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Rethinking computer-based examinations in higher education: psychological, technical, and pedagogical challenges from students' learning experience and future directions

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ABSTRACT

The swift adoption of computer-based examinations (CBEs) in higher education has revolutionized assessment methods; nonetheless, there is a lack of thorough research investigating the psychological, technical, and pedagogical experiences of students using these systems. This research explores the various challenges associated with CBEs at Yarmouk University and assesses their influence on students' learning experiences. A cross-sectional quantitative survey was conducted among 545 undergraduate students from various academic fields during the first semester of the 2025–2026 academic year. Both descriptive and inferential analyses were performed to evaluate students' perceptions. Research shows a moderate level of acceptance for CBEs, but notable worries remain. The main source of stress was found to be technical reliability, often overshadowing worries about educational content. The one-way navigation aspect was recognized as a significant obstacle, which restricted students' ability to review answers and added to cognitive strain and hasty decision-making. Furthermore, a significant gap in feedback was noted, as students mostly viewed the system as a tool for grading rather than a resource for ongoing learning. The research finds that successful digital assessment necessitates not just operational effectiveness but also adaptable design, alignment with pedagogical goals, and valuable feedback systems. Practical implications involve rethinking navigation elements, improving technical support, and offering focused training for faculty.

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1. INTRODUCTION

Recently, the concept of assessment in higher education has undergone a significant transformation with the advent of computer-based examinations (CBEs). These digital assessment methods have assumed a significant role in educational institutions, reflecting the emergence of technology and the need to enhance efficiency, accessibility, and student evaluation. CBEs, which involve having and assessing exams through computers or digital platforms, extend direct feedback and include different types of assessment formats that can help students understand their skills. Higher education's quick digital transformation has drastically changed student involvement models and evaluation procedures [1]. This digital transformation has brought about both major structural constraints and potential for innovation in Jordanian higher education [2].

However, incorporating a new method into the educational process cannot be without challenges. Many studies conducted over the past few years have yielded promising results regarding CBEs and their impact on both students and assessments; however, several issues persist. Starting with psychological challenges, students still suffer from psychological stress and pressure before any online exams, which negatively affects their performance [3]. While the technical challenges among students vary from problems with internet connection, or problems with the software of devices used in exams, to the illiteracy of some students in using computers [4]. It is noted that CBEs have achieved the desired course objectives [5]. The usefulness of online assessments in education is largely dependent on how well they are implemented [6].

The qualitative shift between technical exams and computer-based exams is not new, but due to COVID-19, interest in it has increased. Paper-based exams rely on visual and physical contact from students and allow them more flexibility in dealing with the content [7]. Assessment methods have varied from traditional methods to alternative and, lastly, to digital assessments [8].

This study significantly advances the discipline by shifting the focus from widespread adoption of technology to a more in-depth, multifaceted understanding of CBE experiences. This study is innovative because it takes an integrated approach, evaluating pedagogical, psychological, and technical elements all at once instead of examining assessment tools separately. In contrast to previous research, this study examines how certain system design policies—like navigation restrictions—act as crucial elements affecting student stress and academic performance. Additionally, the extensive empirical data from a varied sample of more than 540 students from Yarmouk University's scientific and humanities divisions highlights the originality. This offers a complete framework that bridges the gap between institutional policies and the genuine psychological and technical realities of students, as well as a strong, localized viewpoint on digital assessment in changing educational contexts.

Despite previous studies and recommendations on computer-based exams, students still suffer from these types of exams, whether psychologically, technically, or educationally. This study works toward reconsidering the reasons and what students can discover so that this type of exam can be developed in a manner that suits educational and teaching objectives. This study aims to: i) explore psychological, technical, and pedagogical challenges; ii) investigate students' learning experiences with CBEs; and iii) suggest future directions for improvement. While the study will answer the following questions:

- What are the psychological challenges students face during CBEs?
- What technical issues delay the effectiveness of CBEs?
- How do pedagogical approaches influence students' experiences with CBEs?

2. COMPUTER-BASED EXAMINATIONS

2.1. Definition and types of CBES

The educational process has evolved rapidly and significantly over the past few years due to the COVID-19 pandemic, which has forced educational institutions to quickly adapt to support distance learning [9]. Furthermore, the recent spread of artificial intelligence tools and technological advancements requires keeping pace with this revolution in the most efficient and rapid ways [10]. Despite the above, the process of remote assessment is not new; educational institutions have relied on remote assessment of their students in various ways, such as using Moodle platforms and computerized assessments. Famoroti [11] described CBE as a systematic process for gathering information and providing feedback that describes the learning procedure, including learners' perception and outcomes; therefore, learners will be effectively engaged in the learning process. Another definition of CBEs refers to the assessment approach where students use computers to answer questions presented on screen [12].

