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Exploring the orientation towards metaverse gaming: Contingent effects of VR tools usability, perceived behavioural control, subjective norms and age

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A B S T R A C T

The Gen-Z, who are deemed digital natives, have shown interest in the metaverse. The emergence of augmented reality (AR), virtual reality (VR), and mixed reality (XR) technologies in recent years has fuelled the increased interest in metaverse gaming. However, extant literature is yet to understand the individual orientations of these digital natives towards prime aspects of metaverse gaming and how it shapes one's attitude and, eventually, behavioural intentions for metaverse gaming. This study investigates the individual orientation towards social gaming, play for earn, flexibility gaming, and mixed reality as potential enablers for individuals' attitudes towards metaverse gaming. Using the well-established theory of planned behaviour (TPB), coupled with an extensive literature review, we explore the influence of attitude on behavioural intentions for metaverse gaming. The study also explores the contingent effects of VR tools' usability, subjective norms, perceived behavioural control, and age. We develop the measures for the used constructs through a literature review and pre-test before final data collection. Using an online questionnaire and purposive sampling, the study collected 308 and 256 complete responses from online gamers residing in South and East India, respectively, after fulfilling specific pre-decided filtering criteria. The findings of the study underscore the significant moderating effects of VR tools, subjective norms, perceived behavioural control, and age towards metaverse gaming. The findings highlight the far-reaching implications for policymakers and practitioners. Companies can leverage this mix of demography and technology for immersive experiences for new marketing, branding, and loyalty programs. Policymakers may underscore the cyber threats and prepare for regulatory and legal challenges.

Introduction

Digital natives are characterized by their involvement with new-age technology (Helsper & Eynon, 2010; Bennett et al., 2008). The emergence of augmented reality (AR), virtual reality (VR), and mixed reality (XR) technologies in recent years has fuelled the increased interest in metaverse gaming (Mystakidis, 2022). Companies plan to set up their customized virtual space and offer users different catered functionalities and experiences (Dwivedi et al., 2023). Mandal et al. (2024) suggest that Gen Zs obtain greater satisfaction from the metaverse usage. Metaverse came into light first in 1992 with the science fiction novel "Snow Crash" by Neal Stephenson, where he used "metaverse" to explain a computer-generated 3D universe that is experienced through goggles (Neal, 1992). Following this, the year 2003 saw the development of the first online virtual world - Second Life by Philip Rosedale and his team at Liden Lab (Bale et al., 2022; Mystakidis, 2022). The metaverse can extend one's presence beyond the physical world with the help of augmented and virtual reality technologies, enabling an individual to smoothly interact between real and simulated environments (Dwivedi et al., 2022). Furthermore, studies have found several games such as Second Life, Fortnite, Roblox, and Varchar as prominent enablers of the metaverse and offer certain critical insights into its different features (Dwivedi et al., 2022). Furthermore, Clement (2023) found that consumer spending on video game content in the US increased from 17.5 billion USD to 47.5 billion USD. As per one of the recent reports (Srivastava, 2023), approximately 52 % of US gamers believe that

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metaverse gaming is going to revolutionize online gaming, and the global metaverse market is expected to touch $1,527.55 billion by 2029 from $100.27 billion in 2022, at a CAGR of 47.6% (Srivastava, 2023).

Certainly, the phenomenon of metaverse is here to stay, and the same is reflected in the actions of many of the technology companies that are now busy developing their core metaverse and allied services. Bale et al. (2022) underlined several benefits the metaverse will offer its users. For example, implementing 3D graph technology, augmented reality, and virtual reality can enable individuals to enjoy the beauty of any location, be it the Taj Mahal, Paris, or London, sitting in the comfort of their home (Bale et al., 2022). Metaverse has the capability to provide its users, like schools, colleges, and organizations, with more engaging and interactive meetings through the deployment of virtual avatars like - Mesh, launched by Microsoft Teams (Upadhyay & Khandelwal, 2022). Metaverse helps users to simulate any experience virtually with the help of morphed reality. Metaverse can help individuals to get engaged in virtual workouts, more often aided by AI trainers (Cho et al., 2023). Cho et al. (2023) found that VR-assisted treadmill walking can help with numerous health benefits like improving cognitive function, concentration, muscular endurance, proper weight maintenance, etc. Using virtual technologies, many concepts can be simulated in meta classroom by teachers, thereby making learning fun and interactive (Bale et al., 2022). Metaverse can provide a simulated reality to impart training for surgeries and treatment (Bansal et al., 2022). Additionally, it has the potential to completely transform training programs across various fields such as medicine, engineering, emergency services, and the military. (Bale et al., 2022). Clearly, the metaverse has found its application in varied aspects of businesses, from products to services, from education to on-the-job training, and extending even further into realms such as virtual commerce, customer engagement, remote collaboration, and immersive marketing experiences. It is being leveraged to enhance product design and prototyping and enable virtual showrooms and interactive sales channels. For example, individuals can explore their spectacles on Lenskart, virtually try and tailor their dresses using 3DLook, or take the entire metaverse experience to another level using Teslasuit. The world of metaverse is further supported by cryptocurrencies, further allowing digital asset trading (Belk et al., 2022). Metaverse is giving e-commerce enterprises a newer perspective on selling their products while providing their customers with a new and unique way of shopping online. Therefore, while the metaverse and its benefits are slowly being realized in different domains, the metaverse gaming sector is still quite in its nascent stages. Modern-day computer games are highly decentralized, and peer-to-peer (P2P) driven, engaging players on gaming data stored on servers (Brooks et al., 2021). Bhattacharya et al. (2023) suggest that in virtual reality environments, the players get engaged in virtual gaming, e.g., Beat Saber, Iron Man, or Startrek, through assisted VR hardware (displays and hand controllers). However, in contrast, augmented reality games like Pokemon Go transform the real environment surrounding the player into a digital interface and provide a related experience (Bhattacharya et al., 2023). With Facebook renaming itself Meta and showcasing rapid developments in augmented and virtual realities, more customized experiences can be provided with 360-degree navigation, and extended reality engines supporting player's higher engagement, for example, eye movements, face and hands expression being transmitted into P2P networks (Bhattacharya et al., 2023). The metaverse also paves the way for developing virtual offices and coworking spaces, enabling a seamless, immersive, remote work experience. Furthermore, businesses are exploring its use for virtual events, trade shows, and networking opportunities, thus breaking down geographical barriers and reaching a global audience.

It is evident that the metaverse holds significant relevance for businesses, customers, academics, and policymakers. However, studies specific to metaverse, and metaverse gaming are still in their infancy and require empirical investigations and theoretical testing (Mandal et al., 2024). There exists limited literature that aims to understand the individual orientations of these digital natives towards prime aspects of metaverse gaming and how it shapes one's attitude and, eventually, behavioural intentions for metaverse gaming.

In this study, we highlight the far-reaching implications for policymakers and practitioners. Companies can leverage this mix of demography and technology for immersive experiences for new marketing, branding, and loyalty programs. Policymakers may underscore the cyber threats and prepare for regulatory and legal challenges.

For effective utilization of the metaverse as a tool for various facets of business application, studies are yet to understand how online gamers' orientation towards social gaming, play-to-earn orientation, passion for flexibility gaming, and mixed reality orientation shape their attitude towards metaverse gaming. Secondly, extant research is yet to address how the resultant attitude would shape their behavioral intentions towards metaverse gaming. Furthermore, such development of attitude and behavioral intentions would vary based on online gamers' compatibility with VR tool's usability. Also, subjective norms, perceived behavioral control, and age would also moderate the formation of attitudes and behavioral intentions towards metaverse gaming.

Given the cultural, linguistic, and socio-economic diversity that encompasses India, it necessitates region-specific sampling (Dheer et al., 2015). The population of the regions has a resemblance to that of several smaller nations, and therefore, this study offers unique and insightful perspectives that will have higher generalizability. Das (1999) highlights that South India has been a frontrunner in education/literacy, healthcare, and overall human development indices. East India, on the other hand, presents a contrast with varying levels of development and significant regional disparities, thereby providing a diverse socio-economic context for study. North India and West India host the National Capital, Delhi, and the Financial Capital, Mumbai, and, therefore, are often the focus of various studies due to their significant political and economic influence. Thus, in this study, we capture East and South India, which offer relatively fresher perspectives.

Investigating how digital natives individually orient toward metaverse gaming–both in terms of what players play, and how and why–equally transcends academic inquiry, profoundly impacting societal behaviors and digital transformation. While augmented and virtual realities have seen the most rapid assimilation into day-to-day digital experiences, the literature has not sufficiently examined how these orientations evolve into attitudes and subsequent behavioral intentions with the metaverse. In this study we address this gap by investigating how orientations toward social interaction, play-to-earn, and mixed reality experiences influence digital natives' engagement with the metaverse. In a world where digital and physical realities increasingly intertwine — impacting social norms, economic opportunities, and digital well-being — understanding these dynamics is essential. Digital natives' preferences for both play-to-earn could fundamentally change what we consider work and play, while orientations towards social gaming could completely transform what community and relationships mean in virtual environments. Moreover, analyzing how these orientations affect attitudes and intentions provides a framework for anticipating the long-term societal shifts brought on by immersive technologies. Such an understanding is important for stakeholders like policymakers considering issues such as digital addiction and privacy, and companies that can build more user-centered and socially responsible virtual spaces. In this way, the present work addresses not only a unique research inquiry, but also a more practical need that emerges from the need of understanding how digital natives can shape the future digital ecosystem and society expanding their presence in the metaverse.

In the context of this research, the TPB has been used as it is a well-established theory to examine and predict human behavior towards new technologies. The Theory of Planned Behaviour (TPB) is appropriate for exploring the attitudes and intentions of digital natives in the metaverse gaming context as it includes three important components, namely: Attitude, subjective norm, and behavioural control. Social gaming, play-to-earn, flexibility in game types and mixed reality experiences are the orientations researched as they tie directly into these factors. More specifically, attitudes are gamers' general feelings toward the metaverse (i.e., positive or negative), and TPB suggests that this sound belief-based evaluation is a major predictor of intentions to behave. This study investigates how these orientations foster attitudes shaping up the behavioral predictors of metaverse gaming. Moreover, subjective norms reflect peer and social influences, an important factor given that gaming is often a socially motivated activity for digital natives. The key TPB component of perceived behavioral control speaks to how easy or difficult individuals think it is to play metaverse games, depending on familiarity with VR tools and the accessibility of technology. The framework complements a nuanced understanding of the interplay between these external and internal factors with regard to determining behavioral intentions. In addition, TPB has a solid theoretical foundation to allow for the consideration of moderating variables such as age and usability of VR tools to better explain the model and find new areas for exploring the contingent aspects underlying attitudes and intentions. Thus, employing TPB enables this study to comprehensively address the complexities of digital natives' engagement with metaverse gaming, both theoretically and empirically. Accordingly, our study addresses the following research questions:

RQ1. *What is the effect of orientation for social gaming, play to earn orientation, passion for flexibility gaming and orientation for mixed reality experience on attitude towards metaverse gaming for online gamers?*

RQ2. *What is the effect of attitude towards metaverse gaming on behavioural intentions for metaverse gaming for online gamers?*

RQ3. *What are the contingent effects of orientation towards VR tools, age, perceived behavioural control and subjective norms on the direct paths?*

TPB, developed by Ajzen (1991) is highly applicable to this investigation as it encapsulates the outlooks, societal expectations, and perceived behavioral management of digital natives regarding upcoming metaverse technologies. The research questions are crafted to leverage this theoretical lens. Specifically, RQ1 examines how stances toward social gaming, play-to-earn models, gaming flexibility, and mixed reality experiences form attitudes toward metaverse gaming. These outlooks directly align with TPB's focus on comprehending how belief-based attitudes influence purposes.

