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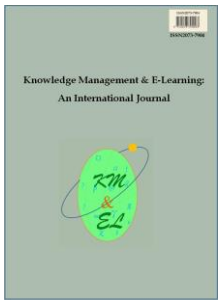

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The mediating role of information security awareness and technology self-efficacy in the relationship between e-learning readiness and academic performance

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Abstract: The study aims to investigate the impact of e-learning readiness on faculty's performance in their academic works. It also seeks to examine how their information security awareness and technology self-efficacy mediate this primary effect. Due to the COVID-19 pandemic, many academic institutions around the world have closed; and adopted online learning platforms to keep the educational process running. However, the issues about universities readiness and effectiveness of e-learning seem to be motionless and not obviously understood, particularly for a developing country such as Jordan. To achieve the study goals, online questionnaire was distributed as a main tool for data collection from academicians. Sequentially, (383) valid questionnaires were subject to statistical analysis. Data analysis was performed using Partial Least Squares - Structural Equation Modelling (PLS-SEM). The results showed that there is a statistically significant impact of e-learning readiness on the academic staff performance through information security awareness and technology self-efficacy in Jordanian higher education institutions. Based on the results, the study proposed some recommendations, such as improving and supporting e-learning readiness in the Jordanian educational institutions due to its role in improving achieving academic performance.

Keywords: e-Learning readiness; Academic performance; Information security awareness; Technology self-efficacy

Biographical notes: Mohammad Khasawneh is an associate professor at the Faculty of Information Technology, Jadara University, Irbed, Jordan. His areas of specialization include Internet of Things, Artificial Intelligence, and Information Systems. His research interests focus on smart technologies, smart learning, technology-enhanced education, knowledge management, and information security. Dr. Khasawneh has participated in numerous international academic conferences and has authored over 20 research papers, many of which have been published in high-ranking peer-reviewed journals. He serves on the editorial boards of several international journals. With over 20 years of experience in information and communication technologies, he has contributed both technically and academically to the field of e-learning and smart learning. Dr. Khasawneh also possesses extensive teaching experience, particularly in integrating e-learning into the university teaching environment.

1. Introduction

COVID-19 virus spread to many countries around the world affecting human life and changing people's lifestyles. Higher education sector as a critical sector was greatly affected by this pandemic. Thus, internet and computer applications have become the most substantial tools in the teaching and learning process, and getting rid of new technologies would be impossible, even in the most outlying areas (Gomez, 2016). As well, the continuous growth of novel technologies allows the creation of new models for the educational system, such as e-learning and blended learning, which have been implemented via electronic means, such as internet and computer applications. This allows the faculty members to provide scientific information to learners online, in addition to face-to-face meetings, this change has been considered a solution for cost issues and competitiveness (Laksitowening et al., 2016).

Globally, the use of e-learning tools in higher education institutions has become unavoidable, so universities have attempted to apply new technologies and computer applications to replace face to face meetings with online meeting to maintain the educational system continuity within a world being influenced by the COVID-19 pandemic (Schleicher, 2020). At higher education institutions, e-learning includes some models, such as a wholly online learning which means that learners receive all scientific content remotely, another model is blended learning which means that learners receive instruction and information remotely in addition to face-to-face meeting between students and academic staff.

The failure of e-learning process may not only due to technological matters, but also as a result of the inability and inexperience of faculty staff and university leaderships such failure may also be due to lack of clear planning and good readiness of e-learning tools, in addition to lack concern of nontechnical issues (Frimpon, 2012). E-learning readiness refers to individuals' ability to use digital tools and media and prepare appropriate syllabus for efficient teaching and learning process (Machado, 2007). Accordingly, the level of academics, students and university leaderships should be measured before employing e-learning process. This must help decision makers to develop strategic plans to best practices of using e-learning models (Kaur & Abas, 2004). Students, academics and organizations readiness measures regarding e-learning is a key factor for the successful practice of using it. However, the success of e-learning applications managed by higher education institutions are significant; in addition, e-learning readiness influences on students' progress, final results of their courses and their academic performance (Budur et al., 2021).

From the academic perspective, many researchers have argued the effect of faculty's and students' e-learning readiness on their academic performance (Torun, 2020; Afshan et al., 2021; Kisacik, 2023). Astonishingly, the researchers have various findings of using new technologies and applications in e-learning in the educational institutions. The main aim of this study is to identify the effect of e-learning readiness on the academic performance by the mediating role of information security awareness and technology self-efficacy among faculty in the Jordanian higher educational institutions.

