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The Effect of the COVID-19 Virus Crisis at Jordanian Higher Education Institutions: A Major View of the Main Benefits and Challenges

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ABSTRACT

Purpose: Amidst the global dissemination of the COVID-19 virus, higher education institutions have increasingly embraced online learning, giving rise to the widespread adoption of virtual classrooms. This shift from physical to virtual instructional models presents a blend of challenges and advantages. Numerous factors impede the implementation of online education in developing nations like Jordan. This research seeks to illuminate the technical and psychological implications inherent in transitioning from traditional to online education in Jordanian academic institutions. Technical considerations include the selection and effectiveness of e-learning applications, devices used by educators and students, instructor technical proficiency, and the evolution of technical competencies over the past eight months. Simultaneously, psychological variables, encompassing academic dishonesty, concentration disparities in online versus in-person exams, and perceived academic earnestness in the online learning environment, are examined. **Method-** Inductive and deductive methodologies were employed for data collection and analysis in this study. A total of 614 participants contributed to the dataset through online questionnaires and academic publications. Furthermore, 16 successful semi-structured interviews were conducted with key stakeholders, including vice-chancellors, school deans, department heads, e-learning systems specialists, and lecturers. **Findings-** The consequential outcomes of this study were amalgamated with a theoretical foundation to formulate a framework delineating the fundamental factors influencing the shift to online learning. Various data analysis technologies, including NVivo, Microsoft Business Intelligence (BI), Microsoft Visio, and additional tools, were employed in the execution of this research. **Originality/Significance-** This study provides significant empirical evidence concerning the sudden implementation of online learning within the higher education system of a developing country, which previously lacked a virtual infrastructure.

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1. Introduction

The global dissemination of COVID-19 emanated swiftly from its origin in China (Ali, Ali, & Fatima, 2023; Alkhodary et al., 2022; Sarma et al., 2020). In response to the COVID-19 crisis, the Jordanian government enacted the national defence law, necessitating the immediate lockdown of all educational institutions in Jordan until further notification (Alkhawaldeh, 2021). Consequently, educational processes across all levels underwent a transition to online platforms (Jawabreh et al., 2023; Nawaiseh et al., 2021). Jordan, characterized as a developing nation with limited technological proficiency, particularly in the realm of online education, presented a formidable challenge to decision-makers within educational institutions (Ali et al., 2023; Alkhodary et al., 2022). During the initial phases of the COVID-19 pandemic, the primary emphasis centred on technological concerns and strategies to sustain the educational continuum through online platforms. In contemporary society, the rapid evolution of technology poses a dual challenge (Al-Rawashdeh, Jawabreh, & Ali, 2023; Alananzeh et al., 2023; Alhaj et al., 2023; Hatamlah et al., 2023; Jawabreh et al., 2023). On one hand, it offers unparalleled opportunities for commercial innovation and efficiency (Al-Hosaini et al., 2023; Al-Hussein et al., 2023; Al Tarawneh et al., 2023; Yang & Ali, 2023). Nonetheless, ongoing study and adaptation are requisite to stay abreast of these advancements and ensure their ethical application. A proactive approach to leveraging technology for sustained growth and success, coupled with a commitment to continuous learning, is imperative to address this challenge (Nawaiseh et al., 2022; Shan et al., 2023; Shniekat et al., 2022).

Preceding the pandemic, online education was minimally integrated into Jordanian higher education institutions, with the predominant mode of instruction being face-to-face. Numerous antecedent studies have delved into the deficiency of e-learning technologies and the challenges confronted by information and communication technology (ICT) within the Jordanian education sector (Al-Shboul, 2013; Al-Shboul et al., 2013; Alkhawaja & Abd Halim, 2019; Mashhour & Saleh, 2010). Despite the provision of specific online programs and courses by some universities, the overall participation in fully online degree programs was comparatively low in contrast to traditional classroom-based learning. This disparity can be predominantly attributed to the underdeveloped technological infrastructure and the dearth of resources for widespread online instruction across most Jordanian universities (Haider & Al-Salman, 2020; Qazaq, 2012). Numerous university lecture halls lacked essential online teaching resources such as internet connectivity, video conferencing capabilities, and learning management systems. Furthermore, both instructors and students possessed limited experience with fully virtual education.

