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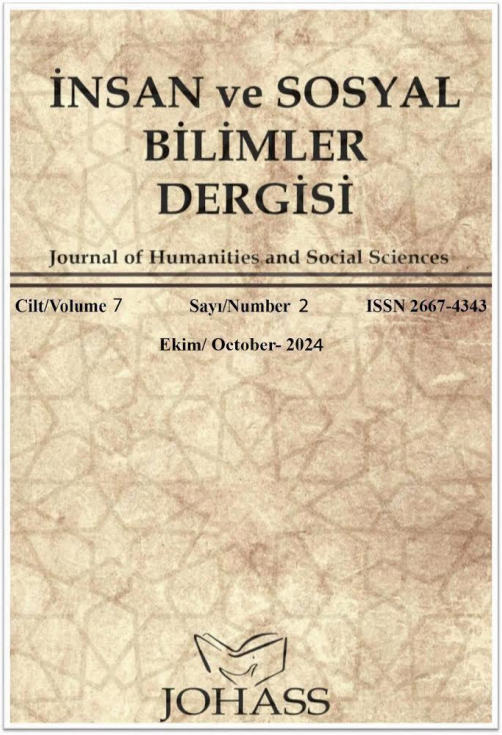

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Research on Mobile Learning (M-Learning) in Higher Education: A Systematic Review (2016 to 2023)

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Abstract

This study investigates the evolution of mobile learning (M-Learning) applications in higher education between 2016 and 2023. This period marks an era of significant technological innovations and the profound impacts of the COVID-19 pandemic on education. The purpose of this research is to delineate how M-Learning applications are represented in the academic literature during this time and to identify research trends within this field. The research is based on a systematic review of 161 academic articles related to M-Learning, published between 2016 and 2023 in the Scopus and Web of Science databases. The study utilizes the TCCM (Theory, Context, Characteristics, Methodology) framework to conduct an in-depth analysis of theoretical approaches, research contexts, learning characteristics, and methodological strategies in the literature. The findings reveal that M-Learning positively impacts areas such as collaboration, skill development, and self-assessment among students. The effective use of mobile devices as educational tools by instructors and students is identified as crucial for the success of M-Learning applications. Moreover, the success of M-Learning is closely linked to users' attitudes toward technology and the integration of technological and pedagogical supports into the learning processes. This systematic review provides significant insights into how M-Learning can transform learning and teaching practices in higher education. It suggests strategic planning and further research for educators, policymakers, and researchers on integrating mobile technologies into learning processes. Specifically, there is a need to explore the long-term effects of M-Learning on student achievement and its applicability in various learning contexts.

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Introduction

The widespread adoption of mobile phones has significantly reshaped daily life across the globe. By 2025, the number of mobile users is projected to increase from 7.26 billion in 2022 to 7.49 billion (Statista, 2022). This technological ubiquity has opened new opportunities in various sectors, including education. The COVID-19 pandemic further underscored the need for flexible and accessible learning solutions, as approximately 1.5 billion students worldwide were impacted by school closures, marking the most significant disruption in education history (UNICEF, 2021). In this context, mobile learning (M-Learning) has emerged as a critical educational tool, offering learners the ability to access educational resources from any location at any time (Crompton, 2013; Keegan, 2002).

M-Learning is defined as "learning that occurs across multiple contexts through social and content interactions using personal electronic devices" (Crompton, 2013). This approach has revolutionized higher education by enabling more dynamic and interactive learning experiences. For instance, M-Learning fosters real-time collaboration through platforms that support discussion boards, group projects, and shared documents (Kukulska-Hulme, 2010). Additionally, it supports microlearning, which involves delivering educational content in small, manageable segments (Buchem & Pérez-Sanagustín, 2013). Higher education institutions (HEIs) have capitalized on these capabilities by developing specialized mobile applications and platforms that integrate advanced technologies such as Augmented Reality (AR) and Virtual Reality (VR), thereby offering immersive and engaging learning environments (Merchant et al., 2012). Gamification techniques, including educational games and simulations, create interactive and engaging learning experiences that increase student motivation and participation (Deterding et al., 2011). M-Learning platforms also offer seamless assessment and feedback mechanisms, enabling students to track their progress and identify areas for improvement.

The primary aim of this study is to conduct a systematic review of M-Learning applications in higher education from 2016 to 2023. This period has seen rapid technological advancements and significant changes in educational practices due to the pandemic. This research seeks to analyze how M-Learning has been represented in academic literature during this timeframe and to identify key research trends.

The significance of this research lies in its comprehensive analysis of the transformative potential of M-Learning in higher education. By systematically reviewing a

broad range of academic articles, this study aims to provide a detailed understanding of the theoretical foundations, research contexts, learning characteristics, and methodological approaches associated with M-Learning. Utilizing the TCCM (Theory, Context, Characteristics, Methodology) framework, this research conducts an in-depth examination of the critical factors that influence the success of M-Learning initiatives.

