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Using Virtual Reality and Conversational AI to Enhance High School Students' Intentions to Pursue Computer Science: Insights from the CS RMUTT Virtual Tour

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Abstract

The integration of Virtual Reality (VR)and Conversational AI in education has modernized how students engage with educational and career guidance. Despite the growing integration of VR and Conversational AI in education, empirical studies on their combined impact on students' intentions to pursue computer science remain limited. This study proposes the Conversational AI-empowered Virtual Reality System (CAI-VR system)as an educational guidance tool designed to enhance high school students' intentions to pursue a Bachelor of Science in Computer Science at RMUTT. We employed a developmental research method to develop and evaluate the system. The findings indicate that 1) the CAI-VR system demonstrates the convergence of VR, conversational AI, and multimedia elements in delivering an immersive 360-degree virtual experience. Users can access the system in two modes, i.e., Immersive VR Mode for full interactivity via VR devices and Web-Based Display Mode for browser access; 2) Usability was assessed with 30 high school students, while five experts evaluated system quality. Both assessments confirmed the system's effectiveness; 3) the system significantly increased students' intention scores, reinforcing its role in guiding educational decision-making; 4) further evaluation with 400 students demonstrated high awareness; however, behavioral commitment—especially in planning, preparation, and application—was lower than cognitive or affective aspects. Overall, students reported a high level of satisfaction with the system (M = 3.99, SD = 0.88). These findings suggest that the CAI-VR system can effectively support digital-native students' educational and career decision-making. Further development should deepen learner engagement via gamified, collaborative, and personalized experiences.

Keywords: 3DVista, digital natives, Edcafe AI, interactive hotspots, virtual reality

1. Introduction

The rapid evolution of media convergence has transformed how students engage with learning (Dwyer, 2010; Puspitasari et al., 2020). Among the most transformative technologies reshaping education are Virtual Reality (VR)and Artificial Intelligence (AI), both of which offer interactive and immersive experiences that enhance learning outcomes (Gandedkar et al., 2021; Hussain et al., 2024). VR allows students to explore simulated environments, promoting engagement and conceptual understanding (Vats & Joshi, 2023; Lau & Lee, 2015). Meanwhile, Conversational AI facilitates personalized guidance, responds to inquiries, and enables real-time interactions, enriching the learning experience (Labadze et al., 2023). The integration of these technologies fosters active learning by catering to the preferences of digital-native students who are accustomed to multimedia-rich, interactive educational experiences (Swargiary, 2024). As a result, their application in education has gained increasing attention, particularly in inspiring students' interest in specialized fields such as science, technology, engineering, and mathematics (Chng et al., 2023).

Despite the growing demand for computer science expertise in the digital economy, many high school students remain hesitant to pursue this field due to limited exposure and inadequate guidance (Armoni & Gal-Ezer, 2023; Happe et al., 2023; Wang et al., 2016; Parker, 2023). Traditional educational guidance methods often fail to provide the interactivity and engagement needed to spark students' interest in computer science education (Gerard et al., 2015). Research suggests that experiential learning environments, such as VR-enhanced platforms, can significantly influence students' career decision-making by offering immersive and engaging experiences that traditional methods lack (Vaishnavi & Ajit, 2024; Yang & Kim, 2023). Additionally, Conversational AI can support students in navigating complex educational pathways by offering real-time academic and career-related assistance (Arshad et al., 2024; Torres-Cruz et al., 2023).

Rajamangala University of Technology Thanyaburi (RMUTT), a leading institution in Thailand, is dedicated to fostering excellence in education and research (Times Higher Education, 2024). RMUTT emphasizes hands-on learning, innovation-driven education, and the cultivation of skilled professionals who contribute to economic, social, and environmental sustainability (Rajamangala University of Technology Thanyaburi, 2022). In alignment with these goals, the CS RMUTT Virtual Tour project was developed to integrate cutting-edge technologies such as VR and Conversational AI to enhance educational guidance for high school students considering a future in computer science.

To address the challenges of engaging students in computer science education, the CS RMUTT Virtual Tour project incorporates the Conversational AI-empowered Virtual Reality System. This innovative educational guidance tool provides students with an interactive, guided exploration of computer science-related academic and career opportunities. By integrating AI-powered conversational agents within a VR environment, the system delivers a personalized and engaging learning experience tailored to students' individual interests and needs. Furthermore, as Masanet et al. (2019)argue, the idea of digital natives as inherently proficient with technology may be oversimplified. Adolescents exhibit varying levels of transmedia skills, influenced by their motivations and learning contexts. Instead of being inherently digitally fluent, they function as digital apprentices, relying on informal learning strategies such as imitation and peer teaching, with platforms like YouTube serving as key sources of knowledge acquisition.

Previous studies have highlighted the effectiveness of immersive technologies in enhancing students' motivation, engagement, metacognition, and academic performance (Sviridova et al., 2023; Portuguez-Castro & Santos Garduño, 2024; Mitsea et al., 2023). VR-based educational tools have been shown to improve knowledge retention, problem-solving skills, and decision-making in various disciplines (Anifowose et al., 2023; Wu et al., 2021; Jensen et al., 2024). However, limited research has explored the combined impact of VR and Conversational AI as a career guidance medium for influencing students' intent to pursue computer science (Malik et al., 2023). This study seeks to bridge this gap by evaluating the effectiveness of the CAI-VR system in guiding students toward informed academic choices.

The development of the CAI-VR system follows the ADDIE Model, a widely recognized Instructional System Design (ISD) framework consisting of Analysis, Design, Development, Implementation, and Evaluation (Li & Sun, 2024; Yu et al., 2021). This systematic approach ensures that the educational guidance process is effectively structured, engaging, and aligned with students' learning needs. This research aims to develop and evaluate the CAI-VR system to enhance high school students' intentions to pursue computer science programs. Specifically, it assesses the system's usability and quality, compares students' intent before and after engagement, and evaluates user satisfaction by examining changes in students' intent and satisfaction levels.

Ultimately, this study contributes to the growing body of knowledge on immersive learning technologies and their role in shaping students' academic aspirations. The findings can inform educators, policymakers, and technology developers interested in implementing Conversational AI-empowered VR systems (CAI-VR system)for modernized educational guidance. By demonstrating the effectiveness of this approach, the research supports the broader goal of increasing high school students' participation in computer science and other STEM fields, facilitating their transition to higher education, and addressing the career decision-making gap. This, in turn, helps prepare future generations for the demands of the digital age and fosters a more skilled workforce in emerging technological fields.

