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Metaverse adoption, Management education, Student perceptions

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Exploring Management Students' Initial Perceptions of Metaverse Technology: A Pilot Study in Tier II cities of India

Abstract
The aim of this study is to understand the initial perception of the metaverse technology in the MBA students of Agra-Mathura region. The research uses quantitative analysis to explore factors affecting students' readiness to learn in the metaverse in management education. The study shows a significant relationship between intentions to adopt and positive beliefs about the metaverse benefits, as well as previous digital experience, with both factors accounting for 61.1% of the variance in behaviour. Interestingly, familiarity with metaverse concepts and concerns about privacy are related to intentions, but are not significant when accounting for other factors. The study suggests a strategy for the tier-2 Management Colleges which focuses on making the business applications real, giving step-by-step real-time experiences and establishing partnership between the Management Colleges for resource sharing. These learnings help in understanding that, despite infrastructure constraints and student digital literacy, immersive technologies can be integrated into emerging educational hubs to help achieve their objectives.

1. INTRODUCTION

With the development of the metaverse technology, the management education landscape has entered into a new dimension and has acquired a special significance for educational institutions like business schools in developing hubs like the Agra-Mathura region. Considering the initial perceptions and reactions of MBA students is important when adopting metaverse-based learning, as they will affect the efficacy of the teaching and learning process towards the purpose of modernizing the teaching techniques. As López-Belmonte et al. (2023) explain, this shift in technology is a shift in how education content can be developed and experienced.

Agra-Mathura has witnessed a rapid growth in management education schools over the last decade, with many of them offering MBA degrees to students. Our pilot study will focus on 100 MBA students from this region to record their initial encounters and expectations of metaverse technology in their educational path. Initial students' impression is highly crucial for achieving successful technology integration in higher education environment as mentioned by Hwang and Chien (2022).

Management studies include virtual corporate environments forming a unique space to Metaverse. Previously, students would have to read about or watch films of corporate scenarios, but now they may engage with diverse avatars in virtual boardrooms, assess markets in simulated environments and attend international business meetings as avatars. The opportunities may change the established approaches of teaching and learning about management, especially in those places where interaction with international business has been limited.

But there are special hurdles in bringing metaverse technology to the Agra-Mathura region. However, Lin et al. (2022) state that success in adoption depends on important success elements such as technology infrastructure, student preparation and institutional capacity. Some pupils may be from semi-urban or rural locations where there might be less utilization of more advanced digital technology. Students' skills are quite varied in terms of internet access, gadgets and overall digital literacy skills.

The emphasis on MBA students is deliberate as they are a particular group of students that require an equal emphasis on academic development and professional abilities. Kye et al. (2021) identify 4 types of metaverse interactions that will enhance management education: Augmented Reality (contextualizing business scenarios), Lifelogging (capturing experience), Mirror Worlds (simulating markets), and Virtual Reality (creating immersive business environments).

The management institutions of the region, already forced by the COVID-19 epidemic to use digital learning tools, are an ideal opportunity to study the deeper integration of technology. The pandemic has accelerated the need for virtual-physical mixed learning environments, according to Wang et al. (2022). Students have been able to study online and grasp what it means, how it works, its advantages and limitations, which will assist them to make an informed appraisal of the prospects of metaverse-based education.

Social interaction is an important part of management education and the metaverse offers interesting possibilities in this area. Capatina et al. (2023) discuss how students can network and interact with other students and professionals around the world and participate in virtual internships and develop cross-cultural communication skills without having to leave their country. The question is whether these virtual interactions are useful as a substitute or addition to the normal process of business networking and relationship building.

The pilot study will be employed to gain an initial insight into the willingness, expectations and concerns regarding the use of the metaverse in management education among 100 MBA students. Garcia et al. (2023) stress the significance of incorporating the user perspective when designing effective virtual learning environments. This will help us understand the obstacles and opportunities that may exist in tier-2 city institutions when deploying this technology, as it is focused on a specific region and program.

We also examine cultural and regional disparities in users' perception of metaverse technology with our research. The importance of local context and cultural elements throughout the procedure of technology adoption is stressed by Teng et al. (2022). "To inform the development of localized implementation strategies that are not culturally insensitive but leverage the global connectivity metaverse offers.

