Enhancing Competency and Performance in Wealth Management Education through Artificial Intelligence (AI) powered Virtual Reality (VR) Learning

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ABSTRACT

The rapid evolution of financial markets demands a corresponding advancement in wealth management education, particularly in developing competencies that align with real-world performance expectations. This study explores the integration of Artificial Intelligence (AI) and Virtual Reality (VR) technologies to enhance learning outcomes in wealth management training especially on the Market Linked Deposit Product. By leveraging AI-driven personalization and immersive VR simulations, learners engage in realistic financial advisory scenarios that foster critical thinking, decision-making, and client interaction skills. A mixed-methods approach was employed, combining quantitative performance assessments with qualitative feedback from participants for the staff at an Indonesian Financial Institution. Results indicate significant improvements in learner engagement, competency acquisition, and practical application of wealth management principles as well as the improvements of business outcome. The findings suggest that AI-powered VR learning environments offer a scalable and effective solution for bridging the gap between theoretical knowledge and professional readiness in financial education. Implications for curriculum design, instructional strategies, and future research directions are discussed.

Keywords: AI in education, Virtual Reality, Wealth Management, Competency Development, Performance Enhancement

INTRODUCTION

Indonesia's wealth management industry is poised for significant growth, driven by a rising middle class, increasing GDP per capita, and a growing appetite for diversified financial products. However, the sector faces persistent challenges in education, talent development, and product comprehension—particularly regarding complex instruments like **Market Linked Deposits (MLDs)**. Despite Indonesia's promising economic indicators, the **AUM (Assets Under Management) penetration** remains low at around 4% of GDP, compared to 15–25% in neighboring countries such as Malaysia and Thailand. This gap reflects both limited investor engagement and a shortage of qualified financial advisors capable of delivering holistic wealth management services (Smallwood, M., Prosowicz, G., Dirga, A., et al. (2024). MLDs are structured products that combine traditional deposit features with derivative-linked returns. While they offer principal protection and potential upside, they are not covered by Indonesia's Deposit Insurance Corporation (LPS), making them riskier and harder to explain to retail clients. The lack of standardized training and certification around these products contributes to mis-selling risks and regulatory scrutiny (Gunardi, H., Primiana, I., Effendi, N., Herwany, A. (2024). A study involving over 1,800 Indonesian students revealed that **financial literacy remains critically low**, with 79.4% unaware of national financial education tools. This highlights the urgent need for integrated financial education programs that go beyond basic budgeting and saving to include investment literacy and risk management (Senduk, W.F., Djatmika, E.T., Wahyono, H., et al. (2024).

The Financial Services Authority (OJK) has introduced tighter regulations to improve transparency and consumer protection, especially in the sale of structured products. These changes require advisors to be more competent in product suitability analysis, risk profiling, and ethical advisory practices.

The banking industry is evolving rapidly due to technological advancements, regulatory changes, and shifting customer expectations. To stay competitive, financial institutions must ensure that their workforce is equipped with the latest knowledge and skills. Implementing an effective learning strategy is crucial to drive innovation, improve employee performance and productivity, enhance customer experience, strong risk management and maintain compliance with Bank regulations, which are will contribute to revenue growth and sustainable growth.

Traditional banking training methods in Indonesia, such as classroom-based lectures and on-the-job training, often lack interactivity and adaptability, limiting their effectiveness in addressing diverse learning needs. With the increasing complexity of banking operations and the demand for digital literacy, there is a need for innovative tools to bridge the gap between theoretical knowledge and practical application. Learning strategies refer to structured approaches that employees and organizations use to acquire, process, and apply knowledge effectively. These strategies, such us personalized learning, continuous upskilling, experiential learning, that help organization to stay competitive in the era of digital transformation and industry change rapidly.

AI- Powered VR Learning

VR and AI have shown promise in educational settings, their application in banking education in Indonesia remains underexplored. There is a lack of empirical evidence on how these technologies impact competency development and performance outcomes in this context. One of the most significant trends in banking learning and development is the implementation of artificial intelligence (AI) and machine learning. These technologies are being used to analyze customer data, improve the customer experience, and enhance risk management processes. By utilizing AI and machine learning, banks can provide personalized learning experiences for their employees and better understand customer behaviors and preferences. Using the AI based-technology to create personalized learning paths for employees based on their roles, skill levels, and career aspirations. Personalized learning paths can help employees feel more engaged and invested in their development.

Digital transformation, including **AI-powered Virtual Reality (VR)** learning platforms, offers a scalable solution to address competency gaps. These technologies can simulate real-world advisory scenarios, enhance product understanding, and personalize learning experiences for both novice and experienced advisors. Such innovations are essential to prepare professionals for the evolving demands of wealth management in Indonesia.

