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"Current Issues, Trends, and New Ideas in Education"

E-Learning Integration and Its Impact on MIS Skill Development and Student Engagement

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Abstract

This paper aims to establish the possibilities of incorporating e-learning in the management information system (MIS) for Omani students' improvements. The first purpose was to establish whether there was a relationship between e-learning integration and MIS skill development; the second purpose was to further test whether student engagement moderated the relationship or acted as a mediator between the two constructs; and the third purpose was to consider whether or not instructor proficiency and institutional support had a moderating effect on this relationship. Participants included 420 students and lecturers from Omani universities. The study also supported H1 and revealed that e-learning integration significantly, though moderately, enhanced student readiness, with a mean increase of 0.141 (p=0.002). The study revealed that student engagement can only partially mediate this relationship, with a regression coefficient of 0.051 and a significance level of 0.001. Yet, the expertise level of the instructor did not emerge as a significant moderator in this relationship (β=-0.027, p=0.292), thus resulting in another rejection of H3. On the other hand, institutional support had a direct positive effect on the readiness of the students for e-learning when integrated in teaching activities, thus supporting H4 (β=0.071, p=0.05). The R-square change ($\Delta R^2 = 0.005$) indicates that the use of moderators increases explained variance by a small extent. The following findings can assist policymakers and educators in improving MIS education in Oman by leveraging institutional support for e-learning to enhance skills.

Keywords:

Student Readiness;
Student Engagement;
Instructor Proficiency;
Institutional Support;
Management Information Systems (MIS);
Curriculum; Oman.

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1- Introduction

The incorporation of e-learning in MIS has been receiving a lot of attention in the recent past. New research has shown that e-learning improves student and faculty performance, especially in the areas of curriculum design and mutual learning [1-3]. However, as the literature review points to the positive potential of e-learning in enriching student learning opportunities and achievements [4], there is a dearth of literature regarding how such innovations benefit student and faculty skills, especially for multicultural and collaborative work. Furthermore, the extant frameworks primarily fail to consider the student and faculty development initiatives implemented using multicultural student and faculty twinning, which is emerging as an important approach in higher learning institutions globally [5-7].

Even though there is an increasing amount of evidence-based research on the effect of e-learning on students, little research has given a framework for the realization of the dual mission of student and faculty development [8]. There is a notable lack of such research in the areas of discussing the proper strategic approaches towards curriculum development and enhancing the intercultural staff education. This work includes recommending mastery of e-learning tools in an institution's curriculum, incorporation of collaborative education in an institution's curriculum, and lastly,

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the formation of a multicultural student and faculty twinning model. In addressing these gaps, this work expects to fill the void and provide a comprehensive framework for implementing e-learning in MIS programs.

Public educational systems in the Arab countries, inclusive of Oman and those in the Gulf region, are under lots of pressure in ensuring that they equip their learners to fit well in the new compulsory transformational and competitive world economy [9]. The rise of the need for technology and ICT skills in the workplace also enhances the need for schools to adopt modern teaching tools, especially e-learning [10, 11]. Although the use of digital platforms in the specified universities has begun in the recent past, the potential for integration of e-learning has not been fully exploited [12]. Therefore, this research aims at filling these gaps by assessing the impact of e-learning in increasing students' readiness and skills, with a focus on the Oman MIS curriculum as a model for the Gulf region [13, 14]. The issue is in the tendency of students to be disengaged from the digital learning environment and the instructors not being enlightened enough to effectively use the systems to enhance student learning [14, 15]. Inconsistent with this research need, numerous scholarly works address e-learning from a broader perspective with limited attention paid to the application of the e-learning environment in developing the MIS-specific competencies in the Arab academic [16, 17]. However, other once-identified precursors such as institutionalization support and e-learning instructor expertise have not received enough consideration when it comes to facilitating the success of e-learning.

This work contributes by constructing a strong theoretical model that evaluates how e-learning integration, through the mediating role of student engagement, positively impacts students' readiness for the workplace. The study adapts numerous control variables like course instructor experience, institutional support, and other related elements that foster learning ecologies. The outcomes will provide precise suggestions on how e-learning may be optimized in Oman and the other countries of the Gulf region and how students are to be prepared for the global marketplace. This way, besides illustrating the need for specific educational approaches that would address the specific needs of certain disciplines, this research underlines the strategic significance of MIS programs. The e-learning could play a main role in shaping future Gulf employees to meet the region's growing economic and technological demands.

One of the leading features of this study is that we concentrate on MIS-related competencies and examine how e-learning can help to develop important skills necessary for students' proper functioning in the context of the AI-dominated environment [18]. In contrast to most pieces of literature on digital education, this study adapts an SEM approach in which engagement is proposed as a mediator while instructor proficiency and institutional support are the moderators. This approach offers a better understanding of how e-learning factors impact readiness among students to study MIS programs.

Carried out in Oman, this research takes into account the cultural aspects, which is an important component for evaluating the usefulness of e-learning in schools and for matching it to the local cultural and educational requirements, which is still rather unexplored in the existing literature.

In any technical societies where technicians form the backbone of professionals, it becomes easier to see the importance of this study in preparing students to fit into the highly technological age where technical skills are dominant. It is more useful to policymakers and institutions in the Gulf area interested in the reformation of education in line with the global society.

1-1- Research Problem

Hence, like other universities in the Gulf region, Omani universities are under pressure to impart skills essential in the current, competitive, and technology-driven global market. Though e-learning platforms have been introduced in various universities, their effectiveness in preparing and developing skills among students, especially in new fields like Management Information Systems (MIS), is limited. The specific problem is twofold: first, students become disinterested and disengaged with the tools and technology of digital learning; second, instructors are not skilled enough to fully exploit the affordances of e-learning systems. This study assumes responsibility for how e-learning assimilation can be enhanced to enhance MIS competencies in Oman. Through liaison with data analysis and systems thinking assessment in addition to problem-solving skills.

1-2- Research Gap

As mentioned earlier, explicit prior studies have not paid much attention to the role of e-learning in availing the development of MIS-specific competencies in the Arab academic environment, let alone its implications for education in general. In addition, essential contextual variables, including institutional support and instructor expertise, have received scant research attention. Akin to most studies on e-learning, the current literature does not present a clear and comprehensive analysis of how e-learning can enhance MIS education in specific culturally different settings such as Oman. This study hence has a practical intent of filling that gap by giving a pragmatic understanding of the moderating effectiveness of student engagement, instructor expertise, and institutional support in improving MIS education through e-learning.

1-3- Contribution

This research therefore has a valuable theoretical contribution in that it builds an analytical framework that examines the impact of integrating e-learning in MIS instruction with a view to enhancing MIS skills; the case of Oman is used. Based on a study that proposed a structural equation modeling (SEM) approach to test student engagement as a mediator in reducing dropout rates in e-learning [19]. Through expanding and adjusting these variables, the study yields valuable information on how e-learning can be further stoked to boost the core MIS competency to aid the current workplace. This research also produces culturally sensitive insights relevant to Oman and other Gulf nations and contains definite policy suggestions for educational leaders and policymakers.

1-4- Significance of the Work

This work has significant implications for academic and practitioner audiences interested in the Gulf countries. As such, by addressing the MIS competencies in the light of e-learning implementation, it solely fulfills the need to equip students for the global economy of AI. The findings will be helpful for making appropriate decisions and supporting demands of policymakers and educational institutions as curricula advance, electronic learning, and training of teachers. In light of these findings, the study comes as a reference for the other nations in the Gulf that are in the process of overhauling teaching, learning, and education to suit the technological advance worldwide. Lastly, the study informs the enhancement of the alignment of MIS education for the region's emerging economic and technological demands.

This work tests the effect of e-learning integration, with adjustments made to reflect the specificities of the MIS curriculum and the role of online learning in enhancing core competencies related to MIS education. The general framework involving computational skills can be adapted to assess how e-learning integration influences the development of MIS-related skills like data analysis, systems thinking, and problem solving.

2- Literature Review

Altogether, the studies in the area of e-learning and edtech applications are abundant [11, 20, 21]; however, specific gaps can still be identified, including the implementation of MIS programs. Previous research covers a wide-ranging set of activities using e-learning in general, but a limited number of studies examine its importance in building technical competencies necessary for MIS, including data analytics, systems approach, system thinking, problem-solving, etc. Furthermore, some of the research gaps include the analysis of student engagement as a mediator to the development of the said competencies [22]. In addition, the role of instructor's qualifications and organizational sponsorship in mediating e-learning on skill development has been under-researched [23]. A similar study examines the effect of e-learning integration on student readiness for English as a Foreign Language (EFL) education, applying the Technology Acceptance Model (TAM) to analyze factors influencing e-learning acceptance among 298 student teachers. Using PLS-SEM, the study reveals complex relationships between perceived usefulness, ease of use, motivation, and actual e-learning use, offering insights for improving e-learning in language education [24].