2. Problem statement

Teaching and learning process occupies the central focus in universities, therefore, academic performance is very important to improve this process. So, academicians who pay attention to their academic performance and achievement motivation would be considered efficient in their teaching and learning process. Consequently, many

researchers have focused on improving the design and implementation of e-learning in the last decade (Hogo, 2010).

According to Gotthardt et al. (2006), the new technologies in teaching and learning process can create a competitive environment, creativity, and innovation for students, teachers, and academic organizations. Nowadays, learners have master skills of using technologies in their teaching and learning process (Sutherland et al., 2024). This means that they are ready to use these technologies in their educational process. Actually, many studies argued that the readiness is an essential factor in adopting and implementing e-learning for both students and teachers (Wagiran et al., 2022).

Teachers must have ability to protect their information which are used in the learning process, such as courses material, exams, and assignments, in addition to a direct and indirect interaction with their students (Pratama et al., 2023). Moreover, academicians must have the ability and skills to use new technologies, tools, and platforms in their teaching process to improve it and cover all curriculum for students to be capable of keeping pace with technological developments (Baroudi & Shaya, 2022; Bagdi & Bulsara, 2023). Therefore, Jordanian universities seek to design a novel model of e-learning, and educational platforms in the learning process.

The Hashemite Kingdom of Jordan has been keen to face all challenges in response to the global rapid educational technologies and platforms. Hence, fulfilment of royal visions, on June 2021 by the Royal Decree was issued for improvement and development of the teaching and learning process by activating the embedded learning system in all higher education institutions. In addition, article (13) of higher education law argues that the universities must be able to provide an embedded learning system, manage and protect it. The law also stipulates the need to provide technological environment that supports all parties in the educational process, including students, academics and administrators, in addition to review the approved assessment mechanisms in all academic programs.

This requires designing and implementing a suitable learning content and materials for interactive learning between students and their teachers (Ministry of Higher Education and Scientific Research, 2022). Based on the above, the research problem can be put into the following main question: What is the impact of e-learning readiness on the academic performance through the mediating role of information security awareness and technology self-efficacy at the higher education sector in Jordan?

3. Theoretical framework

The e-learning readiness, academic performance, information security awareness, and technology self-efficacy topics have been received interested from many researchers and scholars. Some researches were addressed e-learning readiness and academic performance such as (Torun, 2020; Afshan et al., 2021; Kisacik, 2023). While Affuso et al. (2023), Lei et al. (2022), and Namli and Aybek (2022) were addressed the effect between technology self-efficacy and academic performance. Whilst Dash and Ansari (2022), Ribeiro et al. (2022) were presented the relationship of information security awareness and academic performance as mediating role.

Besides, there are many studies have believing that the relationship between e-learning readiness and academic performance is a critical issue in higher education institutions. These studies argued the positive relationship depends on the e-learning readiness. However, the current study is distinguished from other studies by integrating

the factors of e-learning readiness, information security awareness, technology self-efficacy, and academic performance; and applying it on the Jordanian higher education institutions.

For over two decades, many of technology adoption research and the usage of new applications have been conducted, the researchers have proposed adoption theories such as technology acceptance model to examine the individual's acceptance of a novel applications and technologies (Lal et al., 2024). Many researchers argued that the adopt and use of e-learning in the universities must be measured by their level of readiness (Clark & Mayer, 2016). This is enabling the universities to analyse, design and implement the e-learning system to fit the results of measurement. Anyway, the main values of e-learning involve allowed accessibility of information anytime, anywhere; interactive and innovative teaching and learning process; improve the search way via applications; ability to provide assistance when needed; enhancing faculty confidence and responsibilities; in addition to reducing the operational cost for universities through their use of e-learning (Mukhtar et al., 2020; Voutilainen et al., 2017; Yusuf & Al-Banawi, 2013).