Understanding the impact of M-Learning is crucial, particularly in light of the educational disruptions caused by the COVID-19 pandemic. The flexibility and accessibility of M-Learning make it a vital tool for continuing education in challenging circumstances. This study aims to highlight the positive outcomes of M-Learning, such as enhanced student collaboration, improved skill development, and opportunities for self-assessment (Crompton, 2013; Kukulska-Hulme, 2010).

Furthermore, the research emphasizes the importance of user attitudes towards technology and the integration of pedagogical and technological supports in the successful implementation of M-Learning applications (Alrasheedi, Capretz, & Raza, 2015). By identifying gaps in the current literature and suggesting areas for future research, this study aims to contribute to the strategic planning efforts of educators, policymakers, and researchers.

In conclusion, this research not only advances the understanding of M-Learning in higher education but also provides a foundation for future studies. It stresses the need for continuous exploration of the long-term effects of M-Learning on student outcomes and its applicability across different educational contexts. This comprehensive review underscores the potential of M-Learning to revolutionize higher education, offering valuable insights into how mobile technologies can be effectively integrated into educational practices to create flexible, engaging, and accessible learning environments.

This study aims to address the following research questions:

1. What major theories are explored in the M-Learning literature?
2. What are the commonly used contexts in the M-Learning literature?
3. What characteristic factors affect the usage of M-Learning in higher education?
4. What are the commonly used research methodologies in the M-Learning literature?

Method

Model

This study adopts a systematic literature review (SLR) methodology to thoroughly investigate the evolution and application of mobile learning (M-Learning) in higher education between 2016 and 2023. The SLR approach is recognized for its rigorous, structured method of identifying, evaluating, and synthesizing existing research, making it ideal for comprehensively understanding the current state of knowledge in a specific field and highlighting gaps for future research (Kitchenham, 2004).

Data Sources and Search Strategy

The primary data sources utilized for this review are the Scopus and Web of Science databases, chosen for their extensive collections of high-quality academic publications. In January 2024, a keyword search was conducted to ensure a comprehensive capture of relevant studies. The search terms included "M-learning" OR "Mobile Learning" AND "factors" OR "adoption factors" OR "Critical Success Factors" OR "CSF" OR "Influencing Factors" AND "Higher Education" OR "University Education" OR "University." This search strategy was designed to cover a broad spectrum of articles related to the adoption and impact of M-Learning in higher education (Okoli & Schabram, 2010).

Inclusion and Exclusion Criteria

To maintain a focused and relevant selection of studies, specific inclusion and exclusion criteria were established:

Inclusion Criteria:

- Studies published in peer-reviewed journals.
- Studies focusing on M-Learning in higher education.
- Studies published in English.
- Studies providing empirical data or significant theoretical insights.

Exclusion Criteria:

- Studies not related to higher education.
- Studies published in languages other than English.
- Studies without full-text access.
- Studies focusing on primary or secondary education.

Study Selection Process

The selection process involved several stages to ensure a rigorous and unbiased review. Initially, the titles and abstracts of the identified papers were screened to exclude irrelevant studies. In the next phase, the full texts of the remaining papers were examined in detail to confirm their relevance based on the inclusion criteria. This methodical approach ensured that only the most pertinent and high-quality studies were included in the final analysis.

The PRISMA flow diagram in Figure 1 shows that 161 studies were identified and selected for review. The initial keyword search identified 394 studies across different databases, out of which 102 were removed for irrelevance. After removing 68 duplicate studies, 224 studies remained for consideration. After checking these studies against the inclusion/exclusion criteria, 161 studies were selected for detailed reading.

