

Determinants of Student Trust in E-Learning Systems in Libyan Higher Education: Evidence from Azzaytuna University

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محددات ثقة الطلاب في أنظمة التعلم الإلكتروني في التعليم العالي الليبي: أدلة من جامعة الزيتونة

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Abstract:

This study examines the factors that influence student trust in e-learning systems in Libyan higher education. Specifically, it investigates the effects of system quality, instructor interaction, content quality, and perceived security on students' trust in e-learning platforms at Azzaytuna University. A quantitative approach was adopted using a structured questionnaire administered to 169 computer science students. The collected data were analyzed using descriptive statistics, independent samples t-tests, one-way ANOVA, and multiple regression analysis.

The findings indicate that students generally reported a high level of trust in e-learning systems. Instructor interaction emerged as the strongest predictor of trust, followed by system quality, content quality, and perceived security. Female students demonstrated significantly higher levels of trust than male students, while no significant differences were found across academic levels. The regression model explained 62% of the variance in student trust.

The study contributes to the limited body of research on e-learning in developing countries by providing empirical evidence from the Libyan context. The findings suggest that universities should enhance instructor engagement, improve the quality and usability of e-learning systems, provide well-designed learning content, and strengthen data security practices to foster greater student trust in digital learning environments.

Keywords: E-learning; Student Trust; Higher Education; System Quality; Instructor Interaction; Content Quality; Perceived Security; Libya.

المخلص:

تتناول هذه الدراسة العوامل المؤثرة في ثقة الطلاب بأنظمة التعلم الإلكتروني في التعليم العالي الليبي. وتحديداً، تبحث في تأثير جودة النظام، وتفاعل المدرّس، وجودة المحتوى، والشعور بالأمان على ثقة الطلاب بمنصات التعلم الإلكتروني في جامعة الزيتونة. وقد اعتمد منهج كمي باستخدام استبيان مُنظّم وُزِعَ على 169 طالباً وطالبة في علوم الحاسوب. وتم تحليل البيانات المُجمّعة باستخدام الإحصاء الوصفي، واختبارات

للعينات المستقلة، وتحليل التباين الأحادي (انوفه)، وتحليل الانحدار المتعدد. تشير النتائج إلى أن الطلاب أبدوا عمومًا مستوى عالٍ من الثقة في أنظمة التعلم الإلكتروني. وقد برز تفاعل المُدرّس كأقوى مؤشّر للثقة، يليه جودة النظام، ثم جودة المحتوى، وأخيرًا الشعور بالأمان. وأظهرت الطالبات مستويات ثقة أعلى بشكل ملحوظ من الطلاب، بينما لم تُلاحظ فروق ذات دلالة إحصائية بين المستويات الأكاديمية المختلفة. وقد فسّر نموذج الانحدار 62% من التباين في ثقة الطلاب. تُساهم هذه الدراسة في إثراء البحوث المحدودة حول التعلم الإلكتروني في الدول النامية من خلال تقديم أدلة تجريبية من السياق الليبي. تشير النتائج إلى ضرورة أن تعزز الجامعات تفاعل أعضاء هيئة التدريس، وأن تحسّن جودة أنظمة التعلم الإلكتروني وسهولة استخدامها، وأن توفر محتوى تعليميًا مُصمّمًا بعناية، وأن تُعزّز ممارسات أمن البيانات، وذلك لزيادة ثقة الطلاب في بيئات التعلم الرقمي. **الكلمات المفتاحية:** التعلم الإلكتروني، ثقة الطلاب، التعليم العالي، جودة النظام، تفاعل أعضاء هيئة التدريس، جودة المحتوى، الأمن المُدرّك، ليبيا.

Introduction:

The rapid advancement of information and communication technologies (ICT) has fundamentally transformed higher education, driving the widespread adoption of e-learning systems worldwide. E-learning platforms offer flexible, accessible, and scalable learning experiences, allowing students to engage with educational content beyond the constraints of time and location. The COVID-19 pandemic has further accelerated the integration of digital learning, making e-learning a critical component of contemporary education [1], [2].