CBE can be classified into several categories based on accessibility, design, assessment, timing, question type, and proctoring. These categories can overlap for a single exam. Accessibility classified exams could be an online exam like TOEFL iBT or an offline exam like the ICDL exam. Adaptive CBEs types are either adaptive or fixed exams; fixed exams are designed in advance and presented to all students in a random or ordered order, while the adaptive exams, on the other hand, are exams where the nature of the questions adapts and the difficulty level changes based on the examinee's performance, like the GRE and GMAT exams [13]. Finally, exams can be divided according to timing into timed exams and open-time exams [14].

2.2. Advantages and disadvantages of CBES

Research indicates many challenges faced by the CBE process. Research, surveys, and instructor reports have shown a significant increase in reported cheating attempts, high initial cost, and technical limitations like poor connections and power issues [15]. Well-designed online evaluation systems can improve openness, accountability, and fairness while lowering potential for academic misconduct [16].

Most of the problems found can be fixed, and researchers recommend using CBEs after any problems have been fixed by balancing the advantages and disadvantages [17].

2.3. Psychological challenges: stress, perception, and digital readiness

Biccard *et al.* [9] discussed students' psychological concerns in an online assessment environment; their results support three predominant aspects raised by students: digital access, which describes the lack of suitable devices, data, and connectivity, usability of the examination system interface, and the duration of the exam. These three issues create psychological challenges for students to use CBE effectively. According to previous research, technical ambiguity and performance monitoring in digital exam situations may exacerbate cognitive distress [18]. The perception of fairness and trust is another issue, particularly with the advent of AI-assisted proctoring systems [19].

2.4. Technical challenges: infrastructure, security, and privacy

During tests, students reported several technological problems that greatly affect their performance, such as server disconnections, unpredictable electricity supplies, and computer malfunctions [17]. These difficulties frequently result in missed deadlines and unfinished submissions. Additionally, Faniran *et al.* [20] talked about technical challenges that even technologically proficient students have, like sluggish internet speeds and connectivity issues that impede advancement during CBEs. Additionally, poorly designed user interfaces and broken graphics might make it difficult for students to engage with test items.

2.5. Pedagogical challenges: assessment design and educational validity

Significant pedagogical gaps in CBEs were found by Shraim [21], who pointed out that many online assessments have poor design and prioritize memorization and factual recall over critical comprehension or analysis. This is sometimes caused by the use of constrained question formats, such as multiple-choice and true-false questions, which might not sufficiently show higher-order thinking abilities. Shraim [21] suggests changing the emphasis from strictly summative grading to formative assessment and broadening the range of assessment techniques, such as employing e-portfolios and presentations, in order to allay these worries. Effective digital evaluation must ultimately promote deeper cognitive engagement and be in line with long-term learning objectives [22].

3. LITERATURE REVIEW

Basopi *et al.* [17] discussed the challenges of conducting CBEs in Indonesian high schools. Since 2014, the Indonesian government has implemented both CBE and traditional paper-based tests for the national examination, which is a standardized evaluation system administered from junior to senior high school levels in Indonesia. This study aims to explore the challenges encountered by students in these examination formats. A qualitative research design was employed, utilizing semi-structured interviews with six high-school graduates as participants. The findings indicate that CBE poses three primary challenges: limited familiarity with computer hardware, heightened anxiety due to the visible countdown timer, and concerns about potential technical failures that could disrupt the examination process. In contrast, traditional exams are associated with issues such as poor print quality of test papers, difficulties in accurately shading Optical Mark Recognition (OMR) answer sheets, and time-management pressures leading to stress and rushed responses. The study concludes that both CBE and traditional formats present distinct obstacles that can hinder students' optimal performance. These insights contribute to improving the design, implementation, and fairness of national examinations in Indonesia, as discussed further in this paper.

University students' opinions of online tests and e-proctoring systems were examined in previous study by Terblanche *et al.* [23]. According to their findings, students voiced worries about privacy, increased anxiety, technological reliability, and the fairness of remote proctoring technology, even while they praised the flexibility and convenience of online exams. The study suggested that in order to increase students' acceptance and trust in computer-based exams, assessment design should be improved, technical support should be improved, and proctoring systems should be made more transparent.