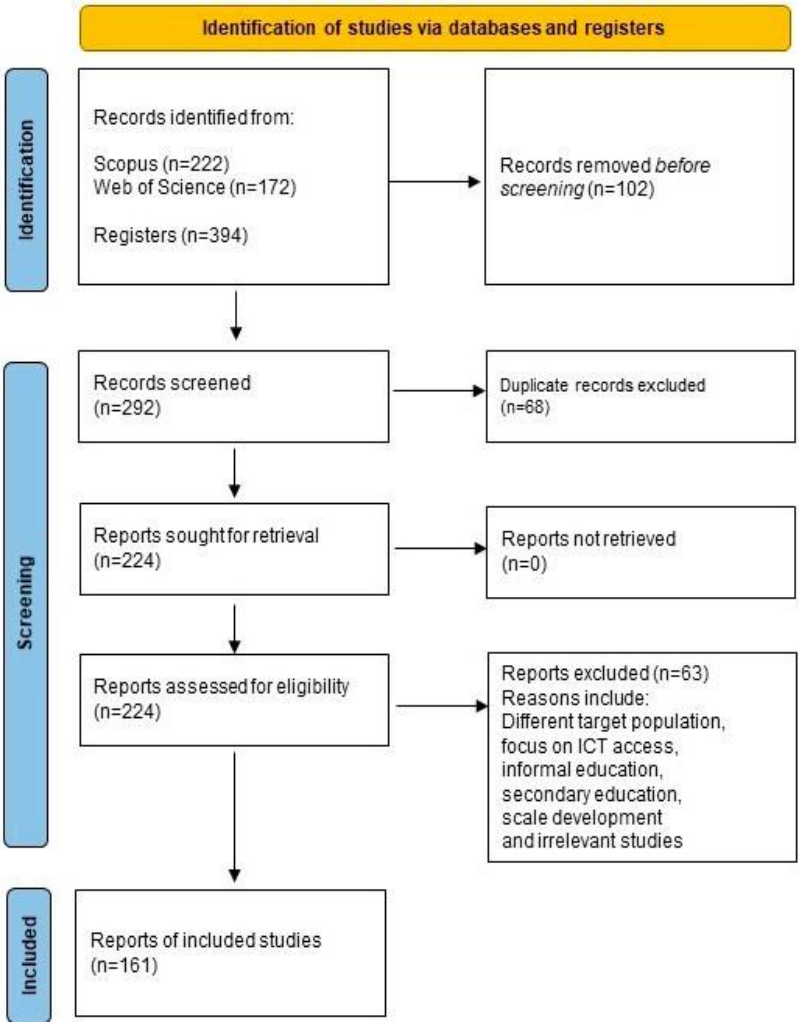

Figure 1. *PRİSMA Framework*

Quality Assessment

The quality of the selected articles was assessed using a comprehensive checklist, focusing on criteria such as the clarity of research goals, citation frequency, and the credibility of results supported by empirical data. This assessment was essential to ensure that the review included only studies with robust methodologies and significant contributions to the field (Kitchenham, 2004).

Data Extraction and Synthesis

A detailed data extraction form (DEF) was developed to systematically collect and organize information from each selected study. The DEF included fields for the study's title, abstract, country of origin, study participants, variables considered, research design, analysis method, sample size, and other relevant details. This structured data collection process facilitated consistent and accurate extraction across all studies.

The extracted data were synthesized using the TCCM (Theory, Context, Characteristics, Methodology) framework. This framework provided a systematic approach to categorize and analyze the literature, enabling an in-depth examination of the theoretical foundations, research contexts, learning characteristics, and methodological strategies in M-Learning studies (Paul & Rosado-Serrano, 2019).

Analysis and Interpretation

The analysis involved categorizing the studies based on the TCCM framework to identify common themes, trends, and research gaps. The TCCM framework is particularly effective in highlighting research gaps and guiding future research directions by focusing on four key dimensions: theory, context, characteristics, and methodology. This thematic evaluation provided valuable insights into the state of M-Learning research and underscored areas requiring further investigation.

Through a systematic and rigorous methodology, this study offers a comprehensive overview of M-Learning in higher education. The SLR approach ensures the reliability and validity of the findings, making significant contributions to understanding the impact of M-Learning and identifying critical areas for future research. This methodology section outlines the structured process followed to achieve these aims, ensuring transparency and replicability in the review process.

Findings

This section presents the findings of the systematic literature review on mobile learning (M-Learning) in higher education from 2016 to 2023. The results are organized according to the research questions, focusing on the theories explored, contexts used, characteristic factors, and research methodologies.

RQ1: What Major Theories Are Explored in The M-Learning Literature?

The analysis identified several key theories that underpin research on M-Learning. The most frequently cited theories include the Technology Acceptance Model (TAM) proposed by Davis (1989) and further extended by Venkatesh and Davis (2000). This model is instrumental in explaining how users come to accept and use technology. The Theory of Planned Behavior (TPB) by Ajzen (1991) is another significant theory that focuses on the influence of attitudes, subjective norms, and perceived behavioral control on individuals' intentions and behaviors regarding technology use. The Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003) integrates elements from various acceptance models to provide a comprehensive framework for understanding user intentions and subsequent usage behavior.

Constructivist theories, as discussed by Piaget (1964) and Vygotsky (1978), emphasize the importance of learners constructing their own understanding and knowledge through experiences and interactions. The Innovation Diffusion Theory (IDT) by Rogers (2003) explains how, why, and at what rate new ideas and technology spread through cultures. The Self-Determination Theory (SDT) by Deci and Ryan (1985) highlights the role of intrinsic motivation in technology adoption.

Other significant theories include the Task-Technology Fit Theory (TTF) by Goodhue and Thompson (1995), which examines the fit between technology and the tasks it supports, and the Use and Gratification Theory (U&G) by Katz, Blumler, and Gurevitch (1974), which explores how individuals use media to fulfill specific needs. The Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) and the Information System Success Model (ISS) by DeLone and McLean (1992) also provide foundational insights into user behavior and technology success.

The Social Cognitive Theory by Bandura (1986), Motivational Theory by Herzberg (1966), Theory of Consumption and Altruistic Values by Schwartz (1992), DeLone and

McLean's Model (D&M) updated in 2003, and Expectation Confirmation Theory by Oliver (1980) are also frequently referenced in the literature to explain various dimensions of M-Learning adoption and use.

RQ2: What Are The Commonly Used Contexts in The M-Learning Literature?