The unforeseen global spread of the coronavirus and subsequent lockdown measures in the education sector posed a substantial challenge for both educators and students. Multiple Jordanian university leaders, administrators, and faculty members contended that emergency remote teaching had supplanted traditional face-to-face education in Jordan. This assertion finds validation in the inadequate technological infrastructure and the unpreparedness of educational institutions for the transition to online learning (Kanan, 2020; Kanan et al., 2022). The COVID-19 crisis has yielded positive outcomes for Jordanian educational institutions, including improved e-learning processes and enhanced technical skills for both students and lecturers. Subsequently, the study's questions were formulated as follows:

1. What are the principal technical determinants impacting online learning within Jordanian higher education institutions in the context of the COVID-19 pandemic?
2. What are the primary psychological factors affecting online learning within Jordanian higher education institutions in the context of the COVID-19 pandemic?
3. What are the principal repercussions of online learning on students' examinations?
4. What strategies can enhance online learning within Jordanian higher education institutions?

Considering the pre-existing constraints in technology infrastructure and preparedness for virtual instruction, analysing the challenges and advantages encountered offers valuable insights for future enhancements. This study, concentrating on Jordanian universities, solicits perspectives from students, instructors, and administrators through surveys and interviews. Through assessing the impact on learning applications, device accessibility, instructor competencies, academic integrity, and student engagement, the research identifies pivotal areas requiring attention to augment remote education. The insights derived from Jordan's swift adaptation to online learning amidst a health crisis can serve as instructive guidelines for developing nations aspiring to establish robust and expansive virtual education systems. As online education is poised to play a progressively central role on a global scale, comprehending the impediments and facilitators identified in Jordan's pandemic-driven transition can enhance the implementation of virtual instructional models. This holds significance for the accessibility, quality, and continuity of learning, particularly as education worldwide becomes more digitally interconnected. The subsequent sections of this paper encompass a literature review, methodology, results, and discussion, followed by a conclusion.

2. Literature review

The advent of coronaviruses has fundamentally transformed the daily routines of students and educators at nearly every university worldwide (Ratten, 2020). Hence, the global educational landscape across all levels has been affected by the challenges posed by the coronavirus. In response, Cambridge University in the United Kingdom announced the continuation of online education until the summer of 2022. It was noted that this transition would exert minimal impact owing to the university's robust technical infrastructure and high state of readiness in online educational services, predating the onset of the COVID-19 pandemic. Conversely, Middle Eastern universities, including those in Jordan, predominantly depended on in-person instruction for approximately 90 percent of their educational processes and possessed restricted and insufficient online infrastructure and educational resources. This stands in contrast to the provision of sophisticated online education services in universities in more developed nations (Ratten, 2020), page 1 notes, "During the peak disruption in April 2020, over 1.6 billion students, constituting over 91% of the global student population, were affected." The COVID-19 pandemic has profoundly disrupted education across all levels. Despite the wealth of literature on the crisis and its impact on the educational system, there is a paucity of research addressing strategies to mitigate the adverse effects of COVID-19 in education (Toquero, 2020). This disparity in research attention may be attributed to the localized impact and varying durations of preceding crises, unlike the global and simultaneous nature of the COVID-19 pandemic,

allowing limited opportunities for cross-country learning. While many universities have primarily addressed the adverse effects of COVID-19, their focus has predominantly centred on technical factors, neglecting the emergence of psychological factors (Cullen, Gulati, & Kelly, 2020). Regrettably, in developing nations like Jordan, students encounter the educational process and examinations with a lack of seriousness.

The COVID-19 crisis may instigate innovation and creativity in the realm of online education (Dua et al., 2020). Universities might enhance collaboration in online modules and various facets, including research initiatives (Buitendijk et al., 2020; Gamage et al., 2020). Moreover, the enhancement of technological infrastructure in developing nations could be facilitated through the implementation of online education. In the case of Jordan, for example, numerous internet service providers have expanded the provision of fiber optic services and offer complimentary educational platforms to primary and secondary schools (Cleofas & Rocha, 2021). Furthermore, the Minister of Higher Education in Jordan has amended regulations pertaining to the recognition of online certificates obtained outside the country. The impact of COVID-19 on higher education institutions may also have ramifications across other sectors, including economics. Students may opt not to enrol or defer the academic year due to concerns about the quality of online education. This decision could have adverse implications for private universities, particularly those lacking government support and relying predominantly on student fees as a primary financial resource (Miles, Huberman, & Saldaña, 2014). Consequently, enhancing the quality of online education may emerge as a pivotal strategic objective for universities in the ensuing decade (Odeh & Yousef, 2021).

