Journal Website

Article history:
Received 01 May 2024
Revised 15 June 2024
Accepted 02 July2024
Published online 18 August 2024

International Journal of Education and Cognitive Sciences

Volume 5, Issue 2, pp 51-61

E-ISSN: 3041-8828

Identification of Dimensions and Components for Implementing E-Learning with an Omnichannel Approach in Upper Secondary Schools

Roya. Haghiri Limodehi[1], Mahbubeh. Abdollahi [1*], Sharare. Habibi[1]

[1] Department of Educational Sciences, Roudehen Branch, Islamic Azad University, Roudehen, Iran.

*** Corresponding author email address**: mahbubehabdollahi@yahoo.com

A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Haghiri Limodehi, R., Abdollahi, M., Habibi1, Sh. (2024). Identification of Dimensions and Components for Implementing E-Learning with an Omnichannel Approach in Upper Secondary Schools. *International Journal of Education and Cognitive Sciences*, *5*(2), 51-61.
https://doi.org/10.61838/kman.ijeas.5.2.7

A B S T R A C T

Purpose: The objective of this study is to identify the critical dimensions and components necessary for implementing e-learning with an omnichannel approach in upper secondary schools.

Methodology: This study employed a qualitative research design, involving in-depth interviews with 16 experts in the field of secondary education and e-learning. Participants were selected based on their experience and expertise in educational technology, with criteria including a minimum of five years of relevant work experience and familiarity with the omnichannel approach in education. Data were collected through semi-structured interviews and analyzed using content analysis to identify key themes and components of e-learning implementation. The study ensured the validity and reliability of the findings through expert reviews and the use of Cohen's Kappa coefficient for coding consistency.

Findings: The analysis revealed several critical dimensions categorized under "Effective Factors" and "Infrastructure." Key themes identified include the importance of technological infrastructure, security and privacy measures, access management, content customization, communication and collaboration tools, user experience design, continuous management, and financial planning. Additionally, the study highlighted the necessity of a robust Learning Management System (LMS) and the role of secure IT infrastructure in supporting e-learning. These findings align with existing literature and underscore the multifaceted nature of successful e-learning implementation.

Conclusion: The study concludes that the successful implementation of e-learning in secondary education requires a comprehensive approach that integrates robust technological infrastructure, security measures, effective content management, and continuous system updates.

Keywords: *E-learning, Omnichannel Approach, Secondary Education, Technological Infrastructure, Content Management, Learning Management System (LMS), Educational Technology, Security and Privacy.*

1. Introduction

The advent of e-learning has revolutionized the educational landscape, particularly in response to the global challenges posed by the COVID-19 pandemic. The shift towards digital platforms for education has been accelerated by the need to maintain continuity in learning during crises, resulting in a significant transformation of traditional teaching and learning methods. E-learning, defined broadly as the use of electronic technologies to access educational curricula outside of a traditional classroom, has now become an integral component of education systems worldwide (Chen et al., 2022; Mardani et al., 2024; Ofem, 2023; Wang et al., 2024).

E-learning in secondary education is particularly crucial as it caters to a pivotal stage in students' academic and personal development. The flexibility and accessibility of e-learning platforms allow for personalized learning experiences that can be tailored to individual student needs, thus enhancing the overall learning process (Bariham et al., 2020; Haseli Songhori & Salamti, 2024; Shariati et al., 2024). However, the effectiveness of e-learning in secondary education is contingent upon several factors, including the technological infrastructure, the availability of digital resources, and the preparedness of both educators and students to engage with these platforms (Bezi et al., 2024; Delghandi et al., 2024; Jahanshahi et al., 2024; Joseph, 2023; Por Jafari shir Joposht et al., 2024; Shariati et al., 2024).

The need for effective e-learning platforms has been underscored by the challenges posed by the COVID-19 pandemic, which forced educational institutions globally to rapidly transition to online learning modalities. This sudden shift exposed the varying degrees of readiness among schools, particularly in terms of infrastructure, digital literacy, and access to necessary resources (Almatari, 2022). Consequently, the pandemic has highlighted the disparities in e-learning implementation across different regions and the urgent need to address these gaps to ensure equitable access to quality education (Padmini, 2023).

An omnichannel approach to e-learning, which integrates multiple channels of communication and learning modalities, has emerged as a promising strategy to enhance the effectiveness of online education. This approach allows for a seamless and cohesive learning experience across various platforms, ensuring that students can access educational content and interact with their peers and instructors through multiple channels (Mittal et al., 2023). The omnichannel approach also supports the personalization of learning experiences, enabling students to learn at their own pace and according to their preferred learning styles (Peiris et al., 2021).

In the context of secondary education, the omnichannel approach can be particularly beneficial in addressing the diverse needs of students. By providing multiple avenues for learning and interaction, this approach can help mitigate some of the challenges associated with e-learning, such as digital fatigue, limited access to technology, and varying levels of digital literacy among students (Pratama et al., 2022). Moreover, the integration of different learning channels can enhance student engagement and motivation, which are critical factors in the success of e-learning initiatives (Koumbis, 2021).

