Cognitive pathways in VR-based metaverse brand experiences: Enhancing consumer brand engagement through perceived absorption

Sara Boccalini, Michela Patrizi*, Maria Vernuccio**

Department of Management, Sapienza University of Rome

sara.boccalini@uniroma1.it, *michela.patrizi@uniroma1.it, **maria.vernuccio@uniroma1.it

Abstract

Virtual Reality (VR)-based metaverse brand experiences present innovative opportunities to enhance consumer brand engagement by leveraging users' perceptual responses within immersive environments. Specifically, perceived absorption in branded VR-based environments may identify a critical factor in reinforcing cognitive brand engagement. However, existing literature on this subject remains fragmented. Therefore, this study aims to investigate whether absorption during VR-based metaverse brand experiences enhances cognitive brand engagement, while also examining the moderating role of the perceived usefulness of VR. Data were collected from a survey of 262 Italian Generation Z consumers who participated in a Tommy Hilfiger brand experience on Roblox's VR-based metaverse. The analysis, conducted using LISREL 8.80 and SPSS software, reveals a positive relationship between perceived absorption and cognitive brand engagement. Furthermore, the perceived usefulness of VR positively moderates this relationship, intensifying the effect of absorption on cognitive brand engagement when perceived usefulness is high. This research contributes to the emerging literature on marketing in the VR-based metaverses and to the field of consumer brand engagement, offering valuable managerial implications for brands looking to leverage experiences in the VR-based metaverse.

1) Introduction

The metaverse is "an online collaborative shared space built of 3D environments that leverage high consumer immersion techniques to reduce the perception of technological mediation" (Yoo et al., 2023, p. 176). Built on extended reality (XR) technologies, i.e., augmented reality (AR), virtual reality (VR), and mixed reality (MR), the metaverse represents an innovative platform for enhancing consumer engagement (Dwivedi et al., 2023). Among these technologies, VR stands out for its ability to create fully virtual and multisensory environments that engage users more deeply than traditional digital platforms (Bilgihan et al., 2024; Vernuccio et al., 2024). In this regard, numerous brands are leveraging VR-based metaverse platforms to introduce consumers to their brand environments in innovative ways (Dwivedi et al., 2023). For example, Tommy Hilfiger launched TommyPlay Space on the VR-based metaverse of Roblox in 2022, where consumers can immerse themselves in a branded city, customize avatars with branded apparel, and explore new product lines (PVH, 2022). Specifically, the potential of brand experiences within the VR-based metaverse lies in the technical features of VR technology, such as interactivity and vividness (Mütterlein, 2018), which can generate a deep experiential involvement known as perceived absorption (Agarwal & Karahanna, 2000). Current marketing literature across various media environments, such as social media and virtual learning platforms, suggests that perceived absorption within brand environments can significantly enhance consumer cognitive brand engagement (Patterson et al., 2006; Hollebeek et al., 2014; Reychav & Wu, 2015; Carvalho & Fernandes, 2018). Although the cognitive dimension of brand

engagement has received less scholarly attention compared to its emotional and behavioral counterparts (Hollebeek et al., 2014), it remains a critical branding outcome, significantly influencing consumer-brand responses such as cognitive brand loyalty, brand love (Shin & Back, 2020), and perceived brand quality (Algharabat et al., 2020). Given the ongoing debate in the literature regarding the potential to enhance cognitive brand engagement through perceived absorption in VR (e.g., Murray et al., 2007; Dwivedi et al., 2023), further investigation into this relationship is warranted. To date, no studies have examined the impact of perceived absorption on cognitive brand engagement within VR-based metaverse brand experiences.

Moreover, previous research on AR environments has revealed that the perceived usefulness of technology can positively moderate the relationship between flow, i.e., an optimal psychological state in which a person is fully immersed in the activity (Bodzin et al., 2020), and consumer brand engagement during AR-based experiences (Arghashi & Yuksel, 2018). This finding suggests a similar moderating effect of the perceived usefulness of VR on the relationship between perceived absorption and cognitive brand engagement within VR brand experiences. However, the moderating role of the perceived usefulness in VR in the relationship between absorption and cognitive brand engagement in the VR-based metaverse remains unexplored. Therefore, this study aims to explore whether absorption in VR-based metaverse brand experiences positively influences cognitive brand engagement and to investigate the moderating role of the perceived usefulness of VR in this relationship.