Another crucial aspect within cloud literature pertains to the confidence reposed in cloud computing. According to Bao and Chen (2012), the initial three components within the trust equation constitute the numerator, with the fourth factor serving as the denominator. In mathematical terms, the requirement for a heightened trust value in this equation is influenced by elevated numerator values and diminished denominator values. The trust value, denoted as T_x(t), is a real number, with (x) representing attributes such as honesty, cooperation, or commitment to the common good. Moreover, there exist two distinct categories of trust observations, the first being labelled as "direct trust observations" and characterized by the following formula:

$$T_{ik}^{\ x} = \frac{BT_{ik}^{\ x}(t)}{1 + BT_{ik}^{\ x}(t)}$$

$$T_{a,u} = \prod_{u}^{a} T_{a,b,c,\ldots,n,u} = T_{a,b} \times T_{b,c} \times \ldots\ldots \times T_{n,u} = T_1 \times T_2 \times \ldots\ldots \times T_5 \times T_6^{n-5}$$

Where T x represents the likelihood of trust, and B denotes the impact of recommended faith. Furthermore, the researcher has the option to categorize belief based on two distinct elements: gauging trust in a social network environment proves challenging due to the varied and predominantly subjective nature of interactions on the network. When users incorporate new friends into their social network on numerous social networking platforms, they are frequently prompted to elucidate the nature of their connections (Abdullah & Al-Chalabi, 2019). The formula provided below serves to delineate this association:

In this context, where T1 through T6 denote the trust weights for different relationships, the trust between users 'a' and 'you,' separated by n+1 JUMPs through an intermediary user in the social network, can be computed using the provided equation. Trust founded on reputation signifies a user's standing, serving as a basis for establishing trust. Notably, even in the absence of direct social connections between the user and the expert, commendation from a recognized authority in a specific domain holds substantial influence among other users. Utilizing the Multiple Attribute Utility Theory, the trust through reputation between users and 'you' can be evaluated based on the measured values of these attributes.

$$T_{a,u} = a\frac{\sum PI}{totpi} + B\frac{\sum WTWP}{totwtwp} + Y\frac{\sum LF}{totlf} + \delta\frac{\sum NF}{totnf} + e\frac{\sum T}{tott} + \theta\frac{\sum_{i=1}^{n} GICi}{totgic}$$

Where α+β+γ+δ+ε+θ=1, Where PI represents personally identifiable information, WTWP corresponds to wall-to-wall postings, LF denotes the count of connections among friends, and NF signifies the number of friends. Additionally, T stands for the quantity of tags shared by users, and GIC represents the number of shared groups. The denominator "tot" associated with each characteristic reflects the overall quantity for each user attribute. The trust factor plays a pivotal role in the realm of electronic cloud services. Various symbols have been formulated within a mathematical equation to enhance feedback efficacy and evaluate diverse facets of trust (Noor & Sheng, 2011).

$$T_{rs} = \frac{\sum_{i=1}^{v} F_c(l,s)}{V(s)}$$

In this context, V(s) symbolizes the collective trust ratings assigned to cloud services.

3. Research Methodology

This mixed methods study employed both qualitative and quantitative approaches for data collection and analysis to investigate the technical and psychological determinants impacting online learning in Jordanian higher education institutions amid the COVID-19 pandemic. Qualitative data was acquired through 16 semi-structured videoconference interviews with students, instructors, and administrators from Jordanian universities. The interview guide focused on experiences with remote learning technology, academic integrity, and student engagement. Consent was obtained for recording, and interviews were transcribed verbatim. The transcripts underwent inductive analysis through thematic analysis, employing open and axial coding to discern significant themes pertinent to the research inquiries. The qualitative data analysis followed a three-step process according to Miles, Huberman, and Saldana, encompassing data reduction, data display, and the formulation or validation of conclusions (Hashimov, 2015).