In the same manner, e-learning readiness means the capabilities of universities in adoption, usage and implementation the novel technologies and applications in their teaching process. Commonly, the level of e-learning readiness depends on the university human, technical and financial resources (Blacer-Bacolod, 2022). This is mean, there are two side of e-learning readiness; firstly, concerns on university resources and environment, secondly, concentrate on faculty's readiness to use these resources (Loock et al., 2022). In conjunction with that, the readiness of e-learning has become a reason for successful the learning and education process in last two decades. This is improving the quality of this process, thus, enhancing academic performance (Thapa et al., 2021).

In continuation of the above, the successful use of e-learning process determined by the awareness of using the novel technologies to protect their content. Whereas the lack of awareness especially in information security approaches will effect negatively of employment e-learning and its readiness (Wagiran et al., 2022). Nambiar (2020) focuses in his study on the importance of information security regarding to e-learning application and content. While Safa and Von Solms (2016) assumed that the information security awareness is the main issue in knowledge sharing such as e-learning. Moreover, faculty must adopt a novel style of their information security awareness to be safe in their e-learning content (Humaidi & Balakrishnan, 2015).

Meanwhile, technology self-efficacy as another mediating factor for using new technologies in teaching and learning process is considered the main role in equipping academic staff to begin use it (Fernandez et al., 2022). However, readiness in educational process will increase when academics have a good background of using new technologies in this process (Loock et al., 2022, Truzoli et al., 2021; Yilmaz, 2017). The competences of using technologies can be a motivational factor of e-learning readiness. Previous studies argued that the technology self-efficacy of is considered a significant mediating factor that effect the capabilities of e-learning readiness, so, it concluded that self-efficacy affects indirectly in e-learning readiness (Wagiran et al., 2022). In line with this, Bailey et al. (2021) argued that there is importance role of learning motivation by self-efficacy as mediating role on the distance learning readiness.

In the same side, many studies explored the effectiveness of e-learning platforms such as Moodle, Microsoft teams, and Black board (Alameri et al., 2020). While, Al Musawi and Ammar (2021), and Torun (2020) focused on e-learning readiness on

academic performance, these studies argued that e-learning readiness effect positively on the academic performance and improve the teaching and learning process.

This study concerns in the relationship between e-learning readiness and academic performance and how to improve students' teaching and learning process by using new technologies and computer applications, the mediating factors depends on technology self-efficacy of and the awareness to protect the contents of these technologies and applications.

4. Research model and hypotheses

A novel research model was derived by assessment and studying of the past resources such as research articles and books, in addition to the real-world observations from academic institutions. As that of, some of these resources presented the probable relations among the research factors directly or indirectly. In the same context, the research was conducted on the Jordanian higher educational institutions to identify the relationships between e-learning readiness and academic performance among academicians with their awareness of information security and technology self-efficacy as mediating factors. Fig. 1 clarified a novel model and presented relationship between the research factors.

