

***Research and Development of the Virtual Academic Conference Room in the Metaverse
for Promoting Digital Citizenship Under the Thailand Cyber University Initiative***

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Abstract

This research focuses on the design and development of the virtual academic conference room in the metaverse under the Thailand Cyber University Initiative, with the aim of promoting digital citizenship behaviors. The objectives of this study were: 1) to develop the virtual academic conference room in the metaverse for academic purposes, 2) to evaluate participants' digital skills and citizenship behaviors, and 3) to analyze the economic efficiency of the virtual conference room using a Social Return on Investment (SROI) method. The prototype integrates interactive and immersive features designed to foster digital citizenship through simulated environments and collaborative learning experiences. The study involved 360 participants engaged in both traditional and virtual academic conferences facilitated within the metaverse environment. Research tools included a digital citizenship assessment, the virtual academic conference room in the metaverse, participant evaluations of digital skills and citizenship behaviors, and an SROI analysis method. Key findings highlight that: 1) The virtual academic conference room in the metaverse effectively creates an interactive learning environment, enhancing engagement and fostering participants' ability to apply digital skills in real-world contexts. 2) Participants demonstrated significant improvements in their digital skills and behaviors, with the metaverse environment supporting the development of awareness and practical applications of digital citizenship. 3) The SROI analysis confirmed the cost-effectiveness of utilizing metaverse technology for educational purposes, demonstrating reduced expenses compared to traditional formats and increased productivity and learning outcomes. This research underscores the potential of metaverse technologies in advancing digital citizenship and education.

Keywords: Virtual Academic Conference Room, Metaverse, Digital Citizenship, Thailand Cyber University Initiative, Social Return on Investment (SROI)

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Introduction

The rapid advancement of digital technologies has profoundly transformed the educational landscape, introducing innovative approaches to teaching, learning, and academic collaboration. Among these, the metaverse—a shared virtual environment enabled by advanced technologies such as augmented reality (AR), virtual reality (VR), and blockchain—has emerged as a promising frontier for enhancing academic experiences (Nahi et al., 2023). Within this context, virtual academic conference rooms have gained prominence, offering immersive and interactive platforms for hosting academic discussions, knowledge exchange, and collaboration (Sá et al., 2019). These environments are particularly valuable in equipping participants with the digital skills and behaviors essential for navigating the complexities of the digital age (Jack & Glover, 2021).

Digital citizenship, which emphasizes the responsible and ethical use of digital technologies, has become a critical competency for learners and professionals (Frau-Meigs et al., 2017). As online platforms increasingly serve as hubs for education, communication, and collaboration, fostering digital citizenship behaviors has become a priority for educational institutions worldwide (Aithal & Maiya, 2023). In Thailand, the Thailand Cyber University (TCU) Initiative, established under the Ministry of Higher Education, Science, Research, and Innovation (MHESI), has long been a leader in promoting e-learning and digital education (Crocco & Pitiyanuwat, 2022). For over a decade, TCU has hosted the International e-Learning Conference as a key platform for academic exchange. Recently, TCU has envisioned transitioning this conference into the virtual metaverse format, leveraging cutting-edge technology to redefine the conference experience and expand its accessibility and impact.

This study explores the development of the virtual academic conference room within the metaverse as part of TCU's initiative to innovate its conference model. The primary aim is to provide an immersive platform that promotes digital citizenship by enabling participants to engage in interactive and collaborative learning experiences. By integrating advanced digital tools and simulated environments, the virtual conference room prototype seeks to create an inclusive and effective learning space where participants can apply and refine their digital skills in real-world scenarios. Additionally, the study evaluates the economic efficiency of this approach using a Social Return on Investment (SROI) method, offering practical insights into its sustainability and broader implications for the educational sector.

The findings contribute to the growing body of knowledge on the applications of metaverse technologies in education. By demonstrating the efficacy of the virtual academic conference room in fostering digital citizenship, this research provides actionable recommendations for integrating innovative technologies into educational frameworks. Furthermore, it underscores the strategic importance of transitioning traditional academic practices, such as conferences, into the metaverse, positioning Thailand Cyber University as a frontrunner in leveraging digital transformation to address the evolving challenges and opportunities of modern education.