2. Research Objectives

1. To develop and assess the quality of the CAI-VR system in enhancing high school students' intentions to pursue computer science programs.

2. To compare high school students' intentions to pursue computer science programs before and after engaging with the CAI-VR system.

3. To evaluate the impact of the CAI-VR system on high school students' intentions to pursue computer science programs.

4. To evaluate high school students' satisfaction with the CAI-VR system.

3. Conceptual Framework

Structuring the conceptual framework around fundamental concepts, manipulated, and dependent variables. This framework integrates key technological and educational principles to support the development of the CAI-VR system as an educational guidance tool for high school students who are exploring potential academic and career pathways in computer science.

3.1 Fundamental Concepts

The conceptual foundation of this study builds upon five key concepts as follows:

1) Virtual Reality (VR): This technology generates immersive, 360-degree simulated environments, enhancing experiential learning by enabling users to interact with realistic scenarios (Brivio et al., 2021; Lertbumroongchai, Saraubon, & Nilsook, 2020; Wang & Hu, 2022; Sakr & Abdullah, 2024). In this study, VR is utilized to offer high school students an engaging career exploration experience, allowing them to visualize and interact with computer science-related content in a simulated environment. To accommodate diverse learning contexts, the VR system is deployed through two modes. The Immersive VR Mode uses head-mounted displays (HMDs)to deliver a fully embodied 360-degree experience, allowing learners to move their heads and interact with virtual environments in real-time—supporting deep, experiential learning through realistic simulations. The Web-Based VR Mode, on the other hand, enables access via standard web browsers using mouse or touchscreen controls, allowing for directional viewing and interactive exploration without specialized hardware. While the immersive effect is less intense, this mode ensures broader accessibility, making the experience inclusive and scalable for educational settings with limited technological resources.

2) Conversational AI: This concept involves AI-powered conversational agents capable of real-time interaction, providing personalized guidance and responding to user queries (McTear, 2022; Ji et al., 2023). Within the CAI-VR system, Conversational AI serves as an interactive guidance agent, offering continuous support through dynamic dialogues based on pre-programmed content. It adapts to students' interests and questions, helping them navigate academic and career information in an engaging and responsive manner. In practice, the system operates primarily through a question–response mechanism that allows students to engage in semi-structured conversations. User input—either typed or selected—is processed using natural language processing (NLP) or keyword tagging to identify intent. The system then retrieves relevant responses from a curated database of answers, resources, or pathways. A dialogue flow engine governs the interaction, enabling contextual continuity through follow-up questions, clarification prompts, and topic redirection. While the chatbot is not fully generative, it simulates natural conversation using decision trees, fallback strategies, and adaptive branching that align with learner behavior and curiosity. This structured yet interactive guidance promotes engagement, autonomy, and personalized learning (McTear, 2022; Ji et al., 2023).

3) Media Convergence: Media convergence encompasses the integration of multiple media platforms, technologies, and communication modes to create cohesive and interactive user experiences (Saheb et al., 2024; Cao, 2023). The CAI-VR system embodies this principle by combining VR, Conversational AI, and interactive multimedia, delivering a unified and immersive educational guidance experience.

4) Digital Native: This concept characterizes today's learners as individuals who have grown up in digitally saturated environments, often displaying a preference for interactive and technology-mediated learning tools (Henne et al., 2024; Eisenlauer, 2020; Napaporn et al., 2023; Margono et al., 2024). By integrating VR and Conversational AI, the CAI-VR system aligns with the cognitive and behavioral patterns of digital-native students, enhancing intuitiveness and learner engagement.

5) Educational Guidance: Educational guidance involves processes that support students in making informed academic and career decisions by providing relevant information, tools, and experiences (Drier & Ciccone, 1988; Hertzberg, 2015). In this study, the CAI-VR system functions as a next-generation educational guidance tool, employing immersive simulations and AI-powered conversations to empower students in exploring career options, clarifying academic goals, and preparing for future opportunities in computer science.

3.2 Manipulated Variable

The manipulated variable in this study involves the utilization of the Conversational AI-empowered Virtual Reality System (CAI-VR system), which integrates VR and Conversational AI technologies to influence and enhance high school students' intentions to pursue computer science programs. Acting as the core intervention, the CAI-VR system provides interactive and immersive career guidance experiences. Beyond its primary objective of influencing students' intentions, the study also examines the system's usability and quality to evaluate its overall effectiveness and appropriateness as an educational guidance tool.

3.3 Dependent Variables

The dependent variables measured in this study include the following:

1) High School Students' Intentions to Pursue Computer Science serves as the main dependent variable, referring to the degree of desire, motivation, and commitment that high school students demonstrate toward pursuing further academic and career pathways in the field of computer science. This construct encompasses a continuum of intentional states—conceptually adapted and structured within the context of this study—including: (1) Awareness and Consideration—students are aware of a computer science program and consider it as a potential option; (2) Interest and Initial Evaluation—students are actively comparing this program with other available choices; (3) Planning and Preparation—students have formulated a clear plan to complete the application process; (4) Strong Commitment—students have started preparing required documents and materials; and (5) Definite Intention and Action—students are fully committed to submitting the

application and completing the process. These stages were informed by the intention component of the Theory of Planned Behavior (Ajzen, 1991), as well as the work of Finzel, Deininger, and Schmid (2018), who emphasize key psychological and situational factors influencing students' academic and career decisions in the field of computer science. This variable is employed to evaluate the potential impact of the CAI-VR system on shaping and guiding students' intentions before and after interaction with the system.

2) High School Students' Satisfaction with the CAI-VR system refers to students' overall satisfaction after interacting with the system, encompassing nine key dimensions: (1) Playability—the ease of use, clarity of objectives, and intuitive interface; (2) Visual Aesthetics—the system's graphic design and visual appeal; (3) Audio Aesthetics—the quality of sound and auditory enhancements; (4) Narratives—the ability to present engaging and meaningful content; (5) Play Engrossment—the capacity to sustain user attention and engagement; (6) Enjoyment—the sense of fun and pleasure during interaction; (7) Creative Freedom—the encouragement of curiosity, creativity, and personal expression; (8) Social Connectivity—the facilitation of interaction and collaboration within virtual or real-world contexts; and (9) Personal Gratification—the motivation and challenge that contribute to a sense of accomplishment. This variable draws upon frameworks proposed by Shelstad, Smith, and Chaparro (2017) and Phan, Keebler, and Chaparro (2016), ensuring a comprehensive evaluation of the CAI-VR system as an educational guidance tool.