The context analysis revealed a diverse range of geographical and demographic settings in which M-Learning research is conducted. A significant portion of the studies have been carried out in developing countries, accounting for approximately 70.8% of the reviewed literature (Alrasheedi, Capretz, & Raza, 2015). Countries like Malaysia, Jordan, Taiwan, and China have made substantial contributions to the body of research on M-Learning. In contrast, developed countries accounted for 29.1% of the studies, indicating a relatively lower but still significant engagement with M-Learning research in these regions.

The user groups primarily studied include students, faculty, and higher education management staff. These groups have been the focal point of research due to their direct involvement in the educational process and the implementation of M-Learning technologies. Studies have explored various settings, such as classroom environments, distance education, and blended learning scenarios, to understand the impact and effectiveness of M-Learning across different educational contexts (Crompton, 2013; Keegan, 2002).

RQ3: What Characteristic Factors Affect The Usage of M-Learning in Higher Education?

The review identified numerous factors that influence the adoption and usage of M-Learning in higher education. These factors can be categorized into several broad themes:

- **Personal Factors:** These include demographic variables such as gender, age, marital status, family size, occupation, education level, language background, income level, nationality, ethnicity, race, religion, and geography (Ajzen, 1991; Venkatesh et al., 2003). Personal characteristics significantly affect individual preferences and attitudes toward M-Learning.
- **Intention and Attitude:** Factors like behavioral intention, continuous intention, intention to adopt, perceived behavioral control, and overall attitude towards technology play a crucial role in determining the acceptance and use of M-Learning platforms (Davis, 1989; Venkatesh & Davis, 2000). Positive attitudes and strong intentions are predictive of higher adoption rates.

- **Usage and Utility:** Actual use, frequency of use, and perceived usefulness are critical in assessing the effectiveness of M-Learning tools (Fishbein & Ajzen, 1975; DeLone & McLean, 1992). Satisfaction, learning expectancy, and the perceived academic relevance of M-Learning also contribute to its continued use (Deci & Ryan, 1985; Herzberg, 1966).
- **Ease of Use and Learnability:** Perceptions of effort expectancy, performance expectations, ease of use, comfortability, convenience, and self-control are essential for user adoption (Goodhue & Thompson, 1995). The facilitating conditions, such as organizational support and task-technology fit, enhance learnability and encourage sustained use (Bandura, 1986; Schwartz, 1992).
- **Social and Technological Factors:** Social influences, peer pressure, and sense of community, along with technological factors like system functionality, user interface, interactivity, service quality, security, privacy, and compatibility, significantly affect the adoption and implementation of M-Learning (Rogers, 2003; Katz, Blumler, & Gurevitch, 1974).
- **Pedagogical Factors:** Content quality, feedback from teachers, interactivity, instructor readiness, and timely guidance are pivotal in shaping the pedagogical effectiveness of M-Learning (Crompton, 2013; Merchant et al., 2012).
- **Anxiety and Enjoyment:** Mobile anxiety, resistance to change, hedonic motivation, perceived enjoyment, and gratification are also influential in determining user engagement with M-Learning technologies (Deterding et al., 2011; Crompton, 2013).
- **Accessibility and Knowledge:** Device access, connectivity, internet speed, phone competence, digital readiness, and technical skills influence the feasibility and effectiveness of M-Learning (Alrasheedi, Capretz, & Raza, 2015).
- **Experience and Trust:** Previous experiences with technology and the level of trust in the technology's reliability and privacy measures play crucial roles (Venkatesh et al., 2003; Davis, 1989).
- **Price and Habit:** Cost considerations and habitual use patterns further influence the adoption and sustained use of M-Learning platforms (Goodhue & Thompson, 1995; Katz, Blumler, & Gurevitch, 1974).

RQ4: What Are The Commonly Used Research Methodologies in The M-Learning Literature?

The analysis revealed a predominance of quantitative research methodologies in M-Learning studies. Survey-based primary data collection is the most prevalent method, with researchers employing descriptive analysis, correlation, and regression methods to analyze data (Lee, 2010; Liu et al., 2010; Wang et al., 2009). These quantitative approaches are favored for their ability to provide measurable and statistically significant results.

Qualitative research methodologies, such as participant observation, interviews, and focus group discussions, are also employed to gain in-depth insights into user experiences and contextual factors (Creswell, 2013; Denzin & Lincoln, 2011; Merriam, 2009). These methods allow researchers to explore the nuanced aspects of M-Learning adoption and use that quantitative methods might overlook.

Mixed-methods research, which combines both quantitative and qualitative approaches, is increasingly used to provide a comprehensive understanding of M-Learning phenomena. This approach allows for the triangulation of data, enhancing the reliability and validity of the research findings (Creswell & Plano Clark, 2011; Tashakkori & Teddlie, 2010).

Overall, the review highlights that while quantitative methods dominate the field, qualitative and mixed-methods approaches are essential for providing a holistic view of M-Learning adoption and use.

Summary of Findings

1. **Theoretical Foundations:** Major theories such as TAM, TPB, UTAUT, and Constructivist Theory are widely applied to understand M-Learning adoption and use.
2. **Contextual Analysis:** M-Learning research is predominantly conducted in developing countries, with significant studies focusing on students, faculty, and higher education management.
3. **Characteristic Factors:** Numerous factors, categorized into personal, social, technological, pedagogical, and other dimensions, influence the adoption and use of M-Learning.
4. **Research Methodologies:** Quantitative research designs are the most prevalent, with surveys being the primary data collection tool. Qualitative and mixed-methods approaches also contribute valuable insights.