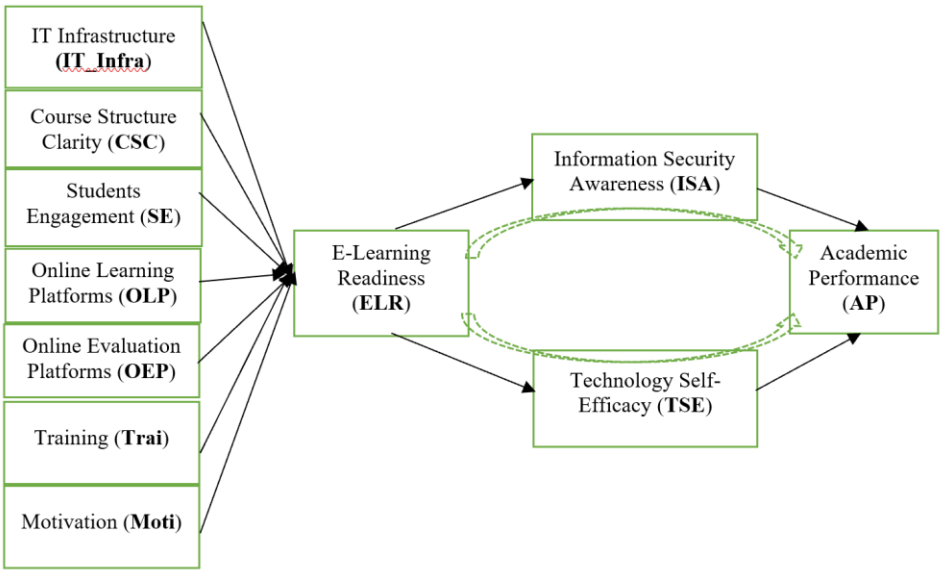

Fig. 1. Research model

After presented the model of the current research and identified its related factors, it was crucial to identify the relationships between these factors by formulating hypotheses of the research. However, the main goal of formulating the hypotheses of the research is to measure the relations between factors of the research model (Sekaran & Bougie, 2016). Actually, the current research was planned to measure the substantial relationship among the factors of the research model that would identify the readiness of e-learning and its effect on academic performance through their information security awareness and their technology self-efficacy in Jordanian education institutions. Thus, the hypotheses and the research model have been developed and designed based on previous studies such as (Azizi et al., 2022; Garad et al., 2021; Sandanayake et al., 2021;

Kebede et al., 2022; Adeyeye et al., 2022; Barbosa & Garcia, 2005; Altınay, 2017; Almusharraf & Khahro, 2020; Yilmaz, 2017; Lucero et al., 2022; Khando et al., 2021; Taha & Dahabiyeh, 2021; Keržič et al., 2021; Khasawneh, 2015). Consequently, these research studies were proved the validity and reliability of current research hypotheses. So, building the research model, formulating the research hypotheses, collecting data from research sample, testing the research hypotheses by data analysis and finally discussion the research results (Sekaran & Bougie, 2016).

In light of the above, this research proposes the following hypotheses:

H1: There is a significant relationship at the level ($p \leq 0.05$) between IT infrastructure and the e-learning readiness among academicians in Jordanian higher educational institutions.

H2: There is a significant relationship at the level ($p \leq 0.05$) between course structure clarity and the e-learning readiness among academicians in Jordanian higher educational institutions.

H3: There is a significant relationship at the level ($p \leq 0.05$) between students' engagement and e-learning readiness among academicians in Jordanian higher educational institutions.

H4: There is a significant relationship at the level ($p \leq 0.05$) between online learning platforms and the e-learning readiness among academicians in Jordanian higher educational institutions.

H5: There is a significant relationship at the level ($p \leq 0.05$) between online evaluation platforms and e-learning readiness among academicians in Jordanian higher educational institutions.

H6: There is a significant relationship at the level ($p \leq 0.05$) between training and e-learning readiness among academicians in Jordanian higher educational institutions.

H7: There is a significant relationship at the level ($p \leq 0.05$) between motivation and e-learning readiness among academicians in Jordanian higher educational institutions.

H8: There is a significant relationship at the level ($p \leq 0.05$) between e-learning readiness and information security awareness among academicians in Jordanian higher educational institutions.

H9: There is a significant relationship at the level ($p \leq 0.05$) between e-learning readiness and technology self-efficacy among academicians in Jordanian higher educational institutions.

H10: There is a significant relationship at the level ($p \leq 0.05$) between information security awareness and academic performance among academicians in Jordanian higher educational institutions.

H11: There is a significant relationship at the level ($p \leq 0.05$) between technology self-efficacy and academic performance among academicians in Jordanian higher educational institutions.

H12: There is a significant relationship at the level ($p \leq 0.05$) between e-learning readiness and academic performance among academicians in Jordanian higher educational institutions.

H13: There is a significant relationship at the level ($p \leq 0.05$) between e-learning readiness and academic performance through information security awareness among academicians in Jordanian higher educational institutions.

H14: There is a significant relationship at the level ($p \leq 0.05$) between e-learning readiness and academic performance through technology self-efficacy among academicians in Jordanian higher educational institutions.

5. Research method

The current research used the quantitative approach to measure the relationships between research model factors and testing its hypotheses. It is used a descriptive analytical method to examine the relationship between e-learning readiness and academic performance in presence of information security awareness and technology self-efficacy among academicians in Jordanian higher education institutions. Online questionnaires were distributed randomly to the research sample by social media site such as Facebook, Whatsapp, and email. The research population consists of all academic staff in the Jordanian higher education institutions which was estimated by (11394) academicians based on the Ministry of Higher Education and Scientific Research (2022). The research sample consists of (420) academicians, (383) were returned as valid questionnaires to statistical analysis from (14) universities in three provinces in Jordan. Whereas this sample was considered representative to the research population (Sekaran & Bougie, 2016).