Quantitative data were gathered through an online survey disseminated to both undergraduate and graduate students, as well as faculty members, in five prominent public and private universities in Jordan. A stratified random sampling method was employed to ensure proportional representation across institutions, taking into account student enrolment and faculty size.. A total of 614 comprehensive responses were collected, comprising 420 from undergraduate students, 104 from master's students, and 90 from

faculty members. The sample exhibited diversity across various academic disciplines, encompassing arts/humanities, social sciences, natural sciences, engineering, business, and health sciences. The demographic characteristics of the survey participants are summarized in Table 1.

Table 1

Interviewee's Codes and Professional Level Description

Codes	Interviewees' professional profile
I1, I2, and I3	IT security managers, professors in cybersecurity
I4, I5, and I6	Project manager, senior technical engineers
I7, I8, and I9	Assistant professor in IT, professors in computer science
I10, I11, and I12	Associate professor in digital marketing, professor in information security, and assistant professor in MIS
I13, I14, I15, and I16	Regional manager in IT, financial manager, and technical engineers.
I17, I18, and I19	Postgraduate students

The concurrent use of qualitative and quantitative methodologies afforded a holistic assessment of the technical and psychological factors influencing online education in Jordan amidst the pandemic. Thematic analysis of interviews yielded nuanced insights into participants' experiences, while the extensive survey facilitated generalizable estimates of impacts on learning technologies, academic integrity, student engagement, and related aspects. The integration of both methodologies enhances the comprehensiveness of the study, contributing to a more thorough exploration of the research questions.

4. Main Results

Numerous factors identified in this study may exert an influence on online learning in the context of the COVID-19 crisis, as delineated below:

4.1 Technological Factors

4.1.1 Online Educational Applications

This study reveals the utilization of various applications for online learning within Jordanian educational institutions, including Moodle, Skype, Zoom, Microsoft Teams, YouTube, and Google Classroom. In April 2020, lecturers in most JHEIs were given the autonomy to choose the online learning application of their preference, resulting in a multitude of applications being employed. This led to student confusion and dissatisfaction. To address this issue, the Minister of Higher Education in Jordan mandated universities to streamline their focus on one or two applications for online learning. Examples include Zarqa University adopting Microsoft Teams and internal Moodle, Jerash University utilizing Zoom, and the University of Jordan emphasizing Moodle and Microsoft Teams. The allowance for diverse applications is argued to have a detrimental impact on students. One of the assistant professors who participated in this study stated, "*At the beginning of the COVID-19 pandemic, We were all confused – I mean both students and lecturers – and more than ten applications were used. Students start complaining day after day because of the inconsistency. It was our fault. We did not have enough experience, especially the practical experience.*" *I7.*

4.1.2 Devices used by Students

During the initial phase of the COVID-19 pandemic, instructors employed various devices for the teaching process, predominantly relying on personal devices such as laptops, smartphones, tablets, and desktops. Figure 1 illustrates the distribution of devices used by instructors, with 44 percent utilizing laptops, 27 percent employing desktops, 16 percent opting for tablets, and 13 percent utilizing smartphones. Notably, 29 percent of instructor's resort to smartphones and tablets, which generally possess more limited capabilities compared to laptops and desktops. Conversely, Figure 2 indicates that a majority of students use smartphones (62 percent) for attending classes or examinations, with 6 percent using tablets, 18 percent using laptops, and 14 percent using desktops. Researchers anticipated these outcomes in light of financial constraints and the prevalence of limitations associated with desktops and laptops among students.

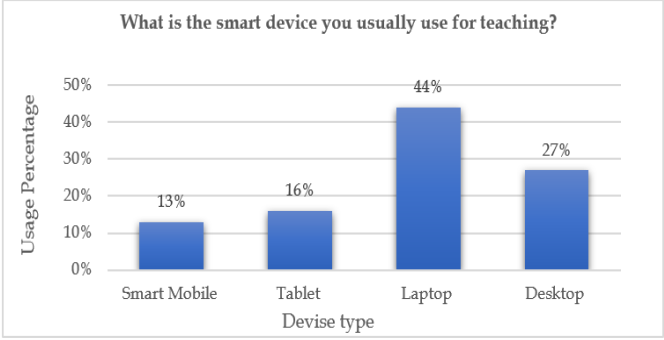

Figure 1. *The Devices used by Lecturers at Jordanian Universities.*

4.2 Lecturer's Technical Skills

An additional crucial determinant derived from this study pertains to the proficiency of lecturers in technical skills. Overall, there was an unforeseen enhancement in the technical skills of the majority of lecturers during the COVID-19 crisis. Figure 3 delineates the initial technical skills of lecturers in handling online learning tools and activities at the onset of the COVID-19 crisis, as per participants' self-assessment.