Biccard *et al.* [9] studied the impact of using online exams on undergraduate students in South Africa. They surveyed Bachelor of Education students and Post Graduate Certificate in Education students, and they received 2858 responses to their survey. Their results indicate the privileges of using online assessment tools, like: flexibility and convenience by taking the exam from home, saving the effort and expense of traveling to exam halls. Also, online assessment tools provide a familiar environment through the availability of a comfortable location, reducing stress and anxiety compared to traditional exams, and finally, they save time. Yet, although students responded positively to the procedure of online assessment, they had few concerns, including technical issues, like unstable internet connections, power outages, and problems with the exam platform itself. Other issues the students highlight are the cheating and lack of integrity,

psychological stress raised by technical concerns, difficulty in assessing certain skills online, and the inequality where not all students have computers or a high-quality internet connection.

Monsurat *et al.* [24] studied the students' perspective on using CBE and the challenges they had. They used a stratified sampling technique, consisting of 800 university students from different departments and universities, and research data collected using a survey entitled computer-based test (CBT) mode of examination questionnaire. Final results reflect a positive computerized examination experience; it was found that this approach reduces the printed papers and answer booklets, saving exam administration time and effort. The challenges raised by applying CBE are: the insufficient CBT centers, interrupted power supply, irregular timetable, and insufficient ICT officers. The conclusion considered using the CBT mode of examination in the university as an effective approach, and recommends continuous use of this examination mode.

Harley *et al.* [25] compared in their research between the traditional and CBE on a sample of 74 undergraduate students in the University of Alberta's ethical committee. Research procedures follow applying five-point Likert scale survey on two different students sets, one study the course and had traditional exam, while test sample had computerized exam. Also, the sample asked to describe the physical environment and their final results showed that during the computerized exams, students had fewer negative emotions comparing to tradition exams, females' students reported higher retrospective negative emotions.

Shraim [21] examined the CBEs from the viewpoint of the students. In order to investigate current online testing methods, she polled 342 undergraduate students at Palestine Technical University–Kadoorie. The study looked at online evaluations' instructional value, validity, reliability, affective elements, practicality, and security. The results showed that pupils favored online assessments over conventional paper-based exams. In terms of grading efficiency and dependability, CBEs performed better, saving time, effort, and money. However, students also mentioned a number of difficulties, especially with regard to security, validity, and fairness. The study further suggests that electronic examinations are more suitable for formative assessments, emphasizing learning progress rather than summative evaluation. Ultimately, the successful adoption of online exams depends on their careful design to ensure validity, reliability, security, and flexibility. Prior studies have also looked at how university students interact with computer-based and online assessment environments, emphasizing how these systems affect students' performance, engagement, and satisfaction [21].

Scherer *et al.* [4] discussed in their study a robust and comprehensive test of the technology acceptance model (TAM) in an educational context by examining the key factors driving teachers' adoption of digital technology in their teaching practices. Using advanced statistical methods, specifically meta-analytic structural equation modeling (MASEM), the researchers collected and synthesized 124 correlation matrices from 114 empirical TAM studies (N=34,357 teachers) and tested the fit of the TAM and its versions. The results confirmed the strong and positive impact of both perceived usefulness and ease of use on teachers' intention to use digital technology. The study also highlighted several external factors influencing technology use in education, such as institutional support, training, and experience.

TAM, which created by Davis [26], serves as the foundation for this investigation. TAM is widely acknowledged as one of the most important frameworks for comprehending how people adopt and utilize new technology, especially in educational contexts. According to TAM, there are two main elements that influence a student's acceptance of CBEs. First, perceived ease of use (PEOU), this is the degree to which a student thinks using the electronic exam platform would be simple and easy. According to this study, PEOU is closely related to the "technical challenges". For example, restricted features like "one-way navigation" make the system seem less user-friendly, which raises students' technical anxiety and decreases their acceptance of it overall. Secondly, perceived usefulness (PU), this is defined as the degree to which a student believes that the CBE system will enhance their academic performance or learning experience. This relates to the "pedagogical challenges" observed in the results; when immediate feedback is missing, or exam designs are poor, students perceive the technology as less useful, which negatively impacts their engagement [27].

4. METHOD

4.1. Research design and procedure

This research utilized a cross-sectional descriptive quantitative approach to investigate students' views on CBEs at Yarmouk University. The study was organized chronologically as: initially, a thorough examination of the literature was done to determine the main challenges (psychological, technical, and educational). Second, a pilot study was used to create and validate the survey instrument. Third, the university granted official ethical approval. Lastly, to guarantee that participants had new experiences with the CBE system, data collection was done during the midterm period of the first semester of the 2025–2026 academic year.

4.2. Population and sample

The research population comprises all undergraduate and graduate students at Yarmouk University. Convenience sampling was used to select a sample of 545 students because it was feasible to reach a wide range of faculties during the intensive exam period. Cochran's formula, which states that for a population larger than 20,000 students, at least 377 participants are needed to achieve a 95% confidence level with a 5% margin of error, provides statistical justification for this sample size. This cutoff is greatly exceeded by our sample of 545 people, guaranteeing strong data representativeness and trustworthy analysis. According to demographic statistics, 67.2% of the sample were female, and 32.8% were male, and the majority (67.0%) were between the ages of 18 and 20. The sample comprised students from both scientific and humanities subjects throughout all academic years.