An additional study surveyed 105 Malawian nursing students on their readiness for e-learning, revealing that high bandwidth costs hinder online instruction. Students preferred blended learning and requested affordable data bundles and devices. Universities should collaborate with the private sector to address these issues [25]. A current study tries to investigate student engagement as a mediator between e-learning integration and student readiness. The study explores the application of problem-based learning (PBL) in e-learning, integrating ICT for collaboration. Research in a Heavy Equipment Technology course shows improved learning outcomes, critical thinking, and Bloom's taxonomy levels C4 and above. Results highlight effective e-learning design and suggest further exploration of PBL in diverse courses and institutions, with Path Coefficients showing EE→LO 0.050, PBL→LO 0.046, and indirect effects ≤ 0.05 [26]. A remarkable and related study in this path explored the relationship between personality traits and e-learning engagement among 1004 Guizhou University students. Extroversion, agreeableness, openness, and conscientiousness positively impacted engagement, while neuroticism showed a negative effect. Achievement emotions and adaptability mediated this relationship, excluding neuroticism and conscientiousness [27].

Surveying 308 students, the research confirmed that these factors significantly influence emotional, cognitive, and behavioral engagement, revealing key mechanisms in distance education. The developed model revealed that belonging, self-efficacy, and hardiness significantly impact postgraduate engagement in distance learning [28]. Additional related work in this path explores how academicians' digital competence influences student engagement during the pandemic. Using a quantitative design, data from 500 faculty members showed that digital competence significantly impacts cognitive, affective, and behavioral engagement, with the pandemic positively moderating this relationship. The findings highlight the importance of digital capacity building [29]. Another study in the current literature investigates similar variables, such as instructor proficiency and institutional support, as moderators to enhance the relationship between e-learning integration and student readiness. The study explores how digital literacy influences self-regulated learning (SRL) in distance education, emphasizing attitudes toward e-learning and task value as significant mediators and

moderators among 538 college students [30]. The qualitative study explores why students choose online learning, using a triangulation strategy of documentation, observation, and semi-structured interviews across three universities. It identifies individual and institutional factors influencing student engagement and willingness to utilize online education [31]. A comparable study explores how lecturers' technological anxiety impacts their adoption of cloud e-learning systems in Ghana's technical universities, highlighting competitive pressure and recommending training, support, and user-friendly platforms [32]. Another study also looked at the moderating effect of computer self-efficacy on the relationship between instructor roles and course content on e-learning acceptance by 403 nursing students in Iran [33]. In another study, it was found after an investigation of a crossed section of 208 nursing students to establish the relationship between e-learning readiness, academic self-efficacy, and academic achievement that there was a positive significant correlation ($p \leq 0.001$) in both [34]. The findings in this review (2016-2023) identified key predictors of M-learning adoption and success in enhancing students' learning engagement, including technical, pedagogical, and social factors, all showing significant impact on adoption and engagement outcomes [35].

Another study compares ChatGPT and Google in education using data from 122 UAE students. ChatGPT's adoption is influenced by information quality, perceived learning value, and satisfaction, offering insights into AI's educational role [36]. A case study explores how Oman's National University of Science and Technology adapted to COVID-19, revealing high satisfaction with online theory classes but lower satisfaction with lab activities, recommending augmented and virtual reality solutions [37]. This study explores factors influencing Omani faculty's readiness to adopt MOOCs, revealing no significant gender differences but highlighting discipline-based differences in attitude and associations between self-efficacy, technical competencies, and MOOC readiness [38].

2-1- Literature Review Summary

Quite a lot has been written about e-learning and specific applications of educational technology, while there are still knowledge gaps about the MIS program implementation. Although the relevance of delivering content through e-learning in general education is well documented, literature dealing with the teaching of specific technical skills in MIS, including data analytics, systems thinking, and problem-solving, is scarce. Further, in enhancing the role, few papers review the students' engagement as a moderator in cultivating these competencies and qualifications and institutional support as moderators of skill development. Other works have analyzed e-learning acceptance based on TAM and self-efficacy, motivation, and readiness, especially in situations like language learning, nursing, and changes due to the pandemic and reallocation of learning to online. The studies presented in the literature reveal the relationship between digital competence, technical support, and personal factors such as personality characteristics, computer self-efficacy, and sense of belonging and e-learning adoption and engagement levels. Studies have been carried out across different fields of education and countries, but promising predictors such as students' preparedness, involvement, teacher competency, and institutional support within the field of MIS education are limited.

Although a number of works are focused on self-efficacy or staking, student involvement, instructor competence, and institutional reinforcement, most of such works analyzed them in other educational modalities (for instance, nursing, language education) or studied them in counter to certain odds just like the pandemic. Surprisingly, there is little research done on how e-learning is mainstreamed into MIS curriculum, and even less on ways in which the three key competencies of data analysis, thinking systems, and problem solving are enhanced. Another area that has not been fully investigated in MIS-related e-learning research concerns the second research question: the extent to which student engagement acts as a mediator and instructor proficiency and institutional support act as moderators.

Thus, our study helps to fill this void by systematically connecting these variables: e-learning integration (IV), student readiness (DV), student engagement (a mediator), instructor proficiency, and institutional support (both as a moderator). Unlike other works, our framework illustrates these variables in their proper places and explores the influence of e-learning performance on the acquisition of MIS-related competencies, including data analytic thinking, system thinking, and problem solving. Besides, this fresh perspective also deepens the appreciation of how e-learning fits in MIS skill acquisition and offers avenues for future discourse on variable congruence appropriate to e-learning literature.

3- Research Methodology

The general steps in employing this kind of approach are shown in Figure 1; however, the actual successful completion of this study involves standard research methods.

The research methodology encompasses several key steps:

- **Problem Analysis**: This step incorporates identification for the overall research problem, enhancing understanding of the background and purpose.