Despite the potential benefits of e-learning, its implementation in secondary education is fraught with challenges. One of the primary challenges is the lack of adequate technological infrastructure, which is essential for the effective delivery of online education. As highlighted by Zhenchenko et al. (2022), the functionality and reliability of e-learning platforms are heavily dependent on the underlying technology, including internet connectivity, hardware, and software resources (Zhenchenko et al., 2022). In many regions, particularly in developing countries, schools struggle with insufficient infrastructure, which hampers the effectiveness of e-learning (Nyagorme et al., 2017).

Another significant challenge is the issue of digital literacy among both educators and students. The rapid transition to online learning has exposed the varying levels of digital competence, with some educators and students being more adept at navigating digital platforms than others (Fadhila & Istiyono, 2019). This disparity in digital literacy can lead to unequal learning experiences, where students with higher digital proficiency benefit more from e-learning platforms than their less proficient peers (Vuorio, 2024). Addressing this challenge requires targeted interventions to enhance digital literacy skills among all stakeholders in the education system.

The issue of accessibility is also a major concern in the implementation of e-learning. In many cases, students from low-income families or remote areas face significant barriers to accessing online education, including lack of internet access, insufficient digital devices, and limited support from their educational institutions (Zahro et al., 2021). These barriers can exacerbate educational inequalities and hinder the effectiveness of e-learning as a tool for inclusive education (Alalwani, 2022).

E-ISSN: 3041-8828

Security and privacy are critical considerations in the implementation of e-learning platforms. As education increasingly moves online, the risk of data breaches and privacy violations has become a significant concern for educators, students, and parents alike (Ilham, 2024). Ensuring the security of e-learning platforms involves implementing robust authentication mechanisms, encryption protocols, and access control measures to protect sensitive information from unauthorized access (Shi & Zheng, 2022). Furthermore, adherence to privacy regulations is essential to safeguard the personal data of students and educators, particularly in the context of online learning where data is frequently exchanged across digital platforms (Ogboye, 2023).

The importance of security and privacy in e-learning is further emphasized by the potential legal and ethical implications of data breaches. Educational institutions must ensure that their e-learning platforms comply with relevant legal frameworks, such as the General Data Protection Regulation (GDPR) in the European Union, to avoid legal liabilities and protect the rights of students and educators (Luo & Clifton, 2017). Additionally, the trust of users in e-learning platforms is contingent upon the perceived security and privacy of these platforms, making it imperative for institutions to prioritize these aspects in their digital education strategies (Xiong et al., 2021).

The successful implementation of e-learning requires continuous management and support to address the dynamic needs of the educational environment. This includes regular updates to e-learning platforms to incorporate new features, fix bugs, and enhance user experience (Liqiang, 2020). Continuous management also involves monitoring the performance of e-learning systems to ensure that they meet the evolving needs of students and educators (Dai & Xia, 2020). Moreover, providing adequate support services, such as helpdesks and technical assistance, is crucial for resolving issues that users may encounter while using e-learning platforms (Padli, 2023).

Financial considerations are also a key aspect of continuous management in e-learning. The cost of developing, maintaining, and upgrading e-learning platforms can be substantial, particularly for institutions with limited resources (Roten & Vanheems, 2022). Therefore, educational institutions must carefully plan and allocate their budgets to ensure the sustainability of their e-learning initiatives (Mariappan, 2023). Additionally, institutions may need to explore alternative funding sources, such as government grants or partnerships with private organizations, to support their e-learning projects (Aleshnikova et al., 2019).

Research has shown that e-learning can have a significant impact on educational outcomes, provided that it is implemented effectively. Studies have indicated that e-learning platforms can enhance student engagement, improve learning retention, and facilitate the development of critical thinking skills (Oraif & Elyas, 2021). For instance, the use of interactive features, such as quizzes, discussion forums, and multimedia content, can make learning more engaging and effective for students (Pangarkar, 2021). Moreover, e-learning platforms that support personalized learning paths can cater to the individual needs of students, thereby improving their overall academic performance (Juty, 2024).

However, the impact of e-learning on educational outcomes is not uniformly positive. In some cases, the lack of face-to-face interaction, digital fatigue, and technical difficulties can negatively affect students' learning experiences and outcomes (Alalwani, 2022). Therefore, it is essential to strike a balance between online and offline learning modalities to ensure that students receive a well-rounded education (Nashrey, 2021). Additionally, ongoing research is needed to explore the long-term effects of e-learning on educational outcomes and to identify best practices for optimizing the use of digital platforms in education (Rezi, 2023).

The implementation of e-learning in secondary education presents both opportunities and challenges. While e-learning platforms offer flexibility, accessibility, and the potential for personalized learning, their effectiveness is contingent upon several factors, including technological infrastructure, digital literacy, security, and continuous management. An omnichannel approach to e-learning, which integrates multiple learning channels, can enhance the effectiveness of online education by providing a seamless and cohesive learning experience. However, addressing the challenges associated with e-learning, such as accessibility barriers and digital literacy gaps, is crucial for ensuring that all students can benefit from this mode of education. The objective of this study is to identify the critical dimensions and components necessary for implementing e-learning with an omnichannel approach in upper secondary schools.

