Asia Pacific Academy of Science Pte. Ltd.

Metaverse 2026, 7(3), A01260040.
https://doi.org/10.54517/mA01260040

Conceptual Paper

Metaverse-Enabled Higher Education: A Socio-Technical and Experiential Learning Perspective

Anuj Kumar[1,3,*], Gautam Bapat[2], Asokan Vaudevan[3]

[1] Rushford Business School, Switzerland
[2] Dr. Vishwanath Karad MIT World Peace University, Pune, India
[3] INTI International University, Malaysia
***Corresponding author:** Anuj Kumar, profanuj15@gmail.com

CITATION

Kumar A, Bapat G, Vaudevan A. Metaverse-Enabled Higher Education: A Socio-Technical and Experiential Learning Perspective. Metaverse. 2026; 7(3): A01260040. https://doi.org/10.54517/mA01260040

ARTICLE INFO

Received: 30 April 2026
Accepted: 16 July 2026
Available online: 25 August 2026

Abstract: This is a conceptual perspective that examines the pedagogical and institutional implications of the introduction of Metaverse to Higher Education. Immersive Virtual Environments are continuing to rapidly change and are now changing how universities are thinking about creating interactive learning experiences. Based on the perspective of Socio-Technical Systems Theory, Experiential Learning Theory, and Dynamic Capabilities Theory, the Metaverse is considered a multi-layered socio-technical ecosystem. That we have a framework that shows how investments in technological affordance, immersive experience, embodiment and real-time interaction, must be coupled with the social aspects of the learning process, including learner engagement and instructional design, to be able to meaningfully impact student outcomes. Both the spectrum of opportunities that go beyond the classroom, and the need for Higher Ed institutions to evolve their organizational skills to sense, seize, and change their organizations to scale these platforms successfully are explored. This paper establishes a holistic theoretical support that will help future empirical studies in immersive educational environments. The paper defines how the institution of higher education should sense, capture, and reverse the abilities to appropriately adapt and scale to the metaverse-based learning platform. The study presents a multi-layered insight into the idea of Metaverse-enabled learning through the amalgamation of micro-level learning processes and macro-level strategy adjustment. The paper also gives insights into emerging literature through its theoretically based model suggesting gaps between technology, pedagogy, and strategy, and providing directions on the future empirical studies concerning immersive learning ecosystems.

Keywords: Metaverse in higher education; Immersive learning; Socio-technical systems; Experiential learning; Dynamic capabilities; Digital pedagogy; Virtual learning environments; Educational innovation

1. Introduction

1.1. Background: Emergence of the Metaverse in Higher Education

The introduction of the Metaverse is a large-scale development of online learning space, as it creates immersive, interactive, and afloat virtual realities that supersede traditional web learning. In comparison to the traditional e-learning systems, Metaverse incorporates virtual reality (VR), augmented reality (AR), and artificial intelligence in order to enable experiential and collaborative learning [1,2]. Within the context of higher education and education, this change is associated with the increase in the popularity of active learning pedagogies, simulation-based learning. Embodied cognition and real-time interaction are facilitated by Metaverse, which increases the engagement of learners and their knowledge retention. As a

result, it is becoming a groundbreaking paradigm of the education ecosystem in the next generation.

1.2. Problem Statement: Fragmentation between Technology, Pedagogy, and Strategy

Although Metaverse's applications in higher education are increasingly being embraced, the current efforts of implementation are largely isolated in technological, pedagogical, and strategic aspects. Digital transformations often focus more on cutting-edge technology instead of building on sound learning design and institutional vision. A one-sided approach to how immersive experiences achieves learning outcomes is a major constraint in the ability of immersive environments to achieve meaningful learning.

Moreover, investment in the digital infrastructure if not linked to a broader transformation agenda is difficult for universities to keep and scale. Although there is existing literature on VR and educational VR, many focus on single factors, such as user experience or specific technology affordances. Expanding the conversation with this conceptual view is the marrying of micro and macro aspects of learning processes and institutional adaptations. Our proposed framework resolves the key question of how immersive technologies can be successfully integrated into the overarching setting of the university to create a sociotechnical alignment as the key linking mechanism. Finally, this multi-theoretical model shows that all three aspects of Instructional Design, Student Engagement, and Institutional Flexibility are necessary for sustainable Metaverse adoption.

1.3. Research Gap

Although past research has examined the use of virtual reality and immersive technologies in educational methods, there are gaps in the TPC perspective of study that encompass technological, teaching, and strategic ideology that exist within the Metaverse. Literature currently tends to concentrate on individual elements (e.g., user experience or technological affordances), but little is said about institutional capabilities and alignment inside the systems [3]. In addition, several studies do not operate within a multi-theoretical framework and integrate socio-technical systems, experiential learning, and dynamic capabilities. This gap highlights the necessity of the development of one conceptual framework that illustrates how immersive technologies may be successfully integrated into the higher education systems to promote outcomes and institutional flexibility.