However, the research questionnaire has been built according to the research hypotheses. The survey instruments were measured on a five point "Likert scale" that ranged from "strongly disagree" to "strongly agree". A total of (50) items were included in the questionnaire, all the instruments were adapted from the previous studies such as (Affuso et al., 2023; Adeyeye et al., 2022; Baroudi & Shaya, 2022; Budur et al., 2021; Khando et al., 2021; Alameri et al., 2020). To ensure the questionnaire validity, consistency, and language drafting, a set of professors and experts of information systems and its application, in addition to statistics sciences have reviewed and assessed the research questionnaire, and the researcher was modified it based on their suggestions.

6. Results and analysis

This section shows the overall profile of academicians in terms of their gender, age, province, education level, academic rank, major, experience, and the availability of Internet in their work and home. Table 1 presents the frequencies and percentages of respondents' profile regarding to their demographic factors.

6.1. Data analysis

The research used PLS-SEM version 3.1.6 to analyzing its hypotheses and to prove its model. Accordingly, SEM was used to analyze and measure multiple independent variables, with correlations between different independent variables. In addition, correlations between dependent variables, also, to measure the hypotheses of the research by using the structural model (Ringle et al., 2014); the PLS structural equation model contains two sub-models, one is the measurement model and the other is structural model (Raza et al., 2017; Hair et al., 2011).

Table 1
Demographic characteristic of respondent

Factor	Items	Number	Percent
Sex	Male	224	58%
	Female	159	42%
Age (Years)	Less than 30	7	02%
	30 – less than 40	62	16%
	40 – Less than 50	150	39%
	60 – Less than 60	92	24%
	60 and more	72	19%
Provinces	North	132	34%
	Middle	167	44%
	South	84	22%
Educational level	M.Sc.	76	20%
	Ph.D.	307	80%
Academic Rank	Instructor	76	20%
	Assistance prof	164	43%
	Associate prof	94	24%
	Full prof	49	13%
Major	Humanities Faculties	209	55%
	Scientific Faculties	174	45
Experience	Less than 5	66	17%
	5 – less than 10	89	23%
	10 – Less than 15	117	31%
	15 – Less than 20	75	20%
	20 and more	36	09%
Availability of home Internet	Yes	360	94%
	No	23	06%
Availability of Internet in workplace	Yes	372	97%
	No	11	03%
	Total	383	100%

6.2. Measurement model

The research model was first assessed by measuring the scale of reliability, validity, and discriminant validity. Further, it is assessed to analyzed for the evaluation of convergent validity by factor loadings for each item, Cronbach's Alpha, composite reliability, in addition to, average variance extracted (AVE). Table 2 presents the findings of convergent validity.

Table 2 shows that the items' factor loadings were significant, the results were above the proposed criteria of (0.55) (Raza & Hanif, 2013), and above of (0.7) (Hair et al., 2011). The results of the composite reliability to each construct included in the research model were greater than (0.7) which was agreed with the acceptable criteria (Hair et al., 2011). This is mean, the results of composite reliability and Cronbach's alpha is above of (0.7) which was agreed of the acceptable criteria (Sekaran & Bougie, 2016).

In the same manner, Fornell and Larcker (1981) argued that the criterion which is used for convergent validity, is the degree of confidence and its measured indicators; and upon it, the results of average variance extracted (AVE) must be greater than (0.5). Table 3 presents that the values of AVE were above of (0.5), this is mean the research model and its variables are achieving the requirement of convergent validity.

Table 2
Measurement model results

Constructs	Items	Factor Loadings	Cronbach's Alph	Composite reliability	AVE
IT_Infra	IT_Infra_1	0.888	0.872	0.924	
	IT_Infra_1	0.878			0.802
	IT_Infra_3	0.921			
Moti	Moti_1	0.703	0.824	0.883	
	Moti_2	0.853			0.655
	Moti_3	0.815			
	Moti_4	0.857			
AP	AP_1	0.861	0.869	0.909	
	AP_2	0.890			0.716
	AP_3	0.804			
	AP_4	0.828			
OEP	OEP_1	0.901	0.859	0.906	
	OEP_2	0.815			0.763
	OEP_3	0.903			
SE	SE_1	0.812	0.804	0.870	
	SE_2	0.815			0.627
	SE_3	0.795			
	SE_4	0.745			
ISA	ISA_1	0.867	0.887	0.925	
	ISA_2	0.879			0.755
	ISA_3	0.868			
	ISA_4	0.862			
OLP	OLP_1	0.912	0.901	0.935	
	OLP_2	0.908			0.829
	OLP_3	0.912			
Trai	Trai_1	0.925	0.921	0.950	
	Trai_2	0.947			0.863
	Trai_3	0.916			
CSC	CSC_1	0.917	0.827	0.913	0.840
	CSC_2	0.917			
TSE	TSE_1	0.909	0.919	0.944	
	TSE_2	0.910			0.810
	TSE_3	0.902			
	TSE_4	0.880			
ELR	ELR_1	0.831	0.834	0.898	
	ELR_2	0.902			0.746
	ELR_3	0.858			