4. Research Hypotheses

1. The developed CAI-VR system expects to demonstrate high usability and quality ratings. The mean usability score, as assessed by participants in the pilot study, should fall within the "Agree" range or higher. Additionally, the mean quality score, as evaluated by experts, should reach the "Agree" level or higher.

2. High school students who engage with the refined CAI-VR system, which incorporates expert recommendations, are expected to demonstrate a statistically significant increase in their intent to pursue computer science. Specifically, posttest mean scores should be significantly higher than pretest mean scores ($p < .05$).

3. The real-world evaluation of the CAI-VR system is hypothesized to positively influence students' inclination toward computer science. The mean intent score among high school participants is expected to fall within the "Neutral" range or higher.

4. Users, in their role as visitors, who interact with the CAI-VR system in real-world settings are hypothesized to report high overall satisfaction, with the mean satisfaction score expected to fall within the "Satisfied" range or higher.

5. Methodology

5.1 Research Design

This study employed developmental research design (Type I) (Richey & Klein, 2007) to systematically design, develop, and evaluate the Conversational AI-empowered Virtual Reality System (CAI-VR system). The ADDIE model was adopted as the guiding framework due to its structured and iterative nature, which supports the systematic creation of educational guidance tools aimed at enhancing high school students' intentions to pursue computer science programs. Through its phases—Analysis, Design, Development, Implementation, and Evaluation—the model enables continuous improvement informed by expert feedback and empirical findings (Li & Sun, 2024; Yu et al., 2021), ensuring a rigorous, evidence-based development process that strengthens both the usability and quality of the CAI-VR system.

5.2 Participants

The participants were divided into three target groups, each selected through purposive sampling based on their relevance to the research objectives as follows:

1) Pilot Study Group: This group comprised 30 high school students from Thanyarat School, Pathum Thani, Thailand. The school was selected due to its proximity to Rajamangala University of Technology Thanyaburi (RMUTT), making it convenient for conducting the pilot study. The study was carried out in a controlled laboratory environment to ensure consistency in testing conditions, including standardized computer equipment, stable internet connectivity, and minimal external distractions. Before interacting with the CAI-VR system, participants completed a pre-test to assess their initial intentions to pursue computer science. They then engaged with the system in a controlled setting. Afterward, they took a post-test to measure any changes in their intentions and completed a system' usability evaluation questionnaire.

2) Expert Panel Group: This group included five experts, selected through purposive sampling to evaluate the CAI-VR system. The panel consisted of one expert in Educational Guidance, two experts in VR, and two experts in Conversational AI. Experts were required to hold a doctoral degree in a relevant field, have at least five years of professional experience, and demonstrate willingness to provide systematic evaluations. The evaluation centered on assessing the quality of the CAI-VR system.

3) Real-World Evaluation Group: This group comprised 400 high school students from schools within RMUTT's service area. Participants were selected to ensure diversity in digital media exposure behaviors and engagement levels. Unlike the pilot study, this phase employed the refined version of the CAI-VR system in a real-world educational setting. In this phase, no pre-test was conducted. Instead, participants interacted with the system and subsequently completed a post-test to assess their intentions to pursue computer science, along with a user satisfaction survey.

5.3 Procedures

This study was conducted using the ADDIE model, which consists of five main stages, as follows:

1. The analysis phase involved three key components to ensure that the CAI-VR system aligned with educational and technological requirements. This phase involves the following three steps:

1) Content Analysis: This study analyzed the Bachelor of Science in Computer Science program at RMUTT to ensure its alignment with the needs of digital natives and their career aspirations. The content analysis focused on job market trends, curriculum design, program structure, career pathways, transportation options, learning environments, tuition and financial aid, and admission requirements.

2) Site Analysis: Identified and selected key indoor and outdoor campus locations—including classrooms, laboratories, libraries, green spaces, and recreational areas—to be featured in the virtual tour. These locations were chosen to reflect the academic environment and available learning facilities.

3) Technology Analysis: The development of the CAI-VR system incorporated four key technologies to enhance accessibility, interactivity, and functionality. These technologies include:

- VR Hardware—The system supported VR headsets, mobile-based VR, and desktop-based VR to ensure accessibility across different devices. Mobile-based VR compatibility reduced cost barriers, allowing broader student participation.
- Multimedia Authoring Tools—Adobe Creative Cloud® (e.g., Adobe Illustrator®, Photoshop®, Lightroom®, Audition®, Premiere Pro®)was used to enhance audio and visual communication, 360-degree image processing, and branding consistency, ensuring a visually immersive experience.
- VR Authoring Tools—3DVista Virtual Tour® was selected for creating interactive 360-degree environments, offering narrated audio, videos, and interactive hotspots (clickable points that provide additional content). Its cross-platform compatibility enabled seamless access via web browsers.
- Conversational AI Platform—Edcafe AI® empowered real-time assistance, interactive guidance, and personalized responses, helping students navigate the virtual tour, answer FAQs, and explore program details.

2. The design phase focused on developing the structure, interface, and user experience of the CAI-VR system to ensure an engaging and effective learning experience. This phase involves the following four steps:

1) Multimedia Design: Designed 360-degree images, graphics, narrated audio, and videos using Adobe Creative Cloud®, ensuring high-quality, VR-compatible media assets.

2) Learning Experience (LX) Design: The VR tour experience was structured using 3DVista Virtual Tour®, ensuring seamless integration of multimedia elements and AI- empowered interactions. The design was guided by the Cognitive Theory of Multimedia Learning (Sorden, 2012), which emphasizes the dual-channel processing of verbal and visual information to enhance cognitive retention. Additionally, the content layout and virtual tour navigation pathways were designed to optimize logical progression and ease of exploration, aligning with key multimedia learning principles, such as modality (using audio narration instead of on-screen text to reduce cognitive overload)and spatial contiguity (placing relevant text and visuals close together to improve comprehension).

3) User Experience (UX) Design: Designed interactive hotspots, intuitive navigation flows, and engagement mechanics to enhance student interaction. The design incorporated Edcafe AI® for real-time, AI-empowered assistance and personalized guidance.
User Interface (UI) Design: Designed navigation menus, interactive buttons, and data interaction features, ensuring seamless usability across desktop, mobile, and VR headsets.

3. The development phase focused on transforming the designed concepts into a functional system. This phase involves the following five steps:

1) 360-Degree Image Capture: Captured high-resolution, VR-compatible 360-degree images using a 360-degree camera. The images were then refined with Adobe Lightroom® and Photoshop® to enhance clarity and visual quality for integration into 3DVista Virtual Tour®.