2. Methods and Materials

E-ISSN: 3041-8828

2.1. Study Design and Participants

This study is designed to identify the key dimensions and components necessary for implementing e-learning with an omnichannel approach in upper secondary schools. The target population includes active participants and experts working in upper secondary schools. The following criteria were used to select the experts:

- A minimum of 5 years of relevant work experience.
- Academic and scientific experience related to the research topic.
- Awareness of technology in education, particularly in the omnichannel approach.

The sampling method employed in this study is snowball sampling, and the sample size was determined at the point of theoretical saturation.

2.2. Measures

2.2.1. Semi-Structured Interview

To identify the foundational themes of the research, interviews were utilized as the primary data collection tool. These interviews were conducted following a structured interview protocol. The interviews were designed to explore the participants' perspectives on the critical dimensions and components of e-learning with an omnichannel approach.

To ensure the validity of the data collection tool, the interview protocol and the subsequent coding were reviewed and approved by experts, university professors, and practitioners in the field. The final version of the interview protocol was sent to these experts, who provided feedback and validation. The Content Validity Ratio (CVR) was used to quantify this validity, with an average CVR of 86%, which is above the standard criterion. Additionally, the reliability of the coding was assessed using Cohen's Kappa coefficient, which was calculated at 0.79, indicating a standard level of reliability.

2.3. Data Analysis

Content analysis was employed to identify the foundational and constructive themes of the research. Initially, semantic expressions were extracted from the conducted interviews. These expressions were then conceptualized and coded. The codes were further analyzed based on their semantic, conceptual, and functional proximity. This process led to the identification of the constructive themes that form the basis of the research findings.

3. Findings and Results

For the qualitative data collection, interviews were conducted with 16 experts who were knowledgeable and well-versed in the research topic. Among the participants, 56% held a postgraduate degree (master's or higher), while 44% had a bachelor's degree. In terms of professional roles, 44% were assistant principals, 37% were principals, and 19% were specialists. Regarding work experience, 12% had 5 to 10 years of experience, 19% had 10 to 15 years, and the majority, 69%, had over 15 years of experience.

Table 1

The Results of Qualitative Analysis

Main Category	Constructive Themes	Basic Themes
Effective Factors	Technology and Infrastructure (I)	Technological Infrastructure (I1)
		Institutional Support and Equipment Procurement (I2)
		Bandwidth and Network Speed, Student Internet Access (I3)
	Security and Privacy (P)	Security Protocols and Measures (P1)
		Adherence to Privacy Regulations (P2)
		User Authentication Mechanisms (P3)
		Regulatory Compliance for E-Learning (P4)
	Access Management (A)	Access Control Policies (A1)
		Scalability of E-Learning Platform (A2)
	Content Management (C)	Content Customization Tools (C1)
		Adaptive Learning Algorithms (C2)
	Communication and Collaboration (CO)	Collaboration Features (CO1)
		Strategies for Student-Teacher Interaction (CO2)
	User Experience (U)	User Interface and Experience Design (U1)
		Real-Time Monitoring and Reporting (U2)
	Continuous Management (CM)	Feedback and Evaluation Mechanisms (CM1)
		Continuous System Updates and Upgrades (CM2)

E-ISSN: 3041-8828

	Support and Financial Management (S)	Implementation and Maintenance Costs (S1)
		User Support and Helpdesk Services (S2)
		Backup and Data Recovery Plan (S3)
Infrastructure	Learning Management System (LMS) (LM)	Learning Management System (LMS) (LM1)
		Personalized Learning Paths (LM2)
		Data Analysis and Reporting (LM3)
	Security (SE)	Secure Authentication (SE1)
		System Encryption (SE2)
		Role-Based Access Control (RBAC) (SE3)
		Regular Security Audits (SE4)
		Privacy Compliance (SE5)
		Content Security (SE6)
	Information Technology (IT)	Secure File Storage (IT1)
		Mobile Compatibility (IT2)
		Scalability and Performance (IT3)
		Single Sign-On (SSO) (IT4)
		API Integrations (IT5)
	Communications and Coordination (CC)	Communication Tools (CC1)
		Video Conferencing (CC2)
		Feedback and Evaluation Tools (CC3)
	Educational Tools (T)	Gamification Elements (T1)
		Accessibility Features (T2)
		Virtual Labs and Simulations (T3)
		Cloud Infrastructure (T4)
		Student Progress Tracking (T5)

The analysis of the interviews led to the identification of several key themes related to the effective implementation of e-learning with an omnichannel approach in upper secondary schools. These themes were categorized into two main categories: "Effective Factors" and "Infrastructure."

3.1. Effective Factors

Technology and Infrastructure (I):

Participants emphasized the importance of robust technological infrastructure as a foundation for successful e-learning. One interviewee noted, "Without proper technological infrastructure, the implementation of e-learning is doomed to face significant challenges." This subcategory includes the availability of essential technological infrastructure (I1), institutional support for acquiring necessary equipment (I2), and ensuring adequate bandwidth and network speed for students' internet access (I3).