RQ2 then expands on this connection by researching how these attitudes forecast behavioral purposes, a core premise of TPB, which proposes that attitudes are primary determinants of purposes. The third research question (RQ3) explores the moderating impacts of orientation towards VR tools, age, perceived behavioural control and subjective norms. This facet of the research enriches the TPB framework by incorporating these moderators, providing insights into how contextual and demographic variables influence the strength of the relationships between attitudes and purposes.

By grounding the research questions within TPB, the study clarifies how belief systems, societal norms, and perceived ease of use affect metaverse gaming participation. The use of TPB provides a systematic approach to unraveling these complex relationships, enabling a comprehensive understanding of the antecedents and consequences of attitudes in the digital gaming domain.

This study employed an online survey, taking advantage of the digital nature of convenience to attract a wide range of participants. Given this, the application is especially relevant given that Gen Z and Millennials are comfortable with online surveys. The sampling strategy was purposive to ensure that only respondents who meet the criteria were included in the survey, providing relevant experience on metaverse gaming. This sampling method is necessary to capture relevant insights because it targets participants who are most suited to give knowledgeable answers regarding their gamer behaviours and attitudes.

Data collection was conducted in two stages. First, the study executed a pre-test with 114 respondents that evaluated the suitability of the identified measurement items to capture the meaning of the relevant constructs, employed in the study. This pre-testing phase helped refine the items, ensuring they were well-aligned with the constructs under investigation. Following this, the main study collected 308 responses from South India and 256 from East India, using filter questions to confirm participants' familiarity with the metaverse and their gaming engagement. This regional focus provides a comparative perspective across diverse socio-economic and cultural backgrounds, offering insights into the variations in attitudes and intentions towards metaverse gaming. Thus, the chosen methods align with the study's objective to explore the impact of specific gaming orientations on behavioral intentions.

The next section discusses the theory of planned behaviour as the basic premise that is being used and modified to develop the proposed hypothetical relationships for empirical testing in the context of Gen Zs and Millennials for a developing nation like India. The subsequent section discusses the proposed hypotheses, leading to the suggested theoretical model. The next section elaborate more the development of the hypotheses, that plays an important part in building the theoretical model of this research, as it gives a logical order that links theory and empirical investigation. Drawing from the Theory of Planned Behavior (TPB), hypotheses are proposed that systematically investigate how different orientations (i.e., social gaming, play-to-earn, gaming flexibility and mixed reality experience) influence attitudes which in turn shapes behavioral intentions towards metaverse gaming. The approach enables the research to build upon TPB by examining how these distinct orientations which are not included in prior studies affect attitudinal and the roles of such factors as usability of VR tool and age that may moderate these relationships.

The relationships among the constructs are presented as hypotheses, which provide a clear and testable guide for empirical validation of the theoretical model. In doing so, this structured approach helps to ground research questions which are directly linked to the conceptual framework thus providing a well defined notion of behaviors observed. As such, the hypothesis development approach enhances the construction of a strong theoretical model while enhancing contextual learning surrounding behavioral dynamics in metaverse gaming at play.

The subsequent section discusses the measure development, pretesting and data collection. The originality of this study lies in applying the theory of planned behavior, which is critical to scouting the orientation of digital natives toward metaverse gaming. It also presents implications for companies that are existing or planning to enter the metaverse business. And this study will be one of the first to build upon the socio-economic differences that exists between South and East India which will enable businesses and policymakers to prioritize and customize as per the needs of the society.

Theoretical background

Metaverse gaming: a theory of planned behaviour perspective

The Theory of Planned Behavior (TPB), first proposed by Ajzen in the late 1980s, is one of the most established perspectives on human action and intention research—especially in the context of adoption of emerging technologies. Theory of Planned Behavior (TPB) extends the earlier Theory of Reasoned Action (TRA) proposed by Fishbein and Ajzen (1975; 2010) and provides a more complete account by adding perceived behavioral control to the explanatory framework. This makes the theory useful in contexts associated with new technologies where the self-efficacy of a person and how hard or easy it is to do behavior are essential.

TPB suggests that the combination of three, interarea correlated components (attitudes, subjective norms, and perceived behavioral control) should underlie human intention towards technology (Ajzen 1991, 2012). Attitudes consist of a positive or negative perception which is based on beliefs of an individual regarding a behaviour (Ajzen, 1985).

These assessments originate from consideration of the consequences of a behavior and the attractiveness of these consequences. Put differently, a favorable attitude is associated with a high intention to perform a behavior. Social norms are the next part; these are the perceived social pressure to perform or not to perform behavior. This construct is related to the impact of family, friends, colleagues and society on an individual's decision making (Ajzen, 1985, 2012). Subjective norms also emphasize social context, as it is common for individuals to adjust their intentions according to the expectations of relevant others. The last aspect, perceived behavioral control, is defined as the extent to which someone believes that he or she can successfully perform the behavior, and is closely related to the concept of self-efficacy (Ajzen & Fishbein, 1980). Internal capacities and external constraints are elements considered to be indispensable in the comprehension of regimes in relation to technology (mostly considered as a complex system of elements).

So, based on TPB, the three constructs interact in a dynamic process in which an individual intends to perform a particular behavior, and then behavioral outcome (Armitage & Conner, 2001). TPB is based on the fundamental assumption that behavioral intentions are the direct antecedents of behavior, where the stronger the intention, the greater the likelihood of the behavior being performed. But moving from intention to action is not automatic as it is frequently mediated by contingencies in the environment and constraints outside of the individual (Ajzen, 2012). As such, TPB also recognizes the interplay between internal and external determinants that jointly contribute to behavior.

In this study, we use TPB as a base theory to create a conceptual model of how orientations towards different facets of metaverse gaming, such as social gaming, play-to-earn, gaming flexibility, and mixed reality, direct attitudes which then leads to metaverse gaming behavioral intentions. Instead of exploring the influence of each construct alone (the role of attitude, subjective norms, perceived behavioral control, etc.) as is common in the existing body of work, we contextualized the constructs within the metaverse to provide a deeper understanding of the research problem in the current study. While existing studies have explored the direct standalone enabler role of attitude, subjective norms and perceived behavioural control towards a certain technology, product, or service (Liu et al., 2023; Huang et al., 2024). For example, Liu et al. (2023) explored individuals' intention for revenge buying using an integrated lens of stimulus-organism -response and TPB framework. Kumar and Nayak (2023) explored the orientation towards green energy behaviour along with contingent effects of cross-cultural factors. Gansser and Reich (2023) explored the impact of new ecological paradigm and environmental concerns on tourists' pro-environmental behaviour using TPB. Hwang et al. (2023) explored the differences in perceived services offered by service robots and human staff at airports using extended TPB. More recently, Huang et al. (2024) explored the intention towards virtual reality paradigm using an integrated lens of the unified technology acceptance model (UTAUT) and TPB.

Regarding metaverse gaming, the extant literature is only emerging with focus on promoting entertainment and mental health stimulation during the pandemic (Kerdvibulvech, 2022); how affordances affect users experiences for metaverse games and gradually become a part of their gaming experience (Shin, 2022), the engagement of prominent game developers like Epic games and the Unity Technologies are coming together for developing reality applications that can deploy cross-platform stories and brand worlds with the efficient management of user payments and identities (Jungherr & Schlarb, 2022). While previously individuals used to buy games, recent years have seen the arrival of non-fungible tokens (NFTs) in gaming to purchase items within games (Seiofddini, 2022). Furthermore, games like Roblox, Fortnite, Minecraft, Animal Crossing and World of Warcraft have already exhibited that virtual gaming worlds can be highly profitable (Wiederhold, 2022). Lebow (2022) suggests US mobile gamers to spend almost $18.83 billion on virtual goods in 2022 and is projected to reach $22.72 billion by 2026 for gaming in-app spending. However, studies are yet to understand how the orientation towards different aspects of metaverse gaming may shape one's attitude and behavioural intentions; further shaping up gaming experience and satisfaction.

Contextualizing southern and eastern India

Das (1999) analyses the socio-economic development in India from a regional perspective and he notes that due to the large size and notable economic and social disparities of the Indian subcontinent, it is more effective to study development at the regional level. Desai and Kulkarni (2008) highlight the existence of substantial inequalities in Indian society and suggest that southern India is a region with a high education level. Dheer et al. (2015) underscores the importance of examining the perspectives of southern and eastern India due to their unique cultural and functional characteristics. The authors highlight the higher level of education and emphasis on learning in the southern region. They also highlight the prominence of international service and technology industries in the southern region, which has led to the recognition of Bengaluru (a city in southern India) as "*The Silicon Valley of India*". The influence of the French, Portuguese, and British is observed in southern India. On the contrary, eastern India depicts a centre of resistance to British imperialism and shows economic laggardness.

The need to investigate the perspective of southern and eastern India is important *firstly* because each region has a substantially large population (comparable to many smaller nations[1]), and *secondly*, it allows us to better understand and address the nuances that arise in customer or business requirements due to disparities and socio-economic particularities of these specific regions. This granular level analysis also facilitates a more precise identification of special characteristics and regional needs, which is essential for formulating more effective development and outreach in each region. Though these disparities and the uniqueness of the two regions can be investigated in various contexts, in this study, we limit ourselves to the attitude and orientation of the population towards metaverse gaming.

Hypotheses development

Orientation towards metaverse gaming

The metaverse gaming landscape has transformed in recent years with the rapid development of augmented reality, virtual reality, and mixed reality technologies (Bhattacharya et al., 2023; Taylor et al., 2024). Users can get more immersive experience with the rapid development of extended reality (XR) technologies (Jungherr & Schlarb, 2022). However, studies are yet to understand how the different aspects of metaverse gaming shapes one's attitude towards metaverse gaming and in turn aids in resulting an appropriate experience and satisfaction. In this regard, our study did an extensive review of metaverse gaming literature and found the following prominent aspects of metaverse gaming for users that might shape their attitude and behavioural intentions for metaverse gaming: **(a) orientation for social gaming** (Zhang et al., 2022; Guidi & Michienzi, 2022) **(b) play to earn orientation** (Vidal-Tomas, 2022; Thomason, 2022) **(c) flexibility gaming orientation** (Uddin et al., 2023;Kara & Cagiltay, 2023) and **(d) orientation for mixed reality experience** (Tayal et al., 2022; Seifoddini, 2022).

However, studies have explored different aspects of metaverse gaming; with the gap remaining to understand how individual orientation towards each aspect of metaverse gaming shapes attitude and in turn users' behavioural intentions. Many users, especially driven by pandemic and lockdowns, were forced to home confinement and

[1] Routley, N. (2022, December 18). *Mapped: The Population of India's States Compared with Countries*. Visual Capitalist. https://www.visualcapitalist.com/population-of-india-compared-with-countries/

therefore get entertained with virtual gaming (Nilsson et al., 2022). With home confinement and forced isolation, many individuals developed a passion for social gaming in the virtual world (Claesdotter-Knutsson et al., 2022). Based on Gen Zs and millennials participation in metaverse, Oh et al. (2023) found that enhanced social presence in metaverse do support their online interactions to a large extent and support their perception of social-efficacy.

