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RESEARCH PAPER

Unlocking the Metaverse Potential: Evaluation of Public and Private Higher Educational Institutions in Pakistan on adoption to Futuristic Technologies

[1]Zakra Ahmad*,[2]Samana Batool and [3]Architect Omer Shujat Bhatti

1. MS Management Student, Dr Hasan Murad School of Management, UMT Lahore, Punjab, Pakistan
2. MS Management Student, Dr Hasan Murad School of Management, UMT Lahore, Punjab, Pakistan
3. Assistant Professor, Dept. of Architecture, School of Architecture & Planning, UMT Lahore, Punjab, Pakistan

*Corresponding Author	zakraahmad10@gmail.com

ABSTRACT

Metaverse is considered as a modern day virtual reality based technology which has the capability to transform the world through virtual universe creation with limitless possibilities for learning, training, education, business and many more. However its adaptability and integration is yet a big question with respect to Pakistan as a developing world country with lack of high-end technological systems deployment and poor research & development prioritization. The current research aims to explore how far the public as well as private educational universities in the context of second largest city of Pakistan i.e. Lahore are responding to its integration in educational endeavors. Major aspects included in research were understanding of the Metaverse, the potential applications of Metaverse in higher education, the transformation of learning and teaching approaches, and the opportunities for career and professional development as well its challenges. Qualitative approach was used through on-site face to face semi-structured interviews with relevant officials from four universities with focus on Metaverse adaptation in future with diversified thematic analysis. Results showed positive attitude towards adoption with defined and undefined challenges as well as higher need for training, deployment and resource dedication. It was recommended that proper trainings, avenue development, deployment projects and prior research & development be ensured for future transformative adoption to Metaverse.

KEYWORDS Adoption, Awareness, Educational Institutions, Integration, Metaverse, Preparedness

Introduction

A virtual environment known as Metaverse has been unveiled, functioning in conjunction with the real world (Narin, 2021). The term "Metaverse" was initially used in the 1992 science fiction book "Snow Crash." Verse indicates the globe or entire universe in harmony, while Meta denotes the virtual and transcendent (Kim, 2021). The term "Metaverse" was first used to refer to the virtual world, but as it gained popularity and became more relevant in the post-pandemic age, its definition evolved to include the virtual world that links the online and offline worlds. A network of virtual spaces called Metaverse allows us to have an immersive online experience (Contreras, González, Fernández, Cepa, & Escobar, 2022). Users of this virtual world will be represented by avatars, who may communicate with one another virtually. Avatars are created by users

that can communicate with one another, take the place of a real person, and create virtual environments that mimic human cooperation. In the future, the Metaverse will be the hub of online social interaction. The goal of the Metaverse is to create a digital environment that will enhance social interaction and resemble actual contact (Lee & Hwang, 2022).

People born after 1995, or members of Generation Z, are the main users of Metaverse. These people differ from those of previous generations in certain ways (Mughal et al., 2022). 2019 saw a pandemic, and businesses all across the world had to adjust to remote working (Yenduri et al., 2023). They began working remotely with their staff members. Tools for remote collaboration, like Zoom and Slack, are used by people all around the world (Prakash etal., 2023). These resources aid workers to implement the switch to remote work (Chamorro-Atalaya et al., 2023).

The term "Metaverse" is not entirely novel. Although it has changed since the 2000s, the advancement has been gradual up to 2019 (Chan, Bogdanovic, &Kalivarapu, 2022). A worrying scenario for learners and the future of their education was brought about by the outbreak of the worldwide pandemic and the introduction of COVID-19 (Park, Ahn, & Lee, 2023). People everywhere are reflecting on how they teach and learn. Higher education is seen to benefit greatly from the digital transformation of education as it helps these academic institutions to tackle the difficulties of the knowledge-driven digital transformation of society in the twenty-first century (Shu&Gu, 2023). "The Metaverse" started introducing IT-related teaching and learning methodologies into the classroom. One of Metaverse's benefits is that it can be accessed from a variety of platforms, including desktop computers, tablets, and smart phones (Onggirawan, Kho, Kartiwa, Anderies, &Gunawan, 2022). In the wake of the a pandemic digital learning and technology innovation have been emphasized in the classroom. The topic of Metaverse in education is gaining a lot of interest. Thus, the most popular methods of instruction and learning in the Metaverse include inquiry-based learning, mobile learning, blended learning, and student-oriented learning (Salloum et al., 2023).