Despite its benefits, the effectiveness of e-learning systems relies heavily on students' acceptance and trust. Trust in e-learning refers to students' confidence in the reliability, usability, security, and overall effectiveness of digital learning platforms [3], [4]. Without sufficient trust, students may experience uncertainty, lower engagement, and reduced satisfaction, which can negatively impact learning outcomes.

Prior studies have identified several key determinants of trust in e-learning systems. System quality, including usability, reliability, and accessibility, is a critical factor influencing students' perceptions and adoption of e-learning platforms [5],[8]. High-quality systems enhance user satisfaction, reduce frustration, and foster confidence, while poor system performance can undermine trust.

Instructor interaction also plays a central role in building trust. Active engagement, timely feedback, and clear communication reduce uncertainty and increase students' confidence in the online learning process [9],[11]. In contexts where digital learning is relatively new, such as Libya, strong instructor presence can compensate for technological limitations and improve students' perception of support.

Content quality, reflected in the clarity, relevance, structure, and interactivity of learning materials, contributes significantly to students' perceived value of e-learning systems [10], [12]. Well-organized and engaging content increases satisfaction and reinforces trust, whereas outdated or poorly structured materials may reduce confidence.

Finally, security and privacy are essential for developing trust in digital environments. Students must feel assured that their personal information and academic work are protected from unauthorized access [11], [13]. While some studies indicate that security is a secondary determinant compared to system quality and instructor interaction, it remains a critical component in building overall trust.

Although trust in e-learning has been extensively studied in developed countries, research in developing contexts remains limited. Libya faces unique challenges, including inconsistent internet connectivity, limited technological infrastructure, and varying levels of digital literacy. These factors may influence students' perceptions and trust in e-learning systems [11], [14].

To address these gaps, this study investigates student trust in e-learning systems at Azzaytuna University, focusing on computer science students at the Faculty of Education. The study examines the influence of system quality, instructor interaction, content quality, and security on trust, while also exploring differences based on gender and academic level. By applying a quantitative approach and multiple regression analysis, this research provides empirical evidence from a developing country context and contributes to the understanding of trust in digital learning environments.

2. Literature Review:

2.1 E-Learning in Higher Education:

E-learning has become a cornerstone of modern higher education, providing flexible, accessible, and scalable learning opportunities that extend beyond traditional classrooms. Digital platforms support knowledge delivery, student engagement, and skill development, particularly in technology-oriented fields such as computer science [1], [2].

However, the effectiveness of e-learning is influenced not only by the availability of technology but also by students' perceptions and acceptance. Prior research emphasizes that psychological factors, particularly trust, play a central role in students' willingness to engage with e-learning platforms [4], [6]. Without trust, students may resist using digital platforms, irrespective of technical capabilities.

2.2 Trust in E-Learning Systems

Trust is a multidimensional construct widely recognized as a key determinant of technology adoption. In e-learning, trust reflects students' confidence that systems are reliable, secure, and capable of supporting effective learning outcomes [3], [8].

The Technology Acceptance Model (TAM) provides a useful theoretical lens to understand trust in digital environments. While TAM primarily focuses on perceived usefulness and ease of use, trust has been increasingly recognized as a mediating factor that influences behavioral intention and engagement in online learning [4], [15]. Trust therefore acts as a bridge between

system characteristics and student engagement, emphasizing its central role in e-learning adoption.

Despite its importance, trust in e-learning is shaped by technical, pedagogical, and contextual factors, highlighting the need to identify its key determinants systematically.

2.3 Determinants of Trust in E-Learning Systems

2.3.1 System Quality and Trust

System quality encompasses usability, reliability, accessibility, and interface design. High quality systems facilitate seamless learning, reduce uncertainty, and enhance trust [5],[8].