2. Conceptual Foundations of the Metaverse in Education

2.1. Defining the Metaverse in the Educational Context

In the educational paradigm, the Metaverse is an unbroken, common, and immersive virtual experience containing advanced digital technologies like virtual reality, augmented reality, and artificial intelligence above others, to support interactive learning experiences. In comparison to the conventional online platforms, the Metaverse will allow us to collaborate in real-time, participate in the embodied form via avatars, and interact in space, thus increasing experience and constructivist learning processes [1,2]. In higher education, it is an intersection point between the physical and electronic learning environments where students can practice simulations, virtual labs and group problem solving it renegotiates the boundaries of teaching and learning in digitally mediated environments.

2.2. Key Features: Immersion, Presence, Embodiment, Interactivity

The accuracy of Metaverse in learning is based on the fundamental technological affordances that are immersion, presence, embodiment, and interactivity. Immersion can be defined as the degree to which users get covered by a virtual world situation which promotes focus and turns users much more engaged [4]. Presence refers to the mental feeling of being there, which is an essential part of valuable learning experiences [5]. Embodiment enables the user to engage in interaction using avatars and construct identity and socialize but interacts with the virtual environment by manipulating objects and environments in-the-moment, as well as interactivity. A combination of these characteristics forms a multisensory learning environment, which promotes in-depth cognitive thinking and engagements.

2.3. Evolution of Digital Learning to Immersive Learning

Digital learning has changed drastically, shift that was made merely as a system to deliver the content in the form of static and suffocating systems to interactive dynamic and immersive systems. Earlier models of e-learning were more centered on content distribution using learning management systems with the concentration on accessibility and scalability [6]. Technology development gave rise to blended learning and simulation-based learning which combines interactivity and involvement with the learners. Metaverse is the extension of the above development; full immersing and experience-based learning spaces can be created, consistent with constructivist paradigm and experience-oriented paradigm in learning [7].

2.4. Relevance to Higher Education Ecosystems

Introducing Metaverse as an integrated element has profound implications on the higher education ecosystems in that pedagogical practices, institutional strategies and student engagement models are changed. It provides universities the opportunity to provide their users with Reality based learning elements including virtual Internships, simulations, as well as collaborative projects that transcend from a geographical constraint and are not limited to the geographical [3]. Moreover, the HEIs are making strides in interdisciplinary learning and helping to advance innovation more broadly through providing shared virtual hubs to share knowledge. There should be coordination of technological infrastructure, skills of faculty and vision of strategy development, for what Institutional adoption is necessary. This puts Metaverse in the spotlight for driving digital change and competitive differences in higher education.

3. Theoretical Foundations

The development of Metaverse for education must be grounded in a solid theoretical basis to describe the multi-dimensional impact of the Metaverse's use for learning and change in institutions. For an integrated perspective of analysis, this paper uses the Socio-Technical Systems Theory, Experiential Learning Theory and the Dynamic Capabilities Theory. All aspects of these theories are interrelated with technology and social systems together with experiential construction of knowledge, and strategic capabilities required by the institutions. This multi-theoretical base allows perceiving the full picture of the Metaverse-enabled education and how the strategy changes and evolves important themes of pedagogy, engagement, and strategic transformation by integrating both micro-level learning processes with macro-level organization processes [8–10].

3.1. Socio-Technical Systems Theory

The Socio-Technical System Theory (STS) holds that organizational

effectiveness is the result of social and technical subsystem optimizing together. Firstly, the theory was designed to study workplace systems, and according to it, technological innovation must be optimized to respond to human and organizational forces to produce desirable results [8,11]. STS is an important lens that can be applied to the process of digital transformation and the interaction between new technologies and social structures, roles, and processes. Its applicability has been extended to the education settings where the digital platform is becoming increasingly impactful on the learning outcomes because of the interrelation between the human interaction and the digital platform [12].

3.1.1. Core Constructs

This theory is based on the principle of joint optimization, the technical system, and the social system (the core constructs of the Socio-Technical Systems Theory). Technical system includes tools, technologies and processes whereas social system involves people, relationships, and organization culture [8]. Joint optimization can thus be described as the coordination of these systems to enhance overall efficiency. Also, depending on concepts like interdependence of tasks and adjustability of systems are of paramount importance in dynamic environments [13]. The constructions are also applicable mainly in a technologically oriented environment where a lack of alignment between social and technical aspects has the potential to cause inefficiencies, resistance and non-optimal results [13].

3.1.2. Application to Educational Systems

Socio-Technical Systems Theory can be utilized in higher education to study how digital technologies are implemented in a learning setting. Technical system is represented by virtual reality tools and learning management systems whereas social system is represented by students, faculty and institutional culture. The success of learning is reliant on the synchronization of these factors, especially in those that are immersive, such as the Metaverse [12]. STS emphasizes that it is necessary to design technology-powered learning systems to facilitate collaboration, engagement, and adaptability to make sure that technological improvements are purposefully implemented in the pedagogical practice [14].

3.2. Experiential Learning Theory

Experiential Learning Theory (ELT) introduced by Kolb (1984) is the conceptualization of learning presenting knowledge-creation through experience. It puts active involvement, reflection, and application as primary focus of effective learning. ELT is especially applicable in the context where interaction and simulation is facilitated since it no longer concerns passively learning but rather constructively building knowledge [14]. Within the framework of the Metaverse, ELT offers a theoretical perspective on explaining the role of immersive environment in helping learners gain knowledge via experience and constructiveness, helping them to access the content with a high level of engagement and contemplation [9].