2) Theoretical background and research hypothesis

Absorption is defined as a "state of deep involvement" within the virtual setting (Agarwal and Karahanna, 2000), and is recognized as a pleasurable perception, especially prominent in VR-based environments where the user is fully immersed in the experience (Murray et al., 2007). Perceived absorption is marked by complete attention and involvement, along with a strong sense of control and heightened enjoyment and curiosity within the virtual environment. In the academic literature on virtual learning, cognitive absorption has been identified as a key factor in enhancing cognitive outcomes, such as enhanced content processing during virtual experiences (Reychav & Wu, 2015). Consistent with this evidence, prior research on marketing and human-computer interaction has demonstrated that when technology facilitates the perception of absorption, users tend to be more deeply engaged in the cognitive processing of experiential content (Léger et al., 2014; Balakrishnan & Dwivedi, 2021). Given that, in a brand experience, the brand itself constitutes the experiential content, these studies suggest that absorption may play a significant role in shaping cognitive engagement with the brand in the VR-based metaverse brand experience.

Cognitive brand engagement is defined as 'the level of consumer processing and thinking about the brand during a specific consumer/brand interaction' (Hollebeek et al., 2014, p. 154). A brand is a multifaceted construct encompassing functional, emotional, and symbolic dimensions that collectively shape consumer perceptions, foster emotional connections, and differentiate the brand in a competitive marketplace (Keller, 2003; Schmitt, 2012). The brand serves as the experiential object in a branded environment, including technology-based environments, as these spaces are constructed with brand-related stimuli. Previous research indicates that deep cognitive involvement (i.e., absorption) during a technological environment can affect a consumer's cognitive investment in the experiential object, e.g., the brand itself (Rather et al., 2024). Specifically, absorption captures and directs consumers' attention toward the brand, indicating that individuals who experience deep cognitive involvement in a technology-based brand experience are more likely to focus intensely on brand-related information and engage in complex mental processing (Shin & Back, 2020). Research in other media contexts, such as social media, has highlighted the role of cognitive involvement within brand environments as a precursor to cognitive brand engagement, showing that when consumers are deeply involved with a brand experience, they tend to engage in heightened cognitive processing related to the brand itself (Carvalho & Fernandes, 2018). Although previous literature suggests that

perceived absorption in a VR-based metaverse can positively influence cognitive brand engagement during brand experiences, there is currently a lack of research exploring this relationship in such innovative environments.

Therefore, based on the above considerations, we propose the first hypotheses of our study:
H1: Perceived absorption positively influences cognitive brand engagement during a brand experience in the VR-based metaverse.

Perceived usefulness refers to the extent to which an individual believes that using a specific system will provide personal benefits (Davis, 1989). In the context of VR technology, it refers to the extent to which consumers believe that VR devices will be advantageous to them (Lee et al., 2019). Previous literature on cognitive processes, particularly the Elaboration Likelihood Model (ELM), suggests that the perceived usefulness of a technology may positively moderate cognitive processes during technology-based experiences (Petty & Cacioppo, 1986). According to ELM, individuals process cognitive stimuli through two primary routes: central and peripheral. The central route involves deeper cognitive processing and can occur when individuals perceive the source of stimuli as useful. On the contrary, the peripheral route involves less effortful cognitive processing and can occur when the perceived usefulness is low. In this perspective, the perceived usefulness may serve as a moderator of cognitive processing, amplifying the effect when the source of stimuli is regarded as useful. McLean (2018) identified the perceived usefulness of mobile apps as a key factor in consumer engagement with brands. Similarly, Arghashi and Yuksel (2018) demonstrated that the perceived usefulness of AR technologies positively moderates the influence of flow experiences on brand engagement within AR-based environments. Given that absorption in VR-based environments is closely related to the concept of flow within AR-based settings (Mütterlein, 2018), it can be inferred that the perceived usefulness of VR may positively moderate the relationship between absorption and cognitive brand engagement in the VR-based metaverse brand experience. Specifically, when consumers perceive the VR as useful, they could engage more deeply with the brand experience in the VR-based metaverse, thereby strengthening the effect of cognitive brand engagement. Conversely, when consumers perceive VR as less useful, their engagement with the brand experience in the VR-based metaverse may be reduced, diminishing the impact of absorption on cognitive brand engagement. However, research has yet to explore the moderating role of perceived usefulness of VR on the relationship between perceived absorption during a brand experience in the VR-based metaverse and cognitive brand engagement.

Therefore, we propose the second hypothesis of our study:
H2: The perceived usefulness of VR positively moderates the effect of perceived absorption on cognitive brand engagement during a brand experience in the VR-based metaverse.