Empirical evidence indicates that poor system performance such as slow response times or technical errors undermines trust and discourages continued use, whereas reliable and user friendly platforms foster confidence and engagement [11]. In developing countries like Libya, system quality is particularly critical due to infrastructural limitations, which can amplify the impact of technical performance on trust.

2.3.2 Instructor Interaction and Trust:

Instructor interaction refers to the communication, feedback, guidance, and overall presence of instructors in digital learning environments. Active engagement by instructors reduces uncertainty, strengthens confidence, and enhances perceived support [9],[11].

In developing contexts, where students may be less accustomed to fully digital learning, instructor presence becomes even more crucial. Personal engagement can compensate for technological constraints and increase trust in the system, highlighting the pedagogical dimension of e-learning effectiveness.

2.3.3 Content Quality and Trust:

Content quality reflects the relevance, clarity, structure, and interactivity of learning materials. High-quality content increases the perceived value of e-learning platforms, facilitates effective knowledge acquisition, and enhances trust [10], [12].

While important, some studies suggest that content quality may be secondary to system quality and instructor interaction in influencing trust, particularly in environments where technical and interpersonal factors are more salient [8]. Nevertheless, well structured and engaging content remains essential for a positive e-learning experience.

2.3.4 Security and Privacy and Trust:

Security and privacy are fundamental concerns in online learning. Students must trust that their personal information, academic records, and submitted assignments are adequately protected [11], [13].

Although security is sometimes less influential than usability or instructor-related factors, it remains a necessary condition for establishing trust. In developing countries, where infrastructural challenges may overshadow security concerns, maintaining and communicating robust privacy practices can still enhance students' confidence in e-learning systems.

2.4 Research Gap:

Despite extensive research on trust in e-learning, several gaps remain:

1. Most studies have focused on developed countries, with limited evidence from developing contexts such as Libya [11], [14].

2. Few studies have examined computer science students specifically, despite their higher exposure to digital technologies.
3. Many prior studies rely on descriptive or basic inferential analysis, lacking an integrated examination of multiple trust determinants simultaneously.
4. Empirical studies that combine system quality, instructor interaction, content quality, and security into a single analytical framework are scarce, limiting the understanding of their relative effects.

2.5 Summary and Research Direction:

The literature confirms that trust in e-learning is shaped by system quality, instructor interaction, content quality, and security. However, inconsistencies in prior findings and limited research in developing countries emphasize the need for further empirical investigation.

This study addresses these gaps by employing a quantitative design with multiple regression analysis to examine the relative impact of these determinants on student trust in a Libyan higher education context. Integrating Abuhlfaia's findings on system usability and platform evaluation provides a robust framework for understanding trust in e-learning systems in developing countries. The model integrates system quality, instructor interaction, content quality, and perceived security as key predictors of trust. Trust is conceptualized as a dependent variable representing students' confidence in the reliability, effectiveness, and security of e-learning systems [3], [8].

3. Conceptual Framework:

Building on the Technology Acceptance Model (TAM) and prior research on trust in e-learning, this study proposes a conceptual framework to examine the determinants of student trust in digital learning systems.

Independent Variables:

1. **System Quality (SQ):** Technical performance, usability, accessibility, and reliability of the e-learning platform [5],[7], [11].
2. **Instructor Interaction (II):** Communication, guidance, feedback, and instructor presence in the online learning environment [9],[11].
3. **Content Quality (CQ):** Clarity, structure, relevance, and interactivity of learning materials [10], [12].
4. **Perceived Security (PS):** Students' perception that their personal data and academic information are adequately protected [11], [13].

This model reflects the multidimensional nature of trust, encompassing technological, pedagogical, and security related factors. It provides a structured basis for examining how different aspects of e-learning contribute to the development of trust among computer science students in a Libyan higher education context.