3.2.1. Learning Cycle

Kolb proposed four stages of the experiential learning cycle which include concrete experience, reflective observation, abstract conceptualization, and active experimentation [9]. This is a cyclic process, which allows the learners to keep on correcting their knowledge, through experience and contemplation. Every phase is vital in the transformation of experiences into knowledge, and an active experimentation helps learners to test and implement new ideas [15]. Learning is

cyclical, which highlights the role of the iterative interaction in the process, which makes it especially appropriate to the immersive sector that enables the ongoing interaction and feedback.

3.2.2. Relevance in Immersive Environments

Metaverse environments and other immersion environments improve the relevance of the Experiential Learning Theory through the possibility of realistic simulation and interactive experiences. These settings also allow learners to apply hands-on experience and dynamic experimentation in a manner that cannot be applied in a traditional classroom [5]. The feeling of being present and embodied adds to reflective observation and understanding concepts [15]. As a result, immersive technologies correlate with the ideas of ELT, the increased level of engagement, better retention, and the opportunity to acquire the applicable skills as the result of exercising the experience of learning things practically [16].

3.3. Dynamic Capabilities Theory

Dynamic Capabilities Theory deals with the capacity of an organization to integrate, construct and re-structure internal and external competence in accordance with the constantly changing environments [10]. It also puts strategic adaptability as a key to a long-term competitive advantage. When applied to the context of higher education, this theory can be used to analyze the reaction of the institutions to technological, disruptive technology like the Metaverse. It emphasizes the role of relentless innovation, reconfiguring resources, and strategic alignment to enter digital change.

3.3.1. Sensing, Seizing, Transforming

Dynamic capabilities are operationalized in terms of three major processes namely the sensing opportunities, seizing opportunities by strategic investments as well as the change in modification of organizational structures to maintain change [10]. Sensing entails the recognition of emergent trends in technology like the immersive learning platforms as well as seizing means mobilizing resources to embrace the technologies. Transforming will be about re-doing processes, culture and capabilities to embed those changes. These procedures will be imperative to institutions of higher learning who are aiming to capitalize on Metaverse in the creation of long-term value [17].

3.3.2. Institutional Adaptation in Education

Dynamic capabilities in higher education guide the capability of institutions to ensure that they stay up to date on the technological and pedagogical environment. Build: Universities must have a predisposition to know about the new teaching and learning technologies to invest in fitting equipment and adjust to the issue of teaching and learning [13]. To implement Metaverse, it requires it to be technologically ready, along with being organizationally flexible, faculty-developed, and strategically aligned. Organizations that are successful in dynamic capability, have the potential to go through the successful change and be in a stronger position with regards to competitive position in the field of education.

3.4. Synthesis of Theoretical Perspectives

Socio-Technical Systems Theory, Experiential Learning Theory and Dynamic Capabilities Theory could be united to form a comprehensive theory to analyze the higher education in metaverse environment. Of course, the theories employed are on different levels: alignment of systems, learning processes and strategic adaptation,

which can all contribute to the construction of a multi-level view of immersive learning ecosystems. Collectively this synthesis will help bridge the gap between the micro-level experiences of learners and the macro-level changes that are occurring in an institution, by offering a mosaic of the gliding and collision of technology, pedagogy and strategy as they impact on learning outcomes [18].

3.4.1. Need for Integration

The multi-dimensional nature of the Metaverse-enabled education requires the combined approach in theory since one-dimensional theories cannot be used to comprehend its complexity. Learning effectiveness with technological affordances alone does not account without institutional capabilities and pedagogical processes. On the same note, strategic adaptation should be synchronized with technological systems as well as learning dynamics. The combination of these theories allows getting a more holistic view of the potential implementation and maintenance of immersive technologies in the systems of higher education [18].

3.4.2. Complementarity of Theories

The chosen theories are complementary to each other, as they focus on a key aspect of the Metaverse integration. Explaining the correspondence between human and technological factors is the Socio-Technical Systems Theory, explaining how knowledge is created is the Experiential Learning Theory and institutional adaptability is emphasized in the Dynamic Capabilities Theory. They combine creating an integrated model that addresses system, learning processes, and strategic transformation interdependencies. This complementary property empowers the explanatory value of the presented model and leads to a more detailed interpretation of immersive learning settings on higher educational levels.

3.5. Expanding the Immersive Ecosystem: Ethics, Inclusion, and Governance

Even though the capabilities and characteristics of the Metaverse in terms of technology and pedagogy have been well established, recent research strongly highlights that the realization of a ‘mature immersive learning ecosystem’ requires other socio-technical challenges be addressed. This is of utmost importance, first among these is the nuances in learner experience. However, the novelty value is not enough to keep learners engaged, the learners must be allowed to explore and take a different path and aid them in avoiding over-empowered learning experiences.

The novelty of virtual reality is not sufficient to keep learners engaged; they must be able to explore and navigate themselves and help them steer clear of over-empowered experiences. As these tools become part of the lives of higher education institutions, it is critical that inclusion and ethics questions will be taken very seriously. There is already a digital divide, with VR headsets being expensive and these devices need the internet to be fast which can prevent socioeconomically disadvantaged students from having access to them. Moreover, there are new ethical issues that surround use of data, such as the collection of biometric data and user actions in virtual space; as well as the psychological impacts of avatar representation for identity. While accessibility is a huge concern for developing Metaverse platforms, there are additional challenges that must be addressed for those with cognitive and/or physical disabilities, and proactive, inclusive design strategies should be used.