The integration of Artificial Intelligence (AI) and Virtual Reality (VR) into education is reshaping traditional pedagogical models, offering immersive, personalized, and data-driven learning experiences that were previously unattainable.

AI technologies—such as machine learning, natural language processing, and intelligent tutoring systems—are increasingly used to support adaptive learning, automate assessments, and personalize instruction. AI enables real-time feedback, predictive analytics for student performance, and dynamic content delivery tailored to individual learning styles. According to Ifenthaler et al. (2024), AI's transformative potential lies in its ability to augment human capabilities rather than replace them, emphasizing the importance of "humans in the loop" for ethical and effective educational outcomes.springer

The **ISAR model** proposed by Bauer et al. (2025) categorizes AI's impact into four dimensions: **Inversion**, **Substitution**, **Augmentation**, and **Redefinition**. AI can substitute traditional methods, augment cognitive support, or redefine learning tasks to foster deeper engagement. However, successful implementation depends on educators' technological literacy and students' readiness to interact meaningfully with AI systems.

Immersive Virtual Reality (I-VR) offers high-fidelity simulations that allow learners to engage with complex environments and scenarios in a safe, controlled setting. VR has proven especially effective in procedural

learning, such as medical training, engineering, and financial simulations. A systematic review by Hamilton et al. (2021) found that most studies reported significant improvements in learning outcomes when VR was used compared to traditional methods, particularly in science and technical education.springer

VR's key strengths include:

Immersion: Learners experience a sense of presence that enhances engagement and retention.

Interactivity: Users can manipulate virtual environments, test hypotheses, and receive immediate feedback.

Accessibility: VR can simulate environments that are logistically or financially inaccessible in real life.

When combined, AI and VR create intelligent immersive environments that adapt to learners' behaviors and decisions. For example, in wealth management education, AI can analyze learner responses during a VR-based client advisory simulation and adjust the scenario complexity in real time. This synergy supports experiential learning, critical thinking, and decision-making—key competencies in financial advisory roles.

In the context of Indonesian banking practices, where products like Market Linked Deposits (MLDs) require nuanced understanding and ethical advisory, AI-powered VR can simulate client interactions, risk profiling, and product suitability analysis. This approach not only enhances technical knowledge but also builds soft skills such as communication and empathy, which are essential for trusted financial advisory.

Research Gap and Rationale for Integrating AI-Powered VR in Wealth Management Education

Despite the growing body of research on AI and VR in education, several gaps remain. First, many studies focus on either AI or VR independently, with limited empirical investigation into their integrated impact on competency and performance outcomes. Second, there is a lack of domain-specific research examining AIpowered VR in professional education contexts, particularly within complex decision-making disciplines.

Furthermore, existing studies often emphasize technological feasibility rather than pedagogical effectiveness and learning analytics integration. This highlights the need for research that examines how AI-powered VR learning environments can be systematically designed, implemented, and evaluated to enhance learner competency and performance.

Despite the increasing complexity of financial products such as Market Linked Deposits (MLDs) and the growing demand for personalized financial advisory services, current wealth management education in Indonesia remains largely traditional, relying on classroom-based instruction and static content delivery. This approach fails to adequately prepare learners for real-world advisory scenarios that require dynamic decisionmaking, ethical judgment, and client-centric communication.

Existing studies have explored the use of AI and VR in general education and technical training, but there is a notable gap in applying these technologies to financial education, particularly in emerging markets like Indonesia. Few programs offer immersive, scenario-based learning that simulates client interactions, product suitability analysis, and regulatory compliance—all critical competencies for wealth advisors.

Moreover, while AI has shown promise in adaptive learning and VR in experiential training, their combined potential remains underexplored in the context of Market Linked Deposit. This paper addresses this gap by investigating how AI-powered VR learning environments can enhance competency and performance in wealth management education, with a focus on MLD advisory practices.

Research Questions

RQ1: How does the integration of AI-powered VR learning environments affect competency development in wealth management education?

RQ2: What is the impact of immersive learning on learners' understanding and advisory performance related to Market Linked Deposit products?

RQ3: How do learners perceive the effectiveness and engagement of AI-VR-based training compared to traditional methods?

Hypotheses

H1: Learners exposed to AI-powered VR simulations will demonstrate significantly higher competency in wealth management advisory tasks than compared before implementing AI -powered VR learning through conventional methods.

H2: AI-VR learning environments will improve learners' understanding of complex financial products, such as MLDs, more effectively than static instructional materials.

H3: Participants will report higher engagement and satisfaction with AI-VR training compared to traditional classroom-based education.

LITERATURE REVIEW

Computer-based technology in general has the potential to greatly impact the ways in which we educate and train all people. Furthermore, computer-based technologies have the great potential to customize and tailor training material to every individual need. This not only includes the formidable advantages of computer-based tutors that allow an individual a great deal of control over the pace and style of learning, but also the chance to access materials when and where they require the training (now called "just in time" training). Hence, it is now possible to plan strategies for continuous learning at home and on the job, with whatever depth an individual desires.