Research Objectives

1. To develop the virtual academic conference room in the metaverse for academic purposes.
2. To evaluate participants' digital skills and citizenship behaviors.

3. To analyze the economic efficiency of the virtual conference room using a Social Return on Investment (SROI).

Methodology

This research employed a mixed-methods approach to design, develop, and evaluate the virtual academic conference room in the metaverse, aimed at promoting digital citizenship under the Thailand Cyber University (TCU) Initiative. The study followed the ADDIE instructional design framework, encompassing the phases of Analysis, Design, Development, Implementation, and Evaluation, ensuring a systematic and iterative process.

The study involved 360 participants, including educators and students from TCU's network, who engaged in both traditional and virtual conference formats. A metaverse-based prototype was developed, integrating VR and AR technologies to create an immersive and interactive environment. Features included virtual spaces for discussions, keynote sessions, and collaborative workshops, alongside gamified components to enhance engagement.

To measure outcomes, the research utilized a digital citizenship assessment, capturing key competencies such as ethical digital practices, collaboration, and security awareness. Participants completed pre-and post-tests to evaluate improvements in digital skills and behaviors. Qualitative feedback was gathered through evaluation forms, providing insights into user experiences and the platform's usability.

Economic efficiency was assessed using a Social Return on Investment (SROI) analysis, comparing costs and benefits of the virtual platform with traditional conference models. Statistical analysis, including paired t-tests, was conducted to determine the effectiveness of the platform, while qualitative feedback underwent thematic analysis to identify areas for refinement.

Results

1. Results of the Development of the Virtual Academic Conference Room in the Metaverse

The Virtual Academic Conference Room in the Metaverse for Promoting Digital Citizenship under the Thailand Cyber University Initiative integrates six interconnected components: Purpose, Planets, Platform, Participants, Paradigms, and Practices. These components, collectively known as the 6P framework, provide a structured foundation for designing and implementing the virtual environment that aligns with organizational strategies, promotes global engagement, and delivers measurable educational outcomes.

The first component, Purpose, serves as the cornerstone of the virtual conference. Clearly defined objectives provide a roadmap for the conference, ensuring that its scope, goals, and activities align with the overarching strategies of the organizing institution. For example, the thematic focus of a conference may address pressing global challenges, such as promoting sustainable development or fostering digital citizenship. By explicitly articulating these aims, organizers can create a cohesive and impactful experience for all stakeholders.

The second component, Planets, highlights the importance of aligning the conference with global priorities, particularly the 17 Sustainable Development Goals (SDGs) outlined by the

United Nations. These goals, encompassing dimensions such as social equity, economic prosperity, environmental sustainability, peace, and partnerships, provide a meaningful context for academic discussions. Virtual conferences designed with this component in mind transcend traditional academic boundaries, contributing to global efforts to address complex challenges.

The third component, Platform, represents the technological infrastructure necessary for a successful virtual conference. An effective platform must be scalable, secure, and customizable, accommodating diverse participants and ensuring seamless interactions. Key features include the ability to support large concurrent audiences, protect user data, and provide immersive elements such as virtual environments and realistic avatars. By leveraging these capabilities, the platform enhances the accessibility and interactivity of the conference, creating an engaging digital experience.

The fourth component, Participants, emphasizes the diverse roles and contributions of individuals involved in the conference. This includes keynote speakers, who offer expert insights; presenters, who share research findings; moderators, who facilitate discussions; attendees, who engage with the content; and sponsors, who provide financial and material support. By fostering collaboration and knowledge exchange among these groups, the conference becomes a dynamic ecosystem of ideas and innovation.

The fifth component, Paradigms, reflects the shared values, perspectives, and intellectual frameworks that guide the academic discourse within the virtual environment. By incorporating paradigms that align with the conference's goals, participants are inspired to challenge existing norms, explore new solutions, and advance knowledge in their respective fields. This component underscores the transformative potential of virtual academic conferences.