Scalability and robust governance are required if going from pilot to university-wide digital infrastructure [19]. Again, one should bear in mind that there are huge challenges in the field of interoperability between widely used and competing blockchain platforms on the way to scaling the Metaverse. For these intricate virtual

campuses, institutions must have clear-cut and comprehensive governance. These policies should be applied to digital conduct, IP rights of the co-created virtual environments, and equitable access to digital content. Education goes hand-in-hand with sustainable and successful practices, all of which revolve around the responsible and ethical use of technology.

4. Metaverse as a Socio-Technical Experiential Learning Ecosystem

4.1. Technological System: Platforms, Tools, Infrastructure

Higher education metaverse is a technological system that involves software, digital infrastructure, platforms and tools to provide immersive and interactive learning experiences. These include Virtual Reality (VR) and Augmented Reality (AR) technologies, Virtual 3D virtual environments, AI-based learning platforms and platforms and cloud-based environments that allow real-time interaction and scalability [1,7]. These technologies enable the creation of simulation-based learning, virtual labs and learning collaborative dynamics, none of which are restricted to a traditional teaching/learning classroom. However, interoperability, usability and accessibility will be instrumental in the effectiveness of such systems and the success of which institutions' investments in sound infrastructure will help facilitate smooth integration in learning processes.

4.2. Social System: Learners, Faculty, Collaboration

In the context of learning in Metaverse, social system is the learning system consisting of learners, faculty and learning objects that create learning experiences. The students actively share through avatars, they become an active part of the peer-to-peer communication and process of scaffolding knowledge, and the professors are no longer content producers but guides of rich learning experiences [14,20]. These virtual spaces that facilitate communication, teamwork and problem-solving are helpful in increasing collaborative learning. The faculty preparedness, effectiveness of the social system and its culture are among the factors which can affect it. The dynamic between actors in such digitally mediated structures thus generates interesting learning outcomes.

4.3. Technological Affordances (Immersion, Embodiment, Interaction)

Immersion, embodiment, and interaction are all such technological affordances in the Metaverse that produce action possibilities of immersive digital environments. Immersion fosters user engagement in that it produces a feeling of being engulfed by a virtual environment whereas embodiment enables users to identify themselves via the use of an avatar making it easier to express their identity and presence in the social world [4]. Interaction also facilitates real-time manipulation of objects and being able to collaborate with others to support other dynamic learning processes. All these affordances will contribute to a more enjoyable and intellectually stimulating experience and help make Metaverse an effective tool of learning not subject to the constraints of the traditional digital platform.

4.4. Experiential Learning in Virtual Environments

Integrated virtual environments of the Metaverse help create a rich environment of learning through experiential engaging activities and simulations of real-life situations. These learning conditions are very compatible with the Experiential Learning Theory and learners are susceptible to cycles of experience, reflections, conceptualizations, and experimentations [9]. As an example, helpful tools such as

virtual laboratories and role-playing simulations enable students to practice what they have learned in theory so that the knowledge is better understood and can be retained. Scholarly work suggests that immersive experiences can be very powerful in enhancing learning experience as they promote active learning, contextual learning [5], which complements the importance of experiential methods in online learning.

4.5. Constructivist Learning Dynamics

Constructivist dynamics of learning underline the point of knowledge being an active construction, as it is formed in terms of interaction with the environment and in terms of socializing. Being reinforced in the Metaverse, these dynamics are facilitated by immersive and collaborative virtual space that allows exploration, experimentation, and co-creation of knowledge [14,15]. Students are exposed to content in contextual platforms, where they get to understand more and be able to think critically. Learning is also improved by social interaction in terms of dialogue and shared experiences. Constructivist principles are therefore being put into practice through Metaverse as it offers a platform where learners have the chance to construct meaning, as opposed to passively receiving information [21].

5. Conceptual Framework Development

5.1. Methodology of Conceptual Development

To construct a comprehensive model of Metaverse-enabled higher education, we adopted a systematic approach to conceptual development. First, we conducted a targeted review of recent interdisciplinary scholarship spanning educational technology, immersive pedagogy, and institutional digital transformation. This review identified a pattern of fragmentation in the literature, with most works addressing either technological affordances, pedagogical design or strategic management – but few explicitly addressing the interaction between those three.

To fill this (the theoretical) gap, we wanted an anchor that would connect the micro level of what learner's experience with the macro level of institutional strategic concerns. The focus on our three foundational theories was due to the complimentary properties of each theory in explaining the various aspects of this digital ecosystem [22]. To choose the relevant theory, Socio-Technical Systems (STS) Theory was explicitly selected because technology and social arrangements are reciprocally constituted, making it a good theory to understand the institutional culture in relation to technology for all immersive platforms. The pedagogical face was anchored by choosing the phrase, "Experiential Learning Theory (ELT).," because the core of the Metaverse is built on the principles of immersive and embodied experience, learning by doing, experimenting, and reflecting.