The insights obtained from the pilot research will be included into the current debate about the use of technology for democratization of quality management education. If effective, as suggested by Onu, Pradhan and Mbohwa (2023), the metaverse would be able to impact the education of future business managers from tier-2 cities. The research findings are relevant to institutions wishing to include metaverse technology into their management education program.

2. Literature Review

The field of education is showing enormous promise to become a breakthrough technology, especially in management education. It uses Virtual Reality, Augmented Reality and Artificial Intelligence to deliver immersive learning experiences. The application of metaverse in management education has been widely researched throughout the world but confined to the first impact on MBA students of Agra-Mathura. This literature review attempts to synthesize the findings of past studies to capture the students' perceptions, opportunities, and barriers in the management education and metaverse field.

The metaverse is a brand-new approach to do learning. It allows the students to take part in practice, in simulations, in group activities, and in online cases examples (López-Belmonte et al., 2023). The metaverse is composed of four

main aspects: augmented reality, lifelogging, mirror worlds, and virtual reality (VR) (Kye et al., 2021). They are utilized for dynamic and engaging learning environment which can be used as alternative to classroom environments. Research indicates that the metaverse offers more immersive learning experiences resulting in improved cognitive learning and student engagement (Rahman et al., 2023).

The research identified user experience, simplicity of usage, and benefits as some of the major elements affecting students' initial opinion of the metaverse. Wang and Shin (2022) show that students like metaverse learning for its immersive experience, but have difficulty navigating complicated virtual environments. Likewise, Bhavana and Vijayalakshmi (2022) found that the use of AI-enabled metaverse tools in higher education is useful in enhancing student motivation and engagement, particularly in case-based learning and business simulations.

The metaverse can be used in management education to allow students to participate in business decision-making simulations so that they can develop their practical skills needed in real-world business situations (Prakash et al., 2023). However, the initial experience of students with the metaverse is also observed to vary based on their online literacy and institutional assistance. The students in Agra and Mathura still have no exposure to digital technology and the initial impression of the management institutes could be decided by how successfully the institution has inculcated metaverse in its curriculum.

The metaverse is a space that can be useful for MBA students in many ways, including:

1. Better Learning Experience: The literature suggests that learning in the metaverse can improve student engagement, retention, and collaboration (Lee & Hwang, 2022).
2. Experiential Learning: Virtual simulations and business environments allow students to make decisions in a safe space (Mourtzis et al., 2023).
3. Global Connectivity: The metaverse allows for global collaboration and hence connecting with students and professionals globally (Tlili et al., 2022).
4. Individualized Learning Paths: AI-based metaverses can tailor the learning experience to the individual's needs (Capatina et al., 2023).

However, there are some problems and barriers in the smooth integration of metaverse into management education, despite its several advantages:

1. Technological barriers the expensive cost of VR headsets and AR devices limits the accessibility of the technologies (Prakash et al., 2023).
2. Technological literacy issues: Digital technologies are new and many pupils are not familiar with them, so they have a steep learning curve (Ramanatha, 2022).
3. Infrastructure Limitations: There are many institutes in Agra and Mathura that lack sufficient IT infrastructure to support metaverse adoption (Gupta, 2023).
4. Privacy and security concern: There are likely to be privacy and security concern of students and instructors (Dahan et al., 2022).

Understanding the initial perception of the metaverse among students at tier 2 management institutions is important as these colleges may face certain special problems in implementing new technology. While tier 2 schools could find it challenging to implement metaverse-based learning, premier institutions with access to more funds and digital infrastructure will find it easy to implement it. Studying students' first impressions can help educators and policymakers to develop specific strategies to close the digital divide, increase access to technology and the learning opportunities associated with it, and ensure students learn the benefits of the immersive learning experience. Moreover, the analysis of first impressions can serve to identify potential resistances and areas for improvement for the seamless application of metaverse technology in management education.