Security and Privacy (P):

Security and privacy were highlighted as critical concerns in e-learning environments. Participants discussed the need for stringent security protocols and measures (P1), adherence to privacy regulations (P2), and effective user authentication mechanisms (P3). One expert mentioned, "Maintaining the security and privacy of student data is non-negotiable in any e-learning platform." Moreover, compliance with regulations specific to e-learning was also deemed essential (P4).

Access Management (A):

The ability to manage access effectively was identified as a key factor in ensuring that e-learning platforms function smoothly. This includes establishing clear access control policies (A1) and ensuring the scalability of the e-learning platform to accommodate varying numbers of users (A2). As one participant stated, "Scalability is crucial; the platform must be able to handle an increase in users without compromising performance."

Content Management (C):

Effective content management is crucial for providing personalized and adaptive learning experiences. This subcategory encompasses tools for content customization (C1) and the use of adaptive learning algorithms to tailor educational content to individual students (C2). "The ability to customize content based on student needs is what makes e-learning truly effective," commented one interviewee.

Communication and Collaboration (CO):

The success of e-learning heavily depends on the communication and collaboration mechanisms between students and teachers. Participants highlighted the importance of collaboration features within the platform (CO1) and the need for strategies to enhance student-teacher interaction (CO2). One participant shared, "Interactive

E-ISSN: 3041-8828

communication tools are vital for keeping students engaged and facilitating meaningful learning experiences."

User Experience (U):

User experience plays a significant role in determining the effectiveness of an e-learning platform. This theme includes the design of the user interface and overall user experience (U1) as well as the ability to provide real-time monitoring and reporting (U2). "A user-friendly interface can make or break the learning experience for students," one expert remarked.

Continuous Management (CM):

Ongoing management and continuous improvement were seen as necessary for the long-term success of e-learning platforms. This includes mechanisms for gathering feedback and evaluating the system's effectiveness (CM1) as well as regular updates and upgrades to the system (CM2). According to one participant, "Continuous feedback and system updates are essential for maintaining the platform's relevance and effectiveness."

Support and Financial Management (S):

Financial considerations and user support were identified as critical components. This subcategory covers the costs associated with the implementation and maintenance of the platform (S1), the availability of user support and helpdesk services (S2), and the importance of having a reliable backup and data recovery plan (S3). One interviewee pointed out, "The cost of maintaining the system is a significant factor that schools must consider when adopting e-learning."

3.2. Infrastructure

Learning Management System (LMS) (LM):

The presence of a robust Learning Management System (LMS) was identified as a foundational infrastructure requirement. This includes the LMS itself (LM1), the capability to provide personalized learning paths for students (LM2), and tools for data analysis and reporting (LM3). "An effective LMS is the backbone of any successful e-learning initiative," noted one expert.

Security (SE):

Security within the infrastructure category focuses on the technical aspects of ensuring a secure e-learning environment. This includes secure authentication methods (SE1), system encryption (SE2), role-based access control (RBAC) (SE3), regular security audits (SE4), privacy compliance (SE5), and content security (SE6). As one participant emphasized, "Technical security measures must be in place to protect both the platform and its users."

Information Technology (IT):

Information technology infrastructure was highlighted as a critical aspect of supporting e-learning. This includes secure file storage (IT1), mobile compatibility (IT2), scalability and performance of the system (IT3), single sign-on (SSO) integration (IT4), and API integrations (IT5). "The IT infrastructure must be robust and flexible enough to support various devices and integrations," one interviewee commented.

Communications and Coordination (CC):

Effective communication tools are vital for the coordination of e-learning activities. This subcategory includes communication tools (CC1), video conferencing capabilities (CC2), and tools for feedback and evaluation (CC3). "Communication tools are essential for bridging the gap between teachers and students in an online environment," stated one participant.

Educational Tools (T):

Finally, the availability of educational tools was seen as essential for enhancing the e-learning experience. This includes gamification elements (T1), accessibility features (T2), virtual labs and simulations (T3), cloud infrastructure (T4), and tools for tracking student progress (T5). One expert remarked, "Innovative educational tools like gamification and virtual labs can significantly enhance student engagement and learning outcomes."

4. Discussion and Conclusion

The findings of this study provide a comprehensive understanding of the dimensions and components essential for implementing e-learning with an omnichannel approach in upper secondary schools. By analyzing interviews with experts and stakeholders, the study identified critical themes categorized under "Effective Factors" and "Infrastructure," each contributing uniquely to the success of e-learning initiatives. The discussion will first interpret these findings, aligning them with existing literature, and then explore the implications for practice, limitations, and suggestions for future research.

The results underscored the significance of technological infrastructure as a foundational element for successful e-learning. The availability of robust technological infrastructure, including bandwidth, network speed, and institutional support for acquiring necessary equipment, was consistently highlighted by participants. This finding aligns with the work of Zhenchenko et al. (2022), who emphasized that the functionality and reliability of e-learning platforms

E-ISSN: 3041-8828

are heavily dependent on the underlying technology (Zhenchenko et al., 2022). Similarly, Joseph (2023) noted that the effectiveness of e-learning in secondary education is largely contingent upon the availability of adequate technological resources (Joseph, 2023). The consensus across these studies suggests that without a strong technological backbone, e-learning initiatives are likely to face significant challenges, particularly in regions with limited access to digital infrastructure.