Last, Dynamic Capabilities Theory (DCT) was added to address both the nature and the strategic gap in the existing literature, providing a structured view of the ways in which universities need to continuously sense and adapt to radical technological change. A set of specific constructs were identified through the intersection of these three theories and about the operational dimensions of higher education for inclusion in our proposed framework. The "Technological System" and "Social System" constructs are direct outgrowths of STL and represent the minimal need for socio-technical alignment. We then applied Kolb's experiential cycles to the construct "Learning Processes" that takes into consideration the constructivist dynamics that is present within a virtual environment. Finally, the institutional need for adaptation led to the concept of "Dynamic Capabilities," which is defined as a bundle of skills

and behavior made up of sensing, seizing, and transforming, and can be seen as the ultimate driver of whether immersive efforts can be responsibly scaled. These elements are brought together in this framework, which illustrates the entire causal chain from initial affordances of technology to real-world learning outcomes and institutional success.

5.2. Framework Overview

The suggested conceptual model provides a multi-layered perspective of the concept of the Metaverse-enabled higher education, which entails a combination of the technological perspective, pedagogical perspective, and institutional perspective. The level of input entails transforming the virtual and augmented reality using the work of Metaverse technologies to form immersive spaces facilitating socio-technical alignment between infrastructural and human qualities [1]. This correspondence enables the experiential and constructivist modes of learning that are made by immersion, presence, and engagement [5,9]. Other mediating variables that were incorporated in the model are student engagement, faculty readiness, and the perceived usefulness that impact learning outcomes, including effectiveness, skill development, and retention. Notably, in terms of institutional dynamic capabilities, sensing, seizing, and transforming serve as a general effect and determine the adoption and scalability of Metaverse-based education [10,23].

5.3. Novelty of the Proposed Framework

The learning potential of the Metaverse is vital dimension for scholarly attention; the current concepts in the literature focus mainly on isolated aspects of immersive learning, such as on the technical aspects, users' acceptance, VR uptake, or pedagogical impacts. Research on immersive environments and their educational consequences typically focuses on either the technological features of immersive environments or the educational outcomes of virtual learning, rather than developing a comprehensive understanding of how both technological and educational aspects correspond to institutional strategy and organizational readiness to adopt them. Thus, there is a limited applicability of the current literature in the form of an institutional empowerment framework, as it offers valuable bit-wise insights about Metaverse in Higher Education [24].

The vision presented here aims at overcoming this limitation by synthesizing three complementary theories: namely, Socio-Technical Systems Theory, Experiential Learning Theory and Dynamic Capabilities Theory, under one conceptual framework. In contrast to the existing frameworks that focus mainly on technology adaptation or students' behavior, the current one is a socio-technical framework involving the interaction between technological infrastructure, human interaction, pedagogical processes, and institutional capabilities, all reinforcing each other in the context of a higher education institution supported by the Metaverse. This synergy allows for an examination of micro-level learning experiences, meso-level educational processes and macro-level institutional transformation in the same breath [25,26].

The other unique facet of the framework is the incorporation of socio-technical alignment as the integrating mechanism that connects Metaverse technologies and educational outcomes. The framework suggests that the effectiveness of education is based on alignment between the technological systems and the social systems, such as faculty readiness, instructional design, and engagement or collaboration of learners in the learning process. In addition, Dynamic Capabilities Theory takes a step beyond pedagogical factors as it focuses more on the institutional capabilities needed to sense

technological opportunities, strategically seize them, and continuously transform institutional processes to maintain innovation.

Therefore, as shown in **Table 1**, the proposed framework is based on a more comprehensive approach by offering a model that embraces the technological, pedagogical, organizational, and strategic aspects of Metaverse integration. This multi-level paradigm enhances the theoretical explanations of the concept of an immersive learning ecosystem and offers a practical framework for universities aiming to implement, manage, and expand their educational initiatives in the Metaverse. The framework, which establishes a novel and previously untethered continuities in the flow of literature, provides a more robust basis for ongoing empirical studies and institutional decision-making in the digitally transformed higher education sector.

Table 1. Comparison of Existing Conceptual Models and the Proposed Framework

Dimension	Existing Metaverse Frameworks	Proposed Framework
Primary Focus	Technology adoption, VR applications, learner experience	Integrated socio-technical educational ecosystem
Theoretical Foundation	Single-theory or technology-oriented perspectives	Integration of STS, Experiential Learning Theory, and Dynamic Capabilities Theory
Level of Analysis	Primarily student or technology level	Micro (student), meso (faculty/pedagogy), and macro (institution)
Institutional Strategy	Limited consideration	Dynamic capabilities embedded as a strategic layer
Learning Perspective	Technology-supported learning	Experiential, constructivist, and immersive learning
Key Integrating Mechanism	Technology adoption or usability	Socio-technical alignment
Outcome Focus	User acceptance and learning performance	Learning effectiveness, skill development, knowledge retention, and institutional transformation
Contribution	Explains isolated aspects of Metaverse adoption	Provides a holistic conceptual framework integrating technology, pedagogy, and institutional strategy