Statically, a discriminant validity for the research model constructs showed that the square root value of AVE must be greater than correlation including these constructs (Fornell & Larcker, 1981). Consequently, the results which are shown in correlation matrix presented that the value for each construct is less than the square root of its AVE; this is mean the discriminant validity of research model achieves the first criteria.

On the other hand, the results shown that all items' loadings in their related constructs were higher than its cross loadings as shown in Table 4. In addition, the cross-loadings differences were more than the proposed criteria of (0.1) (Gefen & Straub, 2005).

Table 3
Correlation matrix

	IT_Infra	Moti	AP	OEP	SE	ISA	OLP	Trai	CSC	TSE	ELR
IT_Infra	0.895										
Moti	0.708	0.809									
AP	0.770	0.638	0.846								
OEP	0.755	0.755	0.641	0.873							
SE	0.731	0.754	0.703	0.781	0.791						
ISA	0.750	0.739	0.636	0.766	0.777	0.868					
OLP	0.687	0.689	0.574	0.687	0.647	0.598	0.910				
Trai	0.793	0.660	0.714	0.692	0.646	0.643	0.732	0.928			
CSC	0.757	0.679	0.650	0.772	0.758	0.744	0.658	0.723	0.916		
TSE	0.783	0.683	0.648	0.641	0.654	0.645	0.667	0.775	0.707	0.900	
ELR	0.715	0.760	0.569	0.706	0.663	0.760	0.605	0.613	0.669	0.670	0.863