4.3. Instrument development

Data were gathered through a structured survey created to evaluate students' experiences with CBEs. The device was made up of three parts. Firstly, demographic details (gender, age, department, academic year, educational level). Secondly, primary scale items assessing psychological, technical, and pedagogical difficulties using a five-point Likert scale (1=strongly disagree to 5=strongly agree). Thirdly, questions that invite detailed responses to gather qualitative insights about students' views and recommendations. The completed instrument consisted of 32 items categorized into three areas: mental, technical, and educational obstacles.

4.4. Validity and reliability

4.4.1. Construct validity

The item-total correlation coefficients for each domain were calculated to evaluate construct validity. Correlation coefficients varied between 0.38 and 0.87, all statistically significant at the 0.05 and 0.01 thresholds. These findings show that every item was suitably matched with its corresponding constructs, and no items were eliminated.

4.5. Reliability

Reliability was evaluated with a pilot group of 20 students separate from the primary study sample via a test-retest method carried out over a two-week period. Two reliability metrics were computed: Pearson's correlation coefficient (index of stability), Cronbach's alpha (consistency within), values of Cronbach's alpha varied from 0.82 to 0.86 across different domains, 0.89 for the complete tool. Pearson's stability coefficients varied from 0.88 to 0.90 throughout domains, 0.91 for the complete instrument. These values reflect strong internal consistency and significant stability, affirming the instrument's reliability for the present study.

4.6. Data analysis method

SPSS (v.26) was used to analyze the collected data to meet the research objectives. The statistical techniques listed were used: i) ANOVA to find significant differences based on demographic variables; ii) Cronbach's alpha and Pearson correlation to confirm the tool's psychometric qualities; and iii) descriptive statistics, such as frequencies, percentages, means, and standard deviations, to describe the sample and rank the obstacles.

5. RESULTS

5.1. Statistical standard

The participants' responses were interpreted using a 5-point Likert scale (agree=4, disagree=2, severely disagree=1, neutral=3, and strongly agree=5). The mean scores were divided into three groups for analysis using a specific scale: low (1.00–2.33), moderate (2.34–3.67), and high (3.68–5.00). This classification was computed using the interval equation. By deducting the lower limit (1) from the upper limit (5) and dividing the result by the number of groups (3), the interval of 1.33 was found. By adding this time frame to the end of each category, the study ensured a consistent and objective standard for evaluating the educational, psychological, and technical challenges.

5.2. Validity of the survey

To assess the construct validity of the CBE skills scale, the correlation coefficients between each item and the total score of its corresponding skill were calculated. These coefficients indicate the extent to which each item contributes to measuring the overall construct. The results showed that the correlation coefficients ranged from 0.38 to 0.87, all of which were statistically significant. This demonstrates that all items on the scale are appropriate and effectively measure the intended constructs. Table 1 displays the

outcomes of the analysis on construct validity. Correlation coefficients for each item against the total score of its respective domain were computed to assess how well each item reflects the intended construct. None of the items were removed from the scale because it is evident from the table that all correlation coefficients are adequate and statistically significant. This strong validity attests to the research instrument's suitability for assessing the study sample's intended psychological and pedagogical factors.

Table 1. Correlation coefficients between items and the total score for each skill

Psychological challenges		Technical challenges		Pedagogical challenges	
Item #	R With a total score of skill	Item #	R With a total score of skill	Item #	R With a total score of skill
1	0.87(**)	12	0.44(*)	23	0.40(*)
2	0.85(**)	13	0.51(**)	24	0.67(**)
3	0.85(**)	14	0.38(*)	25	0.63(**)
4	0.76(**)	15	0.56(**)	26	0.82(**)
5	0.82(**)	16	0.56(**)	27	0.61(**)
6	0.76(**)	17	0.39(*)	28	0.64(**)
7	0.69(**)	18	0.61(**)	29	0.83(**)
8	0.65(**)	19	0.51(**)	30	0.75(**)
9	0.63(**)	20	0.63(**)	31	0.40(*)
10	0.51(**)	21	0.44(*)	32	0.69(**)
11	0.67(**)	22	0.67(**)		

Note: *Correlation is significant at the 0.05 level, and correlation is significant at the 0.01 level (2-tailed).