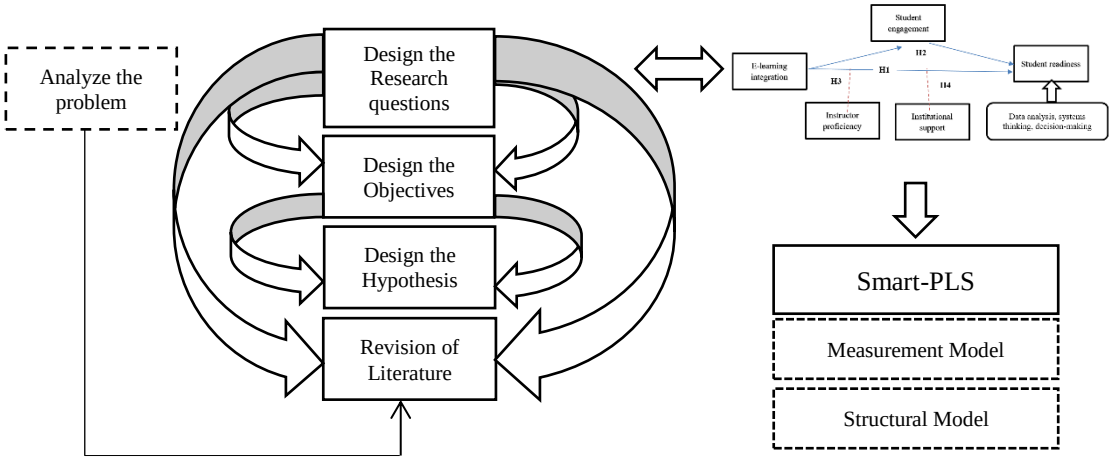

Figure 1. Research Methodology

- **Iterative Development of Research Components**: The next phase has a sequential and cyclical approach towards determining research questions, objectives and hypotheses. At the same time, literature research is performed in order to collect the results of previous works which can be helpful in the further adjustment of the research variables and framework.
- **Survey Development**: In the course of this literature review, questions for the survey are thus adopted from other similar studies with slight modifications to meet the actual research variables being used in the present study. This survey was then reviewed by the research committee at the University of Buraimi for approval.
- **Survey Distribution**: Once the survey was approved, it was conducted via Google Forms and shared with the currently available email and WhatsApp groups. A similar to the above technique, we used the simple random sampling approach to distribute the survey and obtain the necessary convenience and data from the appropriate parties.
- **Data Collection**: The survey questions that had been approved by the university of Buraimi research committee for use were forwarded to 733 people because this is the number of individuals we had on our email and WhatsApp contacts list. When using the survey for two weeks, 420 participants filled in the questionnaire. We could not wait for additional responses because of the internal research project schedule of the University of Buraimi. As such, it became necessary to carry out the research within the set time line. According to other papers, the sample of 422 is considered sufficient to finish our research [39, 40]. The survey has been kept simple and all the respondents were mandated to answer the set survey questions. The data collected was downloaded and saved in our computer for further data analysis to be carried out.
- **Data Pre-processing**: The process of data collection in this case was followed by four major steps in data pre-processing.
    - **Step 1**: We also looked for the lowest and the highest values. As the survey was done using a Likert scale of 1-5, no problem occur during this kind of step.
    - **Step 2**: Missing values were checked. Since the survey was taken through Google Forms and each question was labelled as required, there were no cases of missing data.
    - **Step 3**: First, we checked all the data for outliers. Since participants were responding to values on the scale of 1 to 5, human entry errors were automatically excluded.
    - **Step 4**: The last data pre-processing step was to look for possible misunderstandings and misinterpretations of the survey questions. We measured it using the standard deviation; the lower bound for SD was 0.496, while the upper limit was 1.417 .These values are within the acceptable range according to the literature; therefore, the participants understood the questions asked [39-41].

Thus, it was possible to successfully carry out the following pre-processing steps, as part of the research for this work: Finally, the following SEM-PLS evaluation measures were used for the analysis of this research. The framework which was proposed in this study presented in Figure 2.

This work presents the methodological approach for conducting SEM analysis on e-learning integration in MIS programs. It uses SEM to assess the impact of e-learning integration on enhancing core competencies within the MIS curriculum. By adopting a comprehensive framework that includes Computational Thinking (CT), the study demonstrates how e-learning improves essential MIS skills such as data analysis, systems thinking, and problem-solving. The proposed framework is illustrated in Figure 2, with a detailed description provided below.

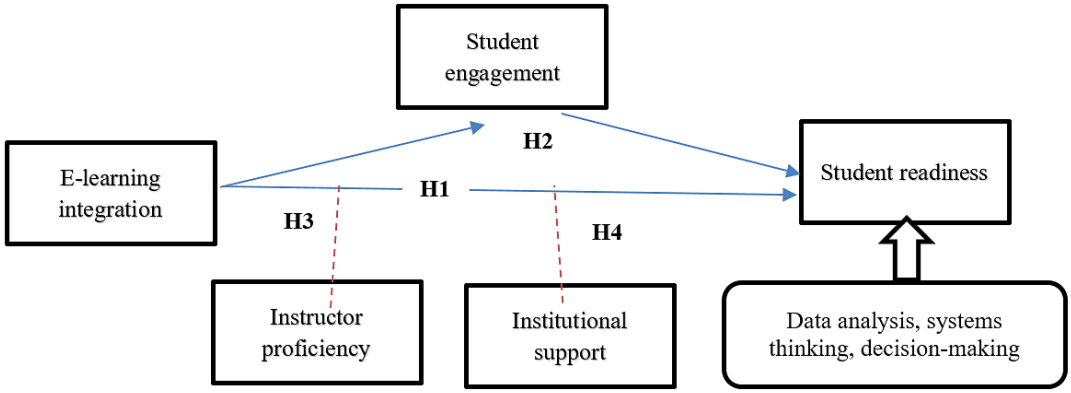

Figure 2. Conceptual Framework

3-1- Research Framework and Variables

The conceptual framework proposed in Figure 2 was developed to explore the relationships among the following variables:

- **Independent Variable** (**IV**): E-learning Integration (Effectiveness).
- **Dependent Variable** (**DV**): Student readiness (Increasing awareness of student, faculty, and other stakeholders of development of MIS-related skills (for example data analysis, systems thinking problem-solving).
- **Mediator**: Student engagement (recast Participation (how students interact with the environment set up for e-learning and participate).
- **Moderators**:
  - Instructor proficiency (defined as the skills of the instructors with reference to the adopted e-learning tools).
  - Institutional support (Availability and access to Instructional design/research resources as well as precise administrative support for online learning activities).

3-2- Research Questions

- RQ1: In what way is e-learning connected with the acquisition of MIS related skills among students?
- RQ2: To what extent does the active participation of students moderate the effect of e-learning integration and the growth of MIS skills?
- RQ3: In what ways does instructor proficiency enhance the association of e-learning integration and student engagement?
- RQ4: In what ways does institutional support significantly moderate the effects of e-learning integration and MIS skill development?

3-3- Research Objectives

- RO1: From here, the author's research question focuses on examining the relationship between use of e-learning and the acquisition of MIS related skills by the students.
- RO2: To explore how student engagement would help in mediating the e-learning integration and MIS skills development.
- RO3: To examine how instructor proficiency mediates e-learning integration and/or students' engagement.
- RO4: To examine the moderating role of institutional support in the CH: There is evidence that the integration of e-learning correlates with the development of MIS skills among faculty members.

3-4- Hypotheses Development

The study aims to test the following hypotheses:

- H1: MIS related skill development is associated with the integration of e-learning.
- H2: The extent of student engagement mediate the level of e-learning integration and skill in developing MIS skills.
- H3: Instructor proficiency will moderate the integration of e-learning to the students' engagement in a positive manner.
- H4: Both e-learning integration and MIS skill development will be significantly and positively moderated by institutional support.

3-5- Expected Contribution

Through SEM, this study will enable the present research to reveal the mediating mechanism by which e-learning integration influences the enhancement of core MIS skills; while considering student engagement as the mediator, and the proficiency of instructors and institutional support as the moderators. This holistic approach provides a sound framework for improvement of e-learning strategies in all the MIS education programs in Oman and other gulf countries.

4- Data Analysis and Results

4-1- Model of Assessment: Measurement Model

Both "Cronbach's Alpha" and "Composite Reliability (CR)" were utilized in order to evaluate the validity and reliability of the collected data. When the dataset was first created, it included items that had factor loadings that were lower than 0.700. (for example, 1.5 Student engagement ← SE(0.429), 2.5E-learning integration ← EL(0.244), 3.1 Instructor proficiency ← IP(0.537), 3.3 Instructor proficiency ← IP(0.669), 3.5 Instructor proficiency ← IP(0.607), 4.1 Institutional support ← IS(-0.011), 4.3 Institutional support ← IS(0.402), 4.5 Institutional support ← IS(0.278), 5.1 Student readiness ← SR(0.671), 5.4 Student readiness ← SR(0.693), 5.5 Student readiness ← SR(0.603). These items were later removed from the dataset. These two figures, Figure 3 (before removal) and Figure 4 (after removal), demonstrate the technique that is being described. The results of this investigation led to the establishment of Cronbach's Alpha and Composite Reliability (CR). This discovery was made possible by the considerable testing that was conducted using AVE and HTMT. Table 1 displays the overall reliability and validity of the remaining items, as well as the factor loadings associated with each of them. There is a high level of dependability demonstrated by all of the alpha values, as well as by the CR beyond the recommended cutoff limit of 0.700. The "convergent validity" was confirmed as the AVE and CR values were both equal to or greater than 0.500 and 0.700, respectively. "Discriminant validity" was established by ensuring that the factor loadings for each item exceeded the corresponding cross-loadings.