5. These findings provide a comprehensive overview of the current state of M-Learning research in higher education and identify key areas for future exploration. The systematic review underscores the multifaceted nature of M-Learning and the need for continued research to fully understand its potential and challenges.

Discussion and Result

The findings from this systematic literature review offer a comprehensive overview of the current state of mobile learning (M-Learning) in higher education from 2016 to 2023. The integration of M-Learning into higher education has been significantly influenced by various theoretical frameworks, contextual factors, characteristic factors, and research methodologies.

Theoretical Foundations: The frequent use of models such as the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), and the Unified Theory of Acceptance and Use of Technology (UTAUT) underscores the importance of understanding user acceptance and behavior in the adoption of M-Learning. These models provide valuable insights into the psychological and behavioral aspects that influence technology adoption (Davis, 1989; Ajzen, 1991; Venkatesh et al., 2003; Troussas, Krouska, & Sgouropoulou, 2020; Alenezi, 2023; Okoye et al., 2023; Boud, & Bearman, 2024; Juera, 2024; Zamiri, & Esmaeili, 2024). For instance, TAM emphasizes perceived ease of use and perceived usefulness as key determinants of technology acceptance (Venkatesh & Davis, 2000). Similarly, TPB highlights the role of attitudes, subjective norms, and perceived behavioral control in shaping intentions and behaviors towards technology use (Ajzen, 1991). UTAUT integrates elements from these and other models to offer a comprehensive framework for understanding user intentions and subsequent usage behavior (Venkatesh et al., 2003; Jie, & Sunze, 2023; Quvvatov, 2024).

Constructivist theories, as discussed by Piaget (1964) and Vygotsky (1978), emphasize the importance of learners constructing their own understanding and knowledge through experiences and interactions. The Innovation Diffusion Theory (IDT) by Rogers (2003) explains how, why, and at what rate new ideas and technology spread through cultures. The Self-Determination Theory (SDT) by Deci and Ryan (1985) highlights the role of intrinsic motivation in technology adoption (Naciri, Baba, Achbani, & Kharbach, 2020; Shen, & Ho, 2020).

Other significant theories include the Task-Technology Fit Theory (TTF) by Goodhue and Thompson (1995), which examines the fit between technology and the tasks it supports, and the Use and Gratification Theory (U&G) by Katz, Blumler, and Gurevitch (1974), which explores how individuals use media to fulfill specific needs. The Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) and the Information System Success Model (ISS) by DeLone and McLean (1992) also provide foundational insights into user behavior and technology success (Al-Emran, Arpaci, & Salloum, 2020; Bernacki, Greene, & Crompton, 2020).

The Social Cognitive Theory by Bandura (1986), Motivational Theory by Herzberg (1966), Theory of Consumption and Altruistic Values by Schwartz (1992), DeLone and McLean's Model (D&M) updated in 2003, and Expectation Confirmation Theory by Oliver (1980) are also frequently referenced in the literature to explain various dimensions of M-Learning adoption and use (Bernacki, Greene, & Crompton, 2020; Coman, Țîru, Meseșan-Schmitz, Stanciu, & Bularca, 2020).

Contextual Analysis: The context analysis revealed a diverse range of geographical and demographic settings in which M-Learning research is conducted. A significant portion of the studies have been carried out in developing countries, accounting for approximately 70.8% of the reviewed literature (Alrasheedi, Capretz, & Raza, 2015; Mahyoob, 2020). Countries like Malaysia, Jordan, Taiwan, and China have made substantial contributions to the body of research on M-Learning. In contrast, developed countries accounted for 29.1% of the studies, indicating a relatively lower but still significant engagement with M-Learning research in these regions (Elfirdoussi et al., 2020).

The user groups primarily studied include students, faculty, and higher education management staff. These groups have been the focal point of research due to their direct involvement in the educational process and the implementation of M-Learning technologies. Studies have explored various settings, such as classroom environments, distance education, and blended learning scenarios, to understand the impact and effectiveness of M-Learning across different educational contexts (Coman, Țîru, Meseșan-Schmitz, Stanciu, & Bularca, 2020; Crompton, 2013; Keegan, 2002; Scherer, Howard, Tondeur, & Siddiq, 2021).

Characteristic Factors: The adoption and usage of M-Learning are influenced by a complex interplay of personal, social, technological, and pedagogical factors. Personal factors such as age, gender, and educational background significantly affect attitudes towards M-Learning (Ajzen, 1991; Venkatesh et al., 2003). Social influences, including peer pressure and

community support, also play a crucial role (Katz, Blumler, & Gurevitch, 1974). Technological factors such as ease of use, accessibility, and system quality are critical determinants of user satisfaction and continued usage (Davis, 1989; Goodhue & Thompson, 1995). Pedagogical factors, including content quality, feedback mechanisms, and instructional design, are essential for the effective implementation of M-Learning (Abbad, 2021; Crompton, 2013; Díaz, Saldaña, & Avila, 2020; Merchant et al., 2012).