With the development of Web 3.0 gaming, players can move characters from one gaming experience to another (Claesdotter-Knutsson et al., 2022). Such a model has come well known as the "play-to-earn" model in the virtual gaming world (Oh et al., 2023). With orientation for social gaming many individuals are looking to actively participate in metaverse gaming and get relaxed and entertained. Therefore, it can be suggested that orientation for social gaming may positively influence attitude towards metaverse gaming. With the development of emerging AR and VR technologies, blockchain and cryptocurrencies and NFTS, there lies lot of attractions for online gamers.

Furthermore, many online gamers are willing to earn money by winning challenges (Foxman, 2022). There is an increased interest among online gamers to win critical challenges in metaverse gaming (Belk et al., 2022). Therefore, with an orientation to earn money online gamers would have a strong inclination for participating in metaverse gaming. Based on this premise, we posit that orientation for play to earn would be positively associated with attitude towards metaverse gaming.

In a similar vein, online gaming offers much more flexibility to its gamers (Scheiding, 2022), aided with Web 3.0 gaming reality offering transfer of characters among games and earn money by participating and winning challenges in metaverse gaming. Furthermore, gamers can earn and sell assets using NFTs and cryptocurrencies (Scheiding, 2022; Oh et al., 2023). Lastly, many gamers are finding the mixed reality experience quite attractive and engaging (Buhalis & Karatay, 2022). While virtual reality completely replaces one's gaming space with a computer-generated virtual space; augment reality overlays digital content into a real environment (XRtoday, 2021). In this regard, mixed reality mixed the elements of augmented and virtual reality and allows users to interact with digital content directly. Users can shift a piece of digital content in the virtual space and can also interact with their colleagues through their digital avatars (XRtoday, 2021). Therefore, quite evidently mixed reality is quite attractive for many online gamers because of the attractive engagement it provides. Therefore, based on these premises we propose that orientations towards social gaming, play to earn, flexibility gaming and mixed reality of online gamers would positively shape their attitude towards metaverse gaming. Accordingly, we posit the following hypotheses:

H1. *Orientation towards social gaming of online gamers would positively influence their attitude towards metaverse gaming.*

H2. *Orientation towards play to earn of online gamers would positively influence their attitude towards metaverse gaming.*

H3. *Orientation towards flexibility gaming of online gamers would positively influence their attitude towards metaverse gaming.*

H4. *Orientation towards mixed reality of online gamers would positively influence their attitude towards metaverse gaming.*

Furthermore, with the development of AR, VR and mixed reality technologies users would gradually be more engaged in metaverse experiences. With days to come, the design elements of metaverse are going to offer more customisation to their users for game play (Dwivedi et al., 2023; 2022). All such developments in the metaverse scape are only going to convert the attitudinal intentions into actual behaviour of playing games, buying, and selling assets and engaging in other activities in the metaverse. Therefore, based on this premise we propose that:

H5. *Attitude of online gamers are positively going to influence their behavioural intentions.*

Contingent effects of VR tools usability perceived behavioural control, subjective norms and age

While orientation towards social gaming, play for earn, flexibility gaming and mixed reality experience may act as potential antecedents shaping attitude towards metaverse gaming; such direct effects would most likely alter based on different individual characteristics. For example, with age gamers may have a different reason for metaverse gaming. Many a timers gamers enjoy the aesthetics of a gaming environment more compared to the game storyline. Furthermore, earlier metaverse experience further may alter the direct effects of such orientations towards different aspects of metaverse gaming. As per theory of planned behaviour perceived behavioural control refers to one's decision-making ability to engage in metaverse gaming despite of social influences (Ajzen, 1985; 2012). Subjective norms refer to the impact of family, friends, peers and other social circles on an individual's decision to engage in metaverse gaming (Ajzen, 1985). Accordingly, perceived behavioural control and subjective norms may alter the direct effects. Furthermore, many gamers and users of virtual world are not equally equipped with VR tools. Users do vary in their understanding of virtual reality tools and capacity to use them for a better experience. Therefore, such varying levels eventually defines the usability of VR tools for a better experience. Accordingly, we propose the following contingent influences:

H6a. *VR tools usability may alter the direct effects of orientation for social gaming, play for earn, flexibility gaming and mixed reality on attitude towards metaverse gaming and in turn on behavioural intentions.*

H6b. *Perceived Behavioural control may alter the direct effects of orientation for social gaming, play for earn, flexibility gaming and mixed reality on attitude towards metaverse gaming and in turn on behavioural intentions.*

H6c. *Subjective norms may alter the direct effects of orientation for social gaming, play for earn, flexibility gaming and mixed reality on attitude towards metaverse gaming and in turn on behavioural intentions.*

H6d. *Age may alter the direct effects of orientation for social gaming, play for earn, flexibility gaming and mixed reality on attitude towards metaverse gaming and in turn on behavioural intentions.*

As highlighted in the literature review, and to bridge the research gap that exists in investigating the region-specific insights due to the cultural, linguistic, and socio-economic diversity that encompasses southern and eastern India, in this study, we contextualize all the hypotheses for the two regions.

The theoretical model in Fig. 1 incorporates the Theory of Planned Behavior (TPB) for explaining digital native attitudes and behavioral intention toward metaverse gaming as an outcome of different orientations. Four unique orientations, namely social gaming, play-to-earn, flexibility in-game orientation and mixed reality enter the new model as precursors of users attitude. The social gaming orientation highlights the need to socially play and make friends in the virtual world, whereas play-to-earn is an affinity of using economic incentives to drive participation. Gaming Flexibility emphasizes the control and customizability of users; in contrast, Mixed Reality Orientation centers on the appeal of immersion. Combined, these orientations serve as the foundation for propensity orientation toward metaverse gaming, which through TPB serves as a major determinant of behavioral intentions.

The model also examines contingent effects such as VR tools usability, subjective norm, perceived behavioral control, and age. These moderators also sharpen our understanding of how attitudes move into behavioral intentions, such that external and demographic variables constrain the intensity of these relationships. The model, which is based on TPB, therefore guides the research to focus on how digital natives

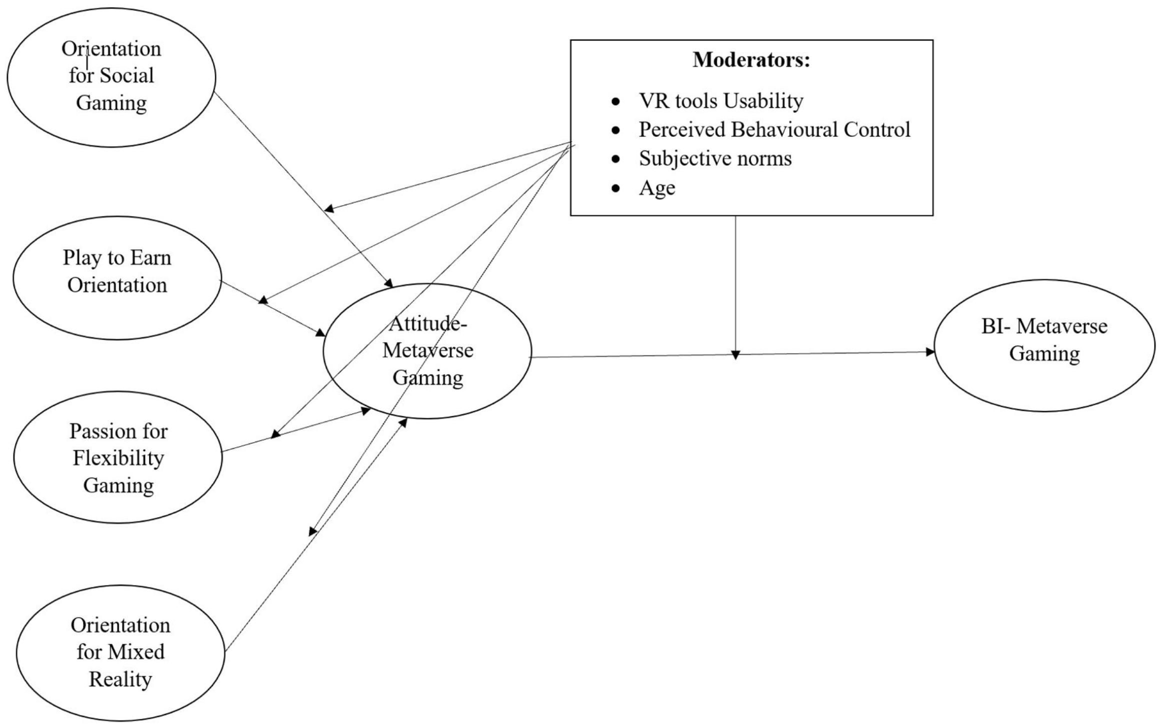

Fig. 1. Theoretical model.

participate in the metaverse from a structural perspective and helps identify behavioral constructs influencing participation within the context of game developers and policies.

Research methodology

In this study a mixed-method research methodology is used to comprehensively explore the attitudes and behavioral intentions toward metaverse gaming among digital-born generations. In particular, the data analysis is done using Partial Least Squares-Structural Equation Modeling (PLS-SEM) which is appropriate as the study is exploratory in its nature and meanwhile it proposes a rather complex model. Therefore for the descriptive statistics analysis of the deployed constructs, thus SPSS was used. In this context, PLS-SEM is the perfect choice because it can be applied to more complex relations (which are especially important for theory testing and development) and return reliable results with a relatively small sample.

We formed an overarching set of measurement items based on underlying constructs in the TPB and refined that set through expert review for conceptual clarity. The data was collected in two stages upon preliminary validation. In the first stage (Study 1) a pre-test to ensure face validity using SPSS was carried out, and in the second stage (Study 2), PLS-SEM was used for data collection and analysis with testing of hypotheses. Such a strategy guarantees the reliability of the constructs and facilitates an intensive examination of the moderating factors, unveiling comprehended revelations on subjective norm, perceived behavioral control, technology usability in affecting metaverse gaming attitudes.

There is limited literature in the context of attitude towards metaverse gaming. Oleksy et al. (2023) were among the first to investigate the attitude toward the metaverse. However, their contextual setup is limited to the role of place attachment for the Polish population. This study explores the role of several antecedents in developing attitudes towards Metaverse gaming, viz. orientation towards social gaming (Zhang et al., 2022; Guidi & Michienzi, 2022), play-to-earn orientation (Vidal-Tomas, 2022; Thomason, 2022), passion for flexibility gaming (Uddin et al., 2023 Kara & Cagiltay, 2023), and orientation for mixed reality (Tayal et al., 2022; Seifoddini, 2022) for gamers in India. Subsequently, the study explores whether the resultant attitude shapes or influences behavioural intentions for metaverse gaming. Gao et al. (2023) highlight the need for future research to identify factors influencing metaverse applications. Xi et al. (2024) argue that XR can provide experiences that can be instrumental in shaping attitudes towards metaverse shopping.