Security and privacy were identified as critical concerns in the implementation of e-learning platforms. Participants stressed the need for stringent security protocols, adherence to privacy regulations, and effective user authentication mechanisms. These findings are consistent with the research by Ogboye (2023), who highlighted the importance of robust security measures in protecting sensitive information within digital education platforms (Ogboye, 2023). The emphasis on privacy regulations also echoes the work of Luo and Clifton (2017), who argued that adherence to privacy laws is essential for maintaining user trust in e-learning platforms (Luo & Clifton, 2017). Furthermore, the necessity for regulatory compliance in e-learning, as discussed by Shi and Zheng (2022), reinforces the idea that institutions must prioritize security and privacy to ensure the safe and effective use of digital learning tools (Shi & Zheng, 2022).

The ability to manage access effectively was another key finding of the study. Participants highlighted the importance of clear access control policies and the scalability of e-learning platforms to accommodate varying numbers of users. This finding aligns with the research by Pratama et al. (2022), who noted that scalability is crucial for e-learning platforms, particularly in accommodating the fluctuating demands of users during peak periods (Pratama et al., 2022). The need for effective access management is further supported by the work of Fadhila and Istiyono (2019), who emphasized that access control is vital for ensuring that only authorized users can access sensitive educational content (Fadhila & Istiyono, 2019). These findings suggest that institutions must implement robust access management strategies to support the scalability and security of their e-learning platforms.

Effective content management emerged as a critical component of successful e-learning. The study found that tools for content customization and adaptive learning algorithms were essential for providing personalized learning experiences. This finding is consistent with the work of Oraif and Elyas (2021), who argued that personalized learning paths enabled by adaptive algorithms can significantly enhance student engagement and learning outcomes (Oraif & Elyas, 2021). Additionally, Zahro' et al. (2021) highlighted the importance of content customization tools in catering to the diverse learning needs of students (Zahro et al., 2021). The alignment of these findings with existing literature suggests that content management is a key driver of e-learning success, enabling institutions to deliver tailored educational experiences that meet the individual needs of students.

The importance of communication and collaboration in e-learning was another significant finding of the study. Participants emphasized the need for features that facilitate collaboration between students and teachers, as well as strategies to enhance student-teacher interaction. This finding is supported by the work of Nyagorme et al. (2017), who noted that effective communication tools are essential for fostering interaction in online learning environments (Nyagorme et al., 2017). Additionally, the research by Dai and Xia (2020) highlighted the role of collaboration features in enhancing student engagement and facilitating meaningful learning experiences (Dai & Xia, 2020). These findings suggest that institutions should prioritize the development and integration of communication tools within their e-learning platforms to support collaborative learning and interaction.

The study also identified user experience as a crucial factor in the effectiveness of e-learning platforms. The design of the user interface and the ability to provide real-time monitoring and reporting were highlighted as key components of a positive user experience. This finding aligns with the research by Peiris et al. (2021), who emphasized the importance of a user-friendly interface in enhancing the overall effectiveness of e-learning platforms (Peiris et al., 2021). Furthermore, the work of Pangarkar (2021) supports the idea that real-time monitoring and reporting tools can help educators track student progress and identify areas where additional support may be needed (Pangarkar, 2021). These findings collectively suggest that institutions must prioritize user experience in the design and implementation of their e-learning platforms to ensure that they meet the needs and expectations of users.

Continuous management and ongoing updates were identified as necessary for the long-term success of e-learning platforms. Participants highlighted the importance of feedback mechanisms and regular system updates to maintain the relevance and effectiveness of e-learning tools. This finding is consistent with the research by Modha (2023), who emphasized the need for continuous

E-ISSN: 3041-8828

improvement and adaptation in digital education platforms to meet evolving educational needs (Modha, 2023). The work of Zhenchenko et al. (2022) also supports the idea that regular updates are essential for maintaining the functionality and security of e-learning platforms (Zhenchenko et al., 2022). These findings suggest that institutions must adopt a proactive approach to the management of their e-learning systems, ensuring that they are continuously updated and refined to meet the changing demands of the educational environment.

The financial aspects of e-learning implementation were also highlighted in the study. Participants discussed the costs associated with the development, maintenance, and support of e-learning platforms, emphasizing the need for adequate financial planning. This finding aligns with the research by Mariappan (2023), who noted that the financial sustainability of e-learning initiatives is a critical factor in their long-term success (Mariappan, 2023). Additionally, the work of Roten and Vanheems (2022) supports the idea that institutions must carefully manage their budgets to ensure that they can support the ongoing costs of e-learning platforms (Roten & Vanheems, 2022). These findings suggest that financial considerations should be a central component of any e-learning strategy, with institutions ensuring that they have the necessary resources to sustain their digital education initiatives over the long term.