4. Research Hypotheses:

Based on the literature review and conceptual framework, the following hypotheses are proposed:

- **H1:** System quality has a positive and significant effect on student trust in e-learning systems [5], [8].

- **H2:** Instructor interaction has a positive and significant effect on student trust in e-learning systems [9]–[11].
- **H3:** Content quality has a positive and significant effect on student trust in e-learning systems [10], [12].
- **H4:** Perceived security has a positive and significant effect on student trust in e-learning systems [11], [13].

Additionally, the study examines demographic differences in trust:

- **H5:** There are statistically significant differences in student trust based on gender [1].
- **H6:** There are statistically significant differences in student trust based on academic level [4].

5. Methodology:

5.1 Research Design:

This study adopts a quantitative research design to investigate the determinants of student trust in e-learning systems at Azzaytuna University, Libya. A survey-based approach was used to collect data and test the relationships between independent variables (system quality, instructor interaction, content quality, and perceived security) and the dependent variable using convenience sampling, which is appropriate for exploratory studies in higher education contexts [6], [11]. This approach is consistent with prior studies examining technology adoption and trust in digital environments [3], [8].

5.2 Population and Sample:

The target population included computer science students at the Faculty of Education, Azzaytuna University. A total of 169 students participated in the study, selected using convenience sampling.

5.3 Research Instrument:

Data were collected using a structured questionnaire composed of two sections:

1. **Section A – Demographics:** Gender and academic level.
2. **Section B – Study Constructs:** Measurement of variables using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Measured Variables See Appendix 1:

- **System Quality (SQ):** 3 items assessing usability, accessibility, and reliability [5], [8].
- **Instructor Interaction (II):** 3 items evaluating communication, feedback, and online presence [9],[11].
- **Content Quality (CQ):** 3 items measuring clarity, relevance, and organization of learning materials [10], [12].
- **Perceived Security (PS):** 3 items on data privacy and protection [11], [13].
- **Trust in E-learning (Dependent Variable):** 5 items assessing students' confidence in system reliability and effectiveness [3].

5.4 Validity and Reliability:

- **Content Validity:** Established through expert review by faculty members familiar with e-learning and trust research [8].
- **Reliability:** Cronbach's alpha coefficients were computed for each construct:

- System Quality: 0.84
- Instructor Interaction: 0.87
- Content Quality: 0.82
- Perceived Security: 0.81
- Trust: 0.85

Overall, the instrument demonstrated good internal consistency, consistent with prior studies [7].

5.5 Data Analysis:

Data were analyzed using SPSS (Version 28) with the following procedures:

1. Descriptive Statistics: Mean and standard deviation to summarize trust levels and determinants.
2. Independent Samples t-test: To examine gender differences in trust (H5).
3. One-Way ANOVA: To examine differences in trust across academic levels (H6)
4. Multiple Linear Regression: To assess the effect of system quality, instructor interaction, content quality, and perceived security on trust. The regression model is expressed as:
 - Significance Level: $\alpha = 0.05$.
 - Assumptions Checked: Linearity, multicollinearity ($VIF < 5$), normality of residuals, and homoscedasticity.

6. Results:

6.1 Descriptive Statistics of Trust Dimensions

Descriptive statistics were computed to assess students' trust in e-learning systems and the determinants (Table 1).

Interpretation:

- Students reported high trust overall.
- Instructor interaction was the highest-rated factor, highlighting the importance of human engagement.
- Security & privacy was the lowest-rated, indicating room for improvement in data protection.

Table 1 Descriptive Statistics of Trust Dimensions

Dimension	N	Mean	Std. Deviation	Trust Level
System Quality	169	3.85	0.72	High
Instructor Interaction	169	4.02	0.68	High
Content Quality	169	3.90	0.70	High
Security & Privacy	169	3.75	0.80	Moderate
Overall Trust	169	3.88	0.65	High

6.2 Independent Samples t-Test: Gender Differences:

An independent samples t-test examined gender differences in trust (Table 2).