3) Methodology

To test our research hypotheses, we surveyed Generation Z users, widely recognized as the first true digital natives. This generation is distinct in having grown up in a world deeply interconnected by technology, which has played a pivotal role in shaping their identity. Unlike earlier cohorts, Generation Z's identity is shaped not only by their values and societal context but also by the pervasive influence of technology in their daily lives (IPSOS, 2022). According to IPSOS (2022), this technological immersion significantly shapes their connection, communication, and worldview modes. Reflecting this influence, Generation Z shows the highest level of awareness of the metaverse compared to other generational groups (Statista, 2024b). Among their preferred metaverse activities are virtual games and socializing with friends within these digital spaces (Statista, 2023). Moreover,

younger consumers increasingly blend various tools, services, and platforms to build their metaverse experiences (Deloitte, 2023). This trend underscores Generation Z's pivotal role in harnessing the potential of the metaverse, with 46% of them anticipating that they will work within this digital realm in the future (Adecco Group, 2023).

To select a specific VR-based experience and collect primary data, we chose Tommy Hilfiger, a brand well-known among Generation Z users. Tommy Hilfiger has announced its strategy to engage this generational cohort through innovative digital technologies, including the metaverse (Milano Finanza, 2022). Tailored specifically for Generation Z, the brand developed an engaging and immersive experience named Tommy Play on Roblox—one of the leading platforms in the metaverse (Statista, 2024a). This virtual environment became the focal point of our study.

Participants aged 18 to 28 were recruited in Italy through email invitations. A total of 275 individuals consented to participate in the study, resulting in a 59% response rate. However, 13 respondents were disqualified because they were unaware of Tommy Hilfiger, as determined by a screening question ("Are you aware of Tommy Hilfiger?"). Consequently, the final sample included 262 respondents, with 60.3% identifying as female. The average age of the respondents was 23.03 years, with a standard deviation of 1.80 years.

To obtain detailed responses, each participant engaged with the selected brand experience using a Meta Quest 2 headset. This activity took place in a specially designated room within the Department, where participants first immersed themselves in the brand's virtual environment before completing a questionnaire. Data collection was conducted from March to May 2024. On average, the VR-based brand experience lasted about 14 minutes, while the questionnaire required approximately 7 minutes to complete.

During the experience, participants were encouraged to explore the virtual environment at their own pace. This environment vividly reflects Tommy Hilfiger's brand identity, featuring stylish virtual storefronts and interactive areas that showcase the latest fashion collections. Users had the opportunity to personalize their avatars with the brand's clothing and accessories. Additionally, the experience included dynamic mini-games and fashion-focused challenges.

The questionnaire consisted of two main sections. In the first section, participants were asked to evaluate their level of absorption during the brand experience, their cognitive engagement with the brand, and their perceived usefulness of the VR technology. The second section gathered sociodemographic information, including gender and age.

Absorption was measured using Mütterlein's (2018) three-item, 7-point Likert scale (e.g., "During the brand experience in the VR-based metaverse, I didn't notice time passing"). The cognitive dimension of consumer-brand engagement was assessed by adapting Harrigan et al.'s (2017) four-item, 7-point Likert scale (e.g., "During the brand experience in the VR-based metaverse, I enjoy learning more about Tommy Hilfiger"). Lastly, the perceived usefulness of VR technology was measured using Lee et al.'s (2019) three-item, 7-point Likert scale (e.g., "Using virtual reality devices will be useful in my daily life").

4) Data analysis and results

4.1 Consistency and validity checks

First, we validated the three-factor measurement model through a confirmatory factor analysis (CFA) conducted using LISREL 8.80 software (Jöreskog & Sörbom, 2006). The results indicated a good fit for the model. Specifically, $\chi^2(32)$ was 59.061, and the chi-square to degrees of freedom ratio was below 3. The root mean square error of approximation (RMSEA) was .06, well below the threshold of .08, with a 90% confidence interval ranging from .0322 to .0783. The standardized root mean residual (SRMR) was .04, also below the acceptable limit of .08. Additionally, the confirmatory fit index (CFI) was .98, the normed fit index (NFI) was .97, and the non-normed fit index (NNFI) was .98, all exceeding the .95 threshold (Bagozzi & Yi, 1988).

All standardized item loadings significantly loaded onto their indented constructs ($p < .001$), and the factor loadings were substantially greater than .50, ranging from .652 to .887 for absorption, from .830 to .912 for cognitive consumer-brand engagement and from .561 to .909 for the VR perceived usefulness (Bagozzi & Yi, 1988).