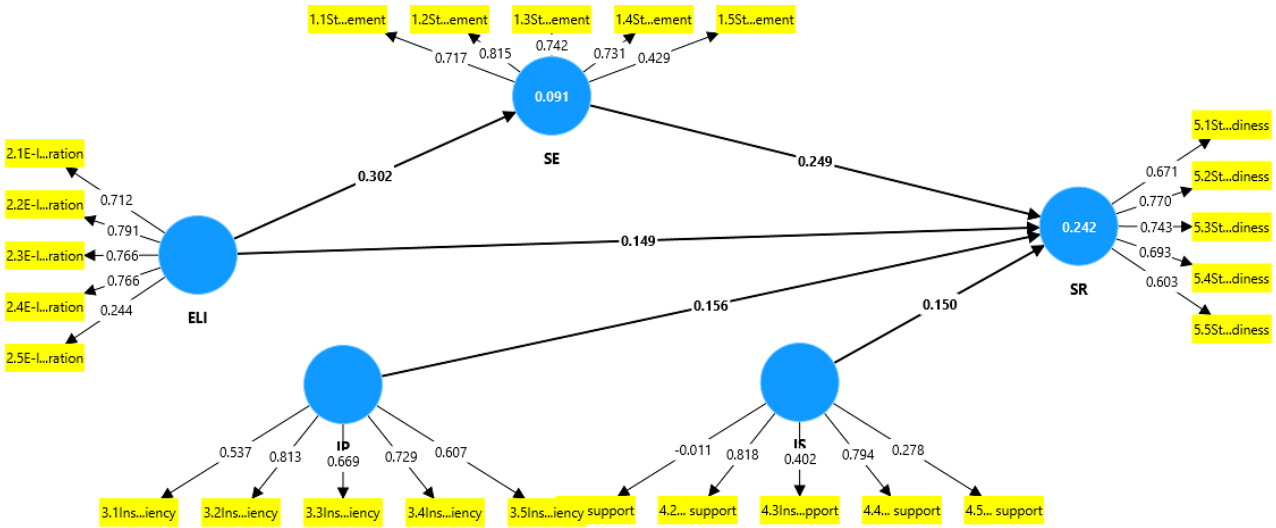

Figure 3. Factor loading (primary data)

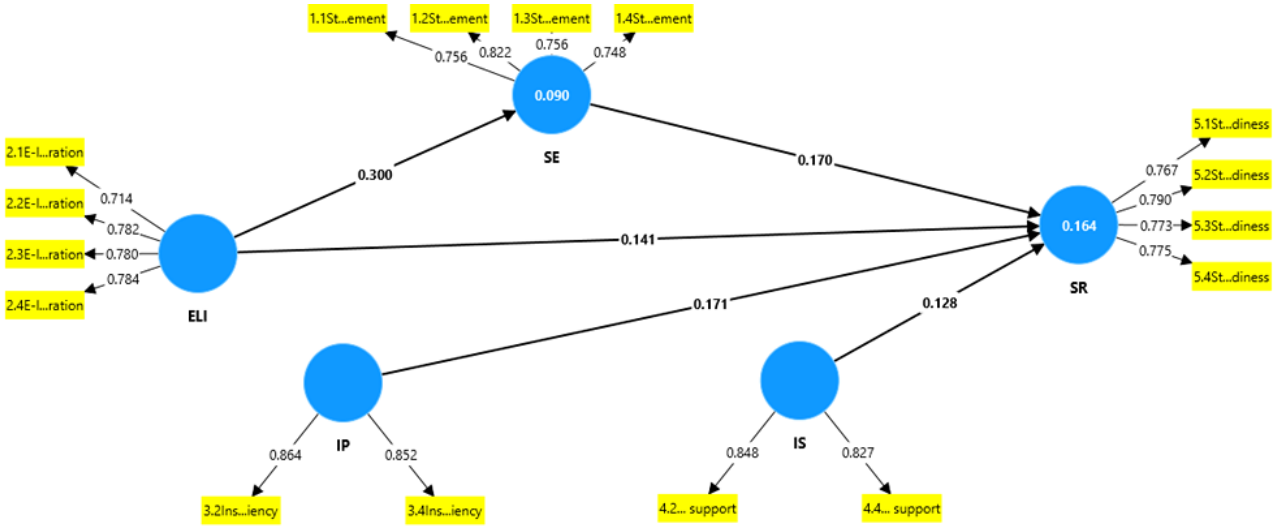

Figure 4. Factor loading (After removal: items < 0.07)

Table 1. "Item loadings, Reliability, and Validity"

	Factor Loading	Cronbach's alpha	(rho_a)	(rho_c)	(AVE)
E-learning integration (EL)		0.772	0.783	0.849	0.586
2.1 E-learning integration	0.714				
2.2 E-learning integration	0.782				
2.3 E-learning integration	0.780				
2.4 E-learning integration	0.784				
Student Engagement(SE)		0.776	0.797	0.854	0.595
1.1 Student engagement ← SE	0.717				
1.2 Student engagement ← SE	0.815				
1.3 Student engagement ← SE	0.742				
1.4 Student engagement ← SE	0.731				
Instructor proficiency (IP)		0.642	0.643	0.848	0.736
3.2 Instructor proficiency ← IP	0.813				
3.4 Instructor proficiency ← IP	0.729				
Institutional support (IS)		0.574	0.576	0.824	0.701
4.2 Institutional support ← IS	0.848				
4 Institutional support ← IS	0.827				
Student readiness (SR)	0.782	0.788	0.858	0.602	0.782
5.1 Student readiness ← SR	0.767				
5.2 Student readiness ← SR	0.790				
5.3 Student readiness ← SR	0.773				
5.4 Student readiness ← SR	0.775				

In general, less internal consistency is indicated by Cronbach's alpha values (0.642) and (0.574) for instructor proficiency (IP) and institutional support (IS), respectively, which are below the suggested threshold of 0.7. In exploratory research, these values may still be deemed acceptable, particularly if additional metrics for validity and reliability, such as average variance extracted (AVE) and composite reliability (rho_c), demonstrate promising outcomes. This example shows that both constructs have sufficient internal consistency and reliability with composite reliability (rho_c) values above 0.7 (IP: 0.848, IS: 0.824). Furthermore, a considerable amount of variance is explained by the constructs as indicated by the AVE values for IP (0.736) and IS (0.701), which are both above 0.5. Consequently, the strong composite reliability and AVE imply that the constructs are valid and reliable even with the lower Cronbach's alpha values. The findings are acceptable, especially in the exploratory sense, as AVE suggests convergent validity and rho_c validates composite reliability.

4-2- Validity Predictive

Table 2 displays the Heterotrait-Monotrait ratio (HTMT) for discriminant validity, while Table 3 offers the Fornell and Larcker criterion. Predictive validity was thus confirmed once more, and discriminant validity received additional backing.

Table 2 shows the HTMT, which is used in SEM in testing discriminant validity. The HTMT values are computed in order to evaluate how strongly different constructs in the model are related. If the values are closer to 1, they can signal discriminant validity issues; that is, the identified constructs are not sufficiently different from one another. In this table, each cell corresponds with the HTMT ratio of two constructs. For instance, the HTMT of E-learning Integration (ELI) and Instructor Proficiency (IP) is 0.291, which means little overlap between these two constructs, thus helpful discriminant validity.

Table 2. Heterotrait-Monotrait ratio (HTMT)

	ELI	IP	IS	SE	SR
ELI					
IP	0.291				
IS	0.388	0.415			
SE	0.345	0.289	0.393		
SR	0.318	0.370	0.371	0.347	

Table 3 goes with another test for discriminant validity, namely the Fornell & Larcker criterion. The AVE must exceed squared correlations, with diagonal values representing the square root of AVE. As for example, the coefficient of the diagonal for the factors PEC is 0.899, and the coefficient between PEC and ELI is 0.542. Due to the fact that the diagonal elements are higher than the off-diagonal correlations, the proposed constructs can be said to have good levels of discriminant validity relative to the Fornell & Larcker criterion.

Table 3. "Fornell & Larcker"

	ELI	IP	IS	SE	SR
ELI	0.765				
IP	0.218	0.858			
IS	0.266	0.254	0.837		
SE	0.300	0.212	0.269	0.771	
SR	0.263	0.270	0.255	0.283	0.776

4-3-Assessment Model: Structural Model

In the subsequent phase of this study, we examined the structural models to assess the proposed hypotheses. Through the bootstrapping process, we were able to test the direct hypotheses (H1), mediation hypothesis (H2), and moderator hypothesis (H3 & H4).

4-4-Direct Hypothesis Testing

In Table 4, which showed significant results for hypothesis H1. The findings demonstrated a strong impact of E-learning Integration (ELI) on Student Readiness (β =0.141, t=2.891, p=0.002), thereby confirming hypothesis H1. With a path coefficient of 0.141, the effect of e-learning integration (ELI) on student readiness (SR) reveals a small but substantial beneficial influence. This is the case even though the influence is not overwhelming. The statistical significance of the link is demonstrated by the high T-statistic (2.891) and the low P-value (0.002); yet, the strength of the relationship is very weak. The testing of H2, H3, and H4 will be detailed in the following sections.

Table 4. Testing (H1)

	(O)	(STDEV)	T statistics	P
ELI → SE	0.3	0.041	7.37	0
ELI → SR	**0.141**	**0.049**	**2.891**	**0.002**
IP → SR	0.171	0.048	3.583	0
IS → SR	0.128	0.048	2.64	0.004
SE → SR	0.17	0.052	3.275	0.001

4-5-Mediation-Analysis

Figure 5 confirms the use of 'Bootstrapping' for the mediation analysis. Table 5 displays the results of testing hypothesis H2, which examines whether SE mediates the relationship between ELI and SR.