5.3. Reliability of the research instrument

The test-retest approach was used to pilot the research instrument (questionnaire) on a sample of 20 students who were not part of the actual study sample in order to assess the reliability of internal consistency and the stability index for the instrument and its domains. Over the course of two weeks, the researcher gave the questionnaire to the pilot sample twice. The following metrics were then used to determine the reliability. First, Pearson's correlation coefficient, which shows how stable the instrument was over the course of the two administrations. Second, depending on the initial administration, Cronbach's alpha is used to show the internal consistency of the questionnaire items.

5.4. Analysis and interpretation

The stability index (Pearson) for the domains in Table 2 varied from 0.88 to 0.90, with a total of 0.91, suggesting strong stability during the two administrations. Furthermore, the domains' internal consistency (Cronbach's alpha) ranged from 0.82 to 0.86, while the instrument's overall Cronbach's alpha was 0.87, suggesting strong inter-item dependability. These findings support the conclusion that the research tool is trustworthy and appropriate for the current investigation.

Table 2. Pearson's correlation coefficient and Cronbach's alpha for the domains

Domain	Cronbach's alpha	Stability index
Psychological challenges	0.84	0.88
Technical challenges	0.86	0.90
Pedagogical challenges	0.82	0.89

Note: correlation is significant at the 0.01 level (2-tailed).

5.5. Reliability of the research instrument

To determine the reliability of internal consistency and the stability index for the research instrument (questionnaire) across its domains and total score, the instrument was piloted on a sample of 20 students outside the actual study sample using the test-retest method. The questionnaire was administered twice to the pilot sample over a period of two weeks. The reliability was calculated using the following measures: i) Pearson's correlation coefficient, to indicate the stability of the instrument across the two administrations; ii) Cronbach's alpha to indicate the internal consistency of the questionnaire items based on the first administration. Table 3 displays the reliability assessment of the research tool, employing the Pearson correlation coefficient and Cronbach's alpha to evaluate the stability and internal consistency of the survey.

Table 3 shows that the stability index (Pearson) for the domains ranged from 0.88 to 0.90, and was 0.91 for the total score. The internal consistency (Cronbach's alpha) for the domains ranged from 0.82 to 0.86, and was 0.89 for the total score. These coefficients indicate that the research instrument is reliable and suitable for use in this study.

Table 3. Pearson's correlation coefficient and Cronbach's alpha for domains and total score

Domain	Cronbach alpha	Stability index
Psychological challenges	0.84	0.88**
Technical challenges	0.86	0.90**
Pedagogical challenges	0.82	0.89**
Overall	0.89	0.91**

**Correlation is significant at the 0.01 level (2-tailed).

5.6. Study sample

Table 4 presents the sample distribution of the study participants across several demographic characteristics. The majority of the sample were female students (67.2%) compared to males (32.8%). Regarding age, most participants were between 18 and 20 years old (67.0%), followed by those aged 21–23 (26.1%), 24–26 (2.9%), and more than 26 (4.0%). In terms of faculty affiliation, slightly more than half of the students (54.7%) belonged to scientific faculties, while 45.3% were from humanities faculties. The academic year distribution shows that the largest group was first-year students (34.5%), followed by second-year (27.3%), third-year (19.6%), and fourth-year or higher (18.5%). Finally, the majority of participants were undergraduates (97.1%), with a small proportion being graduate students (2.9%). This distribution provides a clear overview of the demographic profile of the study sample. How frequently do you take CBE? Understanding the frequency of taking CBE helps gauge students' regular exposure to digital assessments.

As presented in Table 5, most students reported taking CBE often (44.6%) or occasionally (32.8%), while a smaller percentage reported taking them very often (17.6%) or rarely (5.0%). This suggests that the sample generally has frequent experience with computer-based assessments. Do you have any special needs or disabilities that may affect your exam experience? Identifying students with special needs is essential for understanding potential challenges in digital exam settings.

Table 4. Sample distribution

Frequency		Percentage (%)	Valid percentage (%)
Gender	Female	366	67.2
	Male	179	32.8
Age	18–20	365	67.0
	21–23	142	26.1
	24–26	16	2.9
	More than 26	22	4.0
Faculty	Scientific	298	54.7
	Humanities	247	45.3
Academic year	1st	188	34.5
	2nd	149	27.3
	3rd	107	19.6
	4th or more	101	18.5
Academic level	Undergraduate	529	97.1
	Graduate	16	2.9
	Total	545	100.0

Table 5. Frequency of taking CBEs

Percentage (%)	Frequency	Frequency level
44.6	243	Often
17.6	96	Very often
32.8	179	Occasionally
5.0	27	Rarely
100.0	545	Total

Table 6 shows that the majority of students (94.7%) reported having no special needs or disabilities that could affect their exam experience, while a small proportion (5.3%) indicated that they did. This indicates that only a minority of the sample may require accommodations for digital exams. What is your level of computer skills? Assessing students' computer skills provides insight into their preparedness for digital assessments.