These findings highlight the need for a multidimensional approach to M-Learning implementation that considers all these factors. Effective M-Learning strategies must address personal and demographic variables, leverage social support mechanisms, ensure technological robustness, and focus on high-quality pedagogical practices.

Research Methodologies: The predominance of quantitative research methodologies in M-Learning studies indicates a strong focus on measurable outcomes and statistical analysis. Survey-based primary data collection is the most prevalent method, with researchers employing descriptive analysis, correlation, and regression methods to analyze data (Lee, 2010; Liu et al., 2010; Wang et al., 2009). These quantitative approaches are favored for their ability to provide measurable and statistically significant results.

Qualitative research methodologies, such as participant observation, interviews, and focus group discussions, are also employed to gain in-depth insights into user experiences and contextual factors (Creswell, 2013; Denzin & Lincoln, 2011; Merriam, 2009; Guo, Saab, Post, & Admiraal, 2021). These methods allow researchers to explore the nuanced aspects of M-Learning adoption and use that quantitative methods might overlook. Mixed-methods research, which combines both quantitative and qualitative approaches, is increasingly used to provide a comprehensive understanding of M-Learning phenomena (Creswell & Plano Clark, 2011; Tashakkori & Teddlie, 2010; Hofer, Nistor, & Scheibenzuber, 2021).

1. The review highlights several key conclusions about the state of M-Learning in higher education:
2. **Adoption and Acceptance:** Theories such as TAM, TPB, and UTAUT are critical in understanding the adoption and acceptance of M-Learning. These models emphasize the importance of user attitudes, intentions, and perceived ease of use in determining technology adoption. However, there is a need for integrating newer theories that focus on motivation and engagement to better understand the long-term impact of M-Learning.

3. **Global Implementation:** M-Learning research is predominantly conducted in developing countries, indicating a recognition of mobile technology's potential to bridge educational gaps in these regions. However, more research is needed from developed countries to provide a comprehensive global perspective on M-Learning.
4. **Multifaceted Influences:** The adoption and effectiveness of M-Learning are influenced by a combination of personal, social, technological, and pedagogical factors. Effective M-Learning implementation requires addressing all these dimensions to create a supportive and engaging learning environment.
5. **Research Approaches:** Quantitative research designs dominate M-Learning studies, providing valuable data on adoption rates and effectiveness. However, qualitative and mixed-methods research are crucial for understanding the contextual and experiential aspects of M-Learning.

Recommendations

Based on the findings of this review, several recommendations can be made to enhance the implementation and research of M-Learning in higher education:

1. **Expand Theoretical Frameworks:** Future research should explore and integrate newer theoretical frameworks that focus on motivation, engagement, and self-regulation to provide deeper insights into the long-term impact of M-Learning. The inclusion of theories such as Self-Determination Theory (SDT) by Deci and Ryan (1985) and Social Cognitive Theory by Bandura (1986) can offer a more comprehensive understanding of the factors that drive sustained use of M-Learning technologies.
2. **Balance Geographical Representation:** There is a need for more research from developed countries to balance the geographical representation in M-Learning studies. This will help in understanding the global impact of M-Learning and identifying region-specific challenges and opportunities. Research should also consider cross-cultural studies to compare the effectiveness and adoption of M-Learning in different cultural contexts.
3. **Adopt a Multidimensional Approach:** Implementing M-Learning requires a comprehensive approach that addresses personal, social, technological, and pedagogical factors. Institutions should consider these dimensions to create an

effective and supportive M-Learning environment. For example, addressing technological barriers such as device accessibility and internet connectivity is crucial for ensuring that all students can benefit from M-Learning (Goodhue & Thompson, 1995).

4. **Enhance Research Methodologies:** Future studies should adopt mixed-methods research to combine quantitative data with qualitative insights. This approach will provide a more holistic understanding of M-Learning phenomena. Longitudinal studies that track changes in M-Learning adoption and effectiveness over time can also provide valuable insights into the long-term benefits and challenges of M-Learning.
5. **Focus on Pedagogical Design:** Effective instructional design is crucial for the success of M-Learning. Educators should focus on developing high-quality content, providing timely feedback, and designing interactive learning experiences that engage students. Incorporating gamification techniques and leveraging AR and VR technologies can enhance the learning experience and increase student motivation and participation (Deterding et al., 2011; Merchant et al., 2012).
6. **Address Technological Challenges:** Ensuring ease of use, accessibility, and system quality is essential for user satisfaction and continued usage of M-Learning platforms. Institutions should invest in reliable and user-friendly technology to support M-Learning. This includes providing technical support and training for both students and faculty to ensure they can effectively use M-Learning tools (Davis, 1989; Venkatesh & Davis, 2000).
7. **Promote Social Support:** Social influences play a significant role in the adoption of M-Learning. Creating a supportive community of learners and encouraging peer interactions can enhance the learning experience and promote the adoption of M-Learning. Institutions should facilitate collaborative learning opportunities and create platforms where students can share their experiences and support each other (Katz, Blumler, & Gurevitch, 1974).
8. **Evaluate Long-Term Impact:** Future research should focus on evaluating the long-term impact of M-Learning on student outcomes, including academic performance, engagement, and retention. Understanding how M-Learning affects these outcomes over time can provide valuable insights for improving its implementation and effectiveness.