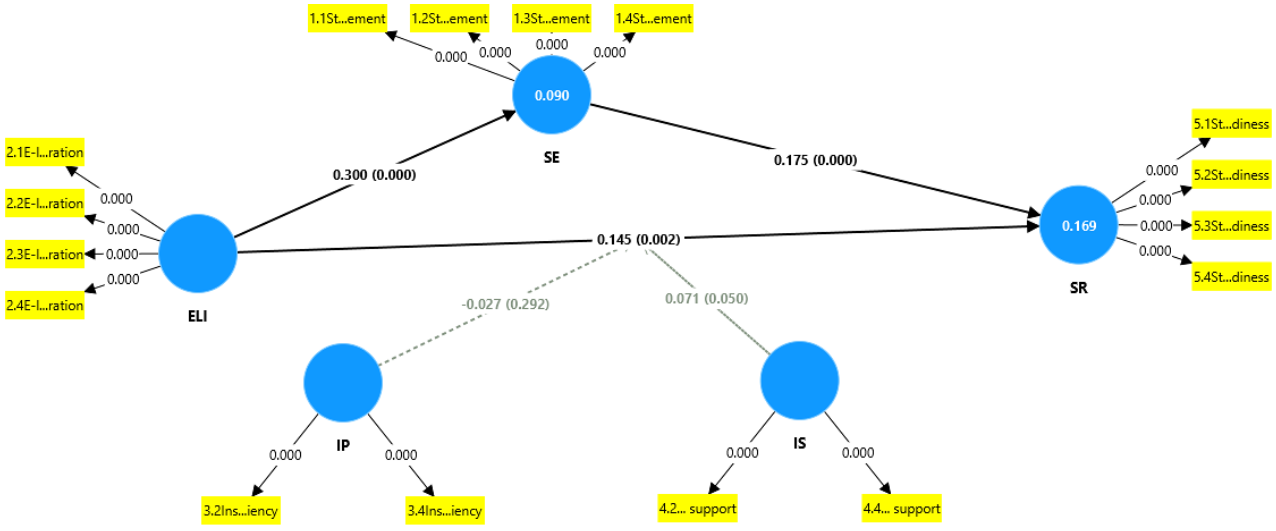

Figure 5. Implementation of Bootstrapping for "Mediator and Moderator" Analysis

Table 5. Result Summary (Mediator analysis H2: ELI → SE → SR)

Total-effect		Direct-Effect		Indirect-Effect-Specific						
B	**P**	**B**	**P**	**Hypothesis**	**B**	**t**	**UL**	**LL**	**P**	**Results**
0.197	0.000	0.145	0.002	H2 ELI → SE → SR	0.052	3.078	0.024	0.080	0.001	Partial Mediation **H2:Accepted**

Hypothesis H2 examines how Student Engagement (SE) mediates the relationship between E-learning Integration (ELI) and Student Readiness (SR) ("ELI → SE → SR"). Data from Table 5 and H2 show a significant indirect link between ELI and SR (β=0.051, t=52.995, p=0.001). As shown in Figure 4, the influence of SE as a mediator is significant (p<0.05). The findings indicate that SE partially mediates the relationship between ELI and SR and also moderates this association. Higher levels of SE weaken the positive relationship between ELI and SR, highlighting its controlling effect on the connection.

When discussing mediator analysis, the terms Upper Limit (UL) and Lower Limit (LL) denote the respective limits of the confidence interval (CI) concerning the mediation's indirect effect.

They mean the following: Upper Limit (UL): The maximum value of the indirect effect that can be found in the population given the sample data and the confidence interval (usually 95 percent). Lower Limit, or LL, is the lowest value of the indirect effect that can be found in the population using sample data that falls inside the same confidence interval. The useful details they offer are as follows. The indirect effects statistical significance is determined in part by UL and LL. Should the confidence interval (CI) be devoid of zero (given that neither UL nor LL cross zero and are either positive or negative), the mediation effect is deemed significant. The indirect effect is statistically significant in your instance, supporting the hypothesis of partial mediation as indicated by the UL = 0.080 and LL = 0.024, which show that the confidence interval does not contain zero. Standard values: Because they depend on the dataset, the confidence interval UL and LL have no set standard value. Nevertheless, in order for the outcomes to matter. There should be no crossing of zero in the confidence interval (between UL and LL). As you can see, there is partial mediation in our case, as the indirect effect of ELI - SE - SR is significant with LL = 0.024 and UL = 0.080 without zero.

4-6- Moderator-Analysis

The results in Table 6 indicate that **Instructor Proficiency (IP)** does not have a significant impact on the relationship between E-learning Integration and Student Readiness (H3: IP × ELI → SR). However the **Institutional support (IS)** moderator is significantly influence the relationships between E-learning Integration and Student readiness (H4: IS × ELI → SR) .Hence, hypotheses H3 rejected and H4 have been accepted.

Table 6. Moderator Results

		Original sample (O)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	
H1	ELI → SR	0.145	0.049	2.951	0.002	Accepted
H3	IP × ELI → SR	-0.027	0.05	0.547	0.292	Rejected
H4	IS × ELI → SR	0.071	0.043	1.646	0.05	Accepted

The moderation analysis examined the role of Instructor Proficiency (IP) and Institutional Support in moderating the relationship between E-learning Integration (ELI) and Student Readiness (SR). The study hypothesized that both IP and Institutional Support would positively moderate this relationship (H3 and H4). However, results showed that Instructor Proficiency did not significantly affect the relationship (β = -0.027, t = 0.547, p = 0.292), leading to the rejection of H3. On the other hand, Institutional Support positively moderated the relationship (β = 0.071, t = 1.646, p = 0.05), supporting H4. Thus, H4 is accepted, while H3 is rejected.

Table 7. F-square results

	f-square
IP × ELI → SR	0.001
IS × ELI → SR	0.005

The f-square (f^2) values calculated in Table 7 explain the proportion of variance in the outcome variable (SR) explained by the predictors (IP, IS) in terms of relation to ELI (E-learning Integration). Here's a breakdown of the values:

IP × ELI → SR: $f^2 = 0.001$ (1)

This shows an extremely small effect size. There are some conventions to this: f^2 less than 0.02 is small, f^2 between 0.02 and 0.15 is medium, and the rest, over 0.15, is large. From this result, one can infer that therefore the relationship between IP – Independent Variable and ELI is not a significant influence on SR – Dependent Variable.

IS x ELI It is once again a small value as in the first result, pointing towards the fact that both IS (Independent Variable) and ELI have no significant influence on SR.

Interpretation: Good or Not? Both f^2 values are significantly low, and hence the interactions you want to study may not have any worthwhile influence on the outcome variable SR. In research situations, these would be seen as undesirable when you want large, re-affecting numbers, which brings us to the concept of. This highlights the need to look at the context of the results a bit further, and if this wasn't enough, other variables or interactions may prove to be much higher.

All things considered, the f-square values demonstrate the existence of small effect sizes, which imply that the interactions of our predictors with the ELI hinder the impact of SR slightly. Perhaps, when testing other related variables, we would consider the other variables or add more variables to your model to discover other crucial associations.

Table 8. R-square with and without moderator (SR)

	R-square (with moderator)	R-square (no moderator)
SR	0.169	0.164

The R-square values computed in Table 8 refer to the proportion of variation in the dependent variable SR accounted for by the independent variables in our proposed model with and without the moderator. If no moderator is involved, then d = 0.169−0.164 = 0.005, representing the proportion of variance in the dependent variable (SR) explained by the independent variables in our model, both with and without the moderator. Here's a breakdown of the results:

Results:

R-square (with moderator): 0.169

R-square (without moderator): 0.164

Interpretation:

Change in R-square:

The change in R-square is calculated by subtracting the R-square value without the moderator from the R-square value with the moderator:

$\Delta R^2 = R^2$ (with moderator) $-R^2$(without moderator) = 0.169 − 0.164 = 0.005.

It shows that the inclusion of the moderator in the model contributes an incremental of 0.5% to the amount of variance in SR that is explained by the model, ($\Delta R^2 = 0.005$).

Meaning of the Change:

Although a small rise was identified towards the overall R-sq, it supports the idea that the moderator has a positive influence over the selected independent variables and the dependent variable, SR. That is, the moderator makes it possible to account for slightly more of the variance in SR than when the model was developed without it.