Finally, Practices focus on the real-world application of knowledge and insights gained during the conference. Whether through the adoption of new methodologies, the implementation of research findings, or the development of professional skills, this component ensures the long-term impact of the conference. By bridging the gap between theory and practice, participants can address real-world problems and contribute to societal progress.

To ensure the successful implementation of the virtual academic conference room, the development process was divided into three key phases: preparation phase, implementation phase, and evaluation phase, as illustrated in Figure 1.

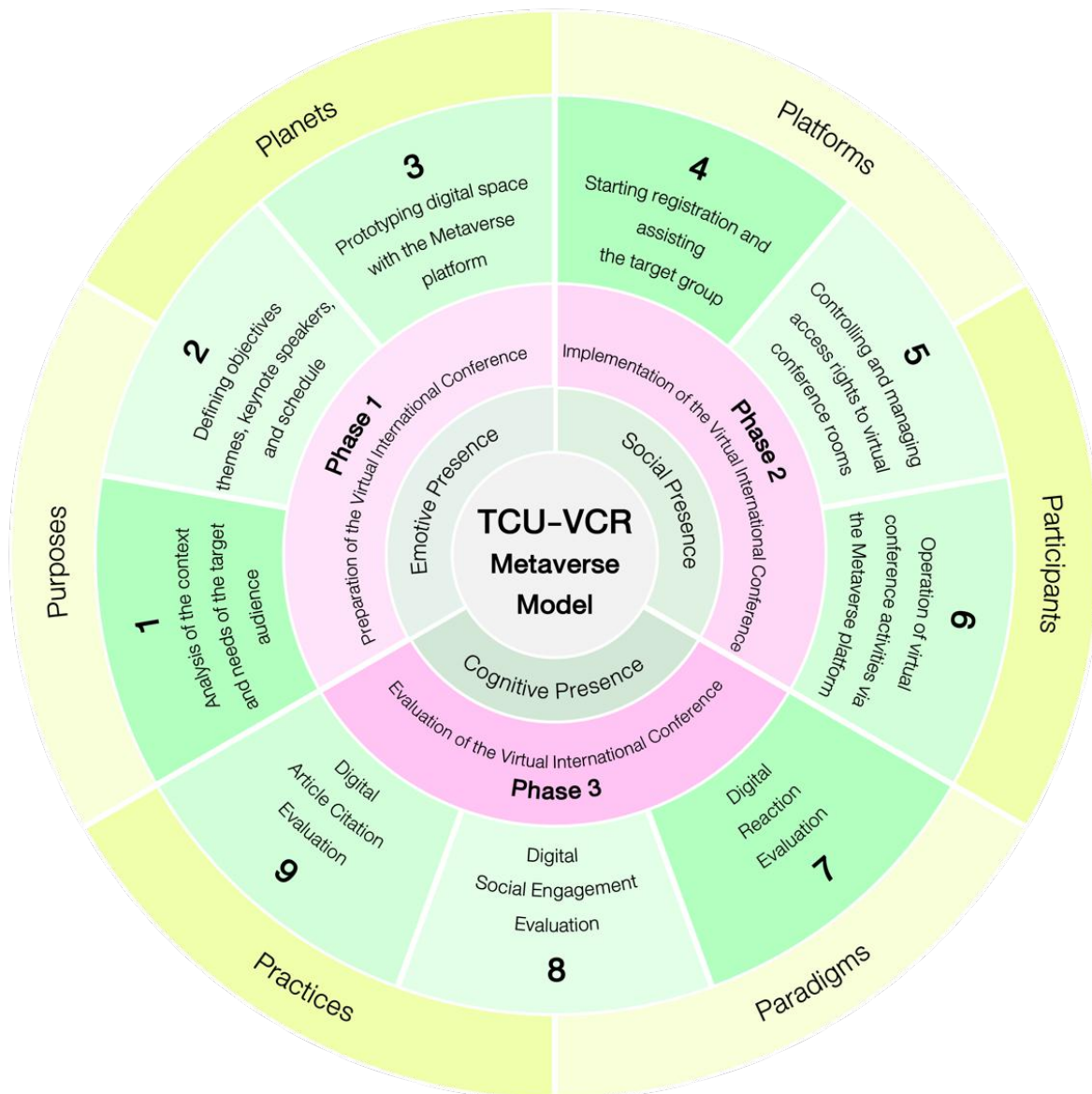


Figure 1: The Model of the Virtual Academic Conference Room in the Metaverse Under the Thailand Cyber University Initiative

As illustrated in Figure 1, the process consists of three key phases: 1) The preparation phase laid the foundation for the virtual conference by focusing on three critical steps. The first step involved a detailed context and needs analysis of the target audience to identify their expectations, technical readiness, and learning objectives. The second step was the setting of objectives, which included defining the conference's theme, selecting keynote speakers, and establishing a schedule tailored to the participants' needs and interests. Finally, the third step was the prototyping of the digital environment, where the metaverse platform was employed to create an interactive and visually engaging conference space. This included developing virtual rooms, customizable features, and interactive tools to support participant engagement; 2) The implementation phase translated the preparatory work into a fully functional virtual conference. It began with the opening of registration and the provision