3. Research Objectives

Primary Objective

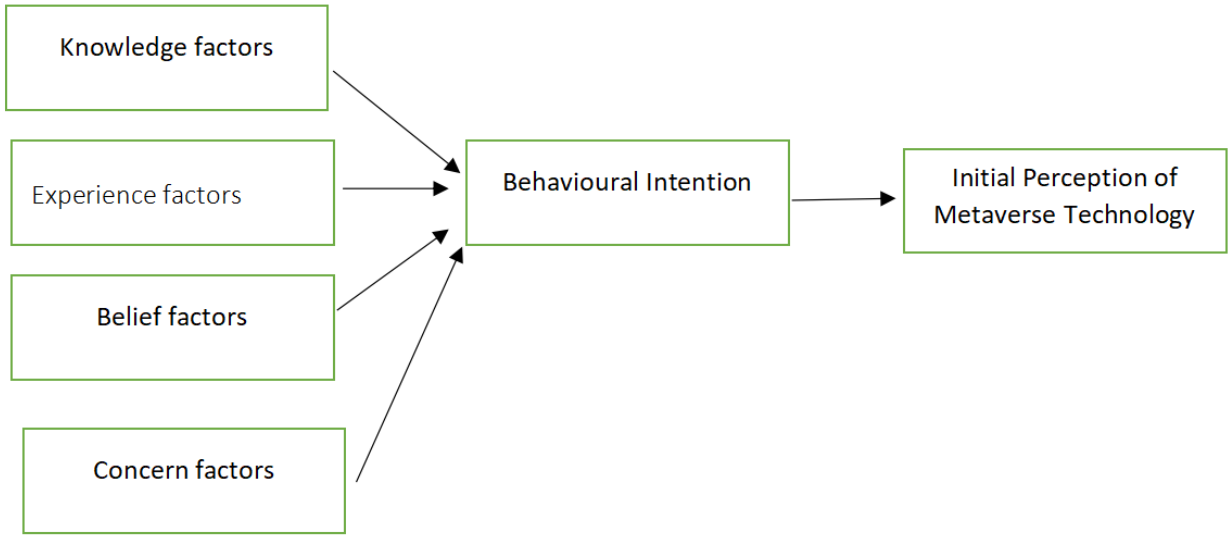
1. To examine the initial perceptions, readiness, and expectations of MBA students towards metaverse-based learning in management education.

Secondary Objectives

1. To analyse thechallenges associated with implementing metaverse-based education in emerging educational hubs.
2. To identify key strategies for effective integration of metaverse technology in management education tailored to tier-2 city institutions.

4. Conceptual Model

The conceptual framework of this study is based on the interaction between various factors influencing MBA students' initial perceptions of metaverse technology in management education. The framework incorporates independent variables (IVs), a dependent variable (DV) to analyse the relationships within the study.



5. Hypothesis Development

Key construct 1: Knowledge & Perceived Usefulness

H1: Higher knowledge of metaverse technology has a positive effect on perceived usefulness of metaverse-based learning.

Key Construct 2: Experience & Readiness

H2: MBA students' readiness to embrace metaverse-based learning is positively shaped by their prior exposure to digital technologies.

Key Construct 3: Beliefs & Attitudes

H3: Positive beliefs about the possible advantages of the metaverse in management education are positively associated with a positive attitude towards the adoption of the metaverse.

Key construct 4: Concerns & Adoption

H4: There is a negative relationship between privacy, security, and ethical implications concerns and MBA students' intention to adopt metaverse-based learning

6. Research Design

This study used a quantitative research design with a structured questionnaire to explore MBA students' perceptions, knowledge and attitude towards metaverse technology. The research used a cross-sectional approach of collecting data at a point in time.

Sample and Sampling Technique Population: MBA students of different institutions in Agra-Mathura region Sample Size: 100 Respondents Sampling Method: Purposive sampling with emphasis on currently enrolled MBA students.

Geographical Coverage: Educational Institutions in Agra and Mathura Regions

Data Collection Tool

The study uses a structured questionnaire with multiple sections.All items (except demographics) are measured using a

5-point Likert scale where: 1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

Statistical Analysis Framework

The study used descriptive and inferential statistical techniques for the analysis of data collected from 100 MBA students of Agra-Mathura region. Descriptive statistics were used to calculate means and medians to gain insight into central tendencies and frequency distributions to investigate response patterns across the 5-point Likert scale items. Pearson correlation coefficients were used to examine relationships among variables. Then, regression analysis was used to predict behavioral intentions towards metaverse adoption with knowledge, experience, beliefs and concerns as independent variables.

7.Data Analysis& Interpretation

Descriptive Statistics

Central Tendency: The median score for most questions is 4.0 on a 5-point scale, indicating that responses were positive across the board. This means that: 1. Respondents are confident in their digital skills and aware of new trends.3. Participants are open to experimenting and learning about metaverse platforms.