Table 4
Loadings and cross loadings

	IT_Infra	Moti	AP	OEP	SE	ISA	OLP	Trai	CSC	TSE	ELR
IT_Infra1	0.888	0.671	0.573	0.727	0.667	0.727	0.584	0.686	0.696	0.668	0.699
IT_Infra2	0.878	0.578	0.625	0.569	0.598	0.590	0.624	0.747	0.624	0.744	0.568
IT_Infra3	0.921	0.656	0.619	0.728	0.702	0.697	0.653	0.716	0.718	0.714	0.651
Moti1	0.623	0.703	0.525	0.543	0.587	0.526	0.703	0.692	0.562	0.658	0.537
Moti2	0.584	0.853	0.541	0.668	0.649	0.658	0.575	0.573	0.613	0.593	0.675
Moti3	0.480	0.815	0.468	0.538	0.544	0.541	0.436	0.360	0.452	0.447	0.623
Moti4	0.650	0.857	0.565	0.722	0.696	0.693	0.576	0.568	0.606	0.565	0.655
AP1	0.684	0.638	0.861	0.640	0.690	0.616	0.601	0.650	0.666	0.674	0.576
AP2	0.564	0.559	0.890	0.545	0.613	0.574	0.514	0.505	0.550	0.535	0.507
AP3	0.460	0.449	0.804	0.455	0.501	0.452	0.383	0.376	0.438	0.449	0.395
AP4	0.559	0.514	0.828	0.533	0.580	0.517	0.436	0.535	0.543	0.531	0.447
OEP1	0.706	0.664	0.587	0.901	0.700	0.703	0.657	0.678	0.750	0.604	0.631
OEP2	0.583	0.680	0.537	0.815	0.698	0.643	0.517	0.465	0.592	0.475	0.593
OEP3	0.711	0.664	0.579	0.903	0.679	0.690	0.647	0.686	0.705	0.619	0.650
SE1	0.618	0.602	0.631	0.603	0.812	0.617	0.553	0.528	0.620	0.521	0.548
SE2	0.621	0.604	0.547	0.677	0.815	0.669	0.563	0.615	0.676	0.575	0.581
SE3	0.559	0.555	0.556	0.550	0.795	0.592	0.516	0.512	0.600	0.517	0.445
SE4	0.545	0.657	0.526	0.667	0.745	0.613	0.445	0.414	0.538	0.423	0.541
ISA1	0.725	0.663	0.558	0.710	0.687	0.867	0.562	0.597	0.691	0.582	0.700
ISA2	0.679	0.634	0.554	0.706	0.691	0.879	0.540	0.627	0.682	0.612	0.676
ISA3	0.607	0.637	0.554	0.622	0.692	0.868	0.476	0.500	0.620	0.532	0.622
ISA4	0.615	0.658	0.564	0.645	0.653	0.862	0.516	0.525	0.614	0.535	0.664
OLP1	0.613	0.663	0.531	0.632	0.597	0.554	0.912	0.615	0.592	0.601	0.559
OLP2	0.630	0.619	0.504	0.625	0.580	0.535	0.908	0.687	0.597	0.613	0.551
OLP3	0.657	0.623	0.553	0.644	0.612	0.566	0.912	0.724	0.631	0.632	0.564
Trai1	0.739	0.609	0.556	0.631	0.610	0.575	0.707	0.925	0.693	0.740	0.574
Trai2	0.740	0.610	0.594	0.650	0.601	0.603	0.681	0.947	0.668	0.737	0.588
Trai3	0.753	0.639	0.578	0.667	0.607	0.632	0.673	0.916	0.674	0.704	0.563
CSC1	0.678	0.628	0.582	0.693	0.706	0.684	0.575	0.637	0.917	0.627	0.619
CSC2	0.727	0.633	0.625	0.740	0.702	0.697	0.646	0.705	0.917	0.686	0.624
TSE1	0.715	0.612	0.572	0.605	0.598	0.597	0.621	0.697	0.629	0.909	0.589
TSE2	0.707	0.593	0.566	0.574	0.597	0.586	0.597	0.716	0.640	0.910	0.591
TSE3	0.739	0.637	0.631	0.598	0.604	0.600	0.617	0.721	0.642	0.902	0.596
TSE4	0.687	0.639	0.585	0.555	0.579	0.565	0.592	0.685	0.659	0.880	0.655
ELR1	0.544	0.680	0.441	0.552	0.522	0.656	0.444	0.443	0.533	0.434	0.831
ELR2	0.656	0.673	0.532	0.641	0.598	0.665	0.550	0.554	0.614	0.614	0.902
ELR3	0.669	0.646	0.517	0.654	0.617	0.675	0.588	0.604	0.606	0.639	0.858

On the other side, the findings of correlations shown in Table 5 the heterotrait-monotrait ratio, the results showed that all values of discriminant validity criteria not above (0.9) which is mean it compatible with the proposed criteria (Teo et al., 2008).

However, the findings which are presented in Tables 4, and Table 5 supported the discriminant validity of the research model constructs.

Table 5
Heterotrait-monotrait ratio results

	IT_Infra	Moti	AP	OEP	SE	ISA	OLP	Trai	CSC	TSE	ELR
IT_Infra											
Moti	0.826										
AP	0.750	0.735									
OEP	0.807	0.819	0.726								
SE	0.853	0.839	0.817	0.806							
ISA	0.835	0.85	0.706	0.83	0.843						
OLP	0.767	0.799	0.627	0.774	0.747	0.659					
Trai	0.827	0.757	0.663	0.769	0.736	0.701	0.794				
CSC	0.822	0.812	0.744	0.847	0.823	0.806	0.752	0.817			
TSE	0.811	0.781	0.703	0.714	0.747	0.705	0.724	0.832	0.8		
ELR	0.818	0.793	0.647	0.825	0.788	0.829	0.686	0.687	0.792	0.75	

6.3. Structural model

The structural model was conducted to determine the relationships between the independent and dependent variables that represented in the research model. Table 6 presented the relationship between independent factors and dependent factors through path analysis.