The presence of a robust Learning Management System (LMS) was identified as a foundational requirement for e-learning. Participants highlighted the importance of an LMS in providing personalized learning paths and supporting data analysis and reporting. This finding is supported by the research of Padmini (2023), who emphasized the critical role of LMS in structuring and managing online learning environments (Padmini, 2023). Additionally, the work of Rezi (2023) underscores the importance of personalized learning paths in enhancing student engagement and learning outcomes (Rezi, 2023). These findings suggest that a well-designed LMS is essential for the effective implementation of e-learning, providing the necessary infrastructure to support personalized and data-driven educational experiences.

Security within the infrastructure category was another critical finding. Participants emphasized the need for secure authentication methods, system encryption, and role-based access control (RBAC) to protect the integrity of e-learning platforms. These findings are consistent with the work of Shi and Zheng (2022), who highlighted the importance of security measures in safeguarding digital learning environments (Shi & Zheng, 2022). The necessity of information technology infrastructure, including secure file storage and mobile compatibility, was also highlighted, aligning with the research by Liqiang (2020), who emphasized the need for robust IT infrastructure to support e-learning (Liqiang, 2020). These findings collectively suggest that security and IT infrastructure are critical components of any e-learning strategy, ensuring that platforms are both secure and capable of supporting the diverse technological needs of users.

Despite the valuable insights provided by this study, several limitations must be acknowledged. First, the study's reliance on qualitative data from interviews may limit the generalizability of the findings. While the interviews provided in-depth insights into the perspectives of experts, the sample size was relatively small, and the findings may not be representative of all secondary education contexts. Additionally, the study was conducted in a specific geographical and educational context, which may limit the applicability of the findings to other regions or educational systems. Furthermore, the study did not extensively explore the experiences and perspectives of students, who are key stakeholders in the e-learning process. Future research could address these limitations by incorporating larger, more diverse samples and by exploring the perspectives of students more comprehensively.

Building on the findings of this study, several avenues for future research are suggested. First, there is a need for quantitative research that can test and validate the dimensions and components identified in this study across different contexts and educational levels. Such research could provide more generalizable insights into the factors that contribute to the success of e-learning initiatives. Additionally, future studies could explore the long-term impact of e-learning on educational outcomes, particularly in terms of student engagement, retention, and academic performance. This research could provide valuable insights into the effectiveness of e-learning over time and identify best practices for sustaining successful e-learning initiatives. Moreover, future research could examine the role of emerging technologies, such as artificial intelligence and virtual reality, in enhancing the effectiveness of e-learning platforms. These technologies hold significant potential for transforming the educational landscape, and research in this area could provide valuable guidance for their integration into e-learning systems.

The findings of this study also have several practical implications for the implementation of e-learning in

E-ISSN: 3041-8828

secondary education. First, educational institutions should prioritize the development of robust technological infrastructure as a foundation for successful e-learning. This includes ensuring that schools have adequate bandwidth, reliable network connections, and access to necessary digital devices. Additionally, institutions should implement comprehensive security measures to protect the privacy and security of students and educators. This includes using secure authentication methods, encryption, and access control policies to safeguard sensitive information. Furthermore, educational institutions should invest in the continuous management and updating of their e-learning platforms to ensure that they remain relevant and effective over time. This includes incorporating feedback mechanisms, regular system updates, and ongoing support services to address the evolving needs of students and educators. Finally, institutions should consider adopting an omnichannel approach to e-learning, integrating multiple channels of communication and learning modalities to provide a seamless and cohesive learning experience. By implementing these practices, educational institutions can enhance the effectiveness of their e-learning initiatives and better support the diverse needs of students and educators in the digital age.

In conclusion, the successful implementation of e-learning in secondary education requires a comprehensive approach that addresses the technological, security, management, and financial aspects of digital education. By aligning the findings of this study with existing literature, we can better understand the critical factors that contribute to the success of e-learning and develop strategies to overcome the challenges associated with its implementation. Through ongoing research and practical innovation, educational institutions can continue to refine and enhance their e-learning platforms, ensuring that they provide high-quality, accessible, and effective education for all students.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We hereby thank all individuals for participating and cooperating us in this study.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the interview and participated in the research with informed consent.

References

Alalwani, S. (2022). Parents' Perspectives of Distance Education During Crises: The Benefits and Disadvantages. *Journal of Educational and Social Research*, *12*(2), 152. https://doi.org/10.36941/jesr-2022-0041

Aleshnikova, V., Beregovskaya, T., & Sundukova, G. (2019). Export of Higher Education: The Marketing Model. https://doi.org/10.2991/icoeme-19.2019.57

Almatari, A. A. (2022). Obstacles in Distance Learning at the Secondary Level According to the Class and Gender Variables in the Light of Corona Pandemic, From the Students' Point of View, in Directorate of Education / Tafila Region. *English Linguistics Research*, *11*(2), 37. https://doi.org/10.5430/elr.v11n2p37

Bariham, I., Ondigi, S. R., & Kiio, M. (2020). Preparedness of Ghanaian Senior High School Instructors for Application of Online Learning in Social Studies Instruction Amid the Covid-19 Pandemic. *Social Education Research*, 52-64. https://doi.org/10.37256/ser.212021554