Taking cues from the literature, this study uses extant methods and measures for the constructs used in the study. The methodology for this study dwells upon an integrated theory of planned behaviour (Ajzen, 1985; 1991) and is directed towards the digital natives. An initial pool of measurement items for measuring four antecedents, leading to an attitude toward metaverse gaming and subsequent behavioral intentions are created. Subsequently, the initial list of items is subjected to further review and required modifications by a carefully selected expert panel of seven members (four faculties of information technologies and three experts from the AI industry). The panel was given the working definition of the concepts and the scope of the study. They were asked to indicate the appropriateness of the measurement items for capturing the essential theme of the first-order factors used in the study as indicated (1= strongly unsuitable, 2= somewhat suitable and 3= strongly suitable). After the expert panel review, only those items that got a "strongly suitable rating from at least five experts. These resulted in a final list of 18 items for the independent and dependent variables. Furthermore, three more items were included, each measuring the moderating variables on a scale of seven-point Likert Scale (1= strongly disagree, 4=neutral, and 7= strongly agree).

The study is divided into two stages. Where the first stage, referred to as Study 1, is used for the pre-test. Once the reasonable face validity of items is achieved in the pre-test using SPSS 28), the second phase of the study, referred to as Study 2, begins with the final data collection and subsequently evaluates the measurement model by partial least squares (PLS) method using ADANCO 2.4 (Henseler & Dijkstra, 2015). Further assessment of structural model is carried out using widely accepted Partial Least Squares Structural Equation Modeling (PLS-SEM) (Dash & Paul, 2021; Hair et al., 2021). Given the exploratory nature of this study with model complexity, PLS-SEM also offers a more robust approach than the Covariance-Based SEM (CB-SEM) (Hair et al., 2011; Hair et al., 2017). In the final leg of Study 2, the moderation effects were evaluated using Process Macro 4.2 in SPSS 27 (Hayes, 2017).

Study 1: pre-test

Since the study targets digital natives, the final 18 items were subjected to a pre-test by using purposive sampling. Creswell et al. (2016) argue that *"purposeful sampling is critical for ensuring that the researcher gathers in-depth, contextual information from participants who are most knowledgeable about the topic" (p. 158).* A questionnaire was prepared in Google Forms with 18 items, the purpose of the study, a description of the essential items, and informed consent to participate in the study. The study also assured the respondents of the anonymity and confidentiality of their responses. Furthermore, the respondents' right to anonymity was further protected as the study did not collect respondents' email IDs and names, thereby further assuring anonymity. The authors' team also included several filter questions to ensure sample representativeness, e.g. ***(1) Are you familiar with metaverse? (High, Low) (2) Do you play computer games (online/ offline)? (Yes, No) and (3) Are you interested in metaverse gaming (Yes, No)?*** The questionnaire link is shared with respondents using purposive sampling through WhatsApp, emails, and social media sites. After several follow-ups, the team received 121 responses. However, **114 responses** satisfied all three filter questions and, therefore, were considered for subsequent analysis. The research team then subjected the 114 complete responses to principal component analysis using SPSS 28 using varimax rotation. The rotated factor loadings pattern showed that items measuring a particular construct come together and are highly correlated. Furthermore, Bartlett's test of sphericity (chi-sq=1485.53, df=153, p<0.001) and KMO (=0.711) also satisfied the minimum required thresholds. With satisfied rotated factor loadings and other allied metrics, the research team went for final data collection and hypotheses testing. Table 1 below shows the rotated factor loadings.

Study 2: main data collection

With adequate face validity in the pre-test sample, the research team prepared another questionnaire in Google Forms, along with earlier filter questions, outlining the scope of the study, definition of important terms, assurance of anonymity and informed consent for the participants. The questionnaire also ensured that no personally identifiable information would be collected and that the responses would be used only for academic purposes. After several follow-ups through WhatsApp and social media messengers, the research team received **308 responses from South India and 256 from East India,** which satisfied all three filter questions. The participants were from Kochi, Coimbatore, Vijayawada, and Hyderabad for the South Indian sample, whereas for the East India sample, they mostly hailed from Bhubaneshwar, Kolkata, Guwahati, and Shillong. Table 2 below shows the final sample.

The study evaluated the hypothesised model in two stages. First, the study assessed the reliability and validity of the proposed measures using the partial least squares method in ADANCO 2.4 (Henseler & Dijkstra, 2015). This is also referred to as measurement model evaluation.

Measurement model evaluation

The measurement items were assessed for reliability and validity using multiple criteria as specified in best practices (Ringle et al., 2020; Benitez et al.,2020). First, the reliability was found satisfactory for all the measurement items as each one had standardised loadings > 0.70, factor level Cronbach's alpha > 0.80 and AVE > 0.50 (Benitez et al., 2020; Ringle et al., 2020). The constructs also, therefore, exhibited adequate convergent validity (Benitez et al., 2020) as their AVE's > 0.50. Lastly, the constructs were also easily discriminable as square roots of their AVEs > their inter-construct correlations (Fornell & Larcker, 1981). Therefore, with satisfactory measurement model results, the study next evaluated the structural model. Table 3 placed in Appendix-1 at the end shows the reliability and validity statistics of the measurement model, followed by Table 4**,** showing the discriminant validity assessment. As shown by the findings, our constructs also demonstrate adequate discriminant validity further supported by the HTMT ratios being < 0.85 (Ringle et al., 2020; Benitez et al., 2020).

Structural model assessment

With satisfactory measurement model assessment in terms of reliability and validity, the study next evaluated the structural model in terms of variance explained in the dependent variables, and the significance of the path coefficients. The proposed model explained a significant proportion of variance in one's attitude and behavioural intentions towards metaverse gaming. Furthermore, the model has decent predictive ability, as shown by the effect sizes as shown in Table 5 below. The effect sizes ranged from 6 % to 55 %, approximately suggesting strong predictive ability of the proposed model, further cross-validated in two

Table 1
Rotated factor loadings.

Rotated Component Matrix[a]	Component					
	1	2	3	4	5	6
sog1	0.088	**0.919**	0.008	0.162	-0.030	0.150
sog2	0.249	**0.885**	-0.092	0.166	-0.011	0.083
sog3	0.274	**0.867**	0.012	0.128	0.041	0.069
pearn1	0.017	-0.015	**0.943**	0.095	-0.005	0.051
pearn2	0.065	-0.011	**0.912**	-0.022	0.101	0.107
pearn3	0.056	-0.032	**0.789**	0.090	0.246	0.107
flexg1	**0.938**	0.129	0.022	0.020	0.134	0.057
flexg2	**0.879**	0.272	0.173	0.056	0.088	0.014
flexg3	**0.939**	0.191	-0.026	-0.035	0.110	0.088
mreal1	0.091	0.018	0.088	0.033	0.094	**0.878**
mreal2	-0.077	0.219	0.031	0.145	0.185	**0.785**
mreal3	0.124	0.065	0.142	-0.036	0.084	**0.867**
att1	-0.003	0.126	0.130	**0.887**	0.013	0.095
att2	0.036	0.140	0.060	**0.916**	0.064	0.058
att3	0.005	0.170	-0.034	**0.772**	0.327	-0.032
bi1	0.092	0.069	0.111	0.010	**0.847**	0.108
bi2	0.066	-0.067	0.084	0.148	**0.849**	0.116
bi3	0.155	-0.008	0.129	0.168	**0.803**	0.131

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a]. Rotation converged in 6 iterations.

Table 2
Respondents profile.

Category	No (South=308)	%	No (East=256)	%
Age				
16-19 years	81	26.30	114	44.53
20-22 years	68	22.08	63	24.61
23-30 years	76	24.68	65	25.39
30 years and above	83	26.95	14	5.47
Gender				
Male	235	76.30	189	73.83
Female	73	23.70	67	26.17
Education				
Undergraduate	163	52.92	131	51.17
Postgraduate	145	47.08	125	48.83
Annual Family Income				
Less than 10 lakhs	71	23.05	78	30.47
10-15 lakhs	96	31.17	89	34.77
15-20 lakhs	89	28.90	82	32.03
20 lakhs and above	52	16.88	7	2.73
Experience with virtual world/metaverse				
Low	196	63.64	167	65.23
High	112	36.36	89	34.77

Table 5
Results of structural model testing.

Direct Effects Inference (South: N=308)

Effect	Original coefficient	Standard bootstrap results							Effect Size (f-sq)
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.025	0.975	
Orient. Social Gaming -> Attitude- Meta. Gaming	0.244	0.245	0.074	3.314	0.001	0.001	0.103	0.391	0.062
Play to Earn Orientation -> Attitude- Meta. Gaming	0.251	0.249	0.073	3.439	0.001	0.000	0.108	0.393	0.082
Passion for Flexibility Gaming -> Attitude- Meta. Gaming	0.195	0.198	0.069	2.811	0.005	0.003	0.062	0.336	0.047
Orient. for Mixed Reality -> Attitude- Meta. Gaming	0.251	0.251	0.058	4.340	0.000	0.000	0.139	0.365	0.100
Attitude- Meta. Gaming -> BI- Meta. Gaming	0.585	0.586	0.043	13.726	0.000	0.000	0.499	0.666	0.520

Indirect Effects Inference (South: N=308)

Effect	Original coefficient	Standard bootstrap results						
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.025	0.975
Orient. Social Gaming -> BI- Meta. Gaming	0.143	0.144	0.046	3.106	0.002	0.001	0.059	0.237
Play to Earn Orientation -> BI- Meta. Gaming	0.147	0.145	0.043	3.412	0.001	0.000	0.063	0.232
Passion for Flexibility Gaming -> BI- Meta. Gaming	0.114	0.116	0.042	2.740	0.006	0.003	0.037	0.200
Orient. for Mixed Reality -> BI- Meta. Gaming	0.147	0.147	0.036	4.035	0.000	0.000	0.078	0.222

Total Effects Inference (South: N=308)

Effect	Original coefficient	Standard bootstrap results						
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.025	0.975
Orient. Social Gaming -> Attitude- Meta. Gaming	0.244	0.245	0.074	3.314	0.001	0.001	0.103	0.391
Orient. Social Gaming -> BI- Meta. Gaming	0.143	0.144	0.046	3.106	0.002	0.001	0.059	0.237
Play to Earn Orientation -> Attitude- Meta. Gaming	0.251	0.249	0.073	3.439	0.001	0.000	0.108	0.393
Play to Earn Orientation -> BI- Meta. Gaming	0.147	0.145	0.043	3.412	0.001	0.000	0.063	0.232
Passion for Flexibility Gaming -> Attitude- Meta. Gaming	0.195	0.198	0.069	2.811	0.005	0.003	0.062	0.336
Passion for Flexibility Gaming -> BI- Meta. Gaming	0.114	0.116	0.042	2.740	0.006	0.003	0.037	0.200
Orient. for Mixed Reality -> Attitude- Meta. Gaming	0.251	0.251	0.058	4.340	0.000	0.000	0.139	0.365
Orient. for Mixed Reality -> BI- Meta. Gaming	0.147	0.147	0.036	4.035	0.000	0.000	0.078	0.222
Attitude- Meta. Gaming -> BI- Meta. Gaming	0.585	0.586	0.043	13.726	0.000	0.000	0.499	0.666