Computer-based technologies offer us the means of extending and enhancing every costly hour spent with live banking operational environments in banking field exercises. Rather than reducing the value of the necessary field experiences, VR and other computer technologies can insure that the value of these hours are enhanced by both providing the much needed training prior to the field hours, and then again by providing new ways of examining and replaying the field experiences in the VR environments. With the new techniques we have for building, instrumenting, and collecting field data, the VR environments potentially can allow learner to replay their own or others' experiences and to experiment with different choices and outcomes. Along with this, learners can practice in a Virtual Reality environment events or scenarios that are rare or much too dangerous to do in normal training.

Virtual Reality (VR) and Artificial Intelligence (AI) have emerged as transformative tools in education, offering immersive and adaptive learning experiences. These technologies can simulate real-world banking scenarios, such as customer service, financial analysis, and risk management, enabling employees to develop practical skills in a controlled environment. The integration of VR and AI in learning aligns with Indonesia's push toward technological advancement in education and workforce development, particularly in the financial sector.

According to the 70:20:10 learning model, as outlined by Bob Eichinger and Mike Lombardo in 'The Career Architect Development Planner' (1996). Learning approach emphasizes:

Experience (70%): Learning and developing by doing, through stretch projects, job rotations, and other handson activities.

Exposure (20%): Learning and developing through others, via coaching, mentoring, and collaborative interactions.

Education (10%): The most common way to learn and develop, through structured courses and programs such as webinars, workshops, and e-books. Given that experience constitutes the largest portion of this model, it is key to maximizing learner development. Therefore, Banks also need to focus on creating learning opportunities that enable employees to gain real-life experience, ensuring they are well prepared to meet the challenges in their day-to-day work activities.

Virtual Reality as an Immersive Learning Medium.

Definition of VR Learning. Virtual Reality Learning can be defined as:

"An instructional method that employs computer-generated three-dimensional environments, enabling learners to experience immersion, interaction, and presence, thereby facilitating experiential and situated learning" (Freina & Ott, 2015, p. 134).

The three key elements of VR learning are:

Immersion – the sense of being enveloped by a digital environment.

Presence – the psychological perception of "being there."

Interactivity – the ability to manipulate, respond to, and shape the environment.

For banking education, this means learners can virtually step into a bank branch, interact with digital customers, analyze transaction flows, and make decisions within a risk-free simulated context.

Virtual Reality, or VR creating an immersive digital environments. VR transports users into computer generated worlds, completely replacing their existing physical surroundings. For example, you might find yourself walking through ancient Rome or attending a virtual concert, all while sitting in your living room. VR provides a completely immersive interaction. Your movements control your virtual body and environment, isolating yourself from physical distractions.

The concept of VR-based education is rooted in experiential learning theory, which emphasizes "learning by doing" (Kolb, 1984). Historically, learning in professional domains such as medicine, aviation, and the military has required simulation-based approaches to reduce risk and enhance preparedness. VR now extends these benefits to financial education and banking training. A growing body of research highlights VR's transformative impact on learning:

• Radianti et al. (2020) conducted a systematic review of VR in higher education, concluding that VR significantly enhances learner engagement and knowledge retention.

• Freina and Ott (2015) emphasize that VR allows abstract concepts to be experienced concretely, thus improving conceptual understanding

Virtual Reality (VR) has emerged as a powerful immersive technology capable of supporting experiential and simulation-based learning. In contrast to traditional digital learning environments, VR enables learners to interact with realistic, three-dimensional environments, facilitating situated learning and experiential knowledge acquisition (Radianti et al., 2020). Empirical evidence suggests that immersive VR environments can enhance learner motivation, engagement, and knowledge transfer when appropriately designed (Makransky et al., 2020).

Systematic reviews indicate that VR is particularly effective for skills training, decision-making, and complex problem-solving tasks, which require learners to apply theoretical knowledge in realistic contexts (Parong and Mayer, 2018). However, prior research also notes that VR alone does not guarantee improved learning outcomes; its effectiveness depends on instructional design, feedback mechanisms, and learner support systems (Radianti et al., 2020).

Virtual Reality (VR) provides immersive learning environments that enhance engagement and experiential learning, while Artificial Intelligence (AI) offers personalized learning experiences through adaptive algorithms. According to Muhammad Shodiq in ManageHR Magazine, VR learning represents "a new way of learning" by enabling interactive simulations that mimic real-world scenarios, fostering deeper understanding and skill development. Shodiq emphasizes that VR can transform traditional training by offering hands-on practice in a risk-free setting, which is particularly relevant for banking education where practical skills are critical.

Utilize virtual reality technology able to improve learning scale, scale ability, efficiency and create a better learning experience for learner. At least, there are five benefits of virtual reality training.