Table 6
Results of hypotheses testing

Hypotheses	Variable		β	Hypotheses Testing Supported √ Not Supported ×
	Independent	Dependent		
H1	IT_Infra	ELR	0.282***	√
H2	CSC	ELR	0.128*	√
H3	SE	ELR	0.135*	√
H4	OLP	ELR	-0.025	×
H5	OEP	ELR	-0.008	×
H6	Trai	ELR	0.088**	√
H7	Moti	ELR	0.444***	√
H8	ELR	ISA	0.762***	√
H9	ELR	TSE	0.671***	√
H10	ISA	AP	0.351***	√
H11	TSE	AP	0.385***	√
H12	ELR	AP	0.039	×
H13	ELR ➔ ISA	AP	0.328*	√
H14	ELR ➔ TSE	AP	0.583***	√

Note. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

7. Conclusion and implication

The findings of the research hypotheses showed that there is a significant relationship of e-learning readiness in academic performance through academics' technology self-efficacy and their awareness of information security in Jordanian higher education institutions. This is mean, the effect of technology self-efficacy and the awareness of information security to e-learning readiness on academic performance among academicians which is refer to the main role of these factors in activating e-learning readiness to achieve academic performance. As a result, the increase of competence by academics to using e-learning technologies and applications, in addition, protect it, will supporting the readiness of e-learning and enhancing the academic performance.

In the same context, the results of the first hypothesis showed a significant relationship of information technology infrastructure and e-learning readiness in Jordanian higher education institutions. Jordanian universities attempt to improve their technology infrastructure to enhance the academics' readiness that supporting using e-learning technologies and applications. Moreover, the results showed a significant relationship between, course structure clarity, students' engagement, training, and motivation, severally, and e-learning readiness. On the other side, the findings indicated that there is no statistically significant effect of online learning platforms and online evaluation platforms, severally, with the e-learning readiness. This is indicating that the online learning platforms and online evaluation platforms in Jordanian higher education institutions has not reached the good stage of using its technologies and tools in e-learning readiness to achieving the high level of academic performance. Consequently, the results showed there are a significant relationship between e-learning readiness and the mediating factors such as information security awareness and technology self-efficacy, severally. In the same manner, the study showed there are a significant relationship between these mediating factors and academic performance; while it appears, there is no statistically significant effect between e-learning readiness and academic performance. Finally, the results showed the effect of mediating factors such as information security awareness and technology self-efficacy on the relationship between e-learning readiness and academic performance. This conclude the importance of the role of information security awareness and technology self-efficacy to improve the e-learning readiness with its combined dimensions on the academic performance; this is mean that Jordanian universities must support the tools and develop the techniques of these mediating factors to contributing and enhancing the academic performance of these universities.

On the other hand, the study implications on Jordanian higher education institutions are to reinforce the awareness of e-learning readiness through academics' self-efficacy of electronic technologies, applications and platforms, in addition to their awareness in information security during their educational process to achieve high level of academic performance. This could be through developing the technologies and tools and enhancing its ability to adopt, use, and implement these new technologies in the information age. Another implication of the study is to improve the Jordanian universities academic performance by using new technologies and sustain the educational process any time - anywhere even if universities are closed due to pandemics or any other reason. Moreover, the universities must support the creation and developing its necessary infrastructures and provide all the requirements for developing e-learning services. Further, they should be support training courses to academic staff, and preparing a comprehensive plan that focuses on develop their competencies and aware of information security. Finally, the research recommends to preparing more studies in the future using these factors in the same or different environments to achieve digital entrepreneurship and competitive advantages in smart organizations.

8. Limitation

The study focuses on the importance of using e-learning technologies and its effect on academic performance in Jordanian higher education institutions from academic staff perspective. The study used potential factors of e-learning readiness through technology self-efficacy and information security awareness to achieve academic performance. Hence, the lack of studies using these factors are considered the main limitation of this study. Further, the study was conducted in Jordan as one of the developing world's where academics in universities undergo for social, finance and political conditions different of developed world. In the other hand, the data was collected from academics in Jordanian universities, so, generalizability to other sector could be limited unless schools. Despite of potential risk, lack of human and financial resources, the leaders of Jordanian higher education sector are advised to continue managing e-learning readiness to achieve academic performance through technology self-efficacy and the awareness of information security among academics and students; because the findings of the current research showed that there is an strong relationship between e-learning readiness on academic performance through the mediating role of technology self-efficacy and information security awareness. This should be by fulfill the privacy, and confidentiality of information to organization, faculty, and students under the security determinants.

Author Statement

The authors declare that there is no conflict of interest.

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