It can be observed from Table 7 that most students reported having intermediate computer skills (58.5%), followed by advanced skills (24.0%) and beginner skills (17.4%). These findings suggest that the sample is generally capable of handling CBEs, though some may benefit from additional support or guidance. To answer the first research question, the means and standard deviations of the psychological challenges faced by students during CBEs were calculated, as presented in Table 8.

Table 6. Presence of special needs or disabilities affecting exam experience

Percentage (%)	Frequency	Response
94.7	516	No
5.3	29	Yes
100.0	545	Total

Table 7. Students' level of computer skills

Percentage (%)	Frequency	Students' level
24.0	131	Advanced
58.5	319	Intermediate
17.4	95	Beginner
100.0	545	Total

Table 8 presents the means and standard deviations of students' psychological challenges during CBEs. The highest mean was reported for the item "Technical issues increase my stress during exams" (M=3.73, SD=1.39), indicating that technical problems are the most stressful factor for students. Conversely, the lowest mean was observed for the items "I feel more anxious during computer-based exams than paper-based ones" and "The lack of human interaction makes computer-based exams feel more isolating" (M=2.50, SD=1.44 and 1.37, respectively), suggesting that anxiety and social isolation are moderately experienced. Overall, the average mean across all items was 2.98 (SD=0.86), reflecting a moderate level of psychological challenges among participants during CBEs.

Table 8. Means and standard deviations of psychological challenges during CBEs

Rank	N	Item	Mean	Std. Deviation	Degree of agreement
1	2	Technical issues increase my stress during exams.	3.73	1.39	High
2	4	I worry about accidentally losing my answers or progress.	3.45	1.43	Moderate
3	5	I experience a fear of "technical failure" (e.g., freezing, disconnection) even before starting the exam.	3.41	1.47	Moderate
4	10	I feel more confident in computer-based exams	3.22	1.41	Moderate
5	7	The visual design (colors, font size, layout) of the exam interface affects my comfort and concentration.	2.89	1.47	Moderate
6	6	I find it difficult to maintain time awareness during computer-based exams.	2.77	1.47	Moderate
7	9	The countdown timer on the screen increases my stress levels.	2.73	1.49	Moderate
8	3	I find it difficult to concentrate in computer-based exams.	2.61	1.41	Moderate
9	1	I feel more anxious during computer-based exams than paper-based ones.	2.50	1.44	Moderate
9	8	The lack of human interaction makes computer-based exams feel more isolating.	2.50	1.37	Moderate
		Psychological challenges	2.98	0.86	Moderate

Note: ranked in descending order

To answer the second research question, the study computed the means and standard deviations for the items related to technical challenges. These items represent different technical factors that may hinder students' performance and experience during CBEs. The results are presented in Table 3, ranked in descending order according to their mean scores.

As shown in Table 9, the item "One-way navigation limits my ability to review and improve my answers" received the highest mean score (M=4.54, SD=1.02), indicating that this is the most significant technical barrier faced by students during CBEs. Conversely, the lowest mean score was observed for the item "The exam platform is not user-friendly or intuitive" (M=2.22, SD=1.16), suggesting that general platform usability is a less critical issue. Overall, the average mean across all technical challenge items was 3.27 (SD=0.43), reflecting a moderate level of technical difficulties encountered by students. These findings highlight that navigation constraints and time restrictions are the most impactful technical issues, while general system usability and support are comparatively less problematic.

To answer the third research question, the study calculated the means and standard deviations for the items related to pedagogical factors. These items reflect different aspects of teaching and assessment practices that may affect students' performance, engagement, and perception during CBEs. The results are presented in Table 4, ranked in descending order according to their mean scores.

Table 9. Means and standard deviations of technical challenges affecting CBEs

Rank	N	Item	Mean	Std. Deviation	Degree of agreement
1	22	One-way navigation limits my ability to review and improve my answers.	4.54	1.02	High
2	21	Setting a fixed time for each question prevents me from thinking carefully about difficult questions.	3.88	1.38	High
3	11	The exam systems are easy to navigate and use.	3.60	1.28	Moderate
4	17	I feel more in control of my exam process when using personal devices (e.g., laptop, tablet).	3.54	1.27	Moderate
5	16	I trust that the system records my answers accurately.	3.39	1.26	Moderate
6	15	The computer lab or testing environment is ergonomically comfortable (e.g., lighting, seating, temperature).	3.33	1.36	Moderate
7	13	Technical support is available when issues occur.	3.31	1.23	Moderate
8	12	The system sometimes freezes or crashes during exams.	3.21	1.26	Moderate
9	14	I worry that my exam might not be submitted successfully.	2.97	1.45	Moderate
10	18	The system design supports students with different abilities (e.g., visual or motor limitations).	2.91	1.22	Moderate
11	20	Internet connection issues have interrupted my exam at least once.	2.40	1.47	Moderate
12	19	The exam platform is not user-friendly or intuitive.	2.22	1.16	Low
		Technical challenges	3.27	0.43	Moderate