Direct Effects Inference (East: 256)

Effect	Original coefficient	Standard bootstrap results							Effect sizes (f-sq)
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.025	0.975	
Orient. Social Gaming -> Attitude- Meta. Gaming	0.146	0.147	0.061	2.411	0.016	0.008	0.031	0.272	0.026
Play to Earn Orientation -> Attitude- Meta. Gaming	0.213	0.210	0.072	2.986	0.003	0.001	0.068	0.347	0.064
Passion for Flexibility Gaming -> Attitude- Meta. Gaming	0.198	0.198	0.054	3.677	0.000	0.000	0.096	0.307	0.067
Orient. for Mixed Reality -> Attitude- Meta. Gaming	0.372	0.375	0.087	4.292	0.000	0.000	0.214	0.552	0.126
Attitude- Meta. Gaming -> BI- Meta. Gaming	0.596	0.599	0.044	13.626	0.000	0.000	0.509	0.680	0.552

Indirect Effects Inference (East: 256)

Effect	Original coefficient	Standard bootstrap results						
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.025	0.975
Orient. Social Gaming -> BI- Meta. Gaming	0.087	0.088	0.037	2.329	0.020	0.010	0.018	0.164
Play to Earn Orientation -> BI- Meta. Gaming	0.127	0.126	0.044	2.892	0.004	0.002	0.041	0.213
Passion for Flexibility Gaming -> BI- Meta. Gaming	0.118	0.119	0.036	3.279	0.001	0.001	0.053	0.196
Orient. for Mixed Reality -> BI- Meta. Gaming	0.222	0.224	0.055	4.054	0.000	0.000	0.128	0.341

Total Effects Inference (East: 256)

(*continued on next page*)

Table 5 (*continued*)

Total Effects Inference (East: 256)								
Effect	**Original coefficient**	**Standard bootstrap results**						
		Mean value	**Standard error**	**t-value**	**p-value (2-sided)**	**p-value (1-sided)**	**0.025**	**0.975**
Effect	**Original coefficient**	**Standard bootstrap results**						
		Mean value	**Standard error**	**t-value**	**p-value (2-sided)**	**p-value (1-sided)**	**0.025**	**0.975**
Orient. Social Gaming -> Attitude- Meta. Gaming	0.146	0.147	0.061	2.411	0.016	0.008	0.031	0.272
Orient. Social Gaming -> BI- Meta. Gaming	0.087	0.088	0.037	2.329	0.020	0.010	0.018	0.164
Play to Earn Orientation -> Attitude- Meta. Gaming	0.213	0.210	0.072	2.986	0.003	0.001	0.068	0.347
Play to Earn Orientation -> BI- Meta. Gaming	0.127	0.126	0.044	2.892	0.004	0.002	0.041	0.213
Passion for Flexibility Gaming -> Attitude- Meta. Gaming	0.198	0.198	0.054	3.677	0.000	0.000	0.096	0.307
Passion for Flexibility Gaming -> BI- Meta. Gaming	0.118	0.119	0.036	3.279	0.001	0.001	0.053	0.196
Orient. for Mixed Reality -> Attitude- Meta. Gaming	0.372	0.375	0.087	4.292	0.000	0.000	0.214	0.552
Orient. for Mixed Reality -> BI- Meta. Gaming	0.222	0.224	0.055	4.054	0.000	0.000	0.128	0.341
Attitude- Meta. Gaming -> BI- Meta. Gaming	0.596	0.599	0.044	13.626	0.000	0.000	0.509	0.680

different samples.

Contingent effects of virtual tools usability, subjective norm, perceived behavioural control, and age

The study next evaluated the contingent effects of the proposed moderators on the direct effects of orientation for social gaming, play-to-earn orientation, flexibility gaming and mixed reality orientation for attitude for metaverse gaming. The moderation effects were evaluated using Process Macro 4.2 (Hayes, 2017) in SPSS 27, after due mean centring to alleviate any potential presence of multicollinearity. As shown in Table 6 placed in Appendix-1 at the end of this manuscript, most of the moderators has a significant effect on the direct paths, suggesting several implications.

Discussion

Gen-Z, as digital natives who have grown up with technology surrounding them from day one, seem likely to be direction-setting influences in the orientation of metaverse gaming towards the future. Studies do not hide the fact that metaverse is becoming the most promising technology (Buhalis et al., 2023; Hennig-Thurau et al., 2023). More recent studies have begun to explore the applications of the metaverses in marketing, advertising, education and virtual experiences (Barrera & Shah, 2023; Nguyen, 2024). Despite this, a large knowledge gap exists around the specific metaverse traits that help contextualise gaming-related attitudes. While a number of researchers have employed the Technology Acceptance Model (TAM) to examine metaverse adoption and provide theoretical constructs affecting gamer acceptance (Davis,1989; Wu & Yu, 2023), our study incorporates the Theory of Planned Behavior (TPB) unlike many others as well to shed light on how attitudes and behavioral intentions relate over time when it comes to metaverse gaming.

Based on our framework, orientations toward social gaming, play-to-earn models, flexibility in gaming and mixed reality experiences are identified as the key antecedents influencing attitudes toward metaverse gaming. We can interpret these findings well using the Theory of Planned Behavior. As TPB postulates, attitudes are formed from a combination of behavioral beliefs concerning the likely consequences of performing a behaviour and the evaluation or desirability of these outcomes. Mindsets about mixed reality and play-to-earn gaming have the big impact on positive attitudes in our analysis — natural for Gen-Z people who prefer experience, engagement, and even sale with some potential element of fun. This aligns with the TPB claim that when people perceive performing a behavior will lead to positive results, they will form beneficial attitudes (Ajzen, 1991).

Additional information about how those wide differences in attitudes toward metaverse gaming may be explained by TPB is found in the regional differences we observed on our findings. Social gaming orientation is an emerging and important determinant of attitudes in South India. That is likely due to relatives of foreign footprints such as French, Portuguese and British colonial legacies have embedded stronger social and collectivistic values (Dheer et al., 2015). Collectivism and education (high educational attainment) orientation within Indian culture (Desai & Kulkarni, 2008) may be responsible for the assertiveness of social gaming as a critical attitude driver. The subjective norms component of TPB—that is, the perceived social pressures to perform a behavior—can also explain why social gaming exerts such an influence in this case. The social acceptability of gaming as a group activity, and the subsequent reinforcement effect, further strengthens attitudes towards metaverse gaming in South India (Ajzen, 1991).

On the other hand, social gaming is a shaper of attitude in East India only when there is no flexibility to play; when it is possible to be flexible with gameplay in this region, then flexibility becomes the more important predictor of attitude compared to social gaming. The later part is in accordance to an individualistic, self governed culture that appreciates personal freedom for each and everyone, and the ability to customize experience. This finding can be explained theoretically by TPB's concept of perceived behavioral control (PBC)—the degree to which people believe they can perform a behavior. We find that attitudes toward metaverse gaming are more positive in the environments where people feel empowered to personalize their own gaming experiences. An even lower generalised influence of social gaming orientation in the East may be because individualistic cultures tend to attach less importance to collective activities and a more significant focus on personal agency and control, which is important for forming perceptions when PBC is high (Ajzen, 1991).

In line with the prediction of the TPB framework, our study also provides further evidence that positive attitudes have a strong impact on behavioral intentions. The relationship between attitude and behavioral intention is strong across both regions, demonstrating that metaverse gaming can be rewarding and fun helps to create intentional engagement. This finding agrees with the core idea of TPB that attitudes defined by beneficial beliefs about consequences ultimately lead to intentions to engage in the behavior (Ajzen, 1991). Through this lens of gaming orientations, we highlight the importance of specific attributes such as mixed-reality and play-to-earn models that are especially attractive to Gen-Z. The Mixed Reality attraction would be a new experience — maybe an even better one than the standard game. At the same time, the play-to-earn model aligns with the entrepreneurial spirit of Gen-Z who are earning real rewards and incentives, which only drives positive perceptions further.

Results further show the moderating roles of VR tools usability, subject norm, PBC, and ages. Based on the above, TPB highlights that external factors can strengthen or buffer the relationship between attitudes and behavioral intentions. For instance, the usability of VR tools acts as a significant moderator and strengthens the impact of orientations to social gaming, play-to-earn model, and mixed reality on attitudes. This demonstrates how technological ease and familiarity increases perceived behavioral control, which is accompanied by more positive attitudes and intentions. The finding that ease of use of VR tools raises confidence to participate in metaverse gaming further integrates with the TPB notion since greater perceived control leads to higher intentions (Ajzen, 1991).

Another core TPB component, subjective norms, also has an important role in moderating social and mixed reality orientations. In areas such as South India, where communal values are particularly potent, peer effects and social norms may strengthen the link between (upper class) orientations and attitudes. In East India, individual preferences and autonomy seem to rank higher so subjective norms do not play a dominant role. This change draws attention to the role of cultural context in moderating social pressure intensity and its attitude formation impact (Ajzen, 1991; Dheer et al., 2015).

This study also examines moderating effects of perceived behavioral control. An example of this is PBC increasing the moderating effect of gaming orientations on attitudes in contexts where individuals experience higher levels of liberty and control (such as in flexible gaming situations). This is even in line with the TPB claim that perceived behaviour control strengthens attitudes and intentions towards a particular behavior (Ajzen, 1991). An actual-age also moderates the links between gaming orientations and attitudes; younger adults differ in preferences and inclinations compared with older ones. These factors contribute to strengthening the gaming generation gap, as generations that are more accustomed to digital and virtual environments – younger generations – become more favorable to mixed reality and social gaming.

Therefore, our research expands the use of TPB in metaverse gaming contexts by demonstrating the effect of orientations toward different types of gaming experiences on attitudes and behavioral intentions. This has huge practical implications, as businesses can use this information to develop marketing and engagement strategies that will appeal to Gen-Z. Knowledge of the theory of attitudes and intentions can help companies develop targeted campaigns and immersive experiences to deliver a strong orientation toward their conjunctions, helping them succeed in this booming metaverse economy.

In the subsequent sections below, we discuss the specific implications of this study to the theory, policy, and practice.

Implications for theory

The constructs of the theory of planned behavior (TPB) framework, which consists of attitudes, subjective norms, and perceived behavioral control, are uniquely positioned to explore the complex behavioral nuances of metaverse gaming among digital natives. More specifically, the framework helps in examining how social gaming orientation, play-to-earn orientation, flexibility orientation and mixed reality experience orientation affects players attitude and behavioral intention.

First, TPB enables a comprehensive analysis of how such orientations relate to attitudes (i.e., positive or negative) toward metaverse gaming. As an example, the play-to-earn model deals with economic incentives, creating perceptions around financial reward among gamers, which directly affects attitudes. Likewise, the orientation of mixed reality is conducted in terms of immersive digital experiences affecting players enjoyment and engagement. Focusing on these two orientations allows one to place some order and clarity on TPB framework in terms of evaluating attitudinal influences that support intention to behave.

Second, subjective norms — the assumed social pressures and expectations others impose on digital natives to engage in metaverse gaming — play an important role in understanding metaverse gaming behavior. It also accounts for how peer dynamics and social norms may encourage or inhibit people from engaging in metaverse spaces. Social gaming orientation, for example, is more specifically revealed by the ways in which expectations from friends and gaming communities influence player choices.