2) Virtual Tour Development: Developed an interactive tour in 3DVista Virtual Tour®, embedding graphics, narrated audio, videos, and interactive hotspots to enhance engagement.
3) Multimedia Integration: Embedded media elements and optimized rendering for seamless cross-platform performance.
4) Conversational AI Integration: Integrated Edcafe AI® to provide real-time student assistance, responding to frequently asked questions and offering personalized guidance.
5) System Optimization: The CAI-VR system was iteratively refined to enhance interface usability, AI responsiveness, and VR stability. A usability assessment was conducted with 30 high school students using a 9-item instrument adapted from the VR System Usability Questionnaire (VRSUQ) by Kim and Rhiu (2024). Concurrently, a quality assessment was carried out by five experts using a 20-item instrument based on Bareišytė et al. (2024), covering four dimensions: technical quality, UI, UX, and LX. Feedback from both students and experts informed further optimization of the system.

4. The implementation phase focused on testing the system's practical application and usability in a controlled environment before real-world deployment. This phase involves the following three steps:

1) Orientation and System Setup: The research team conducted system setup, technical validation, orientation sessions, and pre-test assessments to establish baseline data on students' intentions to pursue computer science. System compatibility and AI response accuracy were verified to ensure a seamless experience.
2) During Pilot Testing: 30 participants engaged with the CAI-VR system under controlled conditions while researchers monitored user interactions, system stability, and AI accuracy.
3) After Pilot Testing: Post-test assessments were conducted to evaluate changes in students' intentions. Qualitative and quantitative feedback was collected to refine system stability, AI-empowered personalization, and VR performance.

5. The evaluation phase emphasized expert assessments and real-world testing to ensure the system's effectiveness. This phase involves the following two steps:

1) Expert Panel Review: A one-week evaluation was conducted with five specialists in educational guidance, VR, and Conversational AI before the system's real-world implementation. The goal was to ensure the system's quality. Experts assessed the system using the developed quality evaluation form, providing feedback on its accessibility, interactivity, and functionality.
2) Real-World Evaluation: A one-month deployment was carried out with 400 high school students from RMUTT's target schools. The study measured the impact of the CAI-VR system on students' intentions to pursue computer science and their satisfaction levels. Data collection included pre-test and post-test surveys, and satisfaction ratings.

5.4 Instruments

The instruments used for data collection consist of five main tools, as follows:

1) The developed CAI-VR system: An educational guidance system designed for the Bachelor of Science Program in Computer Science at RMUTT, integrating Conversational AI and VR to enhance high school students' intentions to pursue a Bachelor of Science in Computer Science at RMUTT. The system is accessible via VR headsets, mobile-based VR, and desktop-based VR.
2) Usability Assessment Form: A standardized instrument adapted from the VR System Usability Questionnaire (VRSUQ) developed by Kim and Rhiu (2024), consisting of 9 items designed to evaluate system responsiveness, feedback clarity, operational accuracy, content clarity, user-friendliness, error correction, immersion, comfort, and overall engagement. The instrument uses a five-point agreement scale (1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree).
3) Quality Assessment Form: A synthesized instrument developed based on the systematic scoping review of VR evaluation tools by Bareišytė et al. (2024). The instrument comprises 20 items, divided into four key dimensions: technical quality, user interface (UI), user experience (UX), and learning experience (LX). Each dimension contains five items, measured using a five-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree). This scale was used to evaluate the CAI-VR system's overall quality (Appendix A).
4) Intent to Pursue Computer Science Scale: A synthesized instrument developed based on the Intention variable of the Theory of Planned Behavior (TPB)by Ajzen (1991)and insights from Finzel, Deininger, and Schmid (2018)on factors influencing students' intentions to pursue computer science. The developed instrument consists of 5 items, evaluated using a five-point agreement scale (1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree). The five items assess students' progression through different stages of intent: awareness and consideration, interest

and initial evaluation, planning and preparation, strong commitment, and definite intention and action. The instrument was administered before and after system interaction to analyze changes in students' intent to pursue a computer science program.

5) CAI-VR system Satisfaction Survey: A synthesized instrument adapted from Shelstad, Smith, & Chaparro (2017) and Phan, Keebler, & Chaparro (2016), this instrument evaluates students' satisfaction with the CAI-VR system. The survey consists of nine items measured on a five-point satisfaction scale (1 = Very dissatisfied, 2 = Dissatisfied, 3 = Neutral, 4 = Satisfied, 5 = Very satisfied). It assesses students' perceptions across playability, visual aesthetics, audio aesthetics, narratives, play engrossment, enjoyment, creative freedom, social connectivity, and personal gratification.

5.5 Data Analysis

The collected data were analyzed using both descriptive and inferential statistics. Quantitative data were examined using descriptive statistics, including percentage, mean (M), and standard deviation (SD), to summarize responses from the usability, quality, intention, and satisfaction instruments. A paired sample t-test was conducted to determine whether the CAI-VR system significantly influenced students' intentions to pursue computer science. Qualitative data from expert panel reviews and student feedback were analyzed through thematic analysis, categorizing key themes such as content clarity, interactivity, and AI responsiveness. Content analysis was employed to classify open-ended responses, providing deeper insights into user experience and areas for improvement.

6. Results and Discussion

6.1 Overview of the CAI-VR System

The Conversational AI-empowered Virtual Reality System (CAI-VR system)was developed as an interactive 360-degree virtual tour as an educational guidance tool to enhance high school students' intentions to pursue a Bachelor of Science in Computer Science at Rajamangala University of Technology Thanyaburi (RMUTT). The system supports multiple platforms, ensuring accessibility across various devices, including VR headsets, mobile-based VR, and desktop-based VR. Users can experience the system in two modes: the Immersive VR Mode (Figure 1), which provides a fully interactive virtual environment when accessed through VR headsets or mobile-based VR devices, enhancing spatial perception and engagement, and the Web-Based Display Mode, accessible through standard web browsers on desktop (Figure 2) and mobile devices (Figure 3), allowing users to navigate the virtual tour without requiring VR hardware. Both modes integrate AI-empowered guidance, interactive hotspots, and multimedia elements to optimize user experience and ensure effective information delivery, aligning with Portuguez-Castro & Santos Garduño (2024), who found that VR-based learning environments significantly boost student motivation and engagement. The system's dual-mode accessibility ensures inclusivity, supporting Labadze et al. (2023)on the role of AI-empowered guidance in personalized learning.

