		Frequent internet outages and disturbances particularly during exams as claimed by many students but lack of evidence to support to their case.
		Unfortunately University supplied faculty with worst quality laptops that are not suitable at all for online learning.

Reasons for the Choice of Teaching and Learning Mode

As previously discussed in the quantitative section, faculty members expressed their preferences for various teaching and learning modes. Table 5 summarizes the prevalent opinions of faculty regarding their chosen teaching and learning modes, as derived from the qualitative data.

Table 5. Key reasons for the choice of teaching and learning mode by faculty

S/N	Teaching Mode	Codes
1	Fully Online	For giving the opportunity to learn to everyone, everywhere and under any circumstances.
		Online is good for lectures and others such as seminars which can be convenient for some people.
		The future is online, it has to keep the old version traditional and well-worked system and built a new one.
2	Blended	Because in this method I can teach online and apply all online activities and at the same time I can bring my students to the lab, communicate with them and allow them to use the devices in the lab.
		We need to make full use of all the platforms and tools we have available to us. Face-to-face learning is the best but it needs to be complemented with online tools for more efficient and flexible teaching and learning.
		Many students struggle to arrive on campus, so reducing the amount of face-to-face classes maybe more beneficial and flexible for any concurrent student commitments.
3	Hybrid-Flexible	After the pandemic is over, I still recommend hybrid flexible learning ... especially for Postgraduate students. It's very suitable for them and may result in increasing the students' enrollment in post-graduate studies.
		Hybrid learning is more adaptive and flexible. Faculty members can choose the method based on the students' needs and learning objectives.
		The Hybrid-flexible learning with the opportunity to attend class in person or join online based on personal needs and situations, is a good approach, but it requires (1) dedicated students, (2) robust cheating rules, and (3) sincere leadership.
4	Face-to-Face	The personal touch, the eye contact, student-to-student interaction, this is what teaches students not the reciting of information over a distant screen
		Better interaction and one on one communication. Loopholes can be identified easily with constant student-faculty interaction. Can keep a track of the learning process by adopting multiple formal and informal assessment tools.
		Because the university education is not only about facilitating knowledge, student should interact personally with each other and with their faculties, and through being on campus would enhance student personality and professionalism

Measures for Improving the Teaching and Learning Process in VLE Context

The faculty overwhelmingly concurred that specific measures are necessary to improve the teaching and learning process through VLEs during emergencies. Analysis of the qualitative data revealed five principal themes, which are detailed in Table 6 along with the corresponding supporting codes.

Table 6. Faculty views on measures required to enhance the teaching and learning process in emergencies

S/N	Theme	Codes
1	Training	Faculty development programs on how to improve teaching and learning in the virtual environment, including frequent updates and training on available tools/applications.
		All academic staff should attend training on essential educational technologies and demonstrate competency in using these.
		Capacity building for staff, faculties and students
2	Policies	Policies at a higher level should hold students accountable.
		Change of educational policies. Insistence on the student turning on both camera and microphone. Taking attendance automatically and barring students who exceed the absence limit.
		New policies to encourage hybrid or online mode… robust cheating rules.

3	Moderate teaching load	Reduce the load and have reasonable expectations.
		Class size must be kept within reasonable limits.
		Classroom capacities need to be reduced.
4	Technology Infrastructure	Accessibility to technology (computers/internet) are key. Perhaps institutes can think about providing/loaning tablets to students. Special government subsidies for students learning in hybrid mode? Essentially ease of access is important to make hybrid-flexible a successful mode.
		Pay more attention for IT infrastructure including servers, Internet speed and bandwidth, adopt Smart Campus techniques (eco-system).
		Care must be taken to regularly update the learning software to keep pace with technical developments
5	Innovative and creative teaching methods: Blended and Hybrid-Flexible	Recognize that the new teaching & learning delivery methods require far more effort on the part of the faculty.
		We need to continue making full use of all the platforms and tools we have available to us. Academic institutions spent so much resources to train faculty to use the online tools, it would be a waste to just go back to traditional face-to-face teaching.
		Revisions should be made to the study plans and syllabi in line with the methods of hybrid and distance education.

