Attitude and behavioral intention for using metaverse in education: learner’s perspective

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Abstract

Purpose – This study aims to understand and analyze the aspects influencing students' attitudes and behavior toward the use of metaverse in education. The metaverse is currently viewed as technology with immense prospects. However, the practice of the metaverse for educational motives is rarely deliberated.

Design/methodology/approach – To assess the effect of the metaverse on students' knowledge and use of resources, general interests and attitudes toward the metaverse in education, a survey was conducted. The collected data were analyzed using a confirmatory factor analysis (CFA) in the first phase to address the various validity parameters. In the second phase, path analysis of the model was performed using structural equation modeling (SEM).

Findings – The study investigated how students intended to behave while using the metaverse for learning. The attitude toward adopting metaverse as technology is influenced by perceived utility and simplicity of use. This leads to behavioral intention as well. Studies reveal that the aspect of perceived usefulness is considered to be more significant in assessing the intention of use.

Research limitations/implications – This quantitative study contributes to the literature on metaverse, which is in the growing stage. In the educational sector, the existing studies are scarce; hence, the addition to the literature on metaverse is quite significant in the education domain.

Practical implications – The study benefits the students and the academicians because metaverse is largely considered an integral part of technology platforms, which has to be included in the learning systems eventually. There are few courses where the use of metaverse is already initiated at an introductory level, thus opening a broad spectrum of opportunities at all levels. It can provide scholars access to a massive array of resources, including multimedia presentations, interactive objects that support the delivery of lessons, videos, images and audio recordings.

Originality/value – This study adds to the existing literature by examining the impact of metaverse in education. The research focused on the students pursuing higher education who were mostly aware of metaverse and were open to the idea of learning and understanding through technology inclusion.

Keywords Metaverse, Education, Artificial intelligence, Teaching and learning, Augmented reality, Virtual reality

Paper type Research paper

1. Introduction

Researchers and computer scientists are driven to quickly create virtual worlds by the phenomenal consumer technology adoption rate and greater connection. Digital games such as Fortnite, Minecraft, Roblox and World of Warcraft are helping online users connect to simulated virtual settings more often (Barry et al., 2015). For illustration, according to Statista’s 2022 report, the game business Roblox had more than 54.1m daily active users. In order to enhance their gaming experiences, people frequently use virtual reality (VR) and augmented reality (AR) technologies (Almarzouqi et al., 2022). To express their identity in the

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virtual world, new players of these games are anticipated to build electronic identities known as avatars (Díaz, 2020; Park and Kim, 2022).

Many academic scholars and professionals working for computer behemoths like Facebook (Meta), Google and Microsoft are developing a plethora of virtual universes they refer to as the metaverse (Dwivedi et al., 2022). For educators, the virtual world (VW) is a veritable Pandora’s box (Riley and Stacy, 2008). The use of the metaverse technology in education is known as “Edu-Metaverse.” Researchers have used the metaverse in an educational setting using a problem-based approach, allowing teachers and students to present a problem and explore potential solutions in the made-up world using 3D classes and avatars (Barry et al., 2009, p. 6066; Farjami et al., 2011), emphasizing it as a crucial aspect of immersive learning in the coming time. Metaverse’s customized user experience and interactive elements make it so effective that researchers capitalize on these two elements in the context of teaching and learning (Ng et al., 2022).

However, there is a “false name” situation when using the metaverse technology in education. For instance, the demands of user groups and the product software significantly differ while developing the education application platform. Only seven of the 80,000 educational application platforms were available for download through the mobile app store, and the user approval rating for free platforms was much lower, claimed the Brookings Institution of the United States in a policy statement. The foundation of user behavior and satisfaction is the willingness to utilize the product or the service (Lee et al., 2011). Exploring the user intent-influencing aspects of the application platform would thus assist in addressing the supply and demand gap for educational technologies and integrating users into the metaverse education ecosystem. There have been earlier discussions about studies on users’ desire to adopt application platforms for educational technologies, e-learning (Nayak et al., 2022), mobile learning (Lisana, 2022), learning management systems (Al-Nuaimi and Al-Emran, 2021), AR/VR technology and social media services (Al-Rahmi et al., 2021). The research findings based on the influencing factors of other educational technology users’ willingness to use technology, however, do not apply to the field of the metaverse educational technology due to differences in technical equipment, educational content, educational purpose, technical support, application fields and user groups (Lin et al., 2022). Therefore, the characteristics influencing users’ propensity to use the platform for the metaverse education application have particular study value.

