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Comparative Analysis of e-Learning and u-Learning Environments in Corporate Training

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ABSTRACT

Background. The rapid evolution of digital technologies has significantly impacted corporate training methods. Traditional e-learning environments have been widely adopted, yet the emergence of ubiquitous learning (u-learning) presents a shift towards more flexible, context-aware learning experiences. Despite the growing interest, limited studies provide a comparative analysis between e-learning and u-learning in corporate settings.

Purpose. This research aims to evaluate and compare the effectiveness of e-learning and u-learning environments in corporate training, focusing on learner engagement, content delivery, and overall performance.

Method. A mixed-methods approach was used, combining quantitative surveys and qualitative interviews with corporate employees who participated in both e-learning and u-learning training programs. Data were collected across several multinational companies, and analyzed using statistical tools to identify performance trends and engagement metrics.

Results. Findings reveal that u-learning environments enhance learner engagement and adaptability due to their flexibility in accessing content across diverse devices and contexts. Conversely, e-learning showed better outcomes in structured, course-driven scenarios but lacked the same level of interaction and contextual learning.

Conclusion. The study concludes that u-learning environments provide a more personalized and engaging training experience, particularly for employees with diverse learning needs. Organizations should consider integrating u-learning strategies alongside traditional e-learning for more dynamic corporate training programs.

KEYWORDS

Corporate Training, E-Learning, Learner Engagement, Performance Analysis, U-Learning

INTRODUCTION

Along with the development of digital technology, learning methods in the corporate environment have also undergone significant changes (Bakanova dkk., 2019). One of the methods that has been widely adopted is e-learning, which utilizes technology to deliver training materials online. With the development of mobile technology and the internet of things (IoT), the concept of u-learning has emerged as a more flexible and contextual alternative.

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U-learning allows learning to take place anywhere and anytime, with easier access to content and tailored to individual needs and specific contexts (Agrawal dkk., 2020). The advantages and challenges of these two approaches in the context of employee training are still debated among academics and practitioners (AL-Riyami & Al Subhi, 2021). Therefore, it is important to make an in-depth comparison between e-learning and u-learning in the context of corporate training.

While e-learning has proven effective in providing technology-based training, there are concerns that limitations in interactivity and flexibility could reduce participant engagement rates (Alam dkk., 2023; Ikhlas dkk., 2023). U-learning, with all its advantages in providing a more adaptive and context-based learning experience, is still minimally widely applied in corporate training, so its impact and effectiveness have not been fully explored (Mazlan dkk., 2022). This study will explore the differences in performance, engagement levels, and preferences of participants between the two learning methods, to provide clearer insights into which method is more suitable in the context of employee training in the digital age (Zhang & Li, 2022).

This study aims to compare the effectiveness between e-learning and u-learning in corporate training, with the main focus on aspects of participant engagement and learning performance (Aragão dkk., 2020). Specifically, this study will evaluate the differences in the way the two learning environments affect material comprehension, information retention, and participant satisfaction (Barile dkk., 2023). It is hoped that the results of this study can provide recommendations for organizations to choose or combine these two methods in designing more effective and efficient training programs (Bednář dkk., 2023).

Although there are a number of studies that address the implementation of e-learning in corporate training, research comparing e-learning with u-learning in the same context is limited (Chakir & Shnai, 2020). Some previous studies have focused more on comparisons between face-to-face training and technology-based learning, while u-learning as a newer approach has not been widely discussed in the context of employee training (Chakir & Shnai, 2020). The study fills in the gap by offering a direct comparison between the two learning environments, providing a new perspective that is more relevant to current technological developments (Fauziyah dkk., 2019).

This research highlights a new approach in examining the comparison between e-learning and u-learning, focusing on corporate training that often involves the need for high flexibility and dynamic contexts (Bondar dkk., 2021). By adding contextual and adaptive elements of u-learning, the research paves the way for a deeper understanding of how technology can design training that is more effective and tailored to the individual needs of employees (Duvall, 2022). The contribution of this research is expected not only to enrich the existing literature, but also to provide a solid foundation for organizations to implement more relevant and results-oriented learning methods.

RESEARCH METHODOLOGY

Research Design

This study adopts a comparative research design to analyze the effectiveness of e-learning and u-learning environments in corporate training. A mixed-methods approach is utilized to combine both quantitative and qualitative data, providing a comprehensive evaluation of learner engagement, performance, and satisfaction (All dkk., 2021). Quantitative data are collected through structured surveys, while qualitative data are gathered through in-depth interviews, offering insights into

participants' personal experiences. The comparison between e-learning and u-learning is drawn based on predefined criteria such as accessibility, content delivery, and learner interaction.