of technical and informational support to participants, ensuring seamless onboarding to the platform. The second step focused on managing and controlling access rights to the virtual conference rooms, ensuring secure and organized participation. The final step was the execution of virtual conference activities, where keynote sessions, workshops, and discussions were

conducted through the metaverse platform. This phase highlighted the use of interactive tools and immersive technologies to foster a collaborative and engaging environment; 3) The final phase focused on assessing the outcomes and effectiveness of the virtual conference. The first step involved evaluating participants' digital reactions, such as their engagement with the platform and responsiveness to various activities. The second step assessed digital social engagement, measuring the level of collaboration, interaction, and community building among participants. The last step focused on analyzing the citations of digital academic outputs generated during the conference, providing insights into the intellectual and practical impacts of the event.

2. Results of the Design and Development of the Prototype

The prototype for the virtual academic conference room included three main areas: 1) Digital Citizenship Exhibition: Designed to encourage participants to learn and practice digital citizenship behaviors, including respectful communication, appropriate technology use, responsible data sharing, ethical behavior, active engagement, digital safety, and privacy respect; 2) Pavilion Hall: Focused on fostering interaction with media, experts, and other participants, promoting meaningful engagement; 3) Conference Rooms: Aimed at facilitating deep learning and critical thinking among participants on topics of academic interest through discussions and workshops.