Finally, perceived behavioral control focuses on the control people have over engaging in metaverse gaming (e.g., through facilitators and barriers affecting gamers' ability to play in the metaverse). The extent to which VR tools are usable and players are familiar with the technology determines whether they feel empowered to play. TPB explains this by including this construct to indicate that different degrees of perceived control affects attitudes and intention. In summary, the TPB capture human behavior complexity and better reflects metaverse gaming context; its insights are valuable for theory-building and practice.

We fairly contribute to theoretical development by presenting an empirical provision between the Theory of Planned Behavior (TPB) and relevant gaming orientations in the metaverse, whilst focusing on how these orientations feed into Gen-Z attitudes and behavioral intentions. This theoretical contribution stems from a focus on the largely ignored direct antecedents of metaverse gaming attitudes, as well as the agenda-setting impact of differential dimensions mediating cultural/demographic status and metaverse gaming intention differences.

Our integration of TPB with new medical orientations—social gaming, play-to-earn models, flexibility and mixed reality—enhances the theory by explaining human behavior in a digital age. According to TPB, intentions are predicted by attitudes, subjective norms and perceived behavioral control (PBC) (Ajzen, 1991). We empirically shed light onto how the theoretical constructs drive attitude towards metaverse gaming in Gen-Z which we further augment with novel insights based on data from different cultural regions in surging India. Our results show, in particular, that social gaming and mixed reality experiences have strong effects on attitudes, consistent with TPB distinctions between attitudinal beliefs about behaviors and perceived outcomes.

This empirical knowledge regarding the determinants of attitudes is consonant with the theoretical proposition that beliefs about the probable consequences (called outcome evaluations) of a behavior and their evaluation exert influence on attitudes. Our findings that Gen-Z finds mixed reality and play-to-earn models to be essential for the metaverse are consistent with TPB, which emphasizes the importance of behavioral outcome expectancies (i.e., perceptual benefits that a metaverse player gets when one engage in an experience) especially when that engagement is immersive or incentivized with rewards. These orientations create positive attitudes, which supports Ajzen (1991) claim that people will be more likely to perform behaviors for which they anticipate positive consequences. In doing so, we deepen the application of TPB (alongside the literature focusing on experience-based belief antecedents) to digital gaming contexts by demonstrating empirically that these beliefs concerning metaverse gaming consequences are a significant predictor for attitudes.

We also discuss subjective norms and perceived behavioral control in response to cultural influences, reflected in attitudes and behavioral intentions. And finally, in South India social gaming has a huge influence on attitudes because of strong subjective norms stemming from a collectivist culture and historical foreign influences (Dheer et al., 2015). This is in line with TPB that social pressures to conform can affect the formation of an employee's attitude and behavioral intention. This validation of a theoretical connection between subjective norms and behavior in the TPB is consistent with gaming being viewed as an acceptable activity to engage in objective trends related to community reinforcement of normative values. The emphasis on collective (family/caste) experiences that have cultivated grievances or fostered a sense of belonging in South India (Desai & Kulkarni, 2008) similarly highlights how high educational attainment is shaped by other contextual factors as well.

On the other hand regarding East India individuals preference for flexibility in gaming this connects with PBC, as it represents individuals beliefs for their capability to carry out a behaviour. When autonomy is highlighted, we show with our data that flexibility within gaming environments increases a sense of perceived control, leading towards favorable attitudes. This theoretical insight advances TPB with a validation to explain how cultural contexts influence perceived behavioral control, thereby impacting attitudes toward behaviors such as metaverse gaming. The individualism orientation associated with East India may be particularly appropriate for determining the significance of PBC, emphasizing independence and personal orientation. As a result, our findings not only support the importance of TPB but also extend it by connecting cultural influence to theoretical constructs.

Moreover, by demonstrating that external factors such as VR tools usability, age and subjective norms moderate the relationships between gaming orientations and attitudes, our moderation analysis provides further theoretical contributions. The finding, for example, that perceived VR tools usability enhances perceived behavioral control and reinforces the effects of gaming orientations on attitudes demonstrates how technology can play a role in influencing digital behavior which has thus far received very little attention in the application of TPB. This new experiential perspective broadens the scope of existing literature on technological factors enhancing perceived control, as the latter is highlighted in TPB's focus on the importance of control beliefs for intention development.

Gaming orientations and attitudes are also age rated, suggesting a generational effect where younger youth are more likely to respond positively to innovations such as mixed reality. It further expands the theory by arguing that different generations can alter and change the value of TPB constructs in its effect on behavior. By providing empirical evidence of how digitally ready and preferences change by age our study elucidates the value actioning TPB affords across demographic cohorts.

Implications

Implications for policy and societal effects

The metaverse will be ever attractive to Gen-Z and its arrival poses lots of challenges and opportunities for public policymakers to make sure they engage in an equitable and safe way. Finally, Gen-Z are digital natives who live practically in the metaverse. Therefore, public policy must emphasize digital literacy and responsible online habits like always watching what one say. Built into school curricula, programs should be designed so that students learn how to manage their privacy and security, as well as how to protect themselves from online harms like cyberbullying or fraud. These measures are important as Gen-Z engagement with new gaming technologies increases. Instead, policymakers should focus on providing digital literacy for young people in these spaces so they can navigate them safely and confidently.

Data privacy and protection are also big concerns, given that metaverse gaming platforms often process significant amounts of personal data. With this widespread use of personal data, comes the need for strict regulations that govern how data can be collected, stored and used by businesses — consumers should know what happens to their data, and we need strong safeguards around this. In particular, there should be further regulation to prevent the exploitation of younger users and hold gaming platforms to stricter data privacy practices. Additionally, policymakers must develop longer-term frameworks to regulate financial transactions in play-to-earn gaming models. With real money and cryptocurrencies involved in these models, they are open to exploitation and fraud but that needs comprehensive consumer protection. This might involve policies centered around secure transaction processing, mandatory disclosures, and the imposition of stringent rules on virtual asset trading to safeguard users — especially the under 18 demographic.

Bridging the digital divide is just as necessary. With the metaverse more crucial within the digital economy, lack of access to technology spells disaster for underserved communities. Policymakers must allocate resources to roll out broader access to the internet as well as subsidizing VR and AR technologies, if only to prepare for greater participation in the metaverse by more segments of society. The imperatives include affordable and widespread broadband, especially in rural and lesser-developed regions of the world. Such programs that subsidize or exempt technology, including a computer or a smartphone, help further democratize access. Furthermore, as more immersive technologies are used for sporting and mixed reality play, there needs to be a push towards low-cost easy classroom programs. These might be in VR and AR skills, eyeing the future workforce of sorting out job markets on these grounds.

Implications for practice in commercial contexts

As the metaverse also presents game developers with significant commercial opportunities, there are multiple ways that the insights from our study could be used to better engage Gen-Z with gaming experiences in the metaverse. Developers need to appropriately craft their games based on Gen-Zs highly developed interest in social gaming, in-game economies (i.e. play-to-earn), and a mixed reality environment. This entails developing leading-edge virtual and augmented reality applications to design memorable and captivating experiences. Developers will be able to offer features that make it easier for gamers to meet and connect with people with whom they have common interests, for instance. Further, play-to-earn mechanisms with real rewards or in-game cryptocurrencies can help preserve younger users by taking advantage of their entrepreneurial spirit and desire to receive services with value.

Furthermore, marketing teams can use the age-specific mechanisms revealed in our study to inform marketing targeting. The key demographic for developers will be those aged 16-22, according to findings, as users in this group are not only the heaviest users of metaverse gaming, but also hold the most positive views of it as well. Focusing game content with demographic-specific chronology can result in greater marketing success and lower user dropout. Autonomy and Flexibility — Incorporate design elements that will appeal to people who want to do it their way while playing games, such as customization and personal control. Gen-Z will definitely want personalized experiences that give them control over how, when and where they play so one can be sure flexible gaming features will connect with them.

Another actionable insight is the usability of the VR tools. Our results show the effect of VR technologies (Easy to Use-VR) in converting these gaming orientations to facilitative attitudes. Keep the VR and AR tools as user-friendly as one could, so that the integration can take place without many hiccups, providing a smooth experience while playing. This component of the usability is imperative because it enhances the perceived behavioral control of users allowing them to be more confident and likely to partake in metaverse gaming. In an ever-evolving digital gaming landscape, those who invest in intuitive interfaces and accessible VR technology can gain a competitive advantage.

Also, developers must start doing educational and socially responsible content. With increasing concerns around gaming addiction and the ethics of virtual worlds, this will allow companies to stand apart from the crowd as they promote well-being and responsible gaming. They can also partner with educational institutions to create programs focused on digital literacy and metaverse skills, and in doing so serve the larger community. Also, variety in gaming & inclusive gaming content, development will make the metaverse attract multiple types of users, thus increase brand reputation & retain a customer base.

Limitations and future research

While our research on the gaming behaviours of Gen Z and Millennials from India highlights numerous facets of Metaverse gaming, it is important to note that the study has several limitations that future research can address. First, our concentration on a single demography presents the possibility that the findings do not capture the full range of gaming behaviour exhibited by age groups and different cultures around the globe. This factor may contribute to poor generalizability of our findings such that they cannot be applied to others. Second, the survey's design is cross-sectional, which poses several challenges, with the main one being the inability of the researchers to assume causality among the variables. A longitudinal study would capture the trends more accurately, thus providing a better picture of how attitudes and behaviour towards Metaverse evolve. Finally, the use of self-reported data is prone to various biases, such as social desirability bias, recall bias, among other potential sources of errors that could affect the findings' validity. And others may have been influential on individuals' perceptions of Metaverse gaming. Therefore, future studies should include these variables or intervene to understand their impact.

Moreover, while we, as researchers, have tried to test several moderators such as VR tool usability and subjective norms, we have not accounted for technological literacy or financial aspects that may influence the users' perception and engagement behaviours. Future perspectives, however, must assess the broader demography, including the cultural impact of generational differences to generalise the findings. However, to comprehend these trends, such studies should be done longitudinally to offer insights into the expanding nature of Metaverse gaming and prevent the risk of several sources of errors, including recall and desirability. Moreover, the researchers should use experimental research to examine instrumental experiences that confirm robust priming and integrate extended models to associate behavioural models with the attitudes of using technology. Therefore, the investigation of a wide range of more moderators might influence the evaluation.

Conclusion

This study contributes to academia and practice by applying the Theory of Planned Behavior (TPB) to the rapidly changing, emergent area of the metaverse, as games with the potential to transform learning, training, work, and play. Focusing on orientations such as social gaming, play-to-earn, flexibility, and mixed reality, we show that these orientations are positively associated with players' attitude toward metaverse gaming, and that the relationship is even stronger for Gen Z and Millennials. As direct determinants of intention, attitudes inform whether enjoyment will be found by players in such immersive environments. In conclusion, the study found VR tool usability, age, PBC, and SN to be major moderators of gaming attitudes and behaviors, which emphasizes the need for game design to match its users' demands.

For developers and marketers, these key findings provide actionable insights on how to improve user engagement by focusing on demographic specifics and building more inclusive gaming experiences. In addition to play, metaverse gaming also has a wider societal impact with applications that one will see in scientific research, education, and immersive training. Considering usability preferences and moderating factors will allow the gaming industry to dedicate themselves to a more practical and easier metaverse which will also be an essential part of the ready-to-go future.