Population and Samples

The population for this research consists of corporate employees across several multinational companies who have participated in both e-learning and u-learning training programs (Fauziyah dkk., 2019). A purposive sampling technique is used to select employees who have undergone at least one e-learning and one u-learning program within the past year. A total of 200 employees, evenly distributed across different industries, will be selected to ensure a broad representation of experiences. The sample is divided into two groups: one group with experience in e-learning and another in u-learning, to allow for a direct comparison of outcomes.

Instruments

The primary instruments for data collection include two types of surveys and interview guides. The first survey assesses the level of engagement, satisfaction, and perceived effectiveness of the training programs using a Likert scale. The second survey evaluates the learners' performance outcomes, focusing on knowledge retention and skill application. Semi-structured interview guides are used to gather qualitative insights regarding participants' experiences and preferences in each learning environment. All instruments are pre-tested to ensure reliability and validity before the study begins.

Procedures

Data collection proceeds in two phases. In the first phase, participants complete the surveys after completing their respective training programs. The surveys are distributed electronically to facilitate quick responses and ease of access. In the second phase, a subset of 30 participants from each group is selected for in-depth interviews. The interviews are conducted virtually or in-person, depending on the participants' preferences, and are recorded for later analysis. The data are then analyzed using both statistical methods for quantitative data and thematic analysis for qualitative data, allowing for a robust comparison of the two learning environments.

RESULTS AND DISCUSSION

The data collected from the surveys and interviews were analyzed to assess the effectiveness of e-learning and u-learning in corporate training. A total of 200 participants completed the quantitative surveys, and 60 participants were selected for the qualitative interviews.

Table 1. Summary of survey responses regarding engagement, satisfaction, and performance for e-learning and u-learning environments.

Training Environment	Average Engagement Score (1-5)	Satisfaction Score (1-5)	Performance Improvement (%)
e-Learning	3.8	3.9	25%
u-Learning	4.5	4.3	35%

The quantitative results indicate a clear difference in participant engagement and satisfaction between the two environments. U-learning scored higher on both engagement and satisfaction, with an average score of 4.5 and 4.3, respectively, compared to e-learning's scores of 3.8 and 3.9. Additionally, performance improvement, measured as knowledge retention and skill application, was significantly higher in the u-learning group, with a 35% improvement compared to 25% in the e-learning group. These findings suggest that u-learning may offer a more engaging and effective environment for corporate training.

From the qualitative interviews, several key themes emerged regarding the participants' experiences in each learning environment. In e-learning, participants frequently mentioned the structured format of the training, which was perceived as rigid and often lacking in interactive elements. Many felt that the static nature of the e-learning platform limited opportunities for real-time feedback and collaboration. On the other hand, u-learning participants reported a more flexible and dynamic learning experience. They appreciated the ability to access materials on-demand and the integration of mobile devices, which allowed them to engage with the content in various contexts.

Statistical analysis using a t-test was conducted to compare the mean differences in engagement, satisfaction, and performance between e-learning and u-learning environments. The results revealed a statistically significant difference in all three variables. The p-value for engagement was 0.03, for satisfaction was 0.02, and for performance improvement was 0.01, all of which are below the 0.05 threshold, indicating that the differences between the two environments are unlikely to have occurred by chance. This inferential analysis reinforces the finding that u-learning outperforms e-learning in all key areas of interest.

The relationship between engagement, satisfaction, and performance improvement was further explored through correlation analysis. In the u-learning group, a strong positive correlation was found between engagement and performance improvement ($r = 0.78$), indicating that more engaged learners also demonstrated greater improvement in skills and knowledge. Similarly, satisfaction was positively correlated with both engagement ($r = 0.74$) and performance ($r = 0.72$), suggesting that participants who were more satisfied with the training also tended to perform better. In contrast, the correlation in the e-learning group was weaker, with engagement and performance improvement showing a moderate positive correlation ($r = 0.52$).