This is especially the case when the change is statistically significant or meaningful; at least in standard practice, a ΔR^2 of 0.005 can be considered small for many research contexts, suggesting the moderator only provides a small extent to the explanation in the model.

In total, these findings indicate that the application of the moderator enhances the explanatory power of the model by a small extent in terms of variance in SR. It may therefore be advisable to question whether that small improvement is worth the time and effort of including the moderator in our study or whether much more work is required to assess other potential moderators or indeed other variables for a much larger impact. For H3, no significant moderation was observed, so slope analysis was not conducted.

Slope Analysis for H4:

The typical interpretation of f-square values is as follows: a red line indicates minimal impact ($f^2 \geq 0.02$), green shows a medium effect ($f^2 \geq 0.15$), and blue indicates a large impact ($f^2 \geq 0.35$). From Figure 6, it is clear that Institutional Support (IS) has a medium effect, positively influencing the relationship between E-learning Integration (ELI) and Student Readiness (SR). The f-square value ($f^2 = 0.072$) suggests a minimal impact, as it is below 0.15.

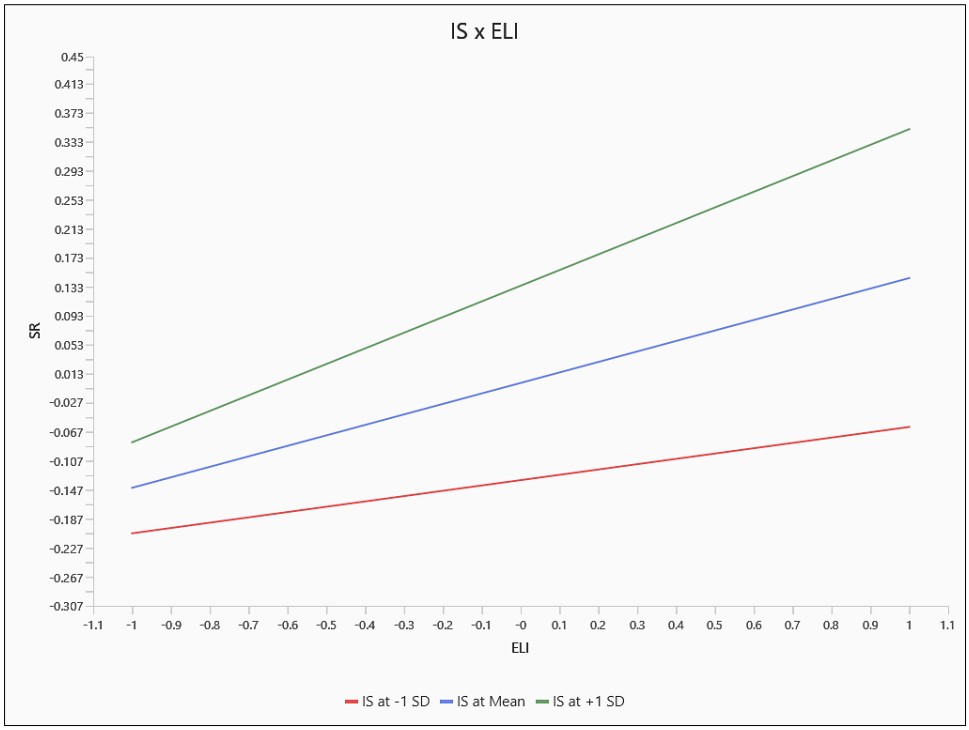

Figure 6. Slope analysis (H4): IS × ELI → SR = 0.072

5- Discussion

Through this research, it is empirically appreciable that the integration of e-learning enhances MIS student competencies in Omani universities. The significant and positive relationship between e-learning integration and student readiness nevertheless narrates the possibility of positive results with the integration of digital learning environment. While the impact may be small, the fact that the result was statistically significant is evidence that e-learning strategies are effective and should receive more consideration from educators and governments.

Through analyzing the mediating factor of student engagement, it was found that enhancing interaction and participation in e-learning could potentiate the impacts of e-learning integration on students' readiness. This means that simple adoption of e-learning technologies is not enough; structures of education must invite the learner into learning to optimize for learning.

However, the studies of instructor presence suggest that the presence of qualified instructors can be inefficacious in improving students' turnover in e-learning environments. This means it is time to reconsider the approaches used to train instructors instead of offering an overall training on effective teaching practices that teachers implement in online classes.

Another important moderator that was established reflected institutional support as a key factor that ensures an appropriate environment for e-learning. To promote e-learning, institutions should consider providing resources, training, and infrastructure to support the implementation of this learning mode.

Therefore, future research should employ longitudinal methods and objective indicators to confirm these results and extend the understanding of the effects of HRQOL on mental health and stress level in this population. Broadening the subject of the research focus to other educational settings might also produce more extensive information concerning e-learning organization in skills acquisition.

5-1- Answering Research Questions and Achieving Objectives

RQ1: What is the nature of the relationship between e-learning and the enhancement of students MIS-related skills?

Objective Achieved (RO1): It was further ascertained that there was a positive correlation between ELI and SR, specifically where β = 0.141, p = 0.002. This settles the notion that proper integration of e-learning enhances the development of MIS skills.

RQ2: How much does the student engagement moderate the e-learning integration for MIS skills development?

Objective Achieved (RO2): This has revealed that ELI positively influences SR, although this relationship is partially mediated by SE. The existence of an indirect effect of ELI on SR through SE (Estimate β= 0.051, p<0.05) supported the call for engagement in boosting skills.

RQ3: In what way do findings regarding e-learning integration effectiveness and student engagement relate to instructor proficiency?

Objective Achieved (RO3): The findings also indicated that the "instructor proficiency" did not moderate the effect of ELI on SR (β = -0.027, p = 0.292); therefore, the current hypothesis was also dismissed. This implies that instructor content knowledge alone can have no direct relation to student interactivity within e-learning environments.

RQ4: How does institutional support enhance or reduce the impact of integrating e-learning into the course and MIS skills training?

Objective Achieved (RO4): Omani institution support had a significant positive moderation effect on ELI and SR (β = 0.071, p = 0.05). This affirms the hypothesis that effective response to e-learning integration for developing MIS skills can be obtained with better institutional support.

5-2- Testing the Hypotheses

H1: Supported. The integration of e-learning has a great impact on student preparedness (β= 0.141, p = 0.002).

H2: Supported. Results show that student engagement moderates the link between ELI and SR (Standardised Beta = 0.051; p = 0.001).

H3: Rejected. The analysis further reveals that there is an inverse correlation between ELI and SR and that Instructor proficiency does not interact with ELI to reduce or increase the correlation coefficient (β=-0.027, p=0.292).

H4: Supported. We also find a moderating role of institutional support on the link between ELI and SR where β=0.071, p=0.05.

In essence, the research satisfactorily addressed the research questions, met the study goals, and the hypothesis, while offering useful information.

The proposed work adds useful insights about the effectiveness of MIS utilizing e-learning for the exploitation of student and faculty competencies in the educational field. However, some areas need a clearer explanation as well as elaboration to improve the paper's effect and applicability.

5-3- Clarification of Key Concepts

It is crucial to conduct a further analysis of insignificant outcomes, although the paper outlines rather impressive ones. It was also seen that these avowals could give a hint to the area that has comparatively less efficacy in the proposed approach, the flaw or the peculiarity that could be tackled, or the point of reference for the subsequent research or for fine-tuning the method. By discussing the trends, which third variable effect or interaction on the spreads combination is statistically insignificant, it provides an objective approach and brings out the areas where improvement is needed, while the discoveries of the study help in the advancement of the comprehension of the subject.

5-4- Cautions for More Inclusive Frameworks

Besides, the finding of the study might be generalized beyond the contexts of Omani higher education. This gap is addressed in the current study, as the focus and indeed the strength of the study is on Omani higher education. However, future research could indicate how the current study's findings could be transferred to other educational systems or cultural contexts. It may cover the discussion of the applicability of the given framework in distinct geographies or fields of study, providing recommendations for institutions in various contexts that use similar strategies.

In this work we have considered the following steps to minimize biases in terms of self-generated variables like readiness and engagement. To reduce response bias, we developed a structured survey that enabled simple and coherent questions that did not differ from response to response. Secondly, most of the questions posed in the survey were mandatory, and using Google Forms added to fewer incidences of half-baked or even misleading results.