Additionally, the reliability and validity of our measures were assessed. The Cronbach's alpha (α) values for all variables exceeded .70, indicating strong internal consistency ($\alpha_{ABS} = .83$; $\alpha_{CBE\_C} = .93$; $\alpha_{PU} = .79$). Composite reliability (CR) also surpassed .70 for each variable ($CR_{ABS} = .84$; $CR_{CBE\_C} = .93$; $CR_{PU} = .82$). The average variance extracted (AVE) for each construct was greater than .50, further confirming validity ($AVE_{ABS} = .64$; $AVE_{CBE\_C} = .77$; $AVE_{PU} = .61$). The correlations between variables ranged from .10 to .29 ($\varphi_{ABS\text{-}CBE\_C} = .20$; $\varphi_{ABS\text{-}PU} = .29$; $\varphi_{CBE\_C\text{-}PU} = .10$). Finally, the shared variance between pairs of factors was lower than the AVE for each factor, supporting discriminant validity (Fornell & Larcker, 1981).

4.2 Findings

To estimate the relationships proposed in our conceptual model, we used Hayes's (2017) PROCESS macro (version 4.2) for SPSS (version 28.0). We applied Model 1, designating absorption (ABS) as the primary independent variable, cognitive consumer-brand engagement (CBE_C) as the dependent variable, and the perceived usefulness (PU) as the moderating variable. This tool is particularly suitable for exploring direct relationships and moderations in a nonexperimental context, allowing flexible analysis of cognitive influences, such as those investigated in this study. Because our main objective was to understand whether perceived absorption during an immersive VR experience positively influenced cognitive brand engagement, the use of PROCESS was deemed appropriate for estimating such relationships. In addition, data collection occurred promptly after the VR experience, ensuring closer temporal proximity and better reflection of participants' perceptions.

In testing H1, we examined the impact of ABS on CBE_C. As predicted, absorption had a positive effect on cognitive engagement with the brand ($\beta = .18$, $p < .05$, CI: [.04, .32]). Additionally, we explored the moderating role of the perceived usefulness in influencing the relationship between absorption and cognitive consumer-brand engagement (H2). Consistent with our hypothesis, a significant interaction was found between absorption and the VR perceived usefulness ($\beta = .14$, $p < .05$, CI: [.03, .25]), indicating that the positive effect of absorption on cognitive consumer-brand engagement strengthens as the perceived usefulness increases. This pattern was further confirmed through simple slope analysis. The results showed that the positive effect of absorption on cognitive CBE was weak and not significant when the perceived usefulness of VR technology was low ($\beta = .004$, $p = .97$, CI: [- .19, .20]), increased and became significant at an average level of the perceived usefulness ($\beta = .18$, $p < .05$, CI: [.04, .32]), and was strongest and significant when the perceived usefulness was high ($\beta = .36$, $p < .01$, CI: [.16, .55]) (Figure 1).