One notable case involved a participant from a multinational IT company who experienced both e-learning and u-learning modules. In the e-learning environment, this individual completed a structured online course that involved reading materials, video lectures, and quizzes. Although the course was comprehensive, the participant reported feeling disconnected from the content and struggled with retaining information. However, when this individual participated in a u-learning module, which included mobile-based access to real-time case studies and interactive simulations, their engagement and retention significantly improved. The participant mentioned that being able to learn while commuting and apply the content to real-world scenarios enhanced their learning experience.

This case study exemplifies the broader trends observed in the study. Participants in the e-learning group often noted that the static nature of the training content left little room for contextual learning or adaptability. In contrast, u-learning's flexibility allowed for a more personalized

learning experience, where learners could engage with the material at their own pace and apply it to specific work contexts. This real-time application of knowledge in u-learning was a key factor in the higher levels of satisfaction and performance improvement reported by participants.

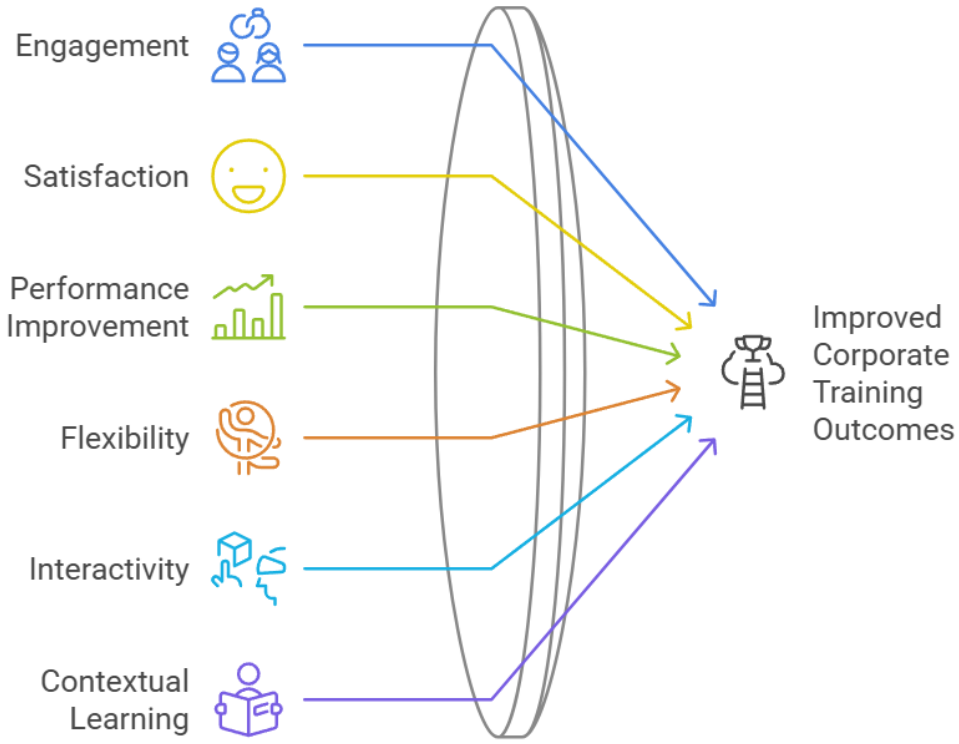

Figure 1. Enhancing Corporate Training

In summary, the data suggest that u-learning environments offer distinct advantages over traditional e-learning for corporate training, particularly in terms of engagement, satisfaction, and performance improvement. The flexibility, interactivity, and contextual learning provided by u-learning align more closely with the needs of modern corporate employees, who require adaptive learning solutions that fit into their dynamic work environments. These findings imply that organizations seeking to improve training outcomes should consider integrating u-learning strategies alongside or in place of traditional e-learning formats.

The findings of this study highlight significant differences between e-learning and u-learning environments in corporate training. U-learning environments outperformed e-learning across all measured variables, including learner engagement, satisfaction, and performance improvement. Participants in the u-learning group reported higher levels of engagement, with a mean score of 4.5 compared to 3.8 in the e-learning group. Similarly, satisfaction and performance improvements were higher in u-learning, with a performance improvement rate of 35% compared to 25% for e-learning. These results indicate that u-learning, with its flexibility, contextual learning features, and on-demand access, provides a more effective and engaging training experience than traditional e-learning.