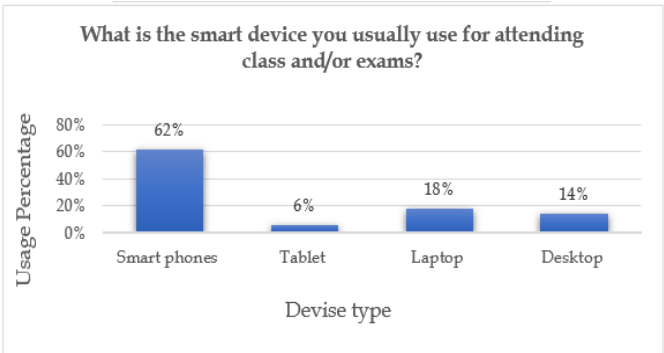

Figure 2.

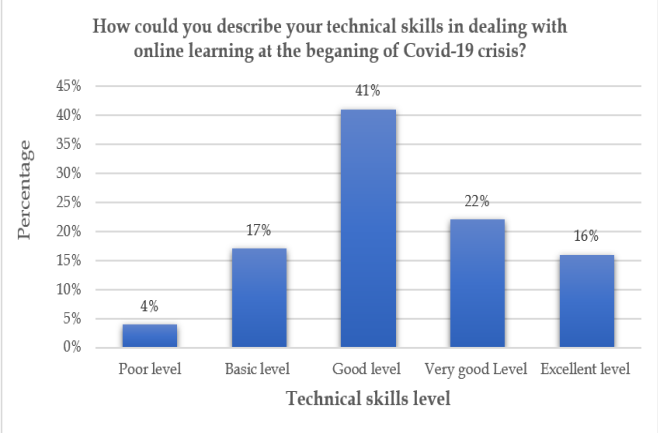

Figure 3. *Technical skills in dealing with online learning from lecturers' perspectives at Jordanian universities.*

As depicted in Figure 3, at the initiation of the COVID-19 pandemic, 41 percent of participants asserted possessing a proficient level of technical skills in navigating the online learning process. This outcome contradicted the researchers' expectations, given that many interviewees had initially described the technical skills of both students and lecturers as deficient during the onset of the COVID-19 pandemic (e.g., I3, I15), in contrast to the findings of this study (Al-Ramahi & Odeh, 2020; Noor & Sheng, 2011). Nevertheless, Figure 4 illustrates a notable enhancement in the technical skills level among the participants. The findings of this study reveal that 79 percent of participants perceive an improvement in their technical skills through the utilization of online learning. In contrast, 12 percent contend that there were no substantial changes in their technical skills, and 9 percent express uncertainty on this matter. These outcomes align with prior research findings regarding the implementation of E-learning in Jordanian educational institutions (Al-Jaghoub et al., 2009).

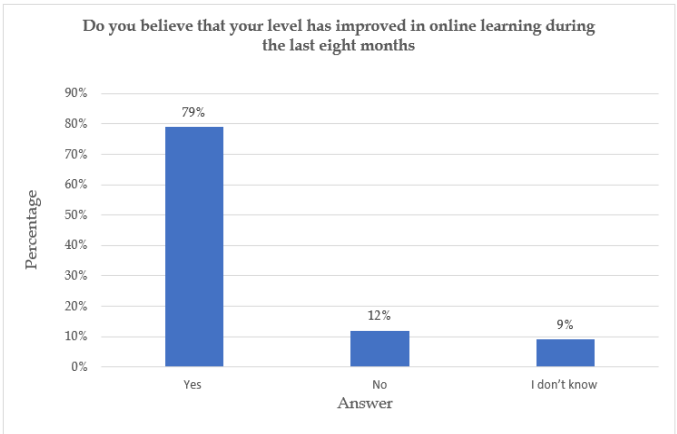

Figure 4. *Technical Skills Improvement in the Last Eight Months at Jordanian Universities*

4.2.1 *Psychological factors*

Various factors were identified in this study and categorized within the realm of psychological repercussions. These effects encompass instances of academic dishonesty during online examinations, the concentration levels of students, and the degree of earnestness exhibited by the student cohort.