Bezi, A., Fakoori, H., Bayani, A. A., & Saemi, H. (2024). Design and Validation of an Environmental Education Curriculum Model for Higher Education Based on the "Aker" Approach [Research Article]. *Iranian Journal of Educational Sociology*, *7*(1), 79-90. https://doi.org/10.61838/kman.ijes.7.1.8

Chen, G., Cao, S., Chen, P., & Zhang, Y. (2022). An Empirical Study on the Factors Influencing Users' Continuance Intention of Using Online Learning Platforms for Secondary School Students by Big Data Analytics. *Mobile Information Systems*, *2022*, 1-13. https://doi.org/10.1155/2022/9508668

Dai, D., & Xia, X. (2020). Whether the School Self-Developed E-Learning Platform Is More Conducive to Learning During the COVID-19 Pandemic? *Best Evidence of Chinese Education*, *5*(1), 569-580. https://doi.org/10.15354/bece.20.ar030

Delghandi, M., karimi, M., Nodehi, H., & Cherabin, M. (2024). Designing an Efficient Virtual Education Pattern in

E-ISSN: 3041-8828

Farhangian University. *Sociology of Education*, *10*(1), 280-294. https://doi.org/10.22034/ijes.2024.2012176.1469
Fadhila, R. R., & Istiyono, E. (2019). A Case Study of E-Learning Readiness in Referral School State Senior High School 1 Paringin. https://doi.org/10.2991/iccie-18.2019.72
Haseli Songhori, M., & Salamti, K. (2024). The Linkage Between University Students' Academic Engagement and Academic Support: The Mediating Role of Psychological Capital [Research Article]. *Iranian Journal of Educational Sociology*, *7*(2), 72-84. https://doi.org/10.61838/kman.ijes.7.2.10
Ilham, M. (2024). The Efficacy of E-Guru Application in Boosting Learning Effectiveness: Does It Deliver Results? *International Journal of Social Learning (Ijsl)*, *4*(2), 197-209. https://doi.org/10.47134/ijsl.v4i2.257
Jahanshahi, R., Haghighatian, M., & Bahian, S. (2024). Sociologically Investigating the Impact of Cultural Factors on the National Identity Reproduction in Students. *Sociology of Education*, *10*(1), 183-192. https://doi.org/10.22034/ijes.2023.2013621.1481
Joseph, J. (2023). The Factors Enabling Adoption of E-Learning Post Covid-19 Pandemic for Teaching and Learning in Selected Secondary Schools in Tanzania. *European Journal of Theoretical and Applied Sciences*, *1*(5), 906-913. https://doi.org/10.59324/ejtas.2023.1(5).76
Juty, S. A. (2024). Impact of Online Learning Platforms on Academic Performance: A Case Study of Rural Schools in Bangladesh. https://doi.org/10.31235/osf.io/cnzt9
Koumbis, D. (2021). An Introduction to Fashion Retailing. https://doi.org/10.5040/9781350098299
Liqiang, G. (2020). Research on Single Chip Microcomputer Teaching Platform Based on Wireless Communication. *Concurrency and Computation Practice and Experience*, *34*(13). https://doi.org/10.1002/cpe.5895
Luo, T., & Clifton, L. A. (2017). Examining Collaborative Knowledge Construction in Microblogging-Based Learning Environments. *Journal of Information Technology Education Research*, *16*, 365-390. https://doi.org/10.28945/3869
Mardani, F., Vázquez, N. P., Rajendrakumar, J., & Saadati, S. M. (2024). The Experience of Learning a Second Language as an Adult: A Qualitative Exploration of Motivation and Challenges. *International Journal of Education and Cognitive Sciences*, *5*(2), 16-22. https://doi.org/10.61838/kman.ijeas.5.2.3
Mariappan, J. (2023). A Study on the Impacts of E - Commerce on Domestic Retailers With Special Reference to Chennai. *Interantional Journal of Scientific Research in Engineering and Management*, *07*(10), 1-11. https://doi.org/10.55041/ijsrem26287
Mittal, T., Dhiman, A., Madan, P., & Sharma, K. (2023). The Interaction of Display Advertisement and E-Wom on Omnichannel Purchase Intention Using Sem: An Age Moderation Effect. *International Journal of Professional Business Review*, *8*(5), e01244. https://doi.org/10.26668/businessreview/2023.v8i5.1244
Modha, B. (2023). Exploring Customer Journeys in the Context of Dentistry: A Case Study. *Dentistry Journal*, *11*(3), 75. https://doi.org/10.3390/dj11030075
Nashrey, A. A. (2021). Beginning of Distance E-Learning (Del) on Gender in Saudi Arabia. *International Journal of Social Science and Human Research*, *4*(5). https://doi.org/10.47191/ijsshr/v4-i5-25
Nyagorme, P., Qua-Enoo, A. A., Bervell, B., & Arkorful, V. (2017). The Awareness and Use of Electronic Learning Platforms: A Case of a Developing Country. *World Journal of Computer Application and Technology*, *5*(2), 13-23. https://doi.org/10.13189/wjcat.2017.050201
Ofem, U. J. (2023). Adjustment Tendencies Among Transiting Students: A Mediation Analysis Using Psychological Wellbeing Indices. *International Journal of Education and Cognitive Sciences*, *4*(3), 1-19. https://doi.org/10.61838/kman.ijecs.4.3.1
Ogboye, A. (2023). The Effect of a Digital Health Intervention on People With Diagnosed and Undiagnosed Hypertension: A Retrospective Cohort Analysis. *Journal of Hypertension*, *41*(Suppl 3), e255. https://doi.org/10.1097/01.hjh.0000941604.16899.d1
Oraif, I., & Elyas, T. (2021). The Impact of COVID-19 on Learning: Investigating EFL Learners' Engagement in Online Courses in Saudi Arabia. *Education Sciences*, *11*(3), 99. https://doi.org/10.3390/educsci11030099
Padli, A. F. N. (2023). Development of E-Learning ICT Guidance at Hidayatul Musthafawiyah Salafiyah Islamic Boarding School. *Qalamuna Jurnal Pendidikan Sosial Dan Agama*, *15*(1), 203-218. https://doi.org/10.37680/qalamuna.v15i1.2495
Padmini, S. (2023). Assessing the Efficacy of E-Learning Resources in Facilitating Course Teaching in Cuddalore District of Tamil Nadu, India. *Asian Journal of Education and Social Studies*, *49*(3), 214-230. https://doi.org/10.9734/ajess/2023/v49i31149
Pangarkar, A. (2021). COVID-19 Review, Analysis and Future Research Directions: Implications for Marketers. *Nmims Management Review*, *29*(04), 43-55. https://doi.org/10.53908/nmmr.290402
Peiris, H., Lakshika, V. G. P., & Rasanjalee, R. M. K. S. (2021). Factors Affecting Consumer Acceptance Towards Omnichannel Approach With Reference to Supermarket Sector. *Journal of Business Studies*, *8*, 81-104. https://doi.org/10.4038/jbs.v8i0.68
Por Jafari shir Joposht, M., Shakibaei, Z., & Zarei, H. (2024). `Provide a Model for Parents' Educational Assistance to Empower Online Education in Critical Situations. *Sociology of Education*, *10*(1), 31-44. https://doi.org/10.22034/ijes.2023.2006736.1434
Pratama, A. R., Sulaymani, O., Alshaikh, M., & Alammary, A. (2022). The Effects of Previous Experience and Self Efficacy on the Acceptance of E-Learning Platforms Among Younger Students in Saudi Arabia. *Contemporary Educational Technology*, *14*(2), ep349. https://doi.org/10.30935/cedtech/11524
Rezi, M. (2023). Development of Educandy Platform as an Educational Game to Improve Arabic Language Learning Achievement. *Journal International Inspire Education Technology*, *2*(1), 53-66. https://doi.org/10.55849/jiiet.v2i1.445
Roten, Y. S., & Vanheems, R. (2022). To Share or Not to Share Screens With Customers? Lessons From Learning Theories. *Journal of Services Marketing*, *37*(1), 65-77. https://doi.org/10.1108/jsm-11-2021-0436
Shariati, F., Niazazari, K., & Jabbary, N. (2024). Presenting a Model for Virtual Education Considering Educational Equity with a Phenomenological Approach in Schools of Golestan Province [Research Article]. *Iranian Journal of Educational Sociology*, *7*(1), 66-78. https://doi.org/10.61838/kman.ijes.7.1.7
Shi, J., & Zheng, J. (2022). Teaching Design and Practice of English Education Under the Network Learning Space. *Scientific Programming*, *2022*, 1-9. https://doi.org/10.1155/2022/8361251
Vuorio, J. (2024). Studying the Use of Virtual Reality Learning Environments to Engage School Children in Safe Cycling