The current study aims to develop a model considering two crucial elements: student attitude and individual behavior intention to use metaverse in learning. The attitude component is influenced by several things, such as user satisfaction, perceived ease of use, perceived usefulness and personal innovativeness. This study seeks to ascertain how user satisfaction, perceived usefulness and perceived ease of use influence the adoption of the metaverse system and impact individual behavior. With an emphasis on perceived usefulness, perceived ease of use, personal Innovativeness and user satisfaction, the goal is to construct a relationship between users’ attitudes and adopting the metaverse system. The current study attempts to bridge this gap by creating and testing a conceptual model that focuses on key aspects of students’ views of the metaverse system.

2. Literature review
2.1 Metaverse role in education
Neal Stephenson’s dystopian cyberpunk novel Snow Crash from 1992 is frequently linked to the concept of a “metaverse” (Stephenson, 1992). The term was more recently made famous by Earnest Cline’s novel Ready Player One. The term “metaverse” is used to describe a new paradigm that will succeed in the post-Internet age. In addition, it is described as “a 3-dimensional (3D) virtual space where social and economic activities like those in the real world
are used” or “a new world and digitized earth contained in digital media such as smartphones, computers, and the Internet that cannot be limited to the virtual world” (Petrakou, 2010).

Through process simplification and automation, ICT has aided in operational cost reduction and transaction speed increases. Academically, it has made possible a plethora of different possibilities, ranging from learning management systems to student information systems, and from student affairs to academic affairs, in addition to online, hybrid and technology-assisted learning (Sengupta and Blessinger, 2022). Research on the metaverse began in developed nations early; nations such as the United States, Germany and India have created reasonably advanced information technology relevant to the metaverse (Zhou, 2022). Oshima (2012) explained how robots can serve as intelligent mentors in smart education. Educators using games to advance student understanding and perception were observed when the HAG drug game was developed to support the learning process of the students of pharmacology (Rohmawaty et al., 2022).

Mustafa (2022) explored the educational applicability of metaverse-based education and carefully examined its perceptions and educational requirements. The importance of augmented reality (AR) was studied by MacCallum and Parsons (2019), who noted that to build a mobile augmented reality experience in a classroom setting, the research concentrated on leveraging MS technologies, particularly AR, among educators. It was explicitly stated that metaverse-based classes would be more productive and efficient in class types (Mustafa, 2022). There is a shared belief that metaverse and motivation are closely related due to metaverse’s efficacy in several sectors. The metaverse platform has a favorable impact on the motivation of educators and students alike. It is a very popular form of communication that satisfies both parties’ expectations (Jeon and Jung, 2021).

According to Lin et al. (2022), the metaverse has a favorable impact on education in seven different ways, including enhancing learning efficiency, breaking down resource constraints and lowering costs and hazards associated with education. The benefits of the metaverse in terms of usability, engagement, immersion and interest in educational applications were confirmed by Lee et al. (2022). The key components that make the metaverse effective are individualized interactions and experiences (Chang et al., 2022). In maker education, metaverse is used along with blockchain technology. It helps the students integrate with multiple social media tools. They could register their digital work as non-fungible tokens (NFT), which could be exhibited later in the metaverse (Hwang, 2023).

Few studies have focused on learners’ perceptions of using the metaverse in education. Almarzouqi et al. (2022) assessed the students’ opinions on the uses of the metaverse in medical instruction. The study concluded that user satisfaction is essential in predicting users’ intent to utilize the metaverse. A recent study (Hwang et al., 2023) sought to investigate how students with varying degrees of learning motivation conceptualized the metaverse in higher education through the use of the draw-a-picture analysis technique, which allows students to freely express their ideas through both text and drawings, supporting the continuous engagement and involvement of the students. However, these studies mainly were for specific fields like medical or level, that is, elementary school. Learning motivation is crucial here when the learners are continuously engaged in a new technology-enhanced environment (Arpaci and Bahari, 2023).

There needs to be more research to understand learners’ attitudes and behavioral intentions to use metaverse in education for general undergraduate and graduate level students. To bridge the gap, it is crucial to carry out research that enables students to share their opinions about utilizing the metaverse in higher education from a variety of viewpoints.