4.2.2 *Cheating on the Exam*

The findings of this study suggest an elevation in cheating incidents during the implementation of online exams. A participant in this study (I3) remarked: "*There is no doubt that cheating was significantly increased in the last three months because of using online exams. Many lecturers informed me that students made groups through WhatsApp during the online exam. The redundancy in students' answers was obvious*". Illustrated in Figure 5, 42 percent of students acknowledged engaging in cheating behaviour during online exams, while 33 percent asserted abstinence from any form of cheating. Approximately 16 percent of participants declined to respond to this query, and 9 percent of students expressed uncertainty regarding whether their actions during exams could be deemed as cheating. Nevertheless, to uphold the study's credibility, participants were repeatedly apprised of the researchers' commitment to ethical considerations. Consequently, privacy holds paramount significance, and no names or profiles will be divulged.

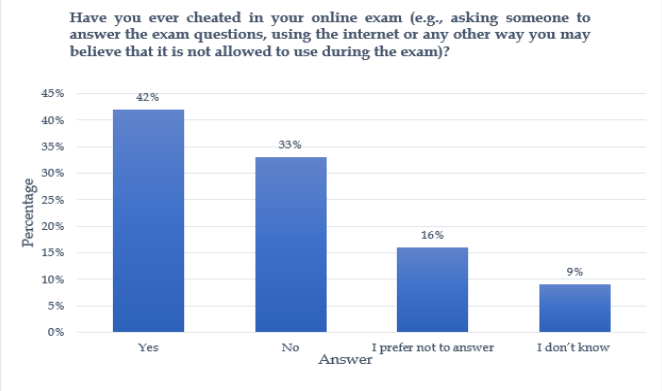

Figure 5. *Cheating on Exams*

In contrast to in-person examinations, gauging the concentration level during online exams represents one of the more intricate factors to assess. It may be regarded as a psychological variable, exhibiting variability across individuals. For instance, as articulated by participant I17: "*The distraction level in online exams is too high, especially at the beginning of COVID-19 quarantine. We have to have an online exam at home. It was widespread that one of the family members started a conversation with you during the exam!*" Figure 6 illustrates responses regarding the focus level during online exams in comparison to face-to-face examinations. Notably, Figure 7 reveals that 23 percent of students reported no focus at all. Intriguingly, 23 percent indicated an acceptable level of focus, 8 percent demonstrated good focus, 26 percent exhibited excellent focus during online exams, 11 percent displayed an exceptional level of focus, and 9 percent were uncertain.

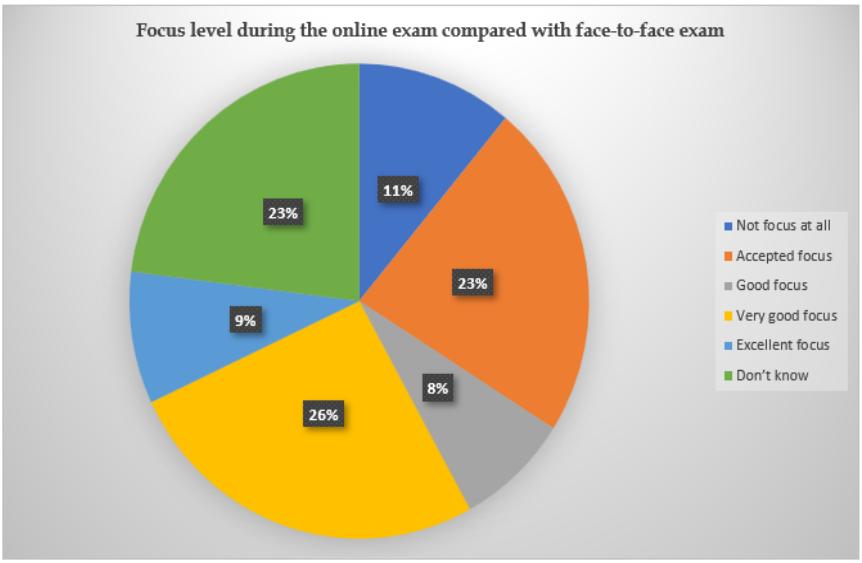

Figure 6. *Focus level during the online exam compared with a face-to-face exam at Jordanian Universities*

4.2.3 Level of the Seriousness of Online Exams Vs. Face-to-Face Exams

The ultimate factor examined in this study pertained to the perceived gravity of online exams. Figure 7 delineates that 6 percent of students perceive online exams as stringent, while 56 percent contend that the seriousness level of online exams is comparatively lower. In addition, 19 percent of students believe online exams hold the same level of seriousness, and an additional 19 percent are uncertain on this matter.