6. Discussion

6.1. Theoretical Contributions

This is presented in **Figure 1** below, which is a part of the growing literature emphasizing the significance of the metaverse in education, which is built on a multi-theoretical foundation based on Socio-Technical Systems Theory, Experience Learning Theory and Dynamic Capabilities Theory. The literature cited in the paper tends to take either a technological or a pedagogical perspective on the subject, which are only studied by a part of the studies devoted to technological or pedagogical issues as such. The paper follows literature that typically focuses on a technological or pedagogical issue but also encompasses those perspectives [3]. They improve theoretical learning by linking the micro processes of experiential learning to the large macro processes of institutionally supported learning, which allows a comprehensive record of the immersive technologies used and the influence on learning. Furthermore,

it can contribute to enriching the socio-technical narrative and to embedding digital learning environments in the context of the "immersive ecosystem," where the interconnectivity and mutual adjustment between technology and the ways humans interact with it become stark.

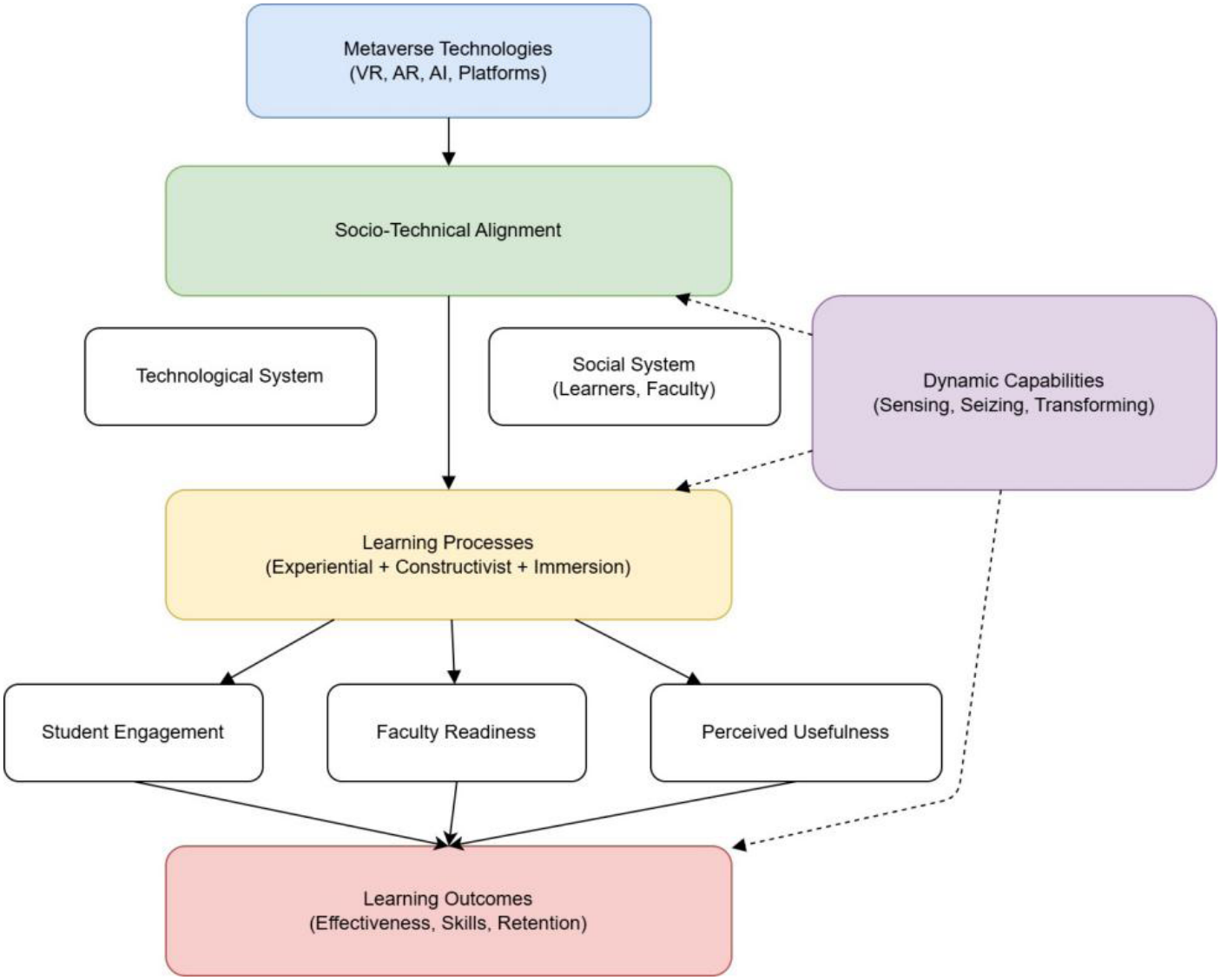

Figure 1. Framework (Authors' Own)

6.2. Managerial / Institutional Implications

The results of this research have implications for Institutions of Higher Education considering implementing the use of the learning environment in this Metaverse. It is important for the institution to develop dynamic capabilities to help the institution "sense" the emerging technological opportunities, understand them through strategic investments and adapt the organization processes, to keep innovation. This necessitates integration of technology infrastructure, faculty capability as well as institutional vision. Also, scalable digital solutions are expected to be invested in by the universities, alongside inculcating a culture of innovation to encourage immersive learning programs. Long-term institutional competitiveness and education values of the Metaverse will become a major enabler from the viewpoint of the governance of the system, the distribution of the resources or the creation of

policy frames [13].