Technological innovation, according to Metaverse, will change student-teacher interactions while expanding, improving, and accelerating up educational processes. In 3D online virtual classrooms, teachers control the virtual locations and design e-content that is unique to courses (Muthuprasad, Aiswarya, Aditya, &Jha, 2021). Because students participate as co-owners of virtual spaces and co-creators of individualized educational programs, the educational Metaverse can offer blended, rich, direct, and transformative learning possibilities. Instructors and students can collaborate to create and evaluate meta-content when AR and VR are used to improve teaching-learning (Sá&Serpa, 2023). They may engage in self-directed study and develop genuine sentiments for utilizing cutting-edge techniques thanks to the educational Metaverse(Kaddoura& Al Husseiny, 2023).

However still due to lack of adaptation, technology availability and challenges of existing system re-configuration raises major concerns towards this technology integration into the existing educational system of Pakistan based institutions and universities.

Literature Review

The use of technology in education has advanced significantly in recent years. Similar to the COVID-19 epidemic, academic institutions and universities moved to online platforms and employed various techniques including Zoom, Google Meet Up, and YouTube broadcasting (Roy et al., 2023). Additionally, the study reveals the positive attitudes toward online learning during the epidemic (Rahman, Shitol, Islam, Iftekhar, &Saha, 2023). The idea of the Metaverse—which is characterized as the confluence of

virtual and physical reality—has drawn interest from all around the world in recent years. It is now anticipated that the concept of the Metaverse will change how we live and learn (Wang & Shin, 2022).

The social, cultural, and economic activities of the whole Metaverse are also moving to the new platform. A research found that student performance is positively impacted by the Metaverse(Hwang &Chien, 2022). Additionally, it was discovered that the Metaverse platform enhanced their understanding of difficult concepts and was visually appealing and engaging. It is also found that academic achievement was the criterion that most strongly suggested an improvement in university education as a consequence of the implementation of the Metaverse, more so than student connection and communication or enjoyment with studying in the Metaverse(Limniou, Varga-Atkins, Hands, &Elshamaa, 2021). The idea of the Metaverse has already been examined using various viewpoints or models. The study's findings demonstrate that, in comparison to traditional teaching methods, a Smart Education Model made possible by the Edu-Metaverse significantly enhances student learning outcomes (Tlili et al., 2022).

By allowing educators to explore environments that were previously unattainable due to financial, temporal, or spatial limitations, the Metaverse can help solve issues pertaining to virtual worlds that arise in the real world (Bhavana&Vijayalakshmi, 2022). Conversely, more support and encouragement must be given to its usage in educational institutions, and platform training must be provided with the help of higher education instructors, teaching, learning centers, and other relevant organizations. Inadequate technology, a lack of technological expertise, and restricted internet connection are barriers to the implementation of Metaverse-based teaching (Sarıtaş&Topraklıkoğlu, 2022). Adopting Metaverse technology also brings up valid questions about security, the privacy of data, and the moral implications of virtual settings (Kumar et al., 2023).

Recent COVID19 pandemic raised limitation and transformed them into challenges for educational activities to be carried on (Bhatti &Huma, 2023). Smart lockdown and social distancing based phenomena lead to transformation of the existing social system into a complex limited physical accessible based space with higher dependency on technology integration for academic, educational and professional working (Bhatti &Ghufran, 2020). Same was also applicable to healthcare and allied domains. Pakistan is no exception and being a developing country, the challenges were multifold with addition of social, religious and socio-economic decline aspects (Bhatti et al., 2023). With shifting to online teaching and professional practices, it was evident that these modern day technologies would act as a savior in these unforeseen conditions across Pakistan and overall on the globe as well (Bhatti et al., 2024).

Every new technology will, nonetheless, have shortcomings that may be researched and fixed in the future. Research on the Metaverse in Pakistani education revealed that pupils in secondary and upper secondary schools knew a lot about it and thought learning in the Metaverse would be better than regular classroom instruction (Díaz, Saldaña, & Avila, 2020). On the other hand, it also became clear that educators in secondary and upper secondary schools, university professors in education departments, M.Phil. holders, and PhD holders needed to be informed about the Metaverse and its use in the classroom (Kye, Han, Kim, Park, & Jo, 2021). These avenues must be taken as an opportunity towards future enhancement of the system through integrative processes using project management skillset to promote manageable targets and scope be defined and later setting strategies and actions plan to meet them (Shah et al., 2023). Another study conducted at public and private institutions revealed favorable opinions among instructors and students regarding

the use of the UTAUT paradigm to teach and learn in the educational Metaverse (López-Belmonte, Pozo-Sánchez, Moreno-Guerrero, &Lampropoulos, 2023).

Previous studies explore the Metaverse from different perspectives, like awareness and acceptance on the level of students and teachers, and some strengthen their study by using different models. Despite the growing interest in Metaverse technologies, limited research has focused specifically on the readiness of Pakistani educational institutions. Further investigations are also needed to explore cultural and contextual factors that influence adopting and integrating the Metaverse potential and usefulness in the existing educational settings in Pakistan.