The LX/UX and UI design focused on intuitive navigation, user engagement, and AI-empowered guidance. The 3DVista Virtual Tour® ensures smooth multimedia integration, with interactive hotspots allowing users to dynamically access additional content (Figure 4). Design principles such as modality (using audio narration instead of text) and spatial contiguity (placing related visuals and text together)were applied to optimize cognitive retention and minimize cognitive overload, aligns with Sorden's (2012) Cognitive Theory of Multimedia Learning, ensuring optimized cognitive processing. Additionally, its career-focused content supports findings by Armoni & Gal-Ezer (2023) on the influence of early exposure to computer science on students' career choices. Additionally, the Conversational AI Platform (Figure 5) provides real-time assistance, interactive guidance, and personalized responses, helping users navigate the system, explore program details, and answer frequently asked questions (FAQs).

The system's content delivery covers both virtual indoor and outdoor locations, addressing key aspects such as job market trends, program structure, career pathwys, learning environments, financial aid, and admission requirements. To enhance student comprehension, the Media Symbol System was integrated, ensuring that information is presented through a combination of verbal (text, audio narration), visual (images, videos), and symbolic (navigation menus, icons, buttons, interactive hotspots)elements. These components facilitate efficient information processing by leveraging dual-channel processing and symbolic representation, which align with Sorden's (2012) Cognitive Theory of Multimedia Learning (CTML). According to CTML, learning is more effective when visual and auditory channels work together to reduce cognitive overload and enhance retention. The Media Symbol System in the CAI-VR system supports this principle by integrating text, audio narration, images, videos, and interactive elements, ensuring learners can process information through multiple modalities. This aligns with Mitsea et al. (2023), who found that VR-based multimedia learning environments improve metacognition and engagement by allowing learners to interact with content in various ways.

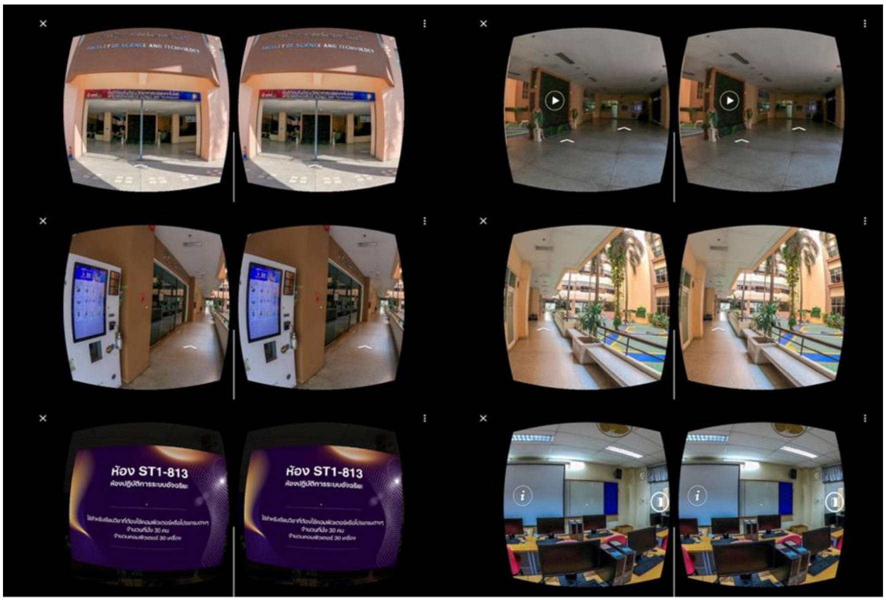

Figure 1. Immersive VR Mode in the CAI-VR System Using VR Headsets and Mobile-based VR