As shown in Table 10, the item "I prefer exams that provide automated feedback immediately after submission" received the highest mean score (M=4.00, SD=1.14), indicating that students highly value immediate feedback and plays a significant role in their exam experience. Conversely, the lowest mean score was observed for the item "I receive useful feedback after taking computer-based exams" (M=2.83, SD=1.32), suggesting that post-exam feedback is perceived as less impactful. Overall, the average mean across all pedagogical factor items was 3.28 (SD=0.66), reflecting a moderate influence of pedagogical approaches on students' experiences with CBEs. These findings indicate that factors such as immediate feedback, transparency in grading, and exam format significantly shape students' engagement and perception during computer-based assessments.

Table 10. Means and standard deviations of pedagogical factors affecting students' experiences with CBEs

Rank	N	Item	Mean	Std. Deviation	Degree of agreement
1	32	I prefer exams that provide automated feedback immediately after submission.	4.00	1.14	High
2	30	I feel the system's grading process is transparent and fair.	3.58	1.29	Moderate
3	27	Computer-based exams encourage me to focus on speed more than understanding.	3.50	1.31	Moderate
4	28	The format (MCQs, drag-and-drop, typing) affects how I think and solve problems.	3.23	1.27	Moderate
5	26	I prefer computer-based exams over traditional paper exams.	3.22	1.52	Moderate
6	31	Computer-based exams often test memory rather than understanding.	3.16	1.30	Moderate
7	23	Computer-based exams reflect the actual learning outcomes of my course.	3.15	1.19	Moderate
7	29	I learn better when I know the exam will be computer-based.	3.15	1.34	Moderate
9	24	The format of computer-based exams helps me think critically.	2.95	1.25	Moderate
10	25	I receive useful feedback after taking computer-based exams.	2.83	1.32	Moderate
		Pedagogical challenges	3.28	0.66	Moderate

6. DISCUSSION

6.1. Interpreting student acceptance through TAM

The current results show that Yarmouk University has a moderate level of general acceptance of CBEs, this approval seems conditional rather than unconditional. The findings imply that PEOU is not necessarily an issue at the interface level when analyzed using the TAM. According to student reports, the platform is typically easy to use, demonstrating a sufficient level of digital literacy and technological tool knowledge. However, it appears that external institutional constraints impair PU and indirectly reduce behavioral intention to fully accept CBEs due to the substantial stress associated with technical instability and restrictive navigation laws.

This conclusion is consistent with the thorough TAM validation carried out by Scherer *et al.* [4], which showed that technology adoption is significantly influenced by external factors including system dependability and institutional support. In the current study, systemic design flaws that undermine confidence in the assessment environment are the problem rather than students' incapacity to use technology. Therefore, the results go beyond TAM by highlighting how regulatory limitations incorporated into digital systems can act as outside factors affecting PEOU.

6.2. Technical anxiety as a contextualized phenomenon

In alignment with previous studies [9], [17], technical instability surfaced as a significant cause of anxiety. Like in Indonesia and South Africa, students were anxious about system failures, internet connectivity issues, and power outages. In contrast to Basopi *et al.* [17], where anxiety arose partly from a lack of familiarity with hardware, students at Yarmouk University exhibited moderate to advanced ICT competencies. This suggests that the anxiety observed in the present study stems from worries about system reliability rather than from digital illiteracy. This difference is significant. It indicates a change in context from "anxiety over adapting to technology" to "anxiety regarding trust in systems." In other terms, students aren't afraid of the computer—they are afraid of institutional weaknesses. This subtlety enhances the literature by recognizing trust in infrastructure as a specific psychological mediator in CBE acceptance. This implies that concerns about system dependability, not digital illiteracy, are the source of the anxiety seen in this study. Additionally, students' perceptions and responses to these digital stressors are mediated by their technical self-efficacy [28].

6.3. The one-way navigation paradox: a pedagogical constraint

The key contribution of this research is recognizing one-way navigation as the most significant perceived obstacle. Although earlier studies [26] focused on security, fairness, and logistical issues, none identified navigation rigidity as a key source of stress. This discovery implies a teaching contradiction: rules implemented to deter cheating might unintentionally raise cognitive stress and weaken metacognitive approaches. The lack of opportunity to review and edit responses interferes with the reflective thinking processes essential for assessment in higher education. While Harley *et al.* [25] observed that computerized exams elicited fewer negative emotions than traditional ones, the current results suggest that emotional reactions might differ based on system setup rather than format alone. Therefore, it is not the digital format that causes stress, but the limiting exam structure incorporated within it.