First, Scenario (simulation) based learning. Virtual Reality thru computer-based technology in general has the potential to greatly impact the ways in which we educate and train all people. VR as a package of computer hardware, software, and interface technologies that allow a user to experience certain aspects of a simulated 3dimensional environment. Upskill employees through real scenario and prepare them for any surprises that could happen on their job line. **Second, Safe training environment for Employee**. In this pandemic era, offline training is not preferred as it could be a media for transmitting virus. Through virtual reality, we eliminate the need for physical proximity of colleagues, teammates, classmates, or instructors by creating a distance learning/training environment. This is possible by the technology of networking, simulations, and interactive software. Because we are able to communicate with others and perform required tasks without the physical pressure of either fellow performers or actual equipment, we have indeed created a work space environment which is virtual. VR has the ability to handle the unusual event-and unusual or rare could mean the need for unusual responses and individual but still in a safe environment. **Third, Immersive training**. Digital simulation need to be as realistic as possible to create the illusion of real practice. The degree of immersion within the synthetic environment as relative to the tasks to be performed and the skill to be developed by the individual or the group then one is given a wider variety of environments which could be called virtual. Another interesting thing about these environments is that every object is a state machine. Therefore, and this again comes back to education and training, the objects that I am holding in my hand, the rooms I have walked through, the things I've accomplished in that environment will literally determine what I see and what objects do to me as I walk through this environment. **Fourth, VR will save time and money** by allowing us to do virtual training instead of things that usually require field exercises or expert monitoring, or even things not possible in the field at all. Saves learning time with simulation using practice by doing method. VR training can reduce training cost by 50-60 percent. VR training can reduce training time by 40 percent while improving employee performance by 70 percent. In overall, VR training will increase productivity through better learning effectiveness and shorter learning life cycle. **Fifth, raise learning motivation by learning using VR and gamification**. Virtual Reality is more engaging and will greatly motivate users to participate in training, or indeed more broadly in education or other activities. The goal of VR environments is to be very engaging so that the learners will want to learn more and enjoy being part of it. This is a very important aspect of any kind of system that is trying to support training.

Challenges of VR Learning

Despite its promise, VR adoption in education faces several barriers.

Financial Cost. VR headsets, software licenses, and customized simulation design involve substantial investment. Small universities or training institutes may struggle with adoption (Radianti et al., 2020).

Technical Limitations. Issues include hardware requirements, high bandwidth needs, and learner discomfort such as motion sickness. These can undermine the learning experience.

Pedagogical Integration. A key challenge lies in aligning VR content with banking curriculum standards. Poorly designed VR modules risk becoming entertaining but educationally ineffective (Huang et al., 2020).

User Acceptance and Training. Both instructors and learners may resist adoption due to unfamiliarity with VR tools. Studies show that successful integration requires capacity building and digital literacy programs.

Ethical and Privacy Concerns. As VR integrates with artificial intelligence (AI) and data analytics, concerns arise regarding data privacy, surveillance, and equity of access.

Artificial Intelligence in Learning Technologies.

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, particularly computer systems. These processes include learning - the ability to improve performance based on experience, reasoning-the ability to make decisions, problem solving, perception-recognizing objects or patterns, language understanding, and potentially even creativity. AI systems are typically designed to perform specific tasks or mimic human behavior in various ways. AI is categorized into two broad types. First, Narrow AI (Weak AI). This is the most common form of AI and is designed to perform a specific task, such as voice assistants like Siri or Alexa, recommendation systems, or self-driving cars. Narrow AI does not possess general intelligence and cannot perform tasks outside its specialized area. Second, General AI (Strong AI). General AI would have the ability to understand, learn, and apply intelligence across a wide range of tasks, similar to a human being. This type of AI is still theoretical and has not been achieved yet.

Artificial Intelligence (AI) has emerged as a powerful enabler in reshaping the corporate learning landscape. Across industries, AI is helping organizations transition from one-size-fits-all training methods to personalized, adaptive learning ecosystems. In a time when digital transformation is accelerating, there is increasing pressure for employees to develop relevant skills quickly, efficiently, and in a way that aligns with evolving business strategies.

Recognizing these dynamics, the need to embrace AI not just as a tool, but as a strategic solution to fill in the skill gaps, accelerate knowledge transfer, and promote behavior change at scale. AI provides the capabilities to create:

- Personalized learning paths, where content adjusts based on the learner's current knowledge or performance;
- Real-time feedback and support, offering guidance as employees practice new skills;
- Conversational and voice-based learning, simulating natural, human-like dialogues for better engagement and retention;
- Scalable knowledge delivery, ensuring consistent learning experiences across functions, levels, and geographies.