Variability: The standard deviations range from around 0.87 to 1.36, indicating a moderate level of variability in responses:

The statement "I have attended seminars or workshops on metaverse technologies" has the highest variability (SD = 1.36), indicating respondents have varying degrees of exposure.2. "The metaverse will have a significant role in the future of business operations" has the lowest variability (SD = 0.87) indicating there is more agreement about this statement.

Results Descriptive Analysis

1. Digital Skills Respondents report being proficient in utilizing digital devices (median = 4.0, SD = 0.99), representing a tech-savvy group.
2. Awareness of the Metaverse: Respondents are moderately to highly aware of the concept of the Metaverse (Median = 4.0, SD = 1.09), but there is more variation in their ability to explain it (SD = 1.15).
3. Future Impact: There is a high level of agreement about the significant role of the metaverse in future business operations (M=4.0, SD=0.87).

4. Educational Use: The respondents are willing to use the metaverse as a medium of learning (median = 4.0, SD = 1.02) but not very confident that it is more effective than the traditional classroom (median = 4.0, SD = 1.04).
5. Concerns Respondents are very concerned about privacy (median = 4.0, SD = 0.92) and ethical implications (median = 4.0, SD = 0.95
6. Exposure: Real metaverse technologies are experienced less often and more diversely in courses (median = 3.0, SD = 1.20) or workshops (median = 3.0, SD = 1.36).

Correlation Analysis

Correlation Matrix

		EF	CF	KF	BF	BI
EF	Pearson's r	—				
	df	—				
	p-value	—				
CF	Pearson's r	0.559	—			
	df	91	—			
	p-value	< .001	—			
KF	Pearson's r	0.486	0.568	—		
	df	91	91	—		
	p-value	< .001	< .001	—		
BF	Pearson's r	0.411	0.644	0.516	—	
	df	91	91	91	—	
	p-value	< .001	< .001	< .001	—	
BI	Pearson's r	0.580	0.617	0.559	0.699	—
	df	91	91	91	91	—
	p-value	< .001	< .001	< .001	< .001	—

The correlation matrix shows significant relationships between all variables at $p < .001$:
1.Strongest correlations with Behavioural Intentions (BI):

- Belief Factors (BF): r = 0.699 (strongest)
- Concern Factors (CF): r = 0.617
- Experience Factors (EF): r = 0.580
- Knowledge Factors (KF): r = 0.559

2. Other notable correlations:

- CF and BF: r = 0.644
- CF and KF: r = 0.568
- KF and BF: r = 0.516
- EF and KF: r = 0.486
- EF and BF: r = 0.411

All correlations are positive, and moderate to strong, suggesting interrelations between all factors. The strongest correlation is between Belief Factors and Behavioural Intentions, which indicates that positive beliefs about metaverse technology have the strongest relationship with intention to adopt.

Regression Analysis

Model Fit Measures		
Model	R	R^2
1	0.782	0.611

Model Coefficients – BI				
Predictor	Estimate	SE	t	p
Intercept	0.7184	0.2873	2.500	0.014
EF	0.2509	0.0758	3.310	0.001
CF	0.0904	0.0973	0.929	0.356
KF	0.1029	0.0638	1.613	0.110
BF	0.4247	0.0833	5.096	< .001

The regression model is predicting Behavioral Intentions (BI) based on all four factors:
The fit of the model was R = 0.782 and R^2 = 0.611.
This means that the model accounts for 61.1% of the variance of Behavioral Intentions. This is a sizeable amount.

Important predictors:

- Belief Factors (BF): β=.4247, p<.001 (strongest predictor)
- Experience Factors (EF): β = 0.2509, p = 0.001.

Non-significant predictors

- Knowledge Factors (KF) β = 0.1029 p = 0.110
- Concern Factors (CF): β = 0.0904, p = 0.356

Evaluation of Hypotheses

1. H1 (Knowledge & Perceived Usefulness):- KF is significantly correlated with BI (r = 0.559), but not a significant predictor in the regression model (p = 0.110)

- Thus, knowledge alone is not a strong predictor of adoption intentions when other factors are taken into consideration.
- Results of the regression do not support H1

2. H2 (Experience & Preparedness) - - EF is positively associated with BI (r=0.580)

- EF is a significant predictor in the regression model (β = 0.2509, p = 0.001)- H2 is supported: Digital technology experience has a positive impact on the readiness to adopt.