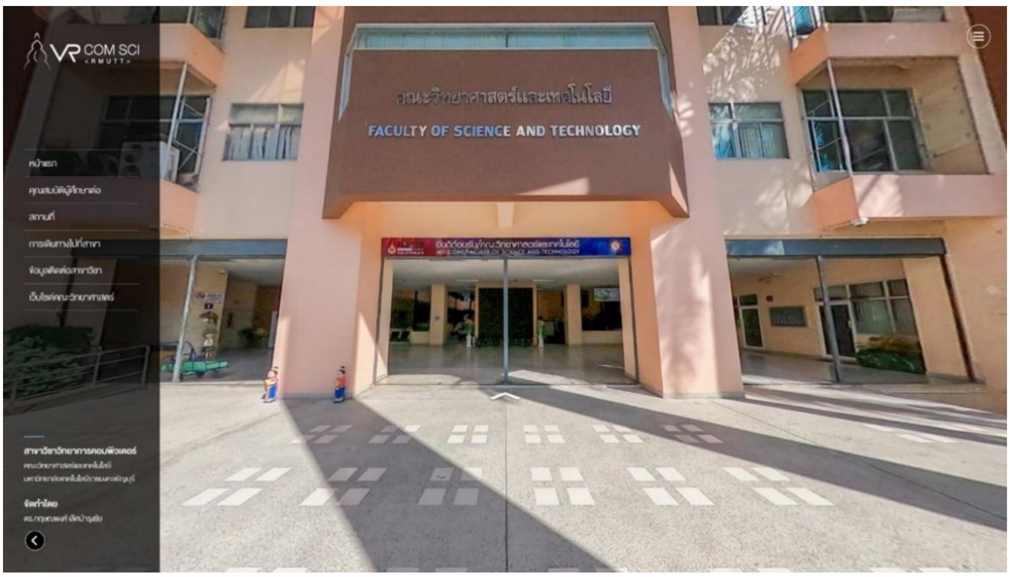

Figure 2. Web-Based Display Mode in the CAI-VR System for Desktop Users

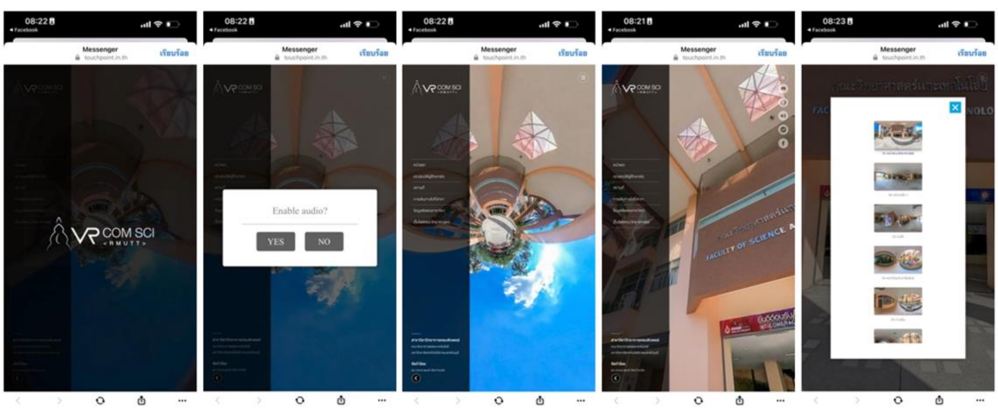

Figure 3. Web-Based Display Mode in the CAI-VR System for Mobile Users

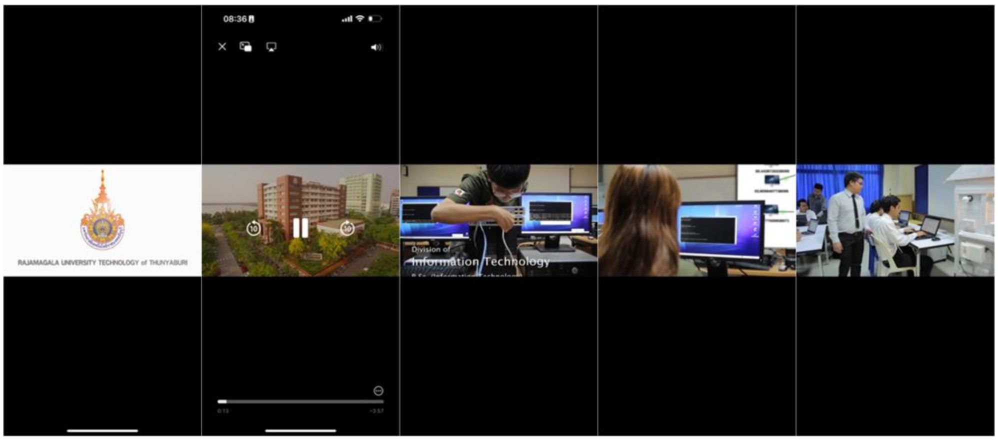

Figure 4. Example of Multimedia-Integrated Interactive Hotspots in the CAI-VR Virtual Tour

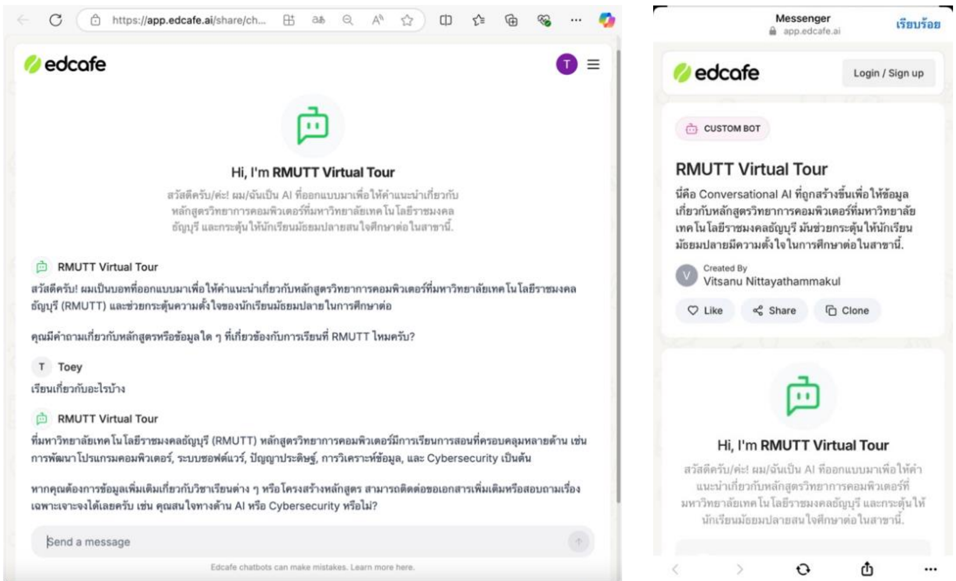

Figure 5. Conversational AI Platform as a Digital Touchpoint in the CAI-VR System

The usability assessment of the CAI-VR system with a Pilot Study Group (Table 1) showed an overall mean score of 4.53 (SD = 0.49), indicating a high level of usability. Participants strongly agreed that the system provided efficient responses, clear feedback, and ease of use, with the highest rating for the ability to make effortless corrections (M = 4.70, SD = 0.47).

Table 1. Results of the Usability Assessment for the CAI-VR system (N = 30)

Evaluation Items	M	SD	Usability Level
1. The system responded efficiently to manipulations, operating smoothly without any delays.	4.57	0.50	Strongly Agree
2. Clear and responsive feedback was provided by the VR system during interactions.	4.60	0.49	Strongly Agree
3. Accurate and effective usage of the VR system was consistently achieved.	4.53	0.51	Strongly Agree
4. Information within the virtual environment was presented clearly and was easy to understand.	4.47	0.51	Agree
5. The system was user-friendly, easy to learn, and designed for seamless adaptation by most users.	4.57	0.50	Strongly Agree
6. Corrections during VR experiences could be made conveniently and effortlessly.	4.70	0.47	Strongly Agree
7. The VR experience was highly enjoyable and immersive.	4.37	0.49	Agree
8. Comfort and ease were maintained throughout the VR experience.	4.50	0.51	Agree
9. The VR experience was engaging and stress-free, allowing for full focus and enjoyment.	4.43	0.50	Agree
Overall Mean Score	4.53	0.49	Strongly Agree

However, enjoyment and immersion received slightly lower scores, suggesting areas for improvement. Similarly, the quality assessment by an Expert Panel Group (Table 2) revealed an overall strong agreement on system quality (M = 4.53, SD = 0.64). Technical, UX, and LX quality were rated highly, while UI quality received a slightly lower score, indicating room for interface refinements. Overall, the findings confirmed that the CAI-VR system was effective, user-friendly, and well-designed, with minor improvements needed to enhance user enjoyment and immersion.

These findings confirm Hypothesis 1, demonstrating that the CAI-VR system achieves high usability and quality ratings. The mean usability score of 4.53 falls within the “Agree” range or higher, as expected, indicating strong user satisfaction with system responsiveness, feedback clarity, and ease of use. Similarly, the mean expert-rated quality score of 4.53 aligns with expectations, affirming the system’s technical robustness, UX effectiveness, and LX design. These results are consistent with Brivio et al. (2021), who found that VR-based learning environments enhance user experience and Li and Sun (2024), who emphasized the importance of structured VR instructional design in maintaining high-quality user experiences. However, the lower scores in enjoyment and immersion suggest room for improvement, as highlighted by Sviridova et al. (2023), who emphasized the need for well-structured immersive elements to sustain motivation. Addressing these aspects through UI refinements and enhanced interactive components could further optimize user engagement and system effectiveness.