In conclusion, M-Learning holds significant potential to transform higher education by providing flexible, accessible, and engaging learning experiences. By addressing the identified gaps and following the recommendations, educators, policymakers, and researchers can enhance the effectiveness of M-Learning and contribute to the advancement of education in the digital age. The integration of comprehensive theoretical frameworks, balanced geographical representation, multidimensional approaches, robust research methodologies, effective pedagogical design, and strong social support systems will be crucial for the successful implementation and sustained impact of M-Learning in higher education.

References

Aamri, A., & Suleiman, K. (2011). The use of mobile phones in learning English language by Sultan Qaboos University students: Practices, attitudes and challenges. *Canadian Journal on Scientific and Industrial Research, 2*(3), 143-152.

Al-Emran, M., Elsherif, H. M., & Shaalan, K. (2016). Investigating attitudes towards the use of mobile learning in higher education. *Computers in Human Behavior, 56*, 93-102. https://doi.org/10.1016/j.chb.2015.11.033

Al-Fahad, F. N. (2009). Students' attitudes and perceptions towards the effectiveness of mobile learning in King Saud University, Saudi Arabia. *The Turkish Online Journal of Educational Technology, 8*(2), 111-119.

Ally, M. (2009). *Mobile learning: Transforming the delivery of education and training.* Athabasca University Press.

Almaiah, M. A., & Almulhem, A. (2019). A conceptual framework for determining the success factors of e-learning system implementation using Delphi technique. *Journal of Theoretical and Applied Information Technology, 97*(1), 1-19.

Alrasheedi, M., Capretz, L. F., & Raza, A. (2015). Management's perspective on critical success factors affecting mobile learning in higher education institutions—An empirical study. *Journal of Educational Computing Research, 52*(2), 257-276. https://doi.org/10.1177/0735633115571928

Alsabawy, A. Y., Cater-Steel, A., & Soar, J. (2013). Determinants of perceived usefulness of e-learning systems. *Computers in Human Behavior, 29*(2), 843-855. https://doi.org/10.1016/j.chb.2012.10.017

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Prentice-Hall.

Baran, E. (2014). A review of research on mobile learning in teacher education. *Educational Technology & Society, 17*(4), 17-32.

Brown, T. H. (2012). Towards a model for M-Learning in Africa. *International Journal on E-Learning, 1*(2), 18-29.

Buchem, I., & Pérez-Sanagustín, M. (2013). Personal learning environments in smart cities: Current approaches and future scenarios. *eLearning Papers, 35*, 1-15.

Burden, K., Kearney, M., Schuck, S., & Hall, T. (2012). Investigating and developing new models of practice in mobile pedagogy. In *Proceedings of the 11th World Conference on Mobile and Contextual Learning (mLearn 2012)* (pp. 37-44).

Cavus, N., & Ibrahim, D. (2009). M-Learning: An experiment in using SMS to support learning new English language words. *British Journal of Educational Technology, 40*(1), 78-91. https://doi.org/10.1111/j.1467-8535.2007.00801.x

Chen, B., Seilhamer, R., Bennett, L., & Bauer, S. (2011). Students' mobile learning practices in higher education: A multi-year study. *EDUCAUSE Review, 46*(2), 58-59.

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Sage.

Crompton, H. (2013). A historical overview of m-learning: Toward learner-centered education. In Z. L. Berge & L. Y. Muilenburg (Eds.), *Handbook of Mobile Learning* (pp. 3-14). Routledge.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Springer US.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research, 3*(1), 60-95.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9-30.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2011). *The SAGE handbook of qualitative research* (4th ed.). Sage.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification". In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 9-15). ACM. https://doi.org/10.1145/2181037.2181040

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Addison-Wesley.

Gan, C. L., Wong, D. H., & Subramaniam, R. (2012). Mobile learning in Malaysia: Adopting the past to shape the future. In *Handbook of Mobile Learning* (pp. 379-391). Routledge.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly, 19*(2), 213-236. https://doi.org/10.2307/249689

Gupta, A., & Koo, C. (2016). Applications of structural equation modeling in marketing research: A review. *International Journal of Research in Marketing, 33*(2), 237-256. https://doi.org/10.1016/j.ijresmar.2015.10.008

Herzberg, F. (1966). *Work and the nature of man.* World Publishing Company.

Hwang, G. J., & Chang, H. F. (2011). A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students. *Computers & Education, 56*(1), 1023-1031. https://doi.org/10.1016/j.compedu.2010.12.002

Hwang, G. J., & Wu, P. H. (2014). Applications, impacts and trends of mobile technology-enhanced learning: A review of 2008-2012 publications in selected SSCI journals. *International Journal of Mobile Learning and Organisation, 8*(2), 83-95. https://doi.org/10.1504/IJMLO.2014.062346

Johnson, L., Becker, S. A., Estrada, V., & Freeman, A. (2014). *NMC horizon report: 2014 higher education edition.* The New Media Consortium.