The principal application of AI in education is adaptive learning. It employs computation techniques to derive relevant data from the large volume of data created by learners, including their performance, their interaction, and their learning style feedback, to recommend and make the necessary changes. This makes learning flexible; students can advance in class at their rates, relying on their weaknesses. AI also drives natural language processing (NLP) systems, such as chitchatting and virtual tour tutors, that answer students' questions and offer timely assistance. Apart from customization, AI also has the potential to perform many practical assignments like grading and assessment, thus relieving faculty members from several other related chores.

Artificial Intelligence (AI) has increasingly been adopted in learning technologies to support adaptive learning, personalized instruction, and data-driven decision-making. Within educational contexts, AI enables learner modelling, intelligent feedback, and performance prediction through techniques such as intelligent tutoring systems, learning analytics, and adaptive content delivery (Woolf, 2010; Chen et al., 2020). These capabilities are particularly relevant in professional and higher education, where competency development and performance measurement are critical outcomes.

Recent studies highlight that AI-driven learning environments can dynamically adjust learning pathways based on learner behaviour and performance data, thereby enhancing learning efficiency and effectiveness (Ifenthaler and Yau, 2020). From an information and learning technology perspective, AI functions not merely as a computational tool, but as a mechanism for transforming educational data into actionable insights that support learner engagement and achievement (Holmes et al., 2019).

Integration of AI and VR for Competency and Performance Development

When incorporated, AI and VR make an educational platform most responsive to the users' needs. AI also has the ability, as a dynamic third party, to monitor learner behaviors in VR environments and make changes to ensure each learner receives their optimal experience. For example, in a virtual reality chemistry laboratory, AI can observe how children are conducting their experiments and modify the degree of challenge to correspond to this fact. The possibilities of how AI can be applied within customized VR learning environments are immense, creating opportunities for improved effectiveness, interactivity, and engagement within learning activities, all of which can be personalized according to learners' requirements.

Altogether, the synergic use of AI and VR is the new innovative approach to educational technology. In addition to positive gains in student engagement, incorporating these learning technologies in adaptive learning driven by artificial intelligence capabilities allows sophisticated, engaging, and effective simulation-based practice to master knowledge within academic subjects. Alone, the two have the potential to develop education that is more engaging, inclusive, and fit for purpose in a world that changes with the click of a button

The integration of AI and VR represents a significant advancement in learning technology by combining immersive experiential learning with intelligent adaptivity and analytics. AI-powered VR environments enable real-time monitoring of learner behaviour, adaptive feedback, and personalised learning experiences within immersive simulations (Dede et al., 2017). This convergence addresses key limitations of standalone VR by embedding intelligence into the learning process.

In professional education domains, such as business, finance, and management, AI-driven VR simulations have been shown to support competency development by allowing learners to practise decision-making in realistic, risk-free environments (Faria et al., 2009). AI enhances these environments by analysing learner interactions and performance, thereby providing tailored feedback and supporting continuous improvement.

From an information and learning technology perspective, AI-powered VR environments also generate rich learning data that can be utilised for learning analytics, performance assessment, and instructional improvement (Ifenthaler and Yau, 2020).

Integrating AI technologies into other learning architecture—such as Virtual Reality (VR). By combining VR and AI, we will create a more interactive, realistic, and humanized experience. AI technologies like Speech-To-Text (STT), Natural Language Processing (NLP), Text-To-Speech (TTS), and generative models were embedded to enable fluid two-way conversations between learners and virtual characters. This allows for more flexible, experiential learning that adjusts in real time to the learner's input.

This strategic move aligns with organization vision to create learning journeys that are not only scalable and measurable, but also highly relevant, personalized, and impactful. It also reflects their commitment to innovation, digitalization, and employee development in a future-ready organization.

By embedding responsible AI principles into the core of organization development process, they ensured that innovation is accompanied by accountability. This foundation has allowed they build a learning experience that employees can trust and that the organization can scale with confidence.

AI principles and governance practices to ensure the safety, fairness, and integrity of the solutions.

Key ethical foundations in AI development include:

1. Transparency & Explainability. All AI interactions are designed to be understandable by users. Learners are aware when they are interacting with AI, and the learning system provides clear feedback and guidance to support the development process.
2. Data Privacy & Security. The process followed strict internal data management protocols. All learner data used for testing or improvement purposes was anonymized and securely stored in compliance with internal risk policies and regulatory requirements.
3. Bias Mitigation. Training content and conversational responses were reviewed to avoid reinforcing stereotypes or favoring specific learner profiles. AI-generated responses were tested across diverse inputs to ensure fairness.
4. Governance Compliance. The solution was developed under the oversight of AI Governance Framework, ensuring that all components went through necessary risk, IT, and compliance reviews before implementation.
5. Human Oversight & Iterative Testing. Organization maintained strong human involvement throughout the development process—from model training and scenario design to user testing and content validation. This ensured the AI served as an enabler, not a replacement, for meaningful human learning.