About the second research question, the study concludes that its part is the partial mediating role of students' engagement in the relationship between e-learning integration and skills. Even more specifically, two aspects—engagement, as well as assignment completion and other activities using the course materials—seem to have the most on-skill effect. Learning time was also learned to have an impact; however, this was not as profound as when learning was active.

Concerning instructor proficiency as a moderator, it lacked the expected qualities and might be a result of a lack of standardization in e-learning tools, or instructors were not well trained enough. This infers that the expertise that teachers have in their various fields may be one of the causes of ineffectiveness in managing e-learning platforms to yield the results desired.

The practical significance of the findings revealing moderators is questionable because the increase in R-square is small (ΔR^2=0.005). This goes further to the suggestion that other contributions, like the curriculum and technology, may in fact explain a much greater proportion of the impact.

Technical support, training, and staff support were the key areas in which institutions were identified as being important in facilitating the implementation process. Such supports are important even in developing country contexts and can be delivered by focused fiscal investments in faculty enhancement.

Last but not least, it should be noted that the research is conducted within the learning context of MIS; however, similar frameworks could be applied to other academic disciplines, especially those with a heavy reliance on technology and digital tools.

6- Conclusion

The current study focuses on the effects of e-learning in the MIS curriculum, and as evidenced by the findings, there are enhancements in student performance and competency. As previously noted, an institution's efficiency and engagement significantly influence MIS student outcomes. These results reassert the importance of seniority in cooperation between teachers, organizations, and governments to enhance e-learning approaches. These strategies should not only cultivate essential skills but also align with the current technological advancements. The integrated approach to education enhances the future work performance of learners, particularly those who intend to work in MIS. This research provides valuable insights into how e-learning enhances the competencies of both students and faculty in the field of education. However, there is potential for further development of specific ideas presented in the paper, which could enhance its practical implications. In this case, we suggest that institutions have to gain control over e-learning tools, introduce collaborative education, and develop a multicultural student-to-faculty twinning model. We began by attempting to demonstrate the integration of e-learning into MIS programs. It also enriches the theoretical body of knowledge by proposing an analytical framework unveiled to analyze the role of e-learning in improving the MIS skills, with reference to Oman. The current study draws upon previous research using SEM to investigate the role of student engagement in reducing dropout rates in online learning. By broadening these variables, the study identifies ways through which e-learning can enhance the primary MIS competencies required in today's working world. These conclusions are specific to Oman and other Gulf countries, as the study focused on suggestions for improving curricula and e-learning implementation. The work is useful for policymakers and leaders in education who want to link the liberal base of MIS education to the demands of new technology and the economy.

6-1- Recommendations

Enhance Institutional Support: Institutions should enhance the e-learning institutional support frameworks by deepening them. This comprises offering effective resources, training, and facilities that enable the development of a stimulating internet-based learning process.

Focus on Student Engagement: Teachers should conceive approaches that enable student participation in e-learning platforms. This could include concepts that are best taught through the use of features like webcams, where students can directly teach each other and make a group project in order to give feedback and correct their mistakes in using tools for a given task.

Instructor Training: Even though e-learning integration was not mediated by instructor proficiency affecting student readiness, OPD plays a crucial role pertaining to instructors' professional competencies. E-learning training sessions help in increasing the quality of instructions as well as the results achieved by the students.

Curriculum Development: Implement e-learning strategies as a coherent part of the MIS curriculum to meet the current trends of MIS job market demands.

6-2- Further Work & Limitations

Further Work:

- A future research agenda should consider examining different mediators and moderators of the interplay between e-learning and skills development, such as students' profiles and preferences.

Limitations:

- Sample Size and Generalizability: Despite the polling of 420 participants, the results can't be regarded as applicable for the overall population of the Omani university students. Future research could continue from this base to include other areas.
- Cross-Sectional Design: The cross-sectional approach of the study hampers the testing of causality. It is suggested to use longitudinal research design to determine how skill acquisition is affected by e-learning integration in the future.

7- Declarations

7-1- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7-2- Funding

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7-3- Acknowledgments

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7-4- Institutional Review Board Statement

Not applicable.

7-5- Informed Consent Statement

Not applicable.

7-6- Conflicts of Interest

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the author.

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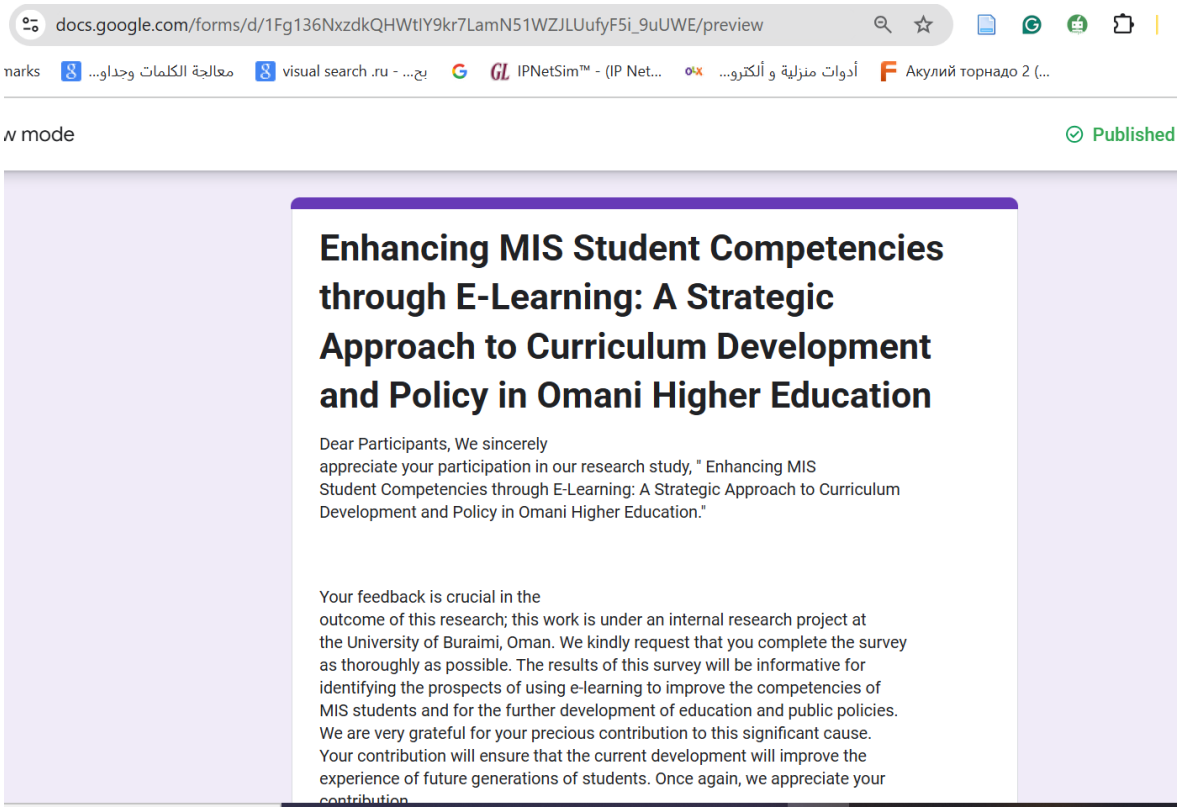
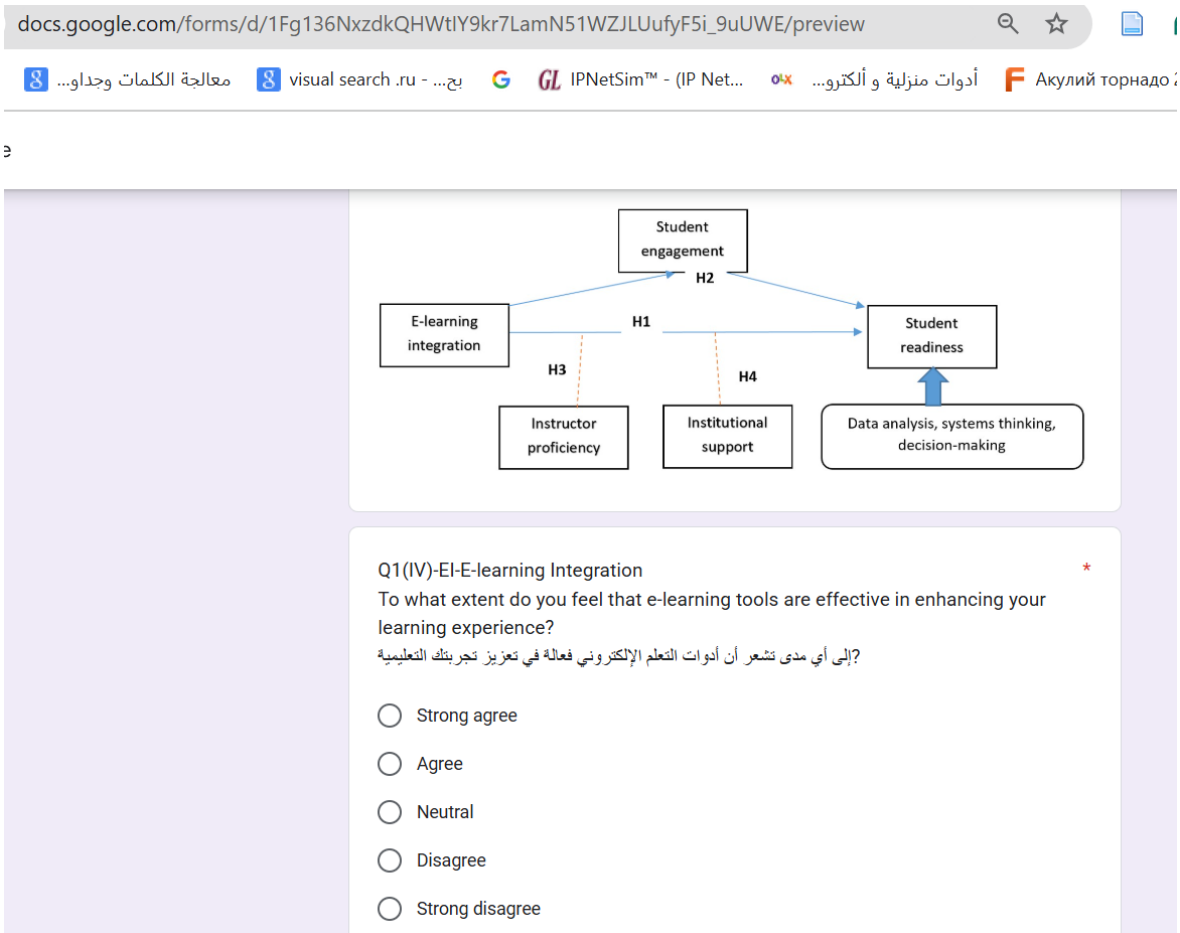
Appendix I: Survey Information