### 2.2 Extended technology acceptance model (TAM)

With the continued growth of the depth and scope of the metaverse application, the study of the variables that influence usage intention has gained interest. Davis et al. (1989) initially put...
up TAM as a way to investigate users’ acceptance of technologies. Teng et al. (2022) employed SEM analysis to research the factors influencing students’ acceptance of the educational metaverse platform based on the expanded UTAUT model. In addition, many elements, such as the TAM’s proposed variables, should be looked into when determining if learners are satisfied with the metaverse system (Chau, 1996, 2001).

Therefore, the extended TAM model was employed to study the current research issue concerning students’ perceptions and willingness. The perceived playfulness (PPLF), perceived ease of use (PEOU), perceived usefulness (PUSF), attitude toward use (ATT), behavioral intention (BI) to use and actual usage make up the expanded TAM model. For the current study, we have added variables, personal innovativeness (PI) and user satisfaction (UI) which seems critical while studying the perception of learners (who are Generation Z here) toward the metaverse.

It can be summarized that the literature highlights that components of metaverse are AR, VR and AI. Also, the applications of metaverse have been explored in multiple domains. Researchers state that metaverse-based education applicability and its future scope are still unexplored, which are huge. Few domains and institutes have initiated experimental courses using gamification and innovative case study methods, teleporting and avatar-based models. Research shows that the outcome of metaverse-based education is increased motivation in trainers and learners. There is still a considerable gap in understanding and adopting metaverse by students and learners, which needs to be explored further.

2.3 Theoretical framework and hypothesis

The most significant variable explaining people’s usage patterns in this situation is the decision to employ the research variable (Assaker, 2020).

When users use a system, the system’s usability is a critical factor in identifying the user’s purpose (Davis, 1989). The favorable assessment resulting from using technology is called transaction-specific or experience satisfaction. While transaction-specific pleasure has been suggested as an antecedent to overall satisfaction (Jones and Suh, 2000; Olsen and Johnson, 2003), cumulative or interchangeable contentment is the favorable appraisal that results from overall satisfaction with the technology. The following hypothesis is proposed:

H1. The higher the user’s satisfaction is, the more positive attitude is to use the metaverse system.

Students of all ages favor distinctive technology designed with simple features and functionalities. In order to understand how perceived usefulness and simplicity of use affect acceptance of the metaverse system and personal innovation, this study will look into the elements that affect its uptake in education. The strong association between personal innovativeness and perceived ease of use supports the premise that students will readily employ novel technology if it is simple and easy for them to acclimate to (Taylor and Todd, 1995; Venkatesh et al., 2000).

H2. The higher the perceived ease of use is, the more positive attitude is toward the use of the metaverse system.

H3. The higher perceived usefulness is, the more positive attitude is toward the use of the metaverse system.

It is asserted that variables of personal innovativeness, which may be viewed as an instance of the risk-taking tendency arising from employing new technology, have the most influence on an individual’s cognitive interpretations of information technology (Rogers, 2003).

H4. The higher the personal Innovativeness is, the more positive attitude is toward the use of the metaverse system.
A user’s acceptance or rejection of technology is referred to as attitude toward technology use (Ajzen and Fishbein, 1977). Positive or negative attitudes toward engaging in active use are considered to be intentions. The most important factor impacting active service is intention because it precedes behavior, according to social psychologists. A person’s behavioral intention is a gauge of how much effort they are prepared to put out to carry out a behavior (Cheon et al., 2012).

**H5.** The higher the positive attitude is, the higher the behavioral intention to use the metaverse system.

Based on the aforementioned research studies, the model proposed for this study is the extended TAM model as shown in Figure 1. The model predicts that, when these elements are considered, a user will interact with new technology that is valued, helpful and easy to use with a favorable attitude, increasing their intention to utilize that technology.

### 3. Research methodology

The proposed model in the previous section is to be tested empirically, and hence, the research method adopted is quantitative through a survey-based method. The study is conducted from the students’ perspective; therefore, the respondents were students from higher educational institutes in a western city of India. The students were taken from both the postgraduate level and undergraduate level of their education degree. The duration of the data collection was from March 2023 to May 2023. The stratified random sampling method was adopted for data collection. The groups were divided into UG and PG, and the data were collected from both strata. The responses were collected using an electronic form distributed through e-mails and other social media channels to the respondents. A total of 508 filled forms were received and included in the data analysis. The demographic information is presented in Table 1.