Expressing alignment with the perspective on the seriousness level during online exams, participant I8 articulated: "*Simply, I can say that online exams have almost no seriousness or to be realistic in my online argument exams have less seriousness level than face-to-face exams. I can reach this conclusion not from my job at university but as a witness in my family. They never deal with online exams seriously*".

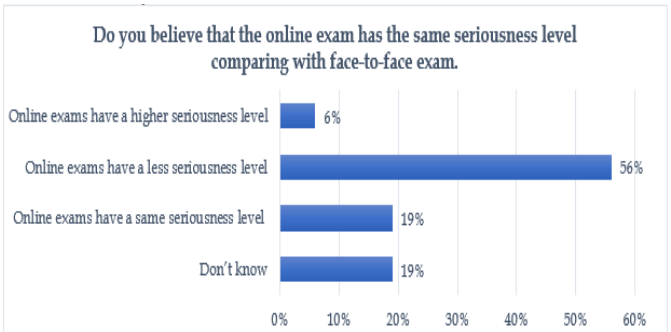

Figure 7. *Online Exams Profound Level among Students at Jordanian Universities*

5. Proposed framework

Figure 8. *Proposed Framework*

Figure 8 encapsulates the outcomes of this study in the form of a conceptual framework. As delineated in the proposed framework, the online learning process is shaped by technological and psychological factors, manifesting both positive and negative impacts. Technological elements identified in this study encompass devices utilized by students, devices employed by lecturers, E-learning applications, technical competencies of lecturers, and advancements in technical skills. Psychological factors encompass cheating on exams, concentration levels, and the extent of seriousness. Devices used by students, E-learning applications, cheating on exams, concentration levels, and the degree of severity exhibit adverse effects on the utilization of E-learning during the COVID-19 pandemic. Concurrently, devices used by lecturers, technical competencies of lecturers, and progress in technical skills exert positive influences on the adoption of E-learning during the COVID-19 pandemic.

6. Framework Validation

The assessment of the newly proposed framework's effectiveness and the reliability of research results is imperative. Validation serves as a crucial component in the development process, enhancing the framework's efficacy and utility. External validation involves comparing the research findings with prior studies, while internal validation incorporates expert feedback from professionals in Jordanian Higher Education Institutions (JHEIs) and cloud computing. This evaluation gauges the perceived value of the framework among stakeholders and assesses its feasibility for adoption and implementation. The researcher engaged with 11 potential evaluators, aiming to secure a minimum of five affirmative responses. These evaluators were selected from interviewees in this study, chosen based on their professional expertise in the research topic. Consequently, five individuals accepted the invitation to participate as evaluators, each possessing a minimum of 15 years of experience in HE. Table 2 delineates the evaluators' codes, areas of expertise, the Jordanian Higher Education Institution (JHEI) to which they are affiliated, their years of experience, and the classification of the university (public or private). It is noteworthy that the evaluators hailed from the same institutions that were integral to the research.

Table 2

Evaluators' Profiles

Evaluator	Professional background	Years of experience	University name code/ Type
P1	Professor of computer engineering/virtual reality	23 years	U1/ Public University
P15	Professor of information systems/ cloud computing	21 years	U2/ Public University
P16	Professor of computer science/cloud computing	19 years	U2/ Public University
P3	Professor of management information systems	15 years	U3/ Private University
P20	Professor of management information systems	17 years	U3/ Private University