3. H3 (Beliefs & Attitudes):- BF has the highest correlation with BI (r = 0.699)
BF was the strongest predictor in the regression model (β = 0.4247, p < .001)

- H3 is strongly supported: positive beliefs about metaverse benefits are the most important predictor of adoption intentions

4. H4 (Problems & Adoption):- Interestingly, CF has positive correlation with BI (r = 0.617), not negative as hypothesized

- CF was not a significant predictor in the regression model (p = 0.356)
- H4 not supported: concerns do not significantly predict adoption intentions considering other factors.

8.Findings

1. The model explains 61.1% of the variance in MBA students' behavioural intentions toward metaverse adoption.
2. Belief factors are the strongest predictor of behavioural intentions, suggesting that positive perceptions about metaverse benefits in business and education strongly drive adoption intentions.
3. Experience with digital technologies is also a significant predictor, indicating that digital literacy and prior exposure facilitate metaverse adoption intentions.
4. Knowledge of metaverse concepts and concerns about privacy/ethics, while correlated with intentions, do not significantly predict adoption when controlling for beliefs and experience.
5. The positive correlation between concerns and intentions contradicts H4, suggesting that awareness of concerns might accompany greater interest in metaverse technologies rather than deterring adoption.

These findings suggest that to increase metaverse adoption among MBA students, educational institutions should focus primarily on building positive beliefs about metaverse benefits and providing hands-on experience with digital technologies, rather than merely increasing knowledge, or addressing concerns.

9. Strategic Framework for Metaverse Adoption in Tier 2 Management College

The positive perceptions of metaverse technology was the strongest predictor for the adoption intentions and consequently Tier 2 management colleges should focus on establishing positive beliefs about metaverse technology. Institutions should generate tangible business use cases, build case repositories with a focus on career benefits, and position metaverse talents as a unique selling proposition for the job market. Colleges should also try to establish gradual, meaningful experiences with the technology by rolling it out in phases, starting with rudimentary AR applications and graduating to immersive surroundings. The second largest predictor was experience, thus having technology familiarization labs and changing group tasks to include virtual collaboration tools will assist create digital confidence. Colleges don't have the finances, but can seek to consortium arrangements with other universities, partnerships with industry for co-funding and cloud-based solutions to cut hardware investments. Faculty development is still relevant, but the focus is on pedagogical application, not technological sophistication. Metaverse knowledge building should be contextual, using existing courses with metaverse concepts injected, rather than isolated technical modules. Finally, while the concerns were not strong negative predictors, institutions should nonetheless be concerned with privacy and cost issues and address them transparently with ethical frameworks and opt-in ways to establish confidence. The belief-based experience-building technique is the most promising one for successful integration into management education in the metaverse.

10. Conclusion

The present study provides important pragmatic implications about the MBA students' initial perspective, readiness and behavioural intents towards metaverse-based learning in Agra-Mathura region which is a growing educational hub in India. As immersive technologies are becoming more relevant in higher education, especially in the management disciplines, it is important to understand how students perceive these advances in an effort to ensure their effective implementation. The results suggest that the most important predictors of students' propensity to adopt this technology are students' perceptions of the probable advantages of the metaverse and their prior familiarity with digital technologies. In contrast, understanding of metaverse concepts and privacy or ethics issues were connected with the intent to adopt, but not significant variables in the regression model.

Importantly, the positive relationship between concerns and desire to adopt reflects a more complex student perspective, where being aware of obstacles does not necessarily decrease enthusiasm about new technology, but could be reflective of a more intelligent, informed, and involved approach to learning. The findings also contradict the notion of concerns being hurdles, highlighting the significance of transparency, ethical integration, and digital readiness.

The report proposes a belief-centric and experience-based strategic framework for tier2 institutions to bridge the digital gap. The main phases will be: emphasize practical applicability of the metaverse, incremental hands-on exposure, and collaborative industrial relationships. And as students and professors alike become more digitally confident, and as tools of the metaverse are included in current educational institutions, technology may be certain of becoming a vehicle to democratize excellent management education, rather than entrench existing gaps.

In a world where management education is adapting to the requirements of a more and more virtualized business environment, this study underlines the relevance of local context, student-centered design, and inclusive implementation perspectives. Future research could extend this pilot to longitudinal outcomes, institutional preparation and comparative studies in diverse geographic and socio-economic settings, thereby adding to the discourse on immersive education technologies in emerging economies.

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