### 3.1 Survey instrument

To test the hypotheses, the data are collected through a self-designed questionnaire. The questionnaire (survey instrument) was designed taking into consideration similar previous studies, and the questions were modified as per this study (Agarwal and Prasad, 1998; Amoroso and Ogawa, 2013; Bennett and Bennett, 2003; Simanjuntak and Purba, 2020; Shih, 2011; Teo et al., 2008, etc.). The pilot study was conducted for 35 respondents, and a few modifications were made to the survey instrument (see Appendix). The Likert’s five-point agreement scale (1: strongly disagree to 5: strongly agree) was used in the questionnaire. In the survey instrument, some demographic questions were also included.

![Figure 1. Proposed model](source(s): Author’s own work)
3.2 Data analysis

The proposed model was tested using structural equation modeling (SEM), which allows developing the complex path models and is a set of various regression analyses that can be applied simultaneously to dependent and independent variables (Saris and Stronkhorst, 1984).

4. Results

The collected data were analyzed using the software AMOS 22.0 in two phases. In the first phase, a confirmatory factor analysis (CFA) was performed to address the various validity parameters. The CFA results were used to measure model fitness and construct reliability through convergent and discriminant validity. In the second phase, path analysis of the model was performed using SEM.

Model fitness is demonstrated through fit indices (Hair et al., 2010). Researchers have used chi-square/degree of freedom (CMIN/DF), comparative fit index (CFI) and Tucker–Lewis index (TLI) for the goodness of fit, and root mean square error of approximation (RMSEA) for the badness of fit as shown in Table 2. It can be seen that all the obtained values are in the suggested range, and hence the model is fit for conducting the further steps.

The validity aspects addressed the values obtained from CFA (Figure 2, Tables 3 and 4).

(1) Content validity: A rigorous literature review was conducted for the model development, and the advice of two subject matter experts was taken while designing the questionnaire to ensure content validity.

(2) Reliability: The reliability of the survey instrument was tested using the test of Cronbach’s alpha. The acceptable value should be more than 0.8 (Fornell and Larcker, 1981). The value obtained for all 24 items of the questionnaire was 0.83, which indicates the good internal consistency of the scales used.

(3) Convergent validity: It is measured through (1) composite reliability (CR) whose values should be more than 0.7 (Jöreskog, 1971), which are obtained for all constructs,

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational level</td>
<td>Undergraduate</td>
<td>312</td>
<td>61.41</td>
</tr>
<tr>
<td></td>
<td>Postgraduate</td>
<td>196</td>
<td>38.58</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>271</td>
<td>53.34</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>237</td>
<td>46.65</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Number of years using the Internet</td>
<td>5–10 years</td>
<td>181</td>
<td>35.62</td>
</tr>
<tr>
<td></td>
<td>2–4 years</td>
<td>304</td>
<td>59.84</td>
</tr>
<tr>
<td></td>
<td>0–1 years</td>
<td>23</td>
<td>4.52</td>
</tr>
</tbody>
</table>

**Table 1.** Demographics (N = 508)

**Source(s):** Author’s own work- Dr Sarika Sharma

<table>
<thead>
<tr>
<th>Index</th>
<th>Value obtained</th>
<th>Suggested range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMIN/DF (chi-squared)</td>
<td>1.662</td>
<td>Less than 3</td>
</tr>
<tr>
<td>CFI</td>
<td>0.912</td>
<td>More than 0.9</td>
</tr>
<tr>
<td>TLI</td>
<td>0.897</td>
<td>More than 0.9</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.088</td>
<td>Less than 0.1</td>
</tr>
</tbody>
</table>

**Table 2.** Model fitness indices

**Source(s):** Author’s own work- Dr Sarika Sharma
(2) average variance explained (AVE), whose values should be above 0.5 (Hair et al., 2010), which are obtained for all constructs, and (3) CR should be more than AVE, which is achieved for all constructs.

(4) Discriminant validity: AVE should be greater than maximum shared variance (MSV).

The validity aspects are well addressed in the proposed model, and it can be stated that further analysis using SEM can be conducted.
4.1 Path analysis using structural equation modeling (SEM)

In the second phase of the analysis, SEM was carried out for the proposed model, which, according to Hair et al. (2020), is a series of regression analyses (Figure 3). The results obtained were used for the hypotheses testing. There were five hypotheses (H1–H5) proposed in the study. The testing is presented in Table 5.