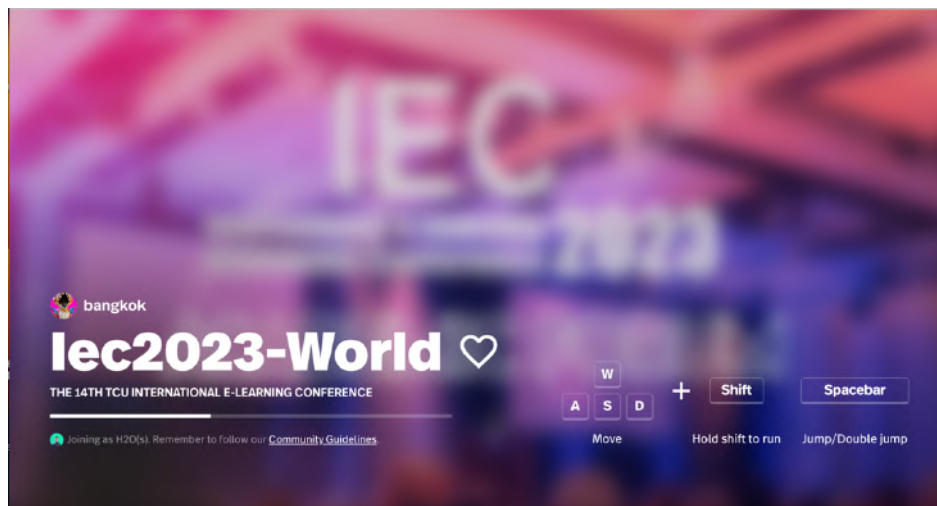


Figure 2: Home Page Spatial IEC2023-World

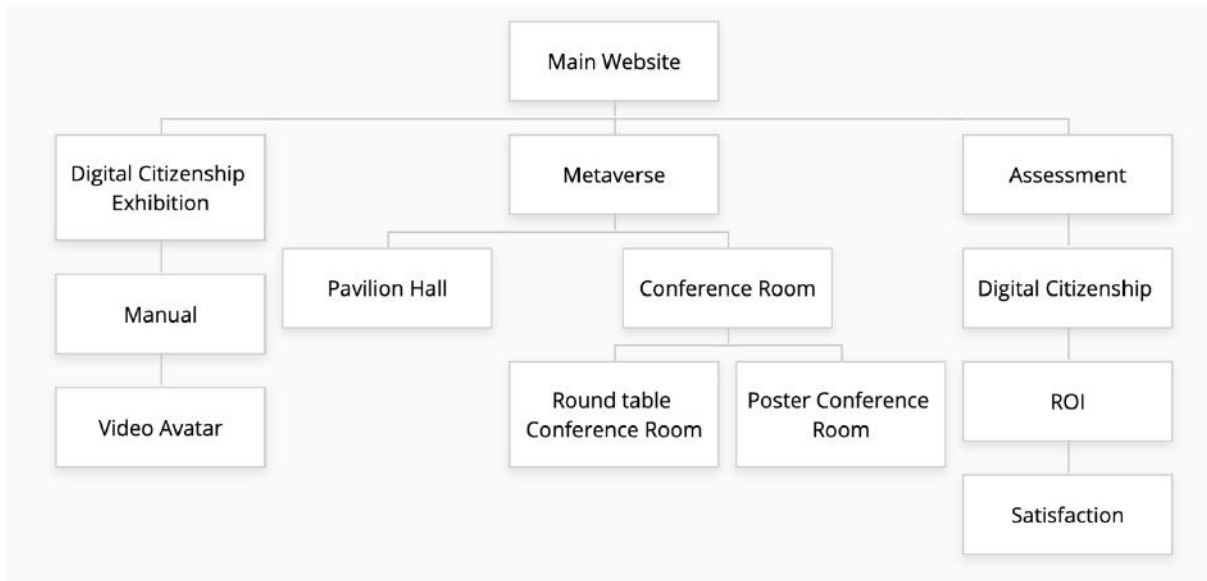


Figure 3: Site Map of the Virtual Academic Conference Room in the Metaverse

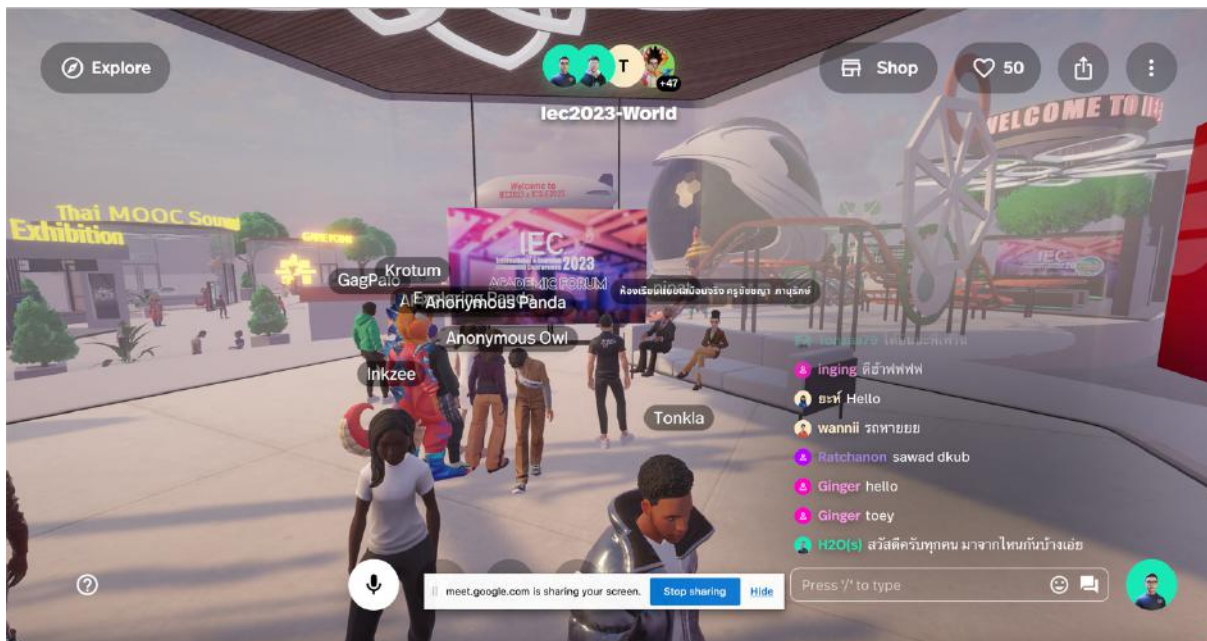


Figure 4: Entry Point to the Virtual Academic Conference Room in the Metaverse

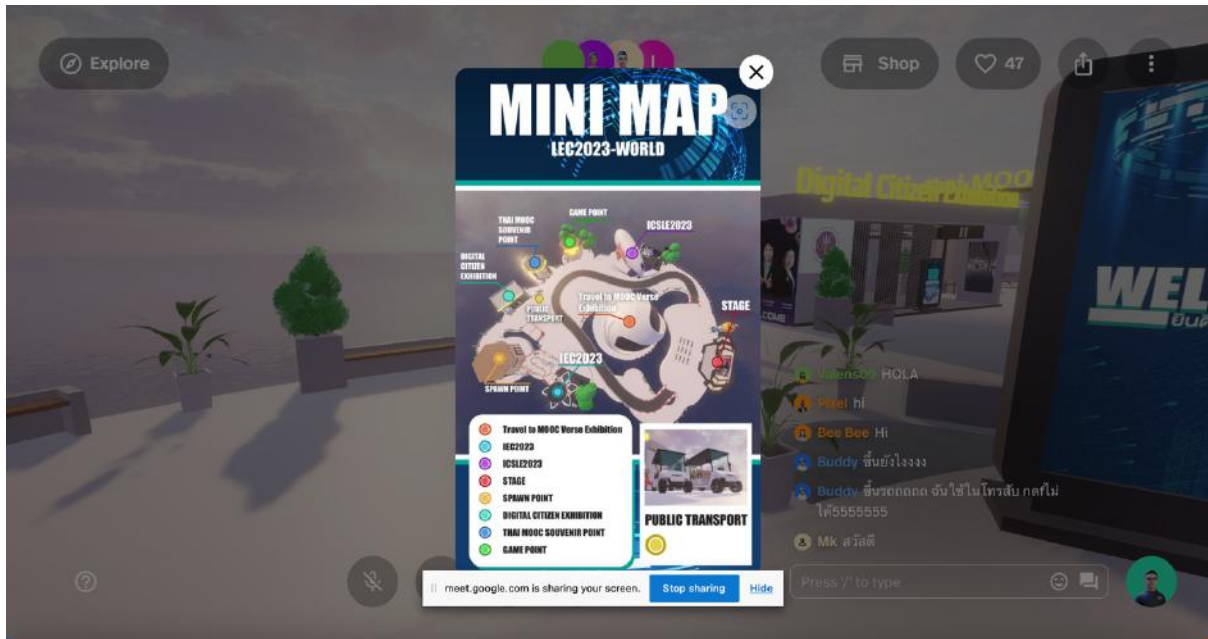


Figure 5: The Map of the Virtual Academic Conference Room in the Metaverse

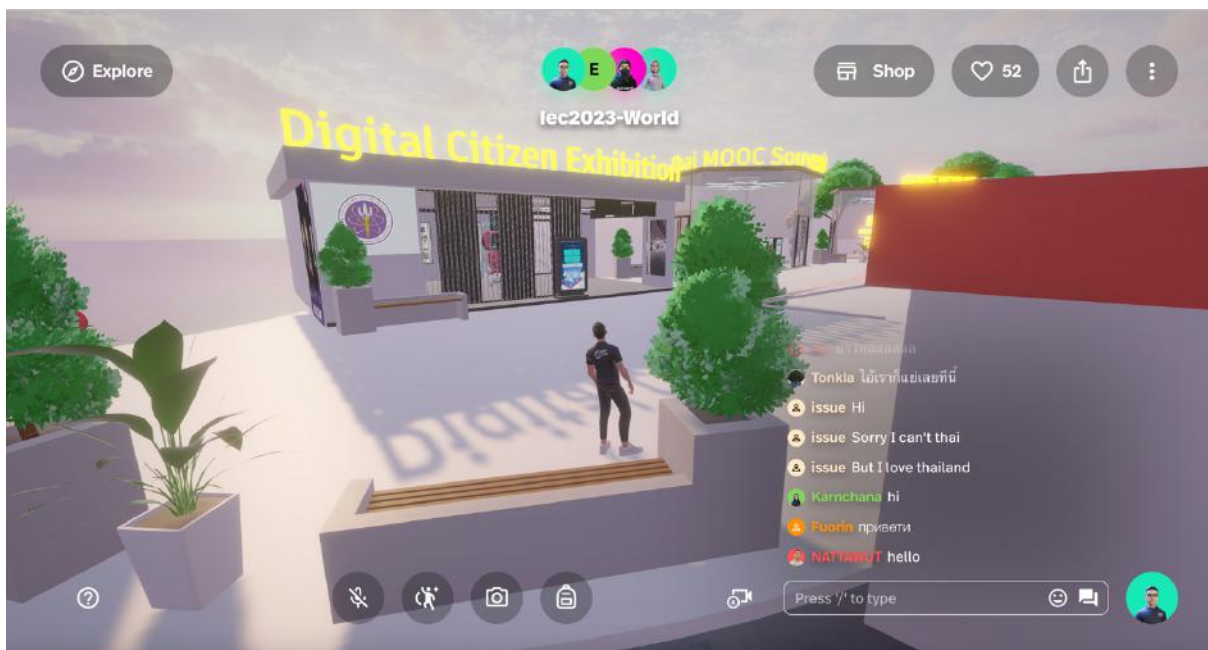


Figure 6: Digital Citizenship Exhibition Room



Figure 7: Pavilion Hall

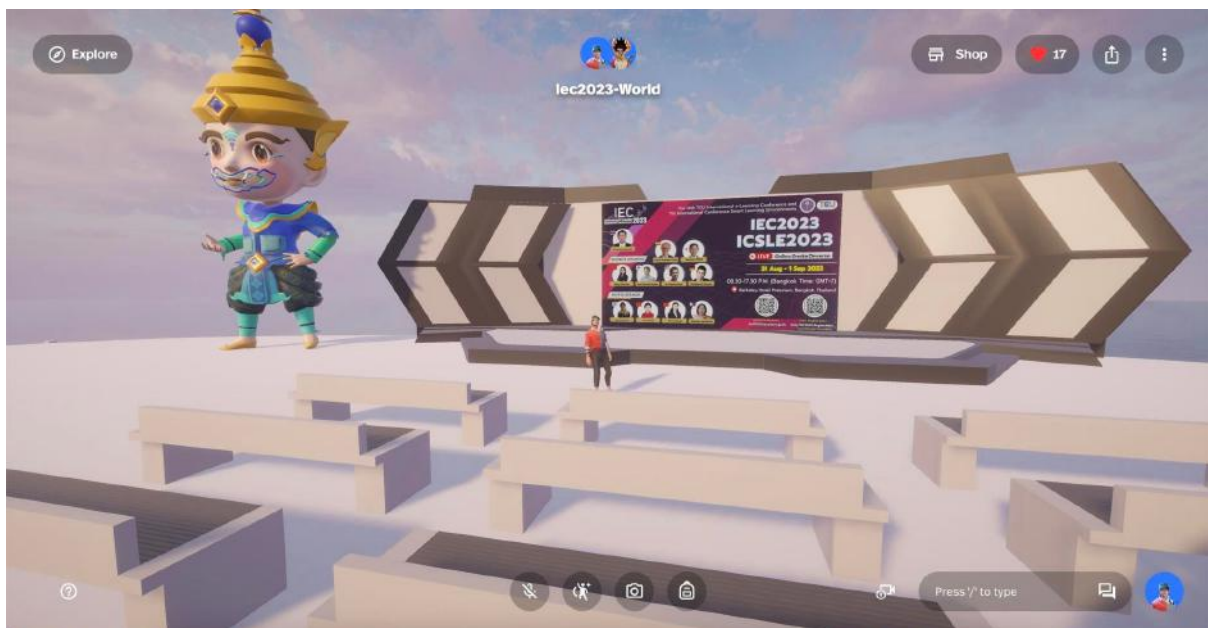


Figure 8: Conference Rooms

3. Results of the Evaluation of Participants' Digital Skills and Citizenship Behaviors

The results indicated significant improvements in participants' digital citizenship behaviors and skills after engaging with the virtual academic conference room. Post-test scores were statistically higher than pre-test scores at a significance level of 0.05, confirming the effectiveness of the metaverse environment in fostering these competencies.