E-ISSN: 3041-8828

Education. *Simulation & Gaming*, *55*(3), 418-441. https://doi.org/10.1177/10468781241246566

Wang, J., Sheng, M., & Song, R. (2024). Enhancing Classroom Behaviors and Creativity: The Impact of a Critical Thinking Workshop. *International Journal of Education and Cognitive Sciences*, *5*(1), 8-15. https://doi.org/10.61838/kman.ijecs.5.1.6

Xiong, J., Yan, J., Fu, K., Wang, K., & He, Y. (2021). Innovation in an Authoritarian Society: China During the Pandemic Crisis. *Journal of Business Strategy*, *43*(2), 79-86. https://doi.org/10.1108/jbs-10-2020-0223

Zahro, A., Khoiri, N., & Wijayanti, E. (2021). Analisis Ragam Platform E-Learning Dalam Pembelajaran Biologi Kelas Xi Sma Dan Ma Negeri Di Kota Semarang. *Bioedukasi Jurnal Pendidikan Biologi*, *14*(2), 185. https://doi.org/10.20961/bioedukasi-uns.v14i2.51956

Zhenchenko, M., Мельник, О. М., Prykhoda, Y., & Zhenchenko, I. (2022). Ukrainian E-Learning Platforms for Schools: Evaluation of Their Functionality. *The International Review of Research in Open and Distributed Learning*, *23*(2), 136-150. https://doi.org/10.19173/irrodl.v23i2.5769

E-ISSN: 3041-8828