Table 2. Results of the Quality Assessment for the CAI-VR system (N = 5)

Evaluation Dimensions	M	SD	Quality Level
Technical Quality	4.56	0.67	Strongly Agree
UI Quality	4.20	0.65	Agree
UX Quality	4.52	0.40	Strongly Agree
LX Quality	4.52	0.83	Strongly Agree
Overall Mean Score	4.53	0.64	Strongly Agree

6.2 Comparison of Students' Intentions Before and After Using the CAI-VR system

The comparison of students' intentions before and after using the CAI-VR system (Table 3) revealed a significant increase in their intention scores. Before interacting with the system, students reported a mean score of 10.27 (SD = 1.76), whereas after the interaction, the mean score increased to 20.00 (SD = 1.86). A paired-sample t-test indicated that this increase was statistically significant (t = -21.41, p < .05). These findings suggest that the CAI-VR system effectively enhanced students' overall intention to pursue a computer science program by providing an immersive and engaging learning experience.

These findings support Hypothesis 2, demonstrating that students who engaged with the CAI-VR system showed a statistically significant increase in their intent to pursue computer science. The observed increase in intention scores aligns with Armoni & Gal-Ezer (2023), who found that early exposure to computer science positively influences students' higher education choices. The CAI-VR system’s immersive and interactive approach likely played a key role in broadening students’ perceptions of computer science, addressing common misconceptions that may initially discourage interest in the field. This is consistent with Labadze et al. (2023), who emphasized that AI- empowered educational tools enhance engagement and decision-making in students. Furthermore, the system’s ability to facilitate career exploration and commitment-building mirrors findings by Drier & Ciccone (1988), who highlighted the importance of career guidance in shaping students’ academic pathways. These results suggest that experiential and interactive learning environments can significantly influence students' attitudes and career intentions, reinforcing the value of VR-based educational guidance systems.

Table 3. Comparison of Students' Intentions Before and After Using the CAI-VR system (N = 30)

Measurement Period	M	SD	t-value	p-value
Before Interaction	10.27	1.76	-21.41	.000*
After Interaction	20.00	1.86		

Note. p* < .05 indicates statistical significance

6.3 Impact Evaluation on Students’ Intentions to Pursue Computer Science Programs

The evaluation of students’ intentions to pursue computer science programs (Table 4)revealed varying levels of intention across different stages. The highest-rated stage was Awareness & Consideration (M = 4.57, SD = 0.51), indicating that most students were aware of computer science programs and recognized them as potential options. Similarly, Interest & Initial Evaluation received an “Agree” rating (M = 3.69, SD = 0.64), suggesting that many students actively considered applying and compared computer science programs with other fields of study. However, as students moved closer to the application stage, their level of intention declined significantly. Planning & Preparation was rated neutral (M = 3.07, SD = 0.96), indicating uncertainty in taking concrete steps toward application. Strong Commitment (M = 2.74, SD = 0.89)and Definite Intention & Action (M = 2.36, SD = 0.50)fell into the neutral to disagree range, suggesting that many students hesitated to progress from high school toward enrolling in a computer science degree program. This hesitation may stem from their consideration of alternative fields of study or computer science programs at other universities.

These findings partially support Hypothesis 3, as the overall mean intent score (M = 3.28) falls within the "Neutral" range or higher, indicating a positive but uncertain inclination toward computer science. High ratings in Awareness & Consideration and Interest & Initial Evaluation align with Armoni & Gal-Ezer (2023), who found that early exposure increases student interest. However, declining intent at later stages reflects Drier & Ciccone (1988), emphasizing the need for stronger career guidance. To improve commitment, integrating mentorship, real-world applications, and diverse learning pathways could provide students with clearer academic and career direction (Labadze et al., 2023).

This pattern of decreasing intention across the decision-making process highlights a common gap between awareness and action in educational and career decision contexts. While students demonstrate strong recognition of and initial interest in computer science programs, the shift toward planning, committing, and executing an application appears to introduce greater cognitive dissonance, hesitation, or logistical barriers. This finding supports the notion that intention is not static but rather dynamic—evolving through multiple stages that require reinforcement at each step (Gati & Levin, 2014). In particular, the observed decline from "Interest & Initial Evaluation" to "Strong Commitment" suggests that while motivation may be sparked by exposure, it is not necessarily sustained without structural and emotional support. These transitional gaps underscore the importance of embedding ongoing interventions within guidance systems, such as interactive mentorship, access to personalized advising, and simulated planning tools (e.g., career exploration VR environments or chatbot-based counseling).

Furthermore, the decline at the action stage aligns with the Theory of Planned Behavior (Ajzen, 1991), which emphasizes perceived behavioral control—meaning that even when intention exists, students may not act if they lack confidence, support, or resources. Thus, beyond increasing awareness, guidance systems must also enhance students' self-efficacy, actionability, and resource access to translate interest into concrete educational choices.

Table 4. Results of the Evaluation of Students' Intentions to Pursue Computer Science (N = 400)

Evaluation Items	M	SD	Intention Level
1. Awareness & Consideration—I am aware of this computer science program and consider it as a potential option.	4.57	0.51	Strongly Agree
2. Interest & Initial Evaluation—I am actively considering applying for this program and comparing it with other available choices.	3.69	0.64	Agree
3. Planning & Preparation—I have a clear plan to complete the application process for this program.	3.07	0.96	Neutral
4. Strong Commitment— I have started preparing the required documents and materials for my application.	2.74	0.89	Neutral
5. Definite Intention & Action—I am fully committed to submitting my application and completing the process successfully.	2.36	0.50	Disagree
Overall Mean Score	3.28	0.78	Neutral

6.4 Evaluation of Student Satisfaction with the CAI-VR System

The evaluation of student satisfaction with the CAI-VR system (Table 5) indicated an overall positive response, with an average satisfaction score of 3.99 (SD = 0.88), categorized as 'Satisfied.' Among the various dimensions assessed, the highest-rated aspect was Playability (M = 4.60, SD = 0.49), suggesting that students found the system intuitive and easy to use, with clear objectives and an accessible interface. In terms of aesthetic design, Visual Aesthetics (M = 4.48, SD = 0.77) and Audio Aesthetics (M = 4.42, SD = 0.80) received high satisfaction ratings, indicating that the graphical and auditory elements contributed positively to the overall user experience. Additionally, Narratives (M = 4.04, SD = 0.84)and Play Engrossment (M = 4.08, SD = 0.92) were rated positively, highlighting the system's ability to present engaging content and maintain user attention.