Material and Methods

For this research exploration, a qualitative methodology (Clarke & Braun, 2013)was selected to gain in-depth knowledge about Pakistan's education sector's readiness for the Metaverse. Semi-structured interviews were conducted to explore the current state of preparedness, challenges, and potential benefits associated with integrating the Metaverse into educational settings.

The respondents/participants were mainly subject domain experts with higher ranks in the selected four universities i.e. two in public sector and two in private sector. Respondents comprised of four functional heads / subject domain leads from renowned universities in Pakistan. Before the interviews, the researchers obtained consent from the participants via email, explaining the purpose and aim of the study. Appointments were scheduled either at their workplaces or through online meetings.

Each participant's responses were recorded during the interviews, and detailed notes were taken to assist in transcription. To ensure confidentiality, no identifying information about the participating universities was included in the research exploration. Thematic analysis was employed to analyze the interview data, identifying primary themes and sub-themes. This analysis aimed to understand the main topics discussed in the interviews and the connections between these themes.

Results and Discussion

Table 01
Metaverse Respondents Data

Metaverse Semi-structured interview questions			Private Sector		Public Sector	
S. No	**Theme**	**Sub-Themes**	**Participant A**	**Participant B**	**Participant C**	**Participant D**
1	Understanding of the Metaverse	Definition and Concept of the Metaverse	Yes	Yes	Yes	Yes
2		Components and Characteristics of the Metaverse	Yes	-	-	-
3		Virtual Reality and Augmented Reality Technologies	-	-	Yes	-
4		Interactivity and Immersion in the Metaverse	Yes	-	Yes	Yes
5	Potential Applications in Higher Education	Enhancing Student Engagement and Learning Experiences	Yes	Yes	Yes	Yes
6		Simulations and Virtual Laboratories	Yes	-	-	Yes
7		Collaborative and Interactive Learning Environments	Yes	Yes	Yes	Yes
8		Virtual Conferences and Remote Presentations	Yes	Yes	Yes	-

9		Access to Global Educational Resources	Yes	Yes	Yes	Yes
10	Transformation of Learning and Teaching	Virtual Learning Environments	Yes	Yes	Yes	Yes
11		Redesigning Teaching and Learning Approaches	Yes	-	-	-
12		Assessment and Evaluation of Metaverse-Based Learning	Yes	-	-	Yes
13		Immersive and Experiential Learning	Yes	-	-	-
14	Staff Readiness and Training	Less Familiarity and Comfort with Metaverse Technologies	Yes	Yes	Yes	Yes
15		Skills and Competencies for Effective Integration	-	-	-	Yes
16		Resistance to Change and Staff Buy-in	Yes	-	-	Yes
17	Other Challenges and Concerns	Resource Allocation and Investment	Yes	Yes	Yes	Yes
18		A team of Experts	Yes	-	-	-
19		Technological Infrastructure and Resources	Yes	-	-	Yes

As shown above, the respondents from four different institutions with prospective potential for Metaverse adaptation was explored. The details with respect to each aspect shown above is discussed below:

Understanding of the Metaverse Technology

All Participants understand the Metaverse, with various perspectives on its definition and concept. One described it as a virtual reality space where users can interact with digital environments and other users. It was also observed that one participant from the private sector has in-depth knowledge of its characteristics, spatial computing, Components, Gadgets and Method of Functioning.

Potential Applications in Higher Education

All participants in the study expressed a positive attitude towards using the Metaverse in higher education. Furthermore, it acknowledged the Metaverse's potential to enhance student engagement, transform learning experiences, and create interactive virtual environments for simulations, laboratories, and hands-on learning. They highlighted the collaborative nature of the Metaverse, enabling seamless collaboration, project work, and real-time discussions among students and educators regardless of physical distance. Additionally, participants recognized the Metaverse's ability to host virtual conferences, deliver remote presentations, and connect with experts, providing increased accessibility and reducing the need for travel. They also emphasized the potential for accessing global educational resources and fostering international collaborations in the Metaverse.

Transformation of Learning and Teaching

In this study, all participants believed that the Metaverse could potentially transform the educational environment and will certainly impact their institutions. They emphasized that to remain competitive globally, their institutions must adopt this new approach. In the same frame, a representative from the private sector emphasized the potential of the Metaverse to create immersive virtual learning environments that surpass traditional classroom settings. This implies a significant shift in teaching and learning approaches. Additionally, the representative highlighted the need to revise patterns of assessment and evaluation in this new context. However, they also emphasized the challenges associated with these changes, emphasizing that transitioning to a virtual reality-based learning environment will not be easy. According to them, the anticipated

difficulties and complexities during the transition to a virtual reality-based learning environment are expected to surpass imagination.