From the table, it can be interpreted that user satisfaction, perceived usefulness and personal innovativeness positively and significantly affect a person’s attitude toward using metaverse. Further, it can be stated from the table that attitude impacts the behavioral intention to adopt the metaverse.

The hypotheses were tested through the SEM, and results can be interpreted for each hypothesis, which are discussed in the discussion session.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Items</th>
<th>IL</th>
<th>CR</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users' satisfaction (US)</td>
<td>US1</td>
<td>0.81</td>
<td>0.929</td>
<td>0.724</td>
</tr>
<tr>
<td></td>
<td>US2</td>
<td>0.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>US3</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>US4</td>
<td>0.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>US5</td>
<td>0.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived ease of use and complexity (PEOU)</td>
<td>PEOU1</td>
<td>0.80</td>
<td>0.849</td>
<td>0.653</td>
</tr>
<tr>
<td></td>
<td>PEOU2</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PEOU3</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived usefulness (PU)</td>
<td>PU1</td>
<td>0.82</td>
<td>0.942</td>
<td>0.729</td>
</tr>
<tr>
<td></td>
<td>PU2</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PU3</td>
<td>0.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PU4</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PU5</td>
<td>0.90</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>PU6</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal innovativeness (PI)</td>
<td>PI1</td>
<td>0.87</td>
<td>0.909</td>
<td>0.769</td>
</tr>
<tr>
<td></td>
<td>PI2</td>
<td>0.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PI3</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude towards using metaverse (AUM)</td>
<td>AUM1</td>
<td>0.98</td>
<td>0.921</td>
<td>0.797</td>
</tr>
<tr>
<td></td>
<td>AUM2</td>
<td>0.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AUM3</td>
<td>0.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioral intention to use metaverse (BI)</td>
<td>BI1</td>
<td>0.84</td>
<td>0.873</td>
<td>0.634</td>
</tr>
<tr>
<td></td>
<td>BI2</td>
<td>0.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BI3</td>
<td>0.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BI4</td>
<td>0.73</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Item loadings, composite reliability and average variance

Source(s): Author’s own work- Dr Ruby S. Chanda

<table>
<thead>
<tr>
<th>CR</th>
<th>AVE</th>
<th>MSV</th>
<th>MaxR(H)</th>
<th>BI</th>
<th>US</th>
<th>PEOU</th>
<th>PU</th>
<th>PI</th>
<th>Attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>BI</td>
<td>0.874</td>
<td>0.635</td>
<td>0.397</td>
<td>0.880</td>
<td>0.797</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US</td>
<td>0.929</td>
<td>0.724</td>
<td>0.500</td>
<td>0.946</td>
<td>0.630</td>
<td>0.851</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>PEOU</td>
<td>0.847</td>
<td>0.650</td>
<td>0.534</td>
<td>0.869</td>
<td>0.555</td>
<td>0.707</td>
<td>0.806</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU</td>
<td>0.907</td>
<td>0.653</td>
<td>0.534</td>
<td>0.938</td>
<td>0.596</td>
<td>0.656</td>
<td>0.731</td>
<td>0.795</td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td>0.912</td>
<td>0.776</td>
<td>0.645</td>
<td>0.913</td>
<td>0.521</td>
<td>0.593</td>
<td>0.408</td>
<td>0.512</td>
<td>0.881</td>
</tr>
<tr>
<td>Attitude</td>
<td>0.922</td>
<td>0.800</td>
<td>0.645</td>
<td>0.972</td>
<td>0.503</td>
<td>0.630</td>
<td>0.391</td>
<td>0.565</td>
<td>0.803</td>
</tr>
</tbody>
</table>

Table 4. Correlation matrix and roots of AVEs

Note(s): Off-diagonal values represent correlations among constructs
Source(s): Author’s own work- Dr Sarika Sharma
5. Discussion

The study investigated how students intended to behave when using the metaverse for learning. The attitude toward adopting metaverse as technology is influenced by perceived utility and simplicity of use. This leads to behavioral intention as well.

A study by Mustafa (2022) supports those classes where metaverse is used, which appears to be very effective in generating learner satisfaction. Therefore, supporting the hypotheses, H1 states that the higher the user’s satisfaction, the more positive the attitude toward using the metaverse system.