6.3. Pedagogical Implications

Pedagogically, it's not just about adapting a traditional content-based approach for introducing Metaverse, but about transforming it into an experiential approach and an experience driven content-based approach. The emphasis is on active learning, simulation learning, and collaborative learning that facilitates the experiential learning theory and constructivism [14]. Faculty needs to also make a change in their instructional methods to effectively realize the affordances of this opportunity and implement interactive and problem-based pedagogies of learning. Furthermore, the importance of lifelong faculty learning contributes to improving Digital Pedagogy skills. Metaverse based education can tremendously enhance student performance and help change teaching in universities through enhanced interactions and contextual learning.

7. Implications for Future Research

7.1. Scope for Empirical Validation

The study, which is of a conceptual nature, is limited to providing theory and propositions that, in turn, are not empirically proven, but rather proposed for testing. Thus, further studies should focus on validating these pathways in some future empirical study. In particular, the hypothesized causal relationships between socio-technical alignment, experiential learning processes, mediating variables (for example, student engagement and faculty readiness) and final learning outcomes could be tested using quantitative research methods such as SEM. Moreover, qualitative or even "mixed methods" research would be extremely helpful to capture the complexities of the user experiences, institutional limitations, and cultural contexts that can affect Metaverse adoption [16]. Operationalizing the constructs in this framework can lead towards evidence-based practices, ultimately clarifying the way in which immersive learning environments can be implemented in a variety of higher education contexts.

7.2. Cross-Disciplinary Studies

Cross-disciplinary studies, particularly in management, engineering and health and social scientists, have great potential in Metaverse in Higher Education. However, the needs of the pedagogist and the needed technologies for the different disciplines are all different, hence, the need to compare them and their learning outcomes [7]. Studies can be conducted across disciplines, such as the use of simulations and computers in medical learning or prototyping in engineering. This type of research can also identify best practices and change in context, increasing the applicability and scalability of Metaverse based learning model in various academic fields [27].

7.3. Longitudinal Research Opportunities

Based on the student outcomes and institutional changes, longitudinal studies are expected to play an important role in its determination of long-term effects of Metaverse. Unlike short term assessments, Longitudinal research can provide answers to whether changes in engagement, skill building and knowledge retention over time occur [10]. Such studies also have the potential of investigating how institutions can be built and nurture dynamic capabilities to adjust to changing technology environments. The digital transformation of the higher education system will be even

better understood, with the help of follow-ups of groups of students and faculty over a longer period, as they will provide data on the efficacy, response pattern and potential barriers of immersive learning culture on a long-term perspective.

7.4. Measurement Scale Development

Reliable and valid Metaverse Enabled measures scales is a crucial means to improve empirical research in Management of Education so far. Further investigations ought to be based on operationalization of important constructs like immersion, presence, socio-technical alignment and experiential engagement. To ensure the construct reliability and validity, development procedures can be indicated/ implemented such as item development, pilot testing and factor analysis, which can be an appropriate validation [17]. Furthermore, adaptation of the current scales of acceptance of technology and learning studies might also be used to develop a basis for measurement. The adoption of measuring tools of high quality will ensure the capacity to compare and evaluate Metaverse-based learning in various contexts as a system.

8. Conclusion

This paper aims to be an addition to the discussions on the incorporation of the Metaverse in HE and to propose a multi-layered conceptual matrix inspired by Socio-Technical Systems Theory (STST), Experiential Learning Theory (ELT) and Dynamic Capabilities Theory (DCT). In a way that embraces the complexity of the socio-technical nature of the Metaverse in this study, the potential of immersive technologies is proposed to be manifested in experience and constructivist learning modality if accompanied by appropriate institutional strategies. The suggested structure suggests the dialectical relationship between the effective use of technology and the strategic balance and synergy between technological standards and social interaction and an organization flexible approach. It is not the objective of this research to draw any definite empirical conclusions, nevertheless it does suggest an important concept of how dynamic capabilities can facilitate a university's ability to sense, seize and transform in the fast-paced digital landscape. To conclude, the perspective herein presented can fill the gap between theory, pedagogy and strategic management, as well as create a training session for new empirical research of immersive learning ecosystems.

Authors Contributions: Conceptualization, literature review, AK; methodology, theoretical framework development, supervision, critical review and editing of the manuscript, validation, data curation, initial manuscript drafting, and visualization, GB; literature review, conceptual refinement, manuscript review, editing, and administrative support, AV. All authors contributed to the interpretation of the literature, reviewed and approved the final version of the manuscript, and agreed to be accountable for all aspects of the work.

Funding: This research received no external funding.

Conflicts of interest: The authors declare no conflicts of interest.