https://docs.google.com/forms/d/e/1FAIpQLSfaOCF71-dDzIu2_AYvQ09KRn_gntZ_PsgiLTWgLBj9wYtgHA/viewform?usp=preview





Abbreviation	Variable	English Question	Arabic Translation
ELI	Q1(IV)-EI-E-learning Integration	To what extent do you feel that e-learning tools are effective in enhancing your learning experience?	إلى أى مدى تشعر أن أدوات التعلم الإلكترونى فعالة فى تعزيز تجربتك التعليمية?
ELI	Q2(IV)-EI-E-learning Integration	How often do you use e-learning tools to engage with course content?	كم مرة تستخدم أدوات التعلم الإلكترونى للتفاعل مع محتوى الدورة؟
ELI	Q3(IV)-EI-E-learning Integration	Do you believe that e-learning integration improves your learning outcomes in MIS courses?	هل تعتقد أن دمج التعلم الإلكترونى يحسن نتائج تعلمك فى دورات نظم المعلومات الإدارية؟
ELI	Q4(IV)-EI-E-learning Integration	In your opinion, how effective are the e-learning tools in supporting your understanding of MIS concepts?	فى رأيك، ما مدى فعالية أدوات التعلم الإلكترونى فى دعم فهمك لمفاهيم نظم المعلومات الإدارية؟
ELI	Q5(IV)-EI-E-learning Integration	How satisfied are you with the overall e-learning experience in your MIS courses?	ما مدى رضاك عن تجربة التعلم الإلكترونى العامة فى دورات نظم المعلومات الإدارية؟
SR	Q1(DV)Student Readiness	How prepared do you feel to use e-learning tools for your MIS courses?	ما مدى استعدادك لاستخدام أدوات التعلم الإلكترونى لدورات نظم المعلومات الإدارية؟
SR	Q2(DV)Student Readiness	Do you think that you have the necessary skills to succeed in an e-learning environment?	هل تعتقد أن لديك المهارات اللازمة للنجاح فى بيئة التعلم الإلكترونى؟
SR	Q3(DV)Student Readiness	How confident are you in using online platforms to complete assignments and assessments?	ما مدى ثقتك فى استخدام المنصات عبر الإنترنت لإكمال الواجبات والتقييمات؟
SR	Q4(DV)Student Readiness	How comfortable are you with learning through online resources and digital tools?	ما مدى راحتك فى التعلم من خلال الموارد عبر الإنترنت والأدوات الرقمية؟
SR	Q5(DV)Student Readiness	How do you rate your overall readiness to participate in e-learning for MIS courses?	كيف تقيم استعدادك العام للمشاركة فى التعلم الإلكترونى لدورات نظم المعلومات الإدارية؟
SE	Q1(Mediator)Student Engagement	do you often actively participate in online discussions related to your MIS courses?	تشارك بنشاط فى المناقشات عبر الإنترنت المتعلقة بدورات نظم المعلومات الإدارية؟
SE	Q2(Mediator)Student Engagement	Do you feel engaged when using e-learning tools for your studies?	هل تشعر بالانخراط عند استخدام أدوات التعلم الإلكترونى لدراستك؟
SE	Q3(Mediator)Student Engagement	frequently complete interactive activities (e.g., quizzes, forums) in your MIS courses?	تكمل الأنشطة التفاعلية (مثل الاختبارات، المنتديات) فى دورات نظم المعلومات الإدارية؟
SE	Q4(Mediator)Student Engagement	To what extent do you believe that e-learning fosters active participation in your learning?	إلى أى مدى تعتقد أن التعلم الإلكترونى يعزز المشاركة النشطة فى تعلمك؟
SE	Q5(Mediator)Student Engagement	How would you rate your overall engagement with e-learning tools in your MIS courses?	كيف تقيم مشاركتك العامة فى أدوات التعلم الإلكترونى فى دورات نظم المعلومات الإدارية؟
IP	Q1(Moderator)Instructor Proficiency	do you believe your instructors are in using e-learning tools?	مدى مهارة أساتذتك فى استخدام أدوات التعلم الإلكترونى؟
IP	Q2(Moderator)Instructor Proficiency	your instructors use e-learning tools to enhance learning?	مدى فعالية استخدام أساتذتك لأدوات التعلم الإلكترونى لتعزيز التعلم؟
IP	Q3(Moderator)Instructor Proficiency	Do you feel that your instructors provide adequate support through e-learning tools?	هل تشعر أن أساتذتك يقدمون دعماً كافياً من خلال أدوات التعلم الإلكترونى؟
IP	Q4(Moderator)Instructor Proficiency	your instructors are trained to utilize e-learning platforms?	كيف ترى مستوى تدريب أساتذتك لاستخدام منصات التعلم الإلكترونى؟
IP	Q5(Moderator)Instructor Proficiency	To what extent do you believe instructor proficiency in e-learning affects your engagement?	إلى أى مدى تعتقد أن مهارة المعلمين فى التعلم الإلكترونى تؤثر على مشاركتك؟
IS	Q1(Moderator2)Institutional Support	How satisfied are you with the institutional support provided for e-learning in your MIS courses?	ما مدى رضاك عن الدعم المؤسسى المقدم للتعلم الإلكترونى فى دورات نظم المعلومات الإدارية؟
IS	Q2(Moderator2)Institutional Support	Do you feel that your institution provides adequate resources for e-learning?	هل تشعر أن مؤسستك توفر موارد كافية للتعلم الإلكترونى؟
IS	Q3(Moderator2)Institutional Support	How helpful is the administrative support you receive for online learning activities?	ما مدى فائدة الدعم الإدارى الذى تتلقاه للأنشطة التعليمية عبر الإنترنت؟
IS	Q4(Moderator2)Institutional Support	often do you receive guidance or assistance regarding e-learning platforms from your institution?	تتلقى الإرشاد أو الدعم بشأن منصات التعلم الإلكترونى من مؤسستك؟
IS	Q5(Moderator2)Institutional Support	How would you rate the quality of institutional support for your learning in MIS courses?	كيف تقيم جودة الدعم المؤسسى لتعلمك فى دورات نظم المعلومات الإدارية؟