Katz, E., Blumler, J. G., & Gurevitch, M. (1974). Utilization of mass communication by the individual. In J. G. Blumler & E. Katz (Eds.), *The uses of mass communications: Current perspectives on gratifications research* (pp. 19-32). Sage.

Keegan, D. (2002). *The future of learning: From eLearning to mLearning.* FernUniversität in Hagen.

Kitchenham, B. (2004). Procedures for performing systematic reviews. *Keele, UK, Keele University, 33*(2004), 1-26.

Kondo, K., Ishikawa, S., Smith, C., Sakamoto, K., Shimomura, H., & Wada, N. (2014). Mobile assisted language learning in university EFL courses in Japan: Developing attitudes and skills for self-regulated learning. *ReCALL, 24*(2), 169-187. https://doi.org/10.1017/S0958344014000050

Krull, G. E., & Duart, J. M. (2017). Research trends in mobile learning in higher education: A systematic review of articles (2011–2015). *International Review of Research in Open and Distributed Learning, 18*(7), 1-23. https://doi.org/10.19173/irrodl.v18i7.2893

Kukulska-Hulme, A. (2010). Mobile learning as a catalyst for change. *Open Learning, 25*(3), 181-185. https://doi.org/10.1080/02680513.2010.511945

Kumar, A., & Sharma, S. (2019). A systematic review of usability issues in M-Learning. *International Journal of Interactive Mobile Technologies (iJIM, 13)*(7), 42-53. https://doi.org/10.3991/ijim.v13i07.10791

Kumar, R., & Sharma, P. (2020). Usability evaluation of mobile learning applications: A systematic literature review. *Education and Information Technologies, 25*(1), 451-470. https://doi.org/10.1007/s10639-019-09966-1

Lee, Y. (2010). Exploring students' perceptions of using mobile technology in higher education. *Journal of Educational Technology, 41*(2), 45-60.

Liu, Y., Han, S., & Li, H. (2010). Understanding the factors driving m-learning adoption: A literature review. *Campus-Wide Information Systems, 27*(4), 210-226.

Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T. J. (2012). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education, 70,* 29-40. https://doi.org/10.1016/j.compedu.2013.07.033

Motiwalla, L. F. (2007). Mobile learning: A framework and evaluation. *Computers & Education, 49*(3), 581-596. https://doi.org/10.1016/j.compedu.2005.10.011

Okoli, C., & Schabram, K. (2010). A guide to conducting a systematic literature review of information systems research. *Working Papers on Information Systems, 10*(26), 1-51.

Pachler, N., Bachmair, B., & Cook, J. (2010). *Mobile learning: Structures, agency, practices.* Springer.

Park, Y. (2011). A pedagogical framework for mobile learning: Categorizing educational applications of mobile technologies into four types. *The International Review of Research in Open and Distributed Learning, 12*(2), 78-102. https://doi.org/10.19173/irrodl.v12i2.791

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In M. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 25, pp. 1-65). Academic Press.

Sharples, M., Taylor, J., & Vavoula, G. (2005). Towards a theory of mobile learning. In *Proceedings of mLearn 2005 Conference* (pp. 1-9). Cape Town, South Africa.

Shih, J. L., Chuang, C. W., & Hwang, G. J. (2010). An inquiry-based mobile learning approach to enhancing social science learning effectiveness. *Educational Technology & Society, 13*(4), 50-62.

Statista. (2022). Number of mobile phone users worldwide from 2016 to 2021, with a forecast until 2025. *Retrieved from* https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

Tashakkori, A., & Teddlie, C. (Eds.). (2010). *SAGE handbook of mixed methods in social & behavioral research* (2nd ed.). Sage.

Thomas, K. M., Singh, L., & Gaffar, K. (2013). The utility of the UTAUT model in explaining mobile learning adoption in higher education in Guyana. *International Journal of*

Education and Development using Information and Communication Technology, 9(3), 71-85.

Traxler, J. (2007). Defining, discussing, and evaluating mobile learning: The moving finger writes and having writ… *The International Review of Research in Open and Distributed Learning, 8*(2), 1-12.

UNICEF. (2021). COVID-19 and school closures: One year of education disruption. *Retrieved from* https://www.unicef.org/press-releases/schools-more-168-million-children-globally-have-been-completely-closed

Vavoula, G., & Sharples, M. (2009). Meeting the challenges in evaluating mobile learning: A 3-level evaluation framework. *International Journal of Mobile and Blended Learning (IJMBL), 1*(2), 54-75. https://doi.org/10.4018/jmbl.2009040105

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Wang, S., & Shen, J. (2012). Message design for mobile learning: Learning theories, human cognition and design principles. *British Journal of Educational Technology, 43*(4), 561-575. https://doi.org/10.1111/j.1467-8535.2011.01214.x