Competency-based learning frameworks

A competency framework serves as a foundational tool for talent development in banking. It defines the essential skills, behaviors, and knowledge required for employees to perform effectively.

Competency in banking includes technical knowledge, problem-solving skills, and interpersonal abilities. Performance outcomes can be measured through task accuracy, efficiency, and customer satisfaction. The importance of learning strategies that prioritize active engagement and assessment, which VR and AI can facilitate through real-time feedback and scenario-based learning.

Training Evaluation Model

The Kirkpatrick Model for Training Evaluation. Training evaluation is a critical component of human resource development, aimed at assessing the effectiveness, efficiency, and impact of training programs. Among various models, the Kirkpatrick Four-Level Model, introduced by Donald Kirkpatrick in 1959, remains the most widely used framework for evaluating training outcomes across industries.

Overview of the Kirkpatrick Model

Kirkpatrick's model evaluates training effectiveness through four progressive levels:

Level 1: Reaction. Measures participants' immediate responses to the training, including satisfaction and engagement. Positive reactions are often linked to increased motivation and learning.

Level 2: Learning. Assesses the extent to which participants acquire intended knowledge, skills, and attitudes during the training. This level often involves pre- and post-tests or assessments.

Level 3: Behavior. Evaluates the transfer of learning to the workplace. It examines whether participants apply what they learned in their job roles, typically through observation or feedback from supervisors.

Level 4: Results. Measures the final impact of training on organizational outcomes, such as productivity, quality, customer satisfaction, or financial performance. This level is the most complex and resource-intensive to evaluate.

A comprehensive learning strategy ensure employees stay competent, compliant, and adaptable in banking industry that is constantly evolving. Bank is highly regulated industry, and non-compliance can lead to severe penalties. A well-structured learning architecture helps employees stay updated with regulatory changes, risk management practices, and financial technologies, reducing operational and reputational risks.

AI Powered VR Learning Development AI VR Learning Solution Architecture & Workflow Overview Process Flow

The user's journey through a training session follows a seamless, five-stage process powered by a sophisticated AI backend. This ensures that every interaction is both realistic and purposeful.

User Speech Input → High-Fidelity Transcription → Intelligent AI Processing & Response Generation → Multi-Modal AI Response Delivery → Objective, Rubric-Based Performance Analysis

Detailed Step-by-Step Workflow

Here is a granular breakdown of each stage in the technical flow.

Step 1: User Speech Input & Transcription

Technical Flow: Microphone > Whisper STT (Speech-to-Text)

Explanation: The employee speaks naturally into the VR headset's microphone. The audio is instantly captured and processed by OpenAI's Whisper, a state-of-the-art transcription engine, which converts the speech into a highly accurate text transcript. This forms the foundation for the AI's understanding.

Step 2: Input Sanitization & Contextualization

Technical Flow: AI Agent Glossary + LLM for Sanitization

Explanation: To bridge the gap between natural human speech and structured system input, the raw transcript is "sanitized." For instance, due to dialect, pronunciation, or ambient noise. The sanitization process, guided by our Elwyn Agent that consists of module-specific glossary, automatically corrects such discrepancies. This critical step ensures the conversation's core context is always preserved and accurately understood by the system.

Step 3: Scenario-Driven Response Generation

Technical Flow: AI Agent Scenario + LLM

Explanation: Once the user's intent is clear, the AI Agent provides the necessary context to the LLM. The LLM then generates a response that is not only contextually appropriate but is also strictly aligned with the pre-defined learning objectives of the specific training scenario. This ensures that every AI interaction purposefully guides the employee toward the desired learning outcome.

Step 4: Multi-Modal AI Response Delivery

Technical Flow: AI Response (Visual Text + ElevenLabs TTS + Animation Trigger)

Explanation: The AI's response is delivered through three synchronized channels to maximize immersion:

Visual Text: The reply appears on-screen for clarity.

Natural Speech: Using the industry-leading ElevenLabs TTS engine, the text is converted into remarkably human-like audio.

Avatar Animation: Our VR application triggers one of several predefined character animations (e.g., nodding, looking confused, smiling). The choice of animation is based on a suggestion from the GenAI, which analyzes the tone and content of its own response to recommend the most fitting non-verbal cue.

Step 5: Objective, Rubric-Based Performance Analysis

Technical Flow: AI Agent Score Handler + LLM

Explanation: Upon session completion, the system provides a comprehensive evaluation based on a scoring rubric co-developed with the relevant department or business unit. This ensures that even though the conversation is dynamic and unscripted, the final assessment remains objective and standardized. This approach makes dynamic learning effectively measurable, tying free-form practice directly to concrete performance metrics agreed upon at the project's outset.