CRediT authorship contribution statement

Santanu Mandal: Writing – original draft, Supervision, Software, Methodology, Investigation, Formal analysis, Conceptualization. **Ritesh Kumar Dubey:** Writing – original draft, Supervision, Software, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Bhaskar Basu:** Writing – review & editing, Supervision, Resources, Project administration, Investigation. **Anubhav Tiwari:** Writing – review & editing, Supervision, Software, Resources, Project administration, Investigation.

Declaration of competing interest

The authors have no competing or financial interests towards the development of this study.

Appendix-1

Table 3
Measurement model assessment.

Measurement Items (1= strongly disagree, 7= strongly agree)	Loadings	t-values	VIF	Mean	Std. Dev.	Skew	Kurt	Loadings	t-values	VIF	Mean	Std. Dev.	Skew	Kurt
	South(N=308)							**East(N=256)**						
Orientation for Social Gaming (Newly Developed) South (308): Rho(a)-0.815, alpha=0.814, AVE=0.729 East(256): Rho(a)-0.871, alpha=0.868, AVE=0.792														
I am interested to form relationships with new gamers in social gaming provided by metaverse	0.840	39.978	1.752	3.795	2.126	0.108	-1.376	0.883	54.187	2.098	3.652	2.111	0.228	-1.324
I would like to compete with others by inviting people in metaverse gaming	0.853	47.289	1.740	3.825	2.005	0.150	-1.249	0.903	69.427	2.516	3.637	1.894	0.188	-1.194
As I enjoy making connections, I would like to explore social gaming in the metaverse	0.870	64.129	1.953	3.776	1.953	0.204	-1.176	0.884	66.581	2.331	3.863	1.955	0.143	-1.204

(continued on next page)

Table 3 (*continued*)

Measurement Items (1= strongly disagree, 7= strongly agree)	**Loadings**	**t-values**	**VIF**	**Mean**	**Std. Dev.**	**Skew**	**Kurt**	**Loadings**	**t-values**	**VIF**	**Mean**	**Std. Dev.**	**Skew**	**Kurt**
Play to Earn Orientation (Newly Developed)														
South (308): Rho(a)-0.851, alpha=0.848, AVE=0.767														
East(256): Rho(a)-0.835, alpha=0.834, AVE=0.751														
I am interested in earning through winning challenges in metaverse games	0.857	48.243	1.925	3.633	1.952	0.204	-1.131	0.854	41.747	1.786	3.867	1.956	0.064	-1.108
I would like engage in trading activities like selling off assets in games that I won and earn	0.867	47.905	2.036	3.766	2.024	0.085	-1.303	0.856	37.382	1.959	4.008	2.012	-0.107	-1.272
I don't want to miss out an opportunity to earn in the metaverse as gaming is my passion	0.903	99.328	2.360	3.912	1.983	0.079	-1.196	0.890	67.307	2.236	4.195	2.000	-0.123	-1.210
Flexibility Gaming Orientation (Newly Developed)														
South(308): Rho(a)-0.852, alpha=0.849, AVE=0.768														
East(256): Rho(a)-0.831, alpha=0.821, AVE=0.736														
I would like to add players in the virtual world gaming	0.859	52.821	1.921	3.734	2.029	0.258	-1.237	0.823	26.334	1.671	3.656	2.067	0.221	-1.265
I would like to create content of players in the metaverse gaming	0.887	62.573	2.292	3.799	2.038	0.178	-1.219	0.885	56.910	1.978	3.715	2.024	0.191	-1.239
I would like to build sub-games within a game in metaverse gaming	0.884	74.490	2.087	4.010	2.060	-0.036	-1.306	0.866	41.511	1.979	3.672	2.152	0.198	-1.351
Orientation for Mixed Reality Experience (Newly Developed)														
South(308): Rho(a)-0.782, alpha=0.777, AVE=0.691														
East (256): Rho(a)-0.839, alpha=0.834, AVE=0.751														
I would like to experience the mixed reality provided by the metaverse gaming environment	0.805	28.662	1.558	3.656	2.054	0.230	-1.266	0.844	43.406	1.778	3.738	2.019	0.238	-1.219
I am excited to explore the mixed reality experience in metaverse gaming	0.849	44.100	1.655	3.760	1.989	0.133	-1.266	0.873	49.818	2.105	3.789	2.028	0.173	-1.207
I cant wait to try out the different mixed reality experiences provided in different metaverse games	0.840	42.622	1.602	3.799	2.149	0.154	-1.357	0.884	71.541	2.025	4.039	2.021	-0.082	-1.256
Attitude- Metaverse Gaming														
(Developed from** Ukenna & Ayodele, 2019**)														
South (308): Rho(a)-0.837, alpha=0.836, AVE=0.753														
East(256): Rho(a)-0.828, alpha=0.827, AVE=0.743														
I would prefer to try metaverse gaming for its unique experience	0.863	47.041	2.005	3.932	1.962	-0.032	-1.186	0.875	49.366	2.031	3.977	1.956	-0.052	-1.202
I would recommend others to try metaverse gaming	0.882	62.606	2.158	4.042	2.050	-0.135	-1.307	0.879	58.715	2.115	4.086	2.047	-0.133	-1.296
I always suggest my friends and peers to try out metaverse gaming	0.859	53.313	1.797	3.916	2.078	0.001	-1.318	0.832	36.864	1.674	3.871	2.055	0.036	-1.313
I would request my closed members to adopt and														

(*continued on next page*)

Table 3 (*continued*)

Measurement Items (1= strongly disagree, 7= strongly agree)	Loadings	t-values	VIF	Mean	Std. Dev.	Skew	Kurt	Loadings	t-values	VIF	Mean	Std. Dev.	Skew	Kurt
encourage others for metaverse gaming*														
BI- Metaverse Gaming *(Developed from* Ajzen, 1991*)*														
South (308): Rho(a)-0.889, alpha=0.883, AVE=0.810														
East(256): Rho(a)-0.886, alpha=0.879, AVE=0.805														
Given an opportunity I would like to try metaverse gaming	0.896	57.733	2.540	3.727	2.051	0.212	-1.276	0.889	47.854	2.420	3.582	2.006	0.299	-1.191
I am ready to pay premium to experience the metaverse gaming	0.901	81.264	2.596	3.854	2.023	0.146	-1.257	0.896	70.886	2.446	3.699	1.984	0.229	-1.191
I would like to opt to explore different facilities offered by metaverse gaming	0.904	88.079	2.350	3.802	2.035	0.189	-1.250	0.908	91.633	2.419	3.703	1.988	0.260	-1.170
I am at times ready to pay premium for extra packaging that may be save for the environment*														

Table 4
Discriminant validity.

		South (N: 308)				
Discriminant Validity: Heterotrait-Monotrait Ratio of Correlations (HTMT) (N=308)						
Construct	Orient. Social Gaming	Play to Earn Orientation	Passion for Flexibility Gaming	Orient. for Mixed Reality	Attitude- Meta. Gaming	BI- Meta. Gaming
Orient. Social Gaming						
Play to Earn Orientation	0.778					
Passion for Flexibility Gaming	0.794	0.722				
Orient. for Mixed Reality	0.734	0.543	0.635			
Attitude- Meta. Gaming	0.824	0.756	0.756	0.748		
BI- Meta. Gaming	0.837	0.700	0.641	0.830	0.675	
Discriminant Validity: Heterotrait-Monotrait Ratio of Correlations (HTMT2) (N=308)						
Construct	Orient. Social Gaming	Play to Earn Orientation	Passion for Flexibility Gaming	Orient. for Mixed Reality	Attitude- Meta. Gaming	BI- Meta. Gaming
Orient. Social Gaming						
Play to Earn Orientation	0.776					
Passion for Flexibility Gaming	0.789	0.721				
Orient. for Mixed Reality	0.732	0.542	0.628			
Attitude- Meta. Gaming	0.823	0.755	0.754	0.745		
BI- Meta. Gaming	0.832	0.700	0.639	0.829	0.672	
Discriminant Validity: Fornell-Larcker Criterion (N=308)						
Construct	Orient. Social Gaming	Play to Earn Orientation	Passion for Flexibility Gaming	Orient. for Mixed Reality	Attitude- Meta. Gaming	BI- Meta. Gaming
Orient. Social Gaming	0.730					
Play to Earn Orientation	0.421	0.768				
Passion for Flexibility Gaming	0.436	0.375	0.769			
Orient. for Mixed Reality	0.344	0.195	0.266	0.691		
Attitude- Meta. Gaming	0.466	0.409	0.409	0.367	0.754	
BI- Meta. Gaming	0.507	0.368	0.307	0.474	0.342	0.810
		East (N: 256)				
Discriminant Validity: Heterotrait-Monotrait Ratio of Correlations (HTMT)						
Construct	Orient. Social Gaming	Play to Earn Orientation	Passion for Flexibility Gaming	Orient. for Mixed Reality	Attitude- Meta. Gaming	BI- Meta. Gaming
Orient. Social Gaming						
Play to Earn Orientation	0.546					
Passion for Flexibility Gaming	0.479	0.311				
Orient. for Mixed Reality	0.786	0.731	0.571			
Attitude- Meta. Gaming	0.676	0.674	0.587	0.830		

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Table 4 (*continued*)

Construct	Orient. Social Gaming	Play to Earn Orientation	Passion for Flexibility Gaming	Orient. for Mixed Reality	Attitude- Meta. Gaming	BI- Meta. Gaming
BI- Meta. Gaming	0.658	0.730	0.658	0.781	0.696	
Discriminant Validity: Heterotrait-Monotrait Ratio of Correlations (HTMT2)						
Construct	Orient. Social Gaming	Play to Earn Orientation	Passion for Flexibility Gaming	Orient. for Mixed Reality	Attitude- Meta. Gaming	BI- Meta. Gaming
Orient. Social Gaming						
Play to Earn Orientation	0.546					
Passion for Flexibility Gaming	0.475	0.311				
Orient. for Mixed Reality	0.785	0.731	0.568			
Attitude- Meta. Gaming	0.675	0.671	0.565	0.827		
BI- Meta. Gaming	0.658	0.730	0.658	0.780	0.694	
Discriminant Validity: Fornell-Larcker Criterion						
Construct	Orient. Social Gaming	Play to Earn Orientation	Passion for Flexibility Gaming	Orient. for Mixed Reality	Attitude- Meta. Gaming	BI- Meta. Gaming
Orient. Social Gaming	0.792					
Play to Earn Orientation	0.217	0.752				
Passion for Flexibility Gaming	0.167	0.066	0.737			
Orient. for Mixed Reality	0.445	0.373	0.224	0.752		
Attitude- Meta. Gaming	0.330	0.313	0.239	0.480	0.744	
BI- Meta. Gaming	0.331	0.393	0.313	0.450	0.356	0.806

Table 6
Contingent effects summary.