Table 2 Gender Differences in Trust

Gender	N	Mean	Std. Deviation	t	p
Male	46	3.65	0.70	2.45	0.015*
Female	123	3.97	0.62		

*p < 0.05, statistically significant

This means the following:

- Female students reported significantly higher trust than males.
- This supports H5 and aligns with prior research suggesting females may value structured and interactive learning more (Al-Draiweesh & Alturki, 2023).

5.3 One-Way ANOVA: Academic Level Differences

A one-way ANOVA examined differences in trust across academic levels (1st–4th year).

Table 3 Descriptive Statistics by Academic Level

Academic Level	N	Mean	Std. Deviation
1st Year	40	3.85	0.67
2nd Year	43	3.89	0.63
3rd Year	45	3.87	0.68
4th Year	41	3.91	0.66

Table 4 ANOVA Results for Academic Level Differences

Source of Variance	Sum of Squares	df	Mean Square	F value	p
Between Groups	0.45	3	0.15	1.12	0.34
Within Groups	21.98	165	0.133		
Total	22.43	168			

Which means:

- No significant differences were observed across academic levels (p > 0.05).
- Trust appears stable throughout students' academic progression, supporting H6.

6.4 Multiple Regression Analysis: Determinants of Trust

Multiple regression assessed the effects of system quality, instructor interaction, content quality, and perceived security on trust (Table 5).

Table 4 ANOVA Results for Academic Level Differences

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6.4 Multiple Regression Analysis: Determinants of Trust

Multiple regression assessed the effects of system quality, instructor interaction, content quality, and perceived security on trust (Table 5).

Table 5 Regression Results for Determinants of Trust

Predictor	B	t	p
Instructor Interaction	0.42	6.31	<0.001
System Quality	0.30	4.78	<0.001
Content Quality	0.18	2.97	0.004
Security & Privacy	0.12	2.05	0.042

Model Summary:

- $R^2 = 0.62$
- $F(4,164) = 68.01, p < 0.001$

This means:

- All four predictors were significant, confirming H1,H2,H3,H4.
- Instructor interaction is the strongest determinant, followed by system quality, content quality, and security privacy.
- The model explains 62% of the variance in student trust.
- These results are consistent with prior research emphasizing both technical and pedagogical determinants of trust [3],[11].

6.5 Summary of Findings

- Overall Trust: High ($M = 3.88$)
- Strongest Determinant: Instructor interaction
- Moderate Determinants: System quality and content quality
- Weakest but significant: Security & privacy
- Gender Differences: Females > Males
- Academic Level Differences: Not significant

- Regression Model: Explained 62% of trust variance ($R^2 = 0.62$)

6.6 Conclusion from Results:

- Student trust is primarily driven by instructor interaction and system usability, while security concerns are secondary but significant.
- Gender affects trust, but academic level does not.

7. Discussion

The findings showed that system quality, instructor interaction, content quality, and perceived security all have significant positive effects on student trust in e-learning systems. Together, these factors explained 62% of the variation in trust, indicating that both technological and human factors are important in building trust [3], [15].

Instructor interaction was the strongest predictor of trust, highlighting the importance of communication, feedback, and support in online learning environments [13]. System quality was the second most influential factor, confirming that usability, reliability, and accessibility are essential for student confidence in e-learning platforms [11], [6].

Content quality and perceived security also had significant positive effects on trust, although their influence was comparatively lower. This suggests that students value clear learning materials and secure digital environments, but place greater importance on instructor support and system performance [13], [14].

The study also found that female students reported higher trust levels than males, while no significant differences were observed across academic levels. Overall, the results emphasize the need for universities to improve instructor engagement, system quality, content development, and data security to enhance student trust in e-learning systems.