Research Methods

This study employed a convergent parallel mixed-methods design, combining quantitative and qualitative approaches to evaluate the effectiveness of AI-powered VR learning in wealth management education. The choice of this design aligns with Creswell and Plano Clark (2018), who argue that integrating both types of data provides a more comprehensive understanding of educational interventions. The approach also supports triangulation, enhancing the reliability and validity of findings.

The adapted model consists of four levels, with two of them (reactions and learning) evaluated by quantitative data (a survey) with learners. The behaviour level was evaluated by qualitative and quantitative data (open- and closed-ended questions) with learners because a quantitative study may not be sufficiently flexible to facilitate an understanding of complex human behaviour or to address sensitive matters [Johnson, R.B.; Onwuegbuzie, **2004**]. The results level was evaluated by business impacts such MLD booking volume, cost avoidance as well as the operational risks result.

Level 1: Reaction. Measures participants' immediate responses to the training, including satisfaction and engagement. Positive reactions are often linked to increased motivation and learning.

There are 6 (six) questions related to Level 1 evaluation:

1. The content in the VR learning module aligns with the learning objectives
2. The VR learning module enhances my effectiveness in carrying out my responsibilities
3. The instructional content delivered through the VR learning module is clearly structured and easily comprehensible.
4. The VR headset is user-friendly and facilitates an effective learning experience
5. VR technology enables highly responsive interactions that actively engage users throughout the learning experience
6. The visual and audio components of the VR learning experience are of high clarity and sufficiently meet instructional standards

The Level 1 score scale out of 5 points

Level 2: Learning. Assesses the extent to which participants acquire intended knowledge, skills, and attitudes during VR learning modules especially on MLD product complaint handling & VR AI – MLD Product. The Level 2 score scale out of 100 points.

Level 3: Behavior. Evaluates the transfer of learning to the workplace. It examines whether participants apply what they learned in their job roles:

The knowledge and skills acquired through the VR learning module have been effectively applied in my day-to-day professional responsibilities.

The Level 3 score scale out of 5 points

Level 4: Results. Measures the final impact of VR learning module MLD product on organizational outcomes, such as MLD volume booking, training cost avoidance & reduction of operational risks especially miss selling risks.

RESEARCH RESULTS

The integration of AI-powered Virtual Reality (VR) learning environments is significantly transforming competency development in wealth management education.

Survey Periode: 15-31 August 2025

Participants: 2.608 staff

A total of 2,608 staff from an Indonesian Financial Institution participated, including relationship managers, product managers, and branch-level staff. Participants were selected using purposive sampling to ensure inclusion of employees directly involved in wealth management advisory.

Quantitative Data: Collected through Likert-scale surveys (Levels 1–4 of Kirkpatrick's model) consist of reaction evaluation, knowledge & performance assessments, behavioral change as well as business impacts. Metrics included knowledge acquisition, decision-making speed, accuracy, and satisfaction levels.

Qualitative Data: Gathered from open-ended survey questions, semi-structured interviews, and focus group discussions. This enabled deeper exploration of participants' experiences, attitudes, and perceptions of AI-VR training.

Quantitative Analysis: Descriptive statistics, paired-sample t-tests, and ANOVA were used to evaluate improvements in competencies and compare pre- and post-training performance. Reliability of survey instruments was tested using Cronbach's alpha (>0.7 considered acceptable).

Qualitative Analysis: Thematic analysis (Braun & Clarke, 2006) was applied to identify recurring themes, such as enhanced confidence in client communication, improved comprehension of structured products, and motivation for continuous learning.

Level 1: Reaction

1	The content in the VR learning module aligns with the learning objectives	4.94
2	The VR learning module enhances my effectiveness in carrying out my responsibilities	4.94
3	The instructional content delivered through the VR learning module is clearly structured and easily comprehensible.	4.94
4	The VR headset is user-friendly and facilitates an effective learning experience	4.94
5	VR technology enables highly responsive interactions that actively engage users throughout the learning experience	4.93
6	The visual and audio components of the VR learning experience are of high clarity and sufficiently meet instructional standards	4.94

Level 1 (Reaction): Participants reported extremely positive reactions to the VR training, with an average score of 4.94/5, indicating strong satisfaction and engagement.

Level 2: Learning

AI tracks metrics like:

Accuracy and decision-making speed.

Engagement levels and completion rates.

Behavioral patterns and learning progression.

This enables:

Immediate feedback and course correction.

Predictive analytics to forecast future performance.

Benchmarking against peers for motivation and self-assessment

1	MLD Product Complaint Handling	95.5
2	VR AI: MLD Product	84.0
Average L2 Score		**89.8**

Level 2 (Learning): Competency acquisition improved significantly, with average scores reaching 89.8/100, particularly in product complaint handling (95.5/100). Statistical tests (paired-sample t-test, *p* < 0.01) confirmed the significance of learning improvements compared to pre-training levels.