7. Discussion

The findings of this study both corroborate and deviate from significant conclusions in the extant literature pertaining to online learning in higher education. In alignment with previous research, the swift shift to remote instruction exposed deficiencies in technological infrastructure, resources, and instructor preparedness to facilitate proficient virtual education (Haider & Al-Salman, 2020; Yassine et al., 2022). Similar to other developing nations scrutinized in the literature, Jordanian universities encountered impediments associated with restricted device accessibility for students, fluctuations in educators' technical competencies, and the availability of robust learning management systems for remote instructional purposes (A Sa'di, Abdelraziq, & A Sharadgah, 2021; Abu-Al-Aish & Jerash, 2021; Alkhalil et al., 2021; Alsoud & Harasis, 2021).. Nonetheless, a fundamental advantage that surfaced aligns with antecedent studies, indicating enhancements in instructors' technological proficiency attributable to necessity-driven

training and experience gained through the utilization of online platforms during the pandemic. (Al-smadi, Abugabah, & Smadi, 2022; Alkhalil et al., 2021; Obeidat, Obeidat, & Al-Shalabi, 2020; Shahroury, 2022).

The elevated instances of academic dishonesty and diminished student engagement and focus, as documented, also correspond with inquiries into the integrity of online exams and academic performance in alternative settings (Elsalem et al., 2021; Khan et al., 2021; Mukhtar et al., 2020). The extent of changes in concentration, effort, and cheating behaviours compared to face-to-face learning varies, highlighting the need for further research to identify culturally influenced underlying factors

In the realm of psychological impacts, the notable disparity perceived between online and in-person exams aligns with findings on reduced motivation and learning discipline observed in other developing nations (Moy & Ng, 2021; Rahm et al., 2021; Sari & Oktaviani, 2021; Zhang et al., 2022). Yet, the reasons for this disparity warrant additional investigation into students' attitudes and study environments during the shift to emergency remote learning. Intriguingly, instructors' perspectives on advancements in their technological skills exhibit some contrast with students' accounts of variations in teacher preparedness and online teaching quality. These divergent perceptions parallel discrepancies observed in other evaluations comparing faculty self-reported confidence with post-pandemic student assessments (Bahodirovich & Romilovich, 2021; Lei & So, 2021; Zhang, 2020).

In summary, though numerous challenges align with existing literature, the pronounced magnitude of academic integrity, engagement, and perception gaps uncovered in Jordan's pandemic transition indicates an elevated significance. Further targeted research is imperative to delineate causes and propose context-specific solutions. This emphasizes the necessity of eschewing universal approaches as online learning continues its global expansion.

8. Conclusion

This study sought to uncover the pivotal technical and psychological factors influencing the abrupt shift to online learning in Jordanian higher education institutions prompted by the COVID-19 pandemic. The findings unveiled both advantages and persistent challenges, carrying implications for theory, practice, and policy.

On a theoretical level, the study validates established models of technology acceptance, emphasizing the critical role of infrastructure and skills in effective utilization of virtual education systems. However, it also underscores the necessity to incorporate elements related to academic integrity and student motivation due to the significant impact on online learning outcomes. In practical terms, urgent attention is required to address gaps in technology access, educator training, and institutional resources. Ongoing support and capacity building for both instructors and students are imperative. Strategic allocation of funding and partnerships with education technology providers can expedite the enhancement of Jordan's higher education system, ensuring it is equipped for digitally connected teaching and learning in the 21st century. In terms of policy implications, the establishment of national standards and quality assurance mechanisms for online education is pivotal to ensure uniformity and equity across universities. This initiative

should encompass guidelines pertaining to learning platforms, cybersecurity, academic conduct, and essential technology requirements. Policy incentives may further stimulate institutions to prioritize the integration of virtual instructional design and delivery within degree programs.

A limitation of this study is its dependence on self-reported data, introducing potential biases. Augmenting the research with learning analytics and institutional metrics could enhance objectivity. Additionally, the geographical restriction to Jordanian universities may limit the generalizability of findings to other developing country contexts. Further cross-institutional and cross-national investigations are warranted.

In summary, this study provides significant empirical evidence on the sudden implementation of online learning in a developing country's higher education system with limited prior virtual infrastructure. While affirming universal challenges reported elsewhere, the results emphasize heightened impacts on academic integrity and student engagement within this regional context. As blended and technology-enabled education continues to expand globally, the Jordanian experience offers instructive lessons for shaping strategies tailored to local needs. This approach ensures that online learning realizes its potential in democratizing access without compromising academic standards or outcomes.

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