Staff Readiness and Training

Under this theme, Participants emphasized the importance of staff readiness and training for successful Metaverse integration. As a sub-theme, familiarity and comfort with Metaverse technologies was identified as an important factor during the study. Participants acknowledged the need for individuals, including Faculty and staff, to become familiar with and comfortable using Metaverse technologies. The study highlighted the significance of skills and competencies as another sub-theme for effectively integrating Metaverse technologies. They emphasized that Faculty and staff must possess the necessary skills and competencies to successfully utilize Metaverse technologies in educational settings successfully. These skills may include technical proficiency in operating virtual reality tools, familiarity with virtual collaboration platforms, knowledge of instructional design principles for immersive learning experiences, and the ability to facilitate engaging and interactive virtual learning environments. They also recognized that acquiring and developing these skills and competencies is crucial for leveraging the full potential of Metaverse technologies in educational contexts.

On the other hand, this study revealed the presence of resistance to change and the importance of staff buy-in when integrating Metaverse technologies. Participants recognized that introducing new technologies and transitioning to a virtual learning environment can encounter resistance from staff and Faculty members. This resistance may stem from concerns about the unfamiliarity of Metaverse technologies, the need for additional training, or a reluctance to depart from traditional teaching methods. Participants emphasized the need for strategies to overcome resistance, such as providing clear communication, addressing concerns, offering training and support, and demonstrating the benefits of Metaverse integration. They acknowledged that obtaining staff buy-in and addressing resistance is critical for successfully implementing and adopting Metaverse technologies in educational institutions.

Allied Challenges and Concerns

Technological infrastructure and resources were identified as sub-theme and found as essential components for integrating Metaverse technologies in educational institutions. This refers to the hardware, software, networking capabilities, and digital infrastructure required to support the implementation and operation of Metaverse platforms and applications(Salloum et al., 2023).

Resource allocation and investment refer to the distribution of financial and non-financial resources to support the integration of Metaverse technologies in educational institutions. This includes allocating funds, personnel, equipment, infrastructure, and other necessary resources to implement and sustain Metaverse technologies in the learning environment effectively.

Financial resources are required to procure the necessary hardware and software, invest in infrastructure upgrades, provide training and professional development opportunities, and cover ongoing maintenance and support costs. Non-financial resources may include dedicated staff members or teams responsible for overseeing the implementation, training, and ongoing support for Metaverse technologies.

In the context of integrating Metaverse technologies in public institutions, there is a need for financial support to address the expenses related to the technical infrastructure and other associated costs. While the government plays a significant role in providing financial assistance to public institutions, additional support from investors, such as NGO`S (presumably referring to organizations or individuals involved in developing geospatial technologies), can be valuable. Ultimately, the combined financial support from the government and investors like n-geos can alleviate the financial burden on public institutions, enabling them to effectively implement and leverage the potential of Metaverse technologies in their educational programs.

Conclusions

The findings suggest that while there is a generally positive attitude towards the Metaverse's potential benefits, institutions are hesitant to be the first movers in adopting these technologies. This hesitation may stem from various factors, including concerns about the unfamiliarity of the Metaverse, the need for training and support, and the perceived risks and challenges associated with implementation.

To overcome these challenges, educational institutions should prioritize the development of a robust technological infrastructure, provide comprehensive training and support for staff, and adapt pedagogical approaches to incorporate the Metaverse into the curriculum effectively. Ensure accessibility for all students, and allocate necessary resources for sustained implementation.

By addressing these challenges proactively, educational institutions can harness the potential of the Metaverse to enhance teaching and learning experiences, foster collaboration, and prepare students for the digital future.

Recommendations

Following were the major recommendations from the research exploration:

1. **Impact of Metaverse technologies on student learning outcomes**: Further research can delve into assessing the direct impact of Metaverse technologies on student learning outcomes. This entails evaluating the academic performance, engagement levels, and retention rates of students exposed to Metaverse-based learning environments compared to those who experience traditional methods.

2. **Ethical implications**: It is crucial to address the ethical implications and challenges associated with their implementation in educational institutions. Future studies can investigate aspects such as data privacy, security concerns, and ensuring equitable access to Metaverse technologies among students.

3. **Comparative analysis**: Moreover, future research can focus on conducting a comparative analysis to assess the readiness towards the Metaverse among different regions or types of educational institutions within Pakistan. This comparative analysis can provide valuable insights into regional disparities and variations in adopting and integrating Metaverse technologies.

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