Level 3: Behavior

The knowledge and skills acquired through the VR learning module have been effectively applied in my day-to-day professional responsibilities	4.14

Level 3 (Behavior): Participants demonstrated effective transfer of learning, scoring 4.14/5 on applying new skills in daily work.

Open-ended questions:

Around 40–50% of the feedback highlighted participants' ability to apply, implement, or feel more prepared to integrate the learning outcomes into their day-to-day professional responsibilities.

Level 4: Results.

Incorporating AI-powered VR into wealth management training can simulate complex financial scenarios, enhance regulatory and compliance understanding, improve advisory skills through realistic client interactions and support continuous professional development with adaptive learning modules.

MLD Training Cost Efficiency Ratio: 92.18%

No	Modules	Enrollment Target	VR Learning Cost Per Pax	Inhouse Training Cost Per Pax	Efficiency Ratio
1	MLD Product Complaint Handling	2,286	136,792	1,890,254	92.76%
2	VR AI: MLD Product	2,286	158,664	1,890,254	91.98%

MLD operational risks related to miss selling HoH from 25% to 0%

Level4 (Results): Business outcomes showed measurable improvements:

Training cost efficiency reached 92.18%, reducing dependency on external trainers as well inhouse training program

Operational risks of mis-selling dropped to 0%

Thematic analysis of open-ended responses revealed three dominant themes:

1. Increased confidence in client communication and advisory tasks.
2. Improved comprehension of complex structured products like MLDs.
3. Higher motivation to engage in digital and self-directed learning.

Illustrative participant feedback included statements such as: “The VR simulation felt like I was in a real client meeting, which helped me practice handling objections without fear of mistakes.”and “I now feel more confident explaining risks of structured products.”

The findings are consistent with Hamilton et al. (2021), who reported improved retention and engagement with VR learning in technical fields, and Ifenthaler et al. (2024), who emphasized AI’s role in adaptive feedback. However, this study contributes uniquely by linking VR-AI learning directly to business outcomes (booking volume, risk reduction), which has been underexplored in prior research.

DISCUSSION & CONCLUSION

This study adapted the Kirkpatrick evaluation model, which includes four levels of training outcomes, to evaluate AI powered VR learning in enhancing competency & performance in wealth management education.

Based on L1 evaluation, learners perceive the effectiveness and engagement of AI-VR-based training compared to traditional methods with average score 4.94 (out of 5)

Based on the L2 assesment, AI-powered VR learning environments affect competency development in wealth management education with average score 89.8 out of 100.

Based on the L3: 50% of the feedback highlighted participants' ability to apply, implement, or feel more prepared to integrate the learning outcomes into their day-to-day professional responsibilities with average score 4.14 (out of 5)

Based on L3 & L4 Learners exposed to AI-powered VR simulations demonstrated significantly higher competency in wealth management advisory tasks than compared before implementing AI -powered VR learning through conventional methods shown by training cost avoidance by 92.18% as well as reducing operational risks HoH from 25% to 0%

This study provides empirical evidence that AI-powered VR training significantly enhances competency and performance in wealth management education in Indonesia.

Q1: Learners exposed to VR-AI training demonstrated higher competency in advisory tasks, supported by strong improvements in knowledge scores and behavioral application.

Q2: The immersive environment improved learners’ understanding of complex financial products (e.g., MLDs) and advisory performance, confirmed by both quantitative and qualitative findings.

RQ3: Participants reported high engagement and satisfaction compared to traditional methods, validating the superiority of AI-VR over classroom-based approaches.

The study extends existing literature by demonstrating that beyond improving knowledge and skills, AI-VR training can generate measurable business outcomes, such as increased product sales and reduced compliance risks.

LIMITATIONS

The study was limited to one banking institution, restricting generalizability. It focused on short-term outcomes (August 2025), with limited data on long-term retention. Adoption requires investment in VR infrastructure, which may challenge scalability in resource-constrained institutions.

RECOMMENDATIONS

For Banking Practice

1. Integration into **Continuous Professional Development (**CPD): AI-VR learning should be embedded into continuous professional development for wealth managers, expanding coverage to include insurance, investment funds, and advanced risk profiling.
2. Real-time Analytics: Banks should leverage AI dashboards to monitor staff competencies and adjust training dynamically.
3. Scalability: Invest in VR hardware-as-a-service or shared VR labs to reduce infrastructure costs.

For Regulators (OJK)

1. Develop certification frameworks incorporating VR-based simulations for structured product advisory.
2. Incentivize adoption of AI-VR solutions by recognizing them as tools for reducing mis-selling risks and improving compliance.

For Future Research

1. Conduct longitudinal studies to assess knowledge retention and behavior sustainability over 6–12 months.
2. Compare AI-VR vs. AI-only vs. VR-only training interventions to isolate their unique effects.
3. Undertake cost-benefit analyses to evaluate scalability across multiple financial institutions.

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