References

1. Dionisio JDN, Burns WG III, Gilbert R. 3D virtual worlds and the metaverse: Current status and future possibilities. ACM Computing Surveys. 2013,45(3):34. http://doi.org/10.1145/2480741.2480751
2. Mystakidis S. Metaverse. Encyclopedia. 2022,2(1):486–497. http://doi.org/10.3390/encyclopedia2010031
3. Dwivedi YK, Hughes L, Baabdullah AM, et al. Metaverse beyond the hype: Multidisciplinary perspectives on emerging

challenges, opportunities, and agenda for research, practice and policy. International Journal of Information Management. 2022,66:102542. http://doi.org/10.1016/j.ijinfomgt.2022.102542

4. Slater M, Wilbur S. A framework for immersive virtual environments (FIVE): Speculations on the role of presence in virtual environments. Presence: Teleoperators and Virtual Environments. 1997,6(6):603–616. http://doi.org/10.1162/pres.1997.6.6.603
5. Makransky G, Petersen GB. The Cognitive Affective Model of Immersive Learning (CAMIL): A theoretical research-based model of learning in immersive virtual reality. Educational Psychology Review. 2021,33(3):937–958. http://doi.org/10.1007/s10648-020-09586-2
6. Garrison DR, Kanuka H. Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*. 2004,7(2):95–105. http://doi.org/10.1016/j.iheduc.2004.02.001
7. Radianti J, Majchrzak TA, Fromm J, et al. A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. Computers & Education. 2020,147:103778. http://doi.org/10.1016/j.compedu.2019.103778
8. Bostrom RP, Heinen JS. MIS problems and failures: A socio-technical perspective. Part I: The causes. MIS Quarterly. 1977,1(3):17–32. http://doi.org/10.2307/248710
9. Kolb DA. *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice-Hall; 1984
10. Teece DJ. Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal. 2007,28(13):1319–1350. http://doi.org/10.1002/smj.640
11. Trist EL, Bamforth KW. Some social and psychological consequences of the longwall method of coal-getting: An examination of the psychological situation and defences of a work group in relation to the social structure and technological content of the work system. *Human Relations.* 1951,4(1):3–38. http://doi.org/10.1177/001872675100400101
12. Baptista J, Stein MK, Klein S, et al. Digital work and organisational transformation: Emergent digital/human work configurations in modern organisations. Journal of Strategic Information Systems. 2020,29(2):101618. http://doi.org/10.1016/j.jsis.2020.101618
13. Benner MJ, Tushman ML. Exploitation, exploration, and process management: The productivity dilemma revisited. Academy of Management Review. 2003,28(2):238–256. http://doi.org/10.5465/AMR.2003.9416096
14. Vygotsky LS. *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press; 1978
15. Piaget J. *Science of Education and the Psychology of the Child*. New York: Orion Press; 1970
16. Shankar V, Smith AK, Rangaswamy A. Customer satisfaction and loyalty in online and offline environments. International Journal of Research in Marketing. 2003,20(2):153–175. http://doi.org/10.1016/S0167-8116(03)00016-8
17. Churchill GA Jr. A paradigm for developing better measures of marketing constructs. Journal of Marketing Research. 1979,16(1):64–73. http://doi.org/10.1177/002224377901600110
18. Stracke CM, Bothe P, Adler S, et al. Immersive virtual reality in higher education: A systematic review of the scientific literature. Virtual Reality. 2025,29(2):64. http://doi.org/10.1007/s10055-025-01136-x
19. Sripan T, Jeerapattanatorn P. Metaverse-based learning: A comprehensive review of current trends, challenges, and future implications. Contemporary Educational Technology. 2025,17(3):ep584. http://doi.org/10.30935/cedtech/16434
20. Nguyen A, Huynh L, Dang B, et al. Conceptualizing and enhancing metaverse literacy for education. Education and Information Technologies. 2025,30:17133–17153. http://doi.org/10.1007/s10639-025-13486-9
21. Huang JE, Chang LW, Chin HH. 5G Metaverse in education. Mobile Networks and Applications. 2024,29:947–960. http://doi.org/10.1007/s11036-024-02354-4
22. De Felice F, Petrillo A, Iovine G, et al. How does the Metaverse shape education? A systematic literature review. Applied Sciences. 2023,13(9):5682. http://doi.org/10.3390/app13095682
23. Ortega-Rodriguez PJ. From broad reality to the Metaverse: Critical reflection on the contribution of education. Metaverse. 2021,2(2). https://doi.org/10.54517/met.v2i2.1784
24. Gualano RJ, Campbell SW. Classrooms in the Metaverse: Educational applications and levels of learner interaction in virtual reality. Communication Education. 2024,73(2):212–225. http://doi.org/10.1080/03634523.2024.2312873
25. Bobko T, Corsette M, Wang M, et al. Exploring the possibilities of Edu-Metaverse: A new 3-D ecosystem model

for innovative learning. IEEE Transactions on Learning Technologies. 2024,17:1290–1301. http://doi.org/10.1109/TLT.2024.3364908

26. Castillo FLV, Reyna ACP, Huaraca CRP, et al. Contribution of Artificial Intelligence to the development of Metaverses: A bibliometric review study on its impact on immersive learning in higher education. International Journal of Learning, Teaching and Educational Research. 2024,23(12):322–341. http://doi.org/10.26803/ijlter.23.12.17
27. Lee LH, Braud T, Zhou P, et al. All one needs to know about metaverse: A complete survey on technological singularity, virtual ecosystem, and research agenda. Journal of Latex Class Files. 2021. Available from: https://arxiv.org/abs/2110.05352