These findings support Hypothesis 4, as the overall satisfaction score (M = 3.99)falls within the "Satisfied" range, confirming that users found the CAI-VR system engaging and well-designed. High ratings for Playability, Visual Aesthetics, and Audio Aesthetics align with Brivio et al. (2021), who emphasized that immersive environments enhance user experience. However, lower ratings for Enjoyment and Social Connectivity suggest room for improvement, consistent with Sviridova et al. (2023), who highlighted the importance of interactive and social engagement in VR learning. Enhancing collaborative features, gamification, and personalization could further improve satisfaction and engagement.

Table 5. Results of the Evaluation of Student Satisfaction with the CAI-VR system (N = 400)

Evaluation Items	M	SD	Satisfaction Level
1. Playability—The ease of use of the CAI-VR system, including clear objectives and an intuitive user interface.	4.60	0.49	Very satisfied
2. Visual Aesthetics—The graphical design and overall visual appeal of the CAI-VR system.	4.48	0.77	Satisfied
3. Audio Aesthetics—The sound quality and auditory effects in enhancing the learning experience.	4.42	0.80	Satisfied
4. Narratives—The system's ability to present engaging and meaningful content that captures user interest.	4.04	0.84	Satisfied
5. Play Engrossment—The system's ability to maintain attention and keep users engaged.	4.08	0.92	Satisfied
6. Enjoyment—The overall enjoyment and pleasure experienced while using the CAI-VR system.	3.39	1.08	Satisfied
7. Creative Freedom—The system's ability to support creativity, curiosity, and freedom of expression.	3.82	0.73	Satisfied
8. Social Connectivity—The system's ability to facilitate interaction and collaboration with people in the virtual world or the real world.	3.55	1.12	Satisfied
9. Personal Gratification—The level of challenge and motivation the system provides to enhance the sense of accomplishment.	3.54	1.14	Satisfied
Overall Mean Score	3.99	0.88	Satisfied

7. Conclusion

This study proposed and evaluated the Conversational AI-empowered Virtual Reality System (CAI-VR system) as a digital educational guidance tool aimed at increasing high school students' intentions to pursue a Bachelor of Science in Computer Science at Rajamangala University of Technology Thanyaburi (RMUTT). The system integrated virtual reality, conversational AI, and multimedia elements to deliver an immersive and accessible career exploration experience. Two interaction modes—Immersive VR Mode and Web-Based Display Mode—supported engagement through either head-mounted devices or web interfaces. The Conversational AI platform provided real-time, responsive dialogue to guide learners through content, while interactive hotspots and multimodal representations enhanced cognitive processing and information retention.

The findings indicated that the CAI-VR system had a positive influence on students' intentions to pursue computer science. However, levels of intention declined during later stages of the decision-making process, particularly during planning and commitment. This suggests a need for enhanced educational guidance mechanisms, such as structured orientation, personalized advising, or interactive planning tools, to help students transition more confidently from initial interest to actual application decisions. Usability and system quality were rated positively, confirming that the system was intuitive, responsive, and accessible. Students generally expressed satisfaction with the experience, although lower ratings in enjoyment and social connectivity highlighted opportunities to improve engagement and interactivity.

In summary, the CAI-VR system shows promise as a scalable and adaptive tool for supporting digital native learners in academic and career decision-making. Future enhancements should focus on integrating collaborative features, gamification strategies, and adaptive learning mechanisms to better engage users and personalize their exploration. With ongoing refinement, the system has the potential to bridge the gap between awareness and informed academic action.

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Authors contributions

Dr. Kridsanapong Lertbumroongchai was responsible for funding acquisition, conceptualization, intervention development, investigation, and drafting the original manuscript. Dr. Weena Janratchakool was responsible for methodology, validation, resource management, and project administration. Dr. Vitsanu Nittayathammakul was responsible for formal analysis and reviewing and editing the manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Obtained.

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The Publication Ethics Committee of the Redfame Publishing.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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No additional data are available.

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Appendix A

Quality Assessment Form

Dimension	Assessment Item	Quality Level				
		5	4	3	2	1
1. Technical Quality	1. The system accurately displays information across all platforms.	☐	☐	☐	☐	☐
	2. The system is accessible across multiple devices, including VR headsets, mobile VR, and web-based platforms.	☐	☐	☐	☐	☐
	3. The system operates smoothly and responds efficiently in both Immersive VR Mode and Web-Based Display Mode.	☐	☐	☐	☐	☐
	4. The system effectively plays audio narration and 360-degree simulated environments without technical issues.	☐	☐	☐	☐	☐
	5. The Conversational AI provides accurate real-time guidance and personalized responses.	☐	☐	☐	☐	☐
2. UI Quality	6. The user interface is well-structured and facilitates seamless navigation across all platforms.	☐	☐	☐	☐	☐
	7. The placement of buttons, icons, and menus is consistent and logically organized throughout the system.	☐	☐	☐	☐	☐
	8. The interactive hotspots are clearly positioned and appropriately sized for different screen types.	☐	☐	☐	☐	☐
	9. The text, colors, and font sizes are visually appropriate and enhance readability.	☐	☐	☐	☐	☐
	10. The layout effectively utilizes whitespace and avoids visual clutter.	☐	☐	☐	☐	☐
3. UX Quality	11. The system is easy to use and does not require extensive learning.	☐	☐	☐	☐	☐
	12. The system effectively provides access to essential information regarding academic programs, career pathways, and financial aid.	☐	☐	☐	☐	☐
	13. The system enhances user engagement and provides an immersive and interactive experience.	☐	☐	☐	☐	☐
	14. The AI chatbot and interactive guidance accurately answer user inquiries.	☐	☐	☐	☐	☐
	15. The system efficiently directs users to different sections of the virtual tour without errors.	☐	☐	☐	☐	☐
4. LX Quality	16. The system delivers information clearly and effectively.	☐	☐	☐	☐	☐
	17. The Media Symbol System (text, audio, visuals, icons)is appropriately integrated to support comprehension.	☐	☐	☐	☐	☐
	18. The system helps users better understand program structures, career pathways, and academic opportunities.	☐	☐	☐	☐	☐
	19. The virtual tour positively influences students' intentions to pursue Computer Science at RMUTT.	☐	☐	☐	☐	☐
	20. The system minimizes cognitive overload by applying Modality and Spatial Contiguity Principles.	☐	☐	☐	☐	☐

Note: The scale used in this instrument is a 5-point Likert scale, interpreted as follows:

5 = Strongly Agree 4 = Agree 3 = Neutral 2 = Disagree 1 = Strongly Disagree