DISCUSSIONS

This study investigated the factors facilitating or impeding faculty's rapid adoption of VLEs during the COVID-19 pandemic in the UAE, highlighting the importance of understanding these elements to lead effective institutional change. Our quantitative analysis revealed distinct trends in the challenges and facilitators of transitioning to VLEs, as illustrated in Figures 1 and 2. These findings underscore the significance of technology acceptance, as outlined in the Technology Acceptance Model (TAM) framework, which emphasizes the perceived ease of use and benefits in adopting new technologies (Davis, 1989). Table 2 elucidates faculty preferences for different teaching modes, emphasizing the need for flexibility and adaptability. The preference for fully online modes was driven by the desire to make learning accessible to everyone, everywhere, aligning with the TAM framework's focus on perceived benefits (Davis, 1989). Blended and hybrid-flexible modes were favored for their ability to combine online and face-to-face interactions, enhancing both engagement and practical application. These preferences reflect the evolving landscape of educational delivery methods and the necessity for multifaceted approaches (Aderibigbe et al., 2023a; Yilmaz et al., 2022; Gillett-Swan, 2017).

Qualitative data from Table 1 highlight several key challenges faced by faculty during the emergency transition to VLEs. Engagement and interaction issues were predominant, with faculty expressing that online teaching lacks the vibrancy and motivation of face-to-face interactions. This aligns with our quantitative findings and supports existing literature on reduced engagement in online environments (Li et al., 2023; Luebstorf et al., 2023; Gasmalla et al., 2022). Faculty also reported difficulties in monitoring student activities and maintaining attentiveness, compounded by students' excuses about technical issues. Additionally, hardware and software issues significantly impacted the effectiveness of VLEs. Frequent network disconnections and the poor quality of university-supplied laptops hindered the teaching process, reflecting broader infrastructural challenges documented in previous studies (Shambour et al., 2022; Khan, 2021).

Our SEM results reveal both alignment and divergence from prior research, illustrating unique contextual factors within the UAE. Notably, female faculty members reported greater challenges in adapting to VLEs, supporting research that suggests gender differences in technology adoption and adaptation (Bawaneh & Malkawi, 2023; Dinu et al., 2022; Shambour et al., 2022; Khan, 2021). Additionally, the higher engagement of females with e-learning tools echoes findings that highlight the value placed on communication and collaboration tools in online learning environments by women (Tinmaz & Lee, 2020; Luppicini & Walabe, 2021). Addressing these gender-specific challenges is essential, and strategies such as fostering a Community of Inquiry (COI) can facilitate social, cognitive, and pedagogical transformation (Garrison et al., 2000). Our analysis also explored the impact of age and experience on VLE adoption. We observed a peak in e-learning tool adoption and support in the transition process up to a certain age, after which resistance to

new teaching methods became more prevalent. This trend corroborates studies suggesting slower technology adoption rates among older and more experienced faculty members (Hradecky et al., 2022; Shambour et al., 2022; Treve, 2021; Liu et al., 2020). However, other research contradicts this, arguing that age and experience do not necessarily impede technological integration in education (Blackwell et al., 2013). The influence of the teaching discipline on the adoption of VLEs was less pronounced, aligning with research indicating consistent challenges and benefits across disciplines (Aderibigbe et al., 2023b, Almaiah et al., 2022; Conrad et al., 2022; Elshami et al., 2022). Nevertheless, contrasting findings highlight the distinct needs and requirements of different academic fields, underscoring the importance of a discipline-sensitive approach as suggested by the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006).