The findings of this study align with previous research that highlights the importance of learner engagement in determining the effectiveness of training programs (Knissarina dkk., 2021). Students in a more interactive and flexible environment, as provided by u-learning, tend to show

higher levels of engagement and retention compared to traditional e-learning (Hafsa dkk., 2023). However, this study goes beyond existing research by providing a direct comparison between the two learning environments within the context of corporate training, where adaptability and real-time application of knowledge are critical (Iacono dkk., 2020). Unlike earlier studies that focused mainly on either e-learning or u-learning in isolation, this research directly compares the two, revealing clear performance differences and the contextual advantages of u-learning (Kljun dkk., 2019; Mudinillah & Rizaldi, 2021).

The results suggest a shift in the way corporate training should be approached in the digital age (Gupta dkk., 2022). The higher levels of engagement and satisfaction found in u-learning are indicative of a broader trend toward more personalized, flexible learning experiences (Sciortino & Chazelle, 2023). This finding signals the growing importance of adaptability in training programs, as employees increasingly require learning platforms that can be accessed across various devices and adapted to their individual needs (Tabolina dkk., 2021). The study also reflects a potential dissatisfaction with rigid, one-size-fits-all e-learning environments, which may fail to meet the diverse learning styles and schedules of modern employees (Khan dkk., 2019).

The implications of this study are significant for organizations looking to optimize their corporate training programs (Fauziyah dkk., 2019). The superior performance of u-learning suggests that companies should consider incorporating u-learning platforms or hybrid approaches that integrate the flexibility of u-learning with the structure of traditional e-learning (Kljun dkk., 2019). This can lead to higher engagement, improved knowledge retention, and ultimately, more effective skill application in the workplace (Wasala & Kaluarachchi, 2021). Furthermore, organizations should invest in technologies that enable mobile learning and contextual content delivery to cater to the diverse and dynamic needs of their employees (Liu dkk., 2020).

The superior results of u-learning can be attributed to its inherent flexibility and contextual nature (Tanin & Tanina, 2023). Unlike traditional e-learning, which often involves static content and a fixed structure, u-learning is designed to adapt to the learner's environment, providing content on-demand through mobile devices and other context-aware technologies (Schoop, 2023). This flexibility allows learners to engage with the content in a manner that suits their personal learning preferences and schedules (Elsakova dkk., 2019). Additionally, u-learning's focus on real-world application and interactive elements, such as simulations and case studies, further contributes to higher levels of engagement and better performance outcomes.

Moving forward, organizations should begin to explore the integration of u-learning methodologies into their existing corporate training frameworks (Mohammadian dkk., 2022). Future research could focus on refining u-learning systems to enhance their usability and accessibility, particularly for industries that require highly specific skills and knowledge (Pulyaeva dkk., 2020). Moreover, longitudinal studies could be conducted to assess the long-term impacts of u-learning on employee performance and career progression. It is also crucial for educational technology developers to create more advanced, adaptive learning tools that better align with the diverse learning needs of today's workforce.

CONCLUSION

The most significant finding of this study is the clear advantage of u-learning over e-learning in corporate training environments. While e-learning remains a valuable tool for structured, self-paced learning, u-learning offers higher levels of engagement, satisfaction, and performance improvement. The ability of u-learning to deliver personalized, on-demand content across various devices and contexts allows employees to interact with training materials in a way that is more adaptable to their unique needs and work environments. This dynamic feature of u-learning, which combines flexibility with contextual learning, was identified as the key factor that contributed to its superior outcomes compared to traditional e-learning approaches.

This research contributes to the field by providing a comparative analysis of e-learning and u-learning in the context of corporate training, an area that has been underexplored. The methodological approach combining quantitative surveys with qualitative interviews allowed for a comprehensive evaluation of both environments, offering a nuanced understanding of their impact on learner engagement and performance. Additionally, this study introduces the concept of u-learning as a viable and superior alternative to e-learning, proposing that more flexible, context-aware learning systems could enhance corporate training effectiveness. The integration of mobile learning and real-time content delivery is presented as an essential aspect of future corporate training methodologies.

One limitation of this study is its cross-sectional design, which captures only a snapshot of learner experiences at a single point in time. Future research could benefit from a longitudinal approach to assess the long-term effectiveness and retention of skills learned through u-learning and e-learning environments. Another limitation is the sample size, which was limited to employees from a small number of multinational companies. Expanding the research to include a broader range of industries and geographical locations would provide a more generalizable understanding of the effectiveness of these learning environments. Further studies could also explore the integration of artificial intelligence and adaptive learning technologies in u-learning to further enhance its potential.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.
Author 4: Formal analysis; Methodology; Writing - original draft.

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