According to H2, the more favorable the attitude toward using the metaverse system, the more significant the perceived ease of usage is. However, this is not supported by the current study. This has also been reflected in the earlier literature (Bai et al., 2021; Sánchez-Prieto et al., 2017), wherein users are not much influenced by perceived ease of use once they are comfortable using the technology. Alternatively, according to Al-Emran et al. (2018), Scherer et al. (2019) and Teo (2019), the confidence and assurance of teachers for new technologies will have an impact on the way they evaluate the perceptions. In the case of perceived usefulness supporting H3, the higher the perceived usefulness is, the more positive the attitude is toward using the metaverse system.

Perceived usefulness has a very strong influence on purchase intention. Users are ready to use metaverse and are getting adapted to it. The user’s primary focus is on the usefulness of virtual reality. Perceived usefulness and perceived ease of use have a great amount of impact on developing a positive attitude toward using the technology.
As per an earlier study conducted by Dávideková et al. (2017) and Ifinedo et al. (2020), the teachers’ personal innovativeness in adding new technologies in the classrooms comprises e-learning tools and online classrooms. This has a high impact on their adoption of behavior. This supports H4, that higher the personal innovativeness, the more positive is the attitude toward using the metaverse system.

Once the attitude of the user is positive, their behavior intention toward adopting the technology in the classroom increases. This was reflected in the study conducted (Bai et al., 2021; Sánchez-Prieto et al., 2017), stating that instructors’ opinions on new technology, whether positive or negative, will affect their attitudes and adoption habits.

The field of teaching and learning has always undergone swift change and is ever-developing due to technology integration. Nevertheless, in some regions of the world, the adoption of technology, increased productivity and improved standards of education are lagging behind due to a very slow rate of change acceptance (Sengupta and Blessinger, 2022).

5.1 Implications

5.1.1 Theoretical implications. This quantitative study contributes to the literature on metaverse, which is in the growing stage. In the educational sector, the existing studies are scarce, hence the addition to the literature on metaverse.

The concept of the metaverse has gained tremendous significance in recent times, and the concept holds many theoretical implications through several domains. The concept of the metaverse is essentially a speculative idea; it holds the potential to restructure the basic understanding of aspects like technology, society and human experience in different ways such as social interaction and identity, economy and commerce, privacy and security, education and learning.

5.1.2 Practical implications. The study is beneficial for the students and the academicians because metaverse is largely considered an integral part of technology platforms, which has to be included in the learning systems eventually.

However, limited studies on the use of the metaverse in education and continued curiosity in this digital universe propose that scholars involved in education must actively participate in research on the learning metaverse. The consequences of this study will aid instructors and pupils in understanding how metaverse expertise has the potential to revolutionize education by giving both teachers and students rich and engaging virtual learning experiences. It can provide scholars access to a massive array of resources, including multimedia presentations, interactive objects that support the delivery of lessons, videos, images and audio recordings. This contributes to the learner-centric practice by enriching the learner’s experience.

6. Conclusion

With a significant presence in several eminent domains, the metaverse scope and significance in the education domain are worth understanding. More so, when students are already technologically advanced and are using metaverse in other aspects already, it becomes inevitable. Rendering to student feedback, the platform was immersive and interesting and improved their understanding of difficult ideas. Because students could communicate with classmates and teachers in real time, the platform also made it possible for more individualized learning experiences. According to the study’s findings overall, metaverse technology has the power to completely change how higher education is provided. It will offer fresh environments and training chances for students. The metaverse might be used to carry out a variety of training courses or goals that are not possible in the real world (Siyaev and Jo, 2021). The present study adds to the body of knowledge on the metaverse and the elements that influence people’s decisions to use it in education. From a theoretical perspective, this study advances the
knowledge of TAM in the education domain. This research reveals several new aspects of metaverse from a learner’s perspective and its potential in teaching and learning. The academicians also are essential stakeholders in practicing metaverse to connect with their students. Hence, teachers and learners are valuable customers for adapting and implementing metaverse technology in education and provide important insight for universities, IT professionals and researchers to frame their policies and competitive strategies.