6.4. The feedback gap: missed formative potential

The contrast between students' strong craving for prompt feedback and their disappointment with existing feedback methods reveals an overlooked educational chance. Faniran *et al.* [20] highlighted that online assessments are especially beneficial for formative objectives. Nonetheless, the existing execution at Yarmouk University seems mainly summative. This underuse diminishes the educational value of CBEs, turning them into mere administrative grading tools instead of instruments that enhance learning. This "feedback gap" signifies a systemic inefficiency in the implementation of digital assessments. The technological opportunities are present, but their educational incorporation is still not fully realized. Although there are technological opportunities, their integration into education has not yet reached its full potential. Furthermore, incorporating AI-assisted proctoring solutions necessitates striking a careful balance between test security and examinees' psychological health [29].

6.5. Contextualizing findings within developing educational systems

In contrast to research carried out in more technologically stable settings (e.g., South Africa or Canada), the situation in Jordan shows infrastructural variability. Worries about power supply, server dependability, and organizational readiness increase students' anxiety. Thus, the acceptance of CBEs in this context should be understood within wider institutional preparedness frameworks. The acceptance of technology is inseparable from trust in infrastructure. Instead of concentrating only on memorization-based evaluation, effective digital assessment design should support deeper learning and be in line with long-term learning outcomes [27].

6.6. Implementations of the study

The study's conclusions have significant ramifications for universities that are progressively using CBT. To guarantee the successful implementation of digital examinations, universities should make investments in dependable IT infrastructure and offer adequate technical support. To help students acquire accustomed to computer-based testing environments and lessen exam anxiety, educational institutions should also provide training sessions and mock exams. From a pedagogical standpoint, rather than concentrating only on factual memory, teachers should create tests that accurately gauge higher-order thinking abilities. Students' acceptance of CBEs and the general efficacy of digital assessment methods in higher education can both be improved by addressing the technological and psychological issues raised by this study.

6.7. Theoretical contribution

By expanding the TAM, this study greatly extends the present theoretical understanding of technology acceptance in education. Traditional models emphasize "ease of use" and "usefulness," but this

study adds "psychological anxiety" and "technical infrastructure readiness" as crucial mediators in the digital assessment process, improving the theory. The study provides a more sophisticated theoretical framework that explains why great technical skill does not necessarily result in favorable instructional outcomes by combining these components. This integration highlights the need for a "human-centered digital assessment theory" that takes into consideration the emotional and infrastructural realities of students in evolving academic environments and challenges merely technical adoption theories.

7. CONCLUSION

This research sought to explore the psychological, technical, and educational difficulties related to CBEs at Yarmouk University from the viewpoint of students' learning experiences. The results indicated that students typically show a moderate degree of acceptance for CBEs. Nonetheless, technical dependability and system design limitations are still the primary elements affecting students' mental well-being and academic success. Technical stress was specifically recognized as the main cause of student anxiety, suggesting that system stability is more crucial than interface usability. Furthermore, the research emphasized the "one-way navigation" aspect as a significant educational and cognitive constraint, as it limits students' capacity to reassess and alter their responses, possibly heightening cognitive strain and encouraging hasty choices during assessments. Additionally, a significant feedback discrepancy was observed between students' keen desire for prompt automated feedback and their discontent with existing feedback methods, implying that CBEs are still mainly employed as summative assessment tools rather than as formative learning resources.

From a practical standpoint, universities must focus on upgrading technical infrastructure, reshaping exam navigation policies, and incorporating instant feedback systems to improve the educational benefits of digital assessments. Theoretically, the research aids in advancing the TAM by highlighting the significance of institutional policy limitations and system trust as key elements in technology-driven assessment settings. Although this study offers valuable insights, it also has numerous limitations. The study took place at one university and employed self-reported survey data, potentially restricting generalizability. Future studies ought to explore multi-institutional samples and longitudinal methodologies to better understand the enduring impacts of CBEs on educational outcomes and emotional reactions of students. Moreover, upcoming research might investigate differences based on gender and variations in academic disciplines regarding CBE experiences. In conclusion, in order to provide equitable and effective evaluation procedures in higher education, the successful implementation of computer-based assessments necessitates both technology advancement and pedagogical alignment in addition to flexible institutional policies.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

ETHICAL APPROVAL

This study was approved by the Institutional Review Board of Yarmouk University, approval number [IRB/2025/469]. All participants provided informed consent prior to participation.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [EMQ], upon reasonable request.

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