Paths (South: N=308)	Path Coefficient	SE	t-value	p-value	ULCI	LLCI	Moderation?
Moderator: VR tools Usability							
VR tools usability —–> Attitude - MG	0.525	0.040	13.059	0.000	0.446	0.604	
Social Gaming* VR tools usability —–> Attitude-MG	**0.179**	**0.024**	**7.616**	**0.000**	**0.133**	**0.225**	Yes
VR tools usability —–> Attitude - MG	0.492	0.044	11.138	0.000	0.040	0.578	
Play to Earn Orientation* VR tools usability —–> Attitude-MG	**0.120**	**0.025**	**4.822**	**0.000**	**0.071**	**0.168**	Yes
VR tools usability —–> Attitude - MG	0.532	0.036	14.605	0.000	0.460	0.604	
Flexibility Gaming * VR tools usability —–> Attitude-MG	**0.131**	**0.019**	**6.899**	**0.000**	**0.094**	**0.169**	Yes
VR tools usability —–> Attitude - MG	0.487	0.041	11.952	0.000	0.407	0.567	
Mixed Reality * VR tools usability —–> Attitude-MG	**0.038**	**0.023**	**1.635**	**0.103**	**-0.008**	**0.083**	Yes
VR tools usability —–> BI-MG	-0.088	0.071	-1.238	0.217	-0.228	0.052	
ATT-MG * VR tools usability —–> BI-MG	**0.024**	**0.031**	**0.771**	**0.442**	**-0.037**	**0.084**	No
Moderator: Subjective Norm							
Subjective norm—–> Attitude - MG	0.564	0.037	15.310	0.000	0.492	0.637	
Social Gaming* Subjective Norm —–> Attitude-MG	**0.150**	**0.021**	**7.183**	**0.000**	**0.109**	**0.191**	Yes
Subjective norm—–> Attitude - MG	0.546	0.037	14.770	0.000	0.473	0.618	
Play to Earn Orientation* Subjective Norm —–> Attitude-MG	**0.094**	**0.021**	**4.543**	**0.000**	**0.053**	**0.134**	Yes
Subjective norm—–> Attitude - MG	0.543	0.035	15.671	0.000	0.475	0.611	
Flexibility Gaming * Subjective Norm —–> Attitude-MG	**0.118**	**0.018**	**6.479**	**0.000**	**0.082**	**0.154**	Yes
Subjective norm—–> Attitude - MG	0.526	0.037	14.185	0.000	0.453	0.599	
Mixed Reality * Subjective Norm —–> Attitude-MG	**0.023**	**0.021**	**1.104**	**0.271**	**-0.018**	**0.065**	No
Subjective norm—–> BI-MG	0.134	0.067	2.014	0.045	0.003	0.266	
ATT-MG * Subjective Norm —–> BI-MG	**0.017**	**0.028**	**0.592**	**0.554**	**-0.039**	**0.072**	No
Moderator: Perceived Behavioural Control							
Perceived Behavioural Control —–> Attitude - MG	0.322	0.035	9.108	0.000	0.253	0.392	
Social Gaming* Perceived Behavioural Control —–> Attitude-MG	**-0.059**	**0.021**	**-2.837**	**0.005**	**-0.099**	**-0.018**	Yes
Perceived Behavioural Control —–> Attitude - MG	0.276	0.041	6.703	0.000	0.195	0.357	
Play to Earn Orientation* Perceived Behavioural Control —–> Attitude-MG	**-0.048**	**0.023**	**-2.096**	**0.037**	**-0.094**	**-0.003**	Yes
Perceived Behavioural Control —–> Attitude - MG	0.314	0.038	8.160	0.000	0.238	0.389	
Flexibility Gaming * Perceived Behavioural Control —–> Attitude-MG	**0.036**	**0.021**	**1.705**	**0.089**	**-0.006**	**0.078**	Yes
Perceived Behavioural Control —–> Attitude - MG	0.392	0.034	11.585	0.000	0.326	0.459	
Mixed Reality * Perceived Behavioural Control —–> Attitude-MG	**-0.126**	**0.020**	**-6.395**	**0.000**	**-0.165**	**-0.088**	Yes
Perceived Behavioural Control —–> BI-MG	-0.158	0.051	-3.081	0.002	-0.259	-0.057	
ATT-MG * Perceived Behavioural Control —–> BI-MG	**-0.038**	**0.025**	**-1.526**	**0.128**	**-0.087**	**0.011**	No
Moderator: Age							
Age —–> Attitude - MG	0.313	0.633	4.944	0.000	1.883	4.372	
Social Gaming* Age —–> Attitude-MG	**-0.675**	**0.159**	**-4.242**	**0.000**	**-0.988**	**-0.362**	Yes
Age —–> Attitude - MG	2.687	0.441	6.090	0.000	1.819	3.556	
Play to Earn Orientation* Age —–> Attitude-MG	**-0.361**	**0.108**	**-3.354**	**0.001**	**-0.572**	**-0.149**	Yes
Age —–> Attitude - MG	3.468	0.520	6.674	0.000	2.446	4.491	
Flexibility Gaming * Age —–> Attitude-MG	**-0.547**	**0.119**	**-4.605**	**0.000**	**-0.781**	**-0.313**	Yes
Age —–> Attitude - MG	3.338	0.398	8.393	0.000	2.555	4.120	
Mixed Reality * Age —–> Attitude-MG	**-0.513**	**0.101**	**-5.080**	**0.000**	**-0.712**	**-0.314**	Yes
Age —–> BI-MG	3.828	0.425	9.005	0.000	2.992	4.665	

(*continued on next page*)

Table 6 (*continued*)

Paths (South: N=308)	Path Coefficient	SE	t-value	p-value	ULCI	LLCI	Moderation?
ATT-MG * Age —–> BI-MG	**-0.319**	**0.095**	**-3.349**	**0.001**	**-0.506**	**-0.131**	Yes
Age: G1 < 22 years, G2> 22 years							
Paths (East: N=256)	**Path Coefficient**	**SE**	**t**	**p**	**ULCI**	**LLCI**	**Moderation?**
Moderator: VR tools Usability							
VR tools usability —–> Attitude - MG	0.602	0.046	13.063	0.000	0.511	0.693	
Social Gaming* VR tools usability —–> Attitude-MG	**0.135**	**0.025**	**5.318**	**0.000**	**0.085**	**0.185**	Yes
VR tools usability —–> Attitude - MG	0.594	0.046	13.069	0.000	0.505	0.684	
Play to Earn Orientation* VR tools usability —–> Attitude-MG	**0.073**	**0.027**	**2.758**	**0.006**	**0.021**	**0.125**	Yes
VR tools usability —–> Attitude - MG	0.691	0.052	13.215	0.000	0.588	0.794	
Flexibility Gaming * VR tools usability —–> Attitude-MG	**0.101**	**0.029**	**3.446**	**0.001**	**0.043**	**0.159**	Yes
VR tools usability —–> Attitude - MG	0.522	0.047	11.202	0.000	0.431	0.614	
Mixed Reality * VR tools usability —–> Attitude-MG	**0.119**	**0.026**	**4.657**	**0.000**	**0.069**	**0.169**	Yes
VR tools usability —–> BI-MG	0.293	0.074	3.952	0.000	0.147	0.439	
ATT-MG * VR tools usability —–> BI-MG	**0.070**	**0.030**	**2.340**	**0.020**	**0.011**	**0.129**	Yes
Moderator: Subjective Norm							
Subjective norm—–> Attitude - MG	0.726	0.038	19.021	0.000	0.651	0.802	
Social Gaming* Subjective Norm —–> Attitude-MG	**0.069**	**0.021**	**3.255**	**0.001**	**0.027**	**0.110**	Yes
Subjective norm—–> Attitude - MG	0.706	0.034	20.749	0.000	0.639	0.773	
Play to Earn Orientation* Subjective Norm —–> Attitude-MG	**0.018**	**0.019**	**0.940**	**0.348**	**-0.020**	**0.056**	No
Subjective norm—–> Attitude - MG	0.785	0.041	19.317	0.000	0.705	0.865	
Flexibility Gaming * Subjective Norm —–> Attitude-MG	**0.005**	**0.023**	**0.208**	**0.836**	**-0.040**	**0.049**	No
Subjective norm—–> Attitude - MG	0.640	0.039	16.243	0.000	0.563	0.718	
Mixed Reality * Subjective Norm —–> Attitude-MG	**0.049**	**0.021**	**2.288**	**0.023**	**0.007**	**0.091**	Yes
Subjective norm—–> BI-MG	0.268	0.091	2.957	0.003	0.089	0.445	
ATT-MG * Subjective Norm —–> BI-MG	**-0.008**	**0.035**	**-0.228**	**0.820**	**-0.077**	**0.061**	No
Moderator: Perceived Behavioural Control							
Perceived Behavioural Control —–> Attitude - MG	0.097	0.048	2.015	0.045	0.002	0.191	
Social Gaming* Perceived Behavioural Control —–> Attitude-MG	**0.062**	**0.026**	**2.350**	**0.020**	**0.010**	**0.113**	Yes
Perceived Behavioural Control —–> Attitude - MG	0.181	0.047	3.827	0.000	0.088	0.274	
Play to Earn Orientation* Perceived Behavioural Control —–> Attitude-MG	**-0.082**	**0.028**	**-2.982**	**0.003**	**-0.136**	**-0.028**	Yes
Perceived Behavioural Control —–> Attitude - MG	0.082	0.052	1.557	0.121	-0.022	0.185	
Flexibility Gaming * Perceived Behavioural Control —–> Attitude-MG	**0.013**	**0.030**	**0.444**	**0.658**	**-0.046**	**0.073**	No
Perceived Behavioural Control —–> Attitude - MG	0.113	0.042	2.710	0.007	0.031	0.196	
Mixed Reality * Perceived Behavioural Control —–> Attitude-MG	**0.072**	**0.025**	**2.913**	**0.004**	**0.023**	**0.120**	Yes
Perceived Behavioural Control —–> BI-MG	-0.149	0.050	-3.006	0.003	-0.246	-0.051	
ATT-MG * Perceived Behavioural Control —–> BI-MG	**0.007**	**0.027**	**0.250**	**0.803**	**-0.047**	**0.060**	No
Moderator: Age							
Age —–> Attitude - MG	1.683	0.590	2.826	0.005	0.521	2.845	
Social Gaming* Age —–> Attitude-MG	**-0.246**	**0.126**	**-1.961**	**0.051**	**-0.494**	**0.001**	Yes
Age —–> Attitude - MG	1.589	1.053	1.510	0.132	-0.484	3.662	
Play to Earn Orientation* Age —–> Attitude-MG	**-0.229**	**0.201**	**-1.142**	**0.255**	**-0.624**	**0.166**	No
Age —–> Attitude - MG	2.916	0.442	6.604	0.000	2.047	3.786	
Flexibility Gaming * Age —–> Attitude-MG	**-0.448**	**0.105**	**-4.279**	**0.000**	**-0.654**	**-0.242**	Yes
Age —–> Attitude - MG	2.580	0.865	2.983	0.003	0.876	4.284	
Mixed Reality * Age —–> Attitude-MG	**-0.500**	**0.170**	**-2.946**	**0.004**	**-0.833**	**-0.166**	Yes
Age —–> BI-MG	4.430	0.658	6.729	0.000	3.133	5.726	
ATT-MG * Age —–> BI-MG	**-0.715**	**0.134**	**-5.325**	**0.000**	**-0.980**	**-0.451**	Yes
Age: G1 < 22 years, G2> 22 years							

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