8. Conclusion

This study examined the determinants of student trust in e-learning systems at Azzaytuna University, focusing on computer science students. Using a quantitative approach and multiple regression analysis, the study provides empirical evidence on how system quality, instructor interaction, content quality, and perceived security influence trust in digital learning environments.

The findings indicate that students exhibit a relatively high level of trust in e-learning systems. Instructor interaction emerged as the strongest predictor, followed by system quality, content quality, and security/privacy. This demonstrates that trust is shaped not only by technological infrastructure but also, and more importantly, by pedagogical practices and human engagement. Significant gender differences were observed, with female students reporting higher trust levels than males, while academic level did not affect trust, suggesting that trust in e-learning is established early and remains stable throughout academic progression.

Overall, the study contributes to the limited research on e-learning in developing countries by providing context-specific insights from Libya and highlights the need for integrating reliable technology with effective instructional strategies to build and sustain student trust.

9. Recommendations

Based on the findings, the following recommendations are proposed:

9.1 Institutional Level:

- Invest in robust and reliable e-learning infrastructure to ensure system stability, accessibility, and ease of use.
- Monitor system performance and implement improvements to enhance user experience and trust.

9.2 Instructional Practices:

- Develop instructor training programs focused on online engagement, timely feedback, and interactive teaching strategies.
- Encourage instructors to actively communicate and provide personalized support to enhance student trust.

9.3 Content Development

- Design clear, structured, and relevant learning materials, using multimedia and interactive resources where possible.
- Regularly update content to maintain accuracy and relevance, enhancing perceived value.

9.4 Security and Privacy

- Strengthen data protection measures and clearly communicate privacy policies to students.
- Ensure transparency in how personal data and academic records are handled to increase trust.

9.5 Future Research

- Extend the study to multiple universities and disciplines to improve generalizability.
- Employ advanced analytical techniques, such as Structural Equation Modeling (SEM), to further validate relationships among trust determinants.
- Investigate additional factors, such as digital literacy, prior e-learning experience, and learning outcomes, for a more comprehensive understanding.

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Appendix 1

Questionnaire

Section A: Demographic Information

1. Gender:

- ☐ Male
- ☐ Female

2. Academic Level:

- ☐ First Year
- ☐ Second Year
- ☐ Third Year
- ☐ Fourth Year

Section B: Study Variables

Please indicate your level of agreement with the following statements regarding the e-learning system used at Azzaytuna University.

Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

System Quality (SQ)

SQ1. The e-learning system used at Azzaytuna University is easy to use.

SQ2. The e-learning system at Azzaytuna University operates reliably during my studies.

SQ3. I can access the e-learning system at Azzaytuna University whenever I need it.

Instructor Interaction (II)

II1. Instructors at Azzaytuna University respond promptly to my questions through the e-learning system.

II2. Instructors at Azzaytuna University provide useful feedback on assignments and learning activities through the e-learning system.

II3. Instructors at Azzaytuna University actively communicate with students through the e-learning platform.

Content Quality (CQ)

CQ1. The learning materials provided through the e-learning system at Azzaytuna University are clear and easy to understand.

CQ2. The content available on the e-learning system at Azzaytuna University is relevant to my courses.

CQ3. The learning materials available through the e-learning system at Azzaytuna University are well-organized and structured.

Perceived Security (PS)

PS1. I believe that my personal information is secure within the e-learning system at Azzaytuna University.

PS2. I trust the e-learning system at Azzaytuna University to protect my academic records and grades.

PS3. The e-learning system at Azzaytuna University provides adequate privacy protection.

Student Trust in E-Learning Systems (TR)

TR1. I trust the e-learning system at Azzaytuna University to support my learning effectively.

TR2. I feel confident when using the e-learning system at Azzaytuna University.

TR3. The e-learning system at Azzaytuna University meets my expectations for learning.

TR4. I depend on the e-learning system at Azzaytuna University to complete my academic activities.

TR5. Overall, I trust the e-learning system used at Azzaytuna University.