Table 3 provides insights into the measures faculty believe are necessary to improve VLEs. Training and capacity building were deemed essential for effective online teaching, underscoring the need for continuous professional development in educational technologies. This is consistent with the COI framework, which emphasizes the importance of social, cognitive, and teaching presence in online learning environments (Garrison et al., 2000). Policy changes, such as enforcing attendance and deterring cheating, were also highlighted as crucial. These suggestions reflect the need for robust institutional policies to support VLEs, aligning with findings on the importance of structured environments in online education (Tinmaz & Lee, 2020; Luppicini & Walabe, 2021). The need for moderate teaching loads and enhanced technology infrastructure was emphasized to ensure a sustainable and effective VLE environment. Faculty called for improved IT infrastructure, smaller class sizes, and updated learning software, echoing concerns about the adequacy of technological support (Almaiah et al., 2022; Conrad et al., 2022).

Linking these findings to emergency situations, such as the rare but impactful floods in the UAE, underscores the necessity of VLEs. Just as VLEs were pivotal during the pandemic, their utility during unexpected natural disasters cannot be overstated. They ensure continuity of education when physical attendance is disrupted. This parallels the need for robust e-learning tools and strategies that can quickly adapt to various emergencies, reinforcing the principles of the activity theory and diffusion of innovations theory, which emphasize proactive engagement and flexible adaptation (Engestrom, 1987; Rogers, 1995). While our study aligns with much of the existing literature, the unique challenges and opportunities presented by emergency situations like floods in the UAE highlight the need for context-specific analyses and adaptable educational technologies. These findings advocate for nuanced, flexible approaches to the implementation and enhancement of VLEs across varied and evolving educational landscapes.

CONCLUSION

This study highlights that faculty members can effectively transition to VLEs and other technology-enhanced educational platforms during crises to ensure the continuity of teaching and learning. The ease and success of this transition are influenced by various enabling and hindering factors. Consequently, institutional leadership must actively work to minimize obstacles and bolster conditions that facilitate an effective faculty transition, tailored to diverse demographic needs, including gender, age, and disciplinary fields.

In regions prone to emergencies such as pandemics and floods, as experienced in the UAE, the robustness of technological infrastructure and institutional support becomes even more critical. To ensure a seamless and effective transition to VLEs in challenging and unpredictable circumstances, institutions could consider the following strategies:

- Boosting Institutions' Technological Support - Enhancing the technological framework is essential, not only updating hardware and software but also providing extensive IT support accessible to all participants in the learning environment. Establishing a rapid-response IT team can ensure smooth operations in virtual classrooms.
- Formulating and Explicitly Communicating Policies - Developing transparent, explicit, and enforceable policies that govern student responsibilities, attendance, and anti-cheating measures is indispensable. For policies to be adequately understood and applied, regular workshops should be conducted to familiarize everyone with these policies. Furthermore, the policies should be regularly

reviewed and adapted to meet evolving educational and technological needs.

- Adopting Flexible Instructional Approaches - Institutions might consider an intentional blend of online and physical teaching elements to support diverse learning preferences. Providing asynchronous learning options can accommodate students in different time zones and with varying schedules, allowing them to engage with content at their convenience.
- Ongoing Monitoring and Improvement - Regularly assessing the technological tools and infrastructure deployed is critical for identifying and resolving issues proactively. Collecting and analyzing feedback from educators and learners will help refine the tools and strategies, ensuring they effectively meet educational goals.
- Continual Professional Growth - Committing to the continuous professional development of teaching staff is crucial. Institutions should priotise training in the latest educational technologies and instructional strategies, enhancing the effectiveness of virtual learning through updated teaching methods and tools.

Lastly, there is a crucial need for further large-scale, nationwide, and longitudinal research to delve into additional factors that influence faculty members' transition to VLEs during emergencies such as pandemics and floods, particularly within the context of the UAE. Such research should aim to uncover deeper insights into the dynamics of faculty adaptation and resilience in face of these challenges. This approach will not only refine and improve current educational practices but also strategically prepare educational institutions to tackle future challenges more effectively. This proactive stance is vital for ensuring the continuity and quality of education in unpredictable scenarios, contributing significantly to the robustness and adaptability of HEIs.

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