4. Social Return on Investment (SROI) Analysis

The study assessed the cost-effectiveness of the Virtual Academic Conference Room in the Metaverse for Promoting Digital Citizenship under the Thailand Cyber University Initiative using a Social Return on Investment (SROI) method. The analysis considered social returns

derived from knowledge acquired (K), knowledge dissemination (P), and knowledge application (A), totaling 152,127.50 THB. With an investment cost of 105,000 THB, the SROI calculation revealed that every 1 THB invested yielded a return of 1.448 THB.

Participants accessed the virtual conference through multiple communication channels compatible with five categories of devices: desktop computers, laptops, smartphones, big screens, and wearable devices such as VR headsets and body sensors. Usability testing of the virtual conference room showed an overall rating of good (Mean = 4.18, S.D. = 0.74). However, future iterations should focus on enhancements to achieve an overall rating of very good and further improve the platform's efficiency and usability.

Conclusion

This study successfully developed and evaluated the Virtual Academic Conference Room in the Metaverse under the Thailand Cyber University Initiative, achieving all research objectives. The platform demonstrated its ability to transform traditional academic conferences into accessible and interactive virtual environments. By fostering ethical technology use, responsible data sharing, and collaborative competencies, participants showed significant improvements in digital citizenship behaviors, as evidenced by statistically higher post-test scores. The economic analysis confirmed the cost-effectiveness of the platform, with a Social Return on Investment (SROI) of 1.448 THB for every 1 THB invested. This result underscores its financial sustainability and potential to reduce logistical challenges while expanding participation. The usability testing results, rated at a good level (Mean = 4.18, S.D. = 0.74), indicate a strong foundation for future development. Further refinements are recommended to optimize usability and adaptability for diverse educational and professional applications.

In conclusion, this study contributes to the growing body of knowledge on integrating metaverse technologies into education, providing a practical and scalable model for fostering digital citizenship and advancing academic collaboration. These findings offer actionable insights for institutions seeking to innovate academic practices and bridge gaps in accessibility, affordability, and digital competency development. Future research should focus on scaling and adapting this model across various disciplines and global contexts to maximize its impact on education and collaboration.

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