7. Limitations and further directions
The current study is an exploratory quantitative study; the study results cannot be generalized across the regions or segments. Further studies could be qualitative to understand the students’ perception for a more accurate and comprehensive view and refined results. The research focused on higher education students who were primarily aware of metaverse. In contrast, teachers and university policies on technology adoption in the teaching-learning process will also be assessed if the same attitude and behavior intention persist. Finally, it did not focus on any specialized stream or region, which can be considered as different streams with varied applications of metaverse in the given region or level depending upon the nature of the course and its learners. So, more specific studies can be conducted to understand learners’ attitudes toward adaptability and the significance of metaverse.

Glossary
AI: The replication of human intellectual processes by machines, particularly computer systems, is known as artificial intelligence. Expert systems, natural language processing, speech recognition and machine vision are a few specific uses of AI

AR: An interactive experience called augmented reality adds computer-generated perceptual data to the physical environment. Augmented reality is the process of superimposing digital content – such as applications, software and hardware like AR glasses – onto actual locations and things

Perceived ease of use: The degree to which a person thinks utilizing a specific technology would be effortless is known as perceived ease of use

Perceived usefulness: It refers to an individual’s belief about the potential benefits of utilizing a specific technology

Personal innovativeness: The term “personal innovativeness” describes a person’s inclination and desire to investigate and study novel technologies and ideas

SEM: A broad range of techniques known as structural equation modeling (SEM) are employed by researchers in both experimental and observational research

User satisfaction: The extent to which a product or service satisfies a user’s requirements, expectations and preferences is known as user satisfaction. Numerous elements, including usability, usefulness, design, performance, support and value, might have an impact on it

VR: It is the computer-generated recreation of a three-dimensional scene or picture that a person may interact with using specialized electronic gear, including gloves with sensors or helmets with screens inside, in a way that appears genuine or tangible
References


Further reading

Han, H.C.S. (2020), “From visual culture in the immersive metaverse to visual cognition in education”, in Cognitive and Affective Perspectives on Immersive Technology in Education, IGI Global, pp. 67-84.


### Appendix

<table>
<thead>
<tr>
<th>Variable No.</th>
<th>Variables</th>
<th>Survey questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Users’ satisfaction (Simanjuntak and Purba, 2020)</td>
<td>I believe that MS has great value in educational settings. I believe that MS has many advantages in my daily lectures. I found MS useful after my trial. I will use MS, as it satisfies my expectations. I think MS will be difficult to use in certain circumstances.</td>
</tr>
<tr>
<td>2</td>
<td>Perceived ease of use and complexity (Bennett and Bennett, 2003)</td>
<td>I think MS is compatible with my study purposes. I think MS is useful for live lectures and forums. I think MS adds many advantages to my study.</td>
</tr>
<tr>
<td>3</td>
<td>Perceived usefulness (Doll et al., 1998; Rogers and Williams, 1983)</td>
<td>I think MS is useful for live lectures and forums. I think MS adds many advantages to my study. I think MS use can improve my knowledge exchange. Using an MS improves the quality of learning for me. Using an MS enhances my effectiveness in the session. Using MS would make my academic life more convenient.</td>
</tr>
<tr>
<td>4</td>
<td>Personal Innovativeness (Agarwal and Prasad, 1998)</td>
<td>I would like to try using MS before actual classes. I think I can use MS for different educational purposes since it’s easy. I believe I am ready to deal with new technology such as the MS.</td>
</tr>
<tr>
<td>5</td>
<td>Attitude toward using metaverse (Shih, 2011; Amoroso and Ogawa, 2013)</td>
<td>The idea of using metaverse to learn is appealing. Using the metaverse system for attending sessions and discussions, group activities and projects rather than from a physical class is a good idea. I feel positive conducting teaching and learning using the metaverse system.</td>
</tr>
<tr>
<td>6</td>
<td>Behavioral intention to use metaverse (Barclay et al., 1995; Teo et al., 2008)</td>
<td>I will definitely use MS in my education. I will use MS for various educational purposes. I intend to use the MS system frequently. I would like to refer my friends to use MS for their learning.</td>
</tr>
</tbody>
</table>

**Table A1.**

Survey instrument **Source(s):** Author’s own work-Dr Ruby S. Chanda
About the authors
Dr Ruby S. Chanda is an associate professor with Symbiosis Institute of Management Studies, Pune. She has a Ph.D. in customer relationship management. Her research areas are CRM, services marketing and brand management, and she has published around 35 research papers with high impact in national and international indexed journals. Ruby S. Chanda is the corresponding author and can be contacted at: ruby.chanda@sims.edu

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