Figure 1: Slope plot
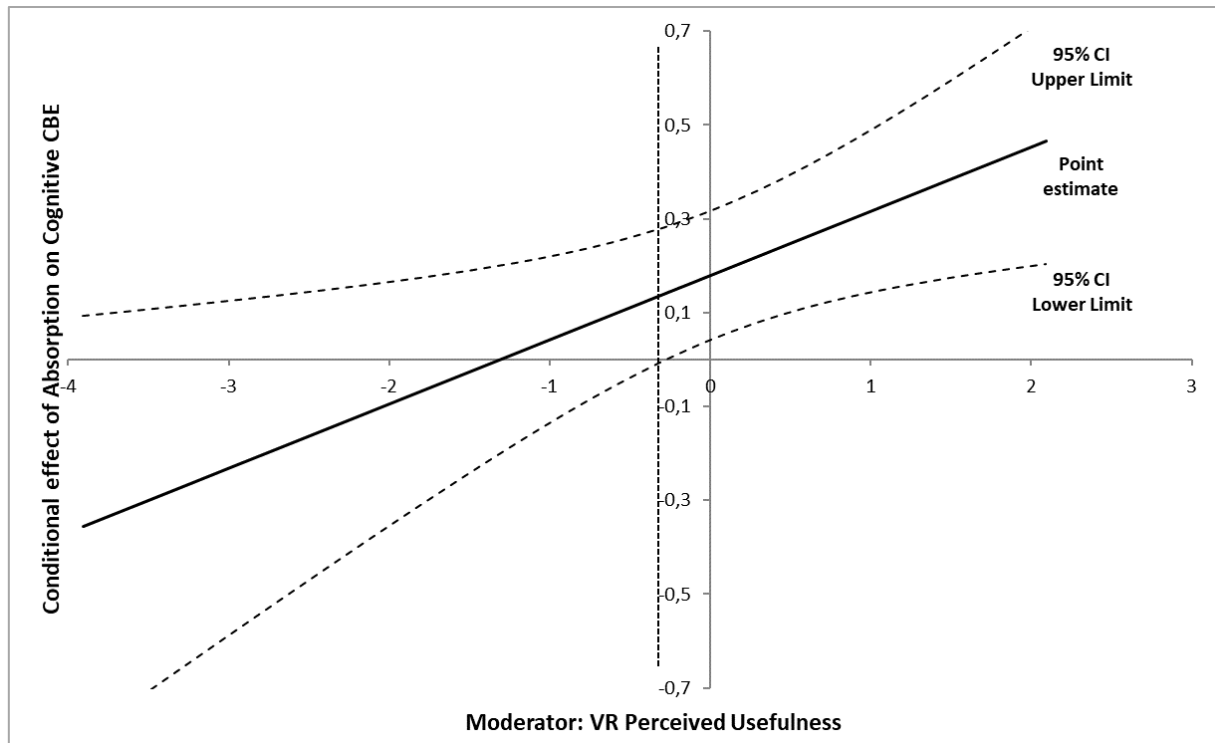
Source: Authors' elaboration

The regression coefficients and the results from the simple slope analysis are presented in Table 1.

Table 1: Model estimation

	H	VR Perceived Usefulness	β	*p*
Hypothesized paths				
Absorption → Cognitive CBE	H1		.18	.0106
Interaction term				
Absorption × VR Perceived Usefulness → Cognitive CBE	H2		.14	.0135
Conditional effect		Low (−1 SD)	.004	.9683
Absorption → Cognitive CBE		Medium (M)	.18	.0106
		High (+1 SD)	.36	.0003

Source: Authors' elaboration

5) Conclusion

This study makes several contributions to the emerging literature on marketing in VR-based metaverse environments and the field of consumer brand engagement, with a focus on the cognitive dimension of engagement. Specifically, this model investigates the influence of perceived absorption during a brand experience in the VR-based metaverse on cognitive brand engagement while also considering the moderating role of the perceived usefulness of VR. Our findings reveal that when users perceive absorption during a brand experience in the VR-based metaverse, cognitive brand engagement increases (H1). Moreover, when users recognize VR as a useful technology, the positive effect of absorption on cognitive brand engagement is amplified. However, as the perceived usefulness of VR declines, the influence of absorption on cognitive brand engagement diminishes until it becomes non-significant (H2). Consequently, our results contribute to the existing literature in multiple ways. The finding of H1 advances research on marketing in the VR-based metaverse by

identifying absorption as a significant perceptual antecedent of consumer brand engagement within immersive environments, particularly concerning its cognitive dimension. First, this contribution elucidates the fragmented discussion in the literature regarding the role of absorption in enhancing consumer responses in VR (e.g., Murray et al., 2007; Dwivedi et al., 2023). Second, it contributes to emerging studies exploring the antecedents of consumer brand engagement in this innovative context, which are still in their infancy (e.g., Wongkitrungrueng & Suprawan, 2024) and predominantly conceptual (e.g., Mittal & Bansal, 2023). Additionally, this study extends the consumer brand engagement literature by investigating, for the first time, the influence of perceived absorption within the VR-based brand experience on cognitive CBE. This finding is indirectly supported by prior research conducted in less immersive contexts, such as virtual learning and social media (Reychav & Wu, 2015; Carvalho & Fernandes, 2018), which have demonstrated that deep cognitive involvement with the brand environment can enhance mental processing related to the content of the experience, i.e., the brand itself. Furthermore, our study shifts the emphasis toward the cognitive dimension of CBE, which has often been overlooked in favor of emotional and behavioral dimensions (e.g., Hollebeek et al., 2014), including in the metaverse context (e.g., Bousba & Aria, 2022; Payal et al., 2024). Considering the results of H2, we further contribute to the academic literature on the perceived ease of use of VR, which has primarily been analyzed concerning its influence on users' intentions to adopt this technology (e.g., Lee et al., 2019). Additionally, we extend the findings of Arghashi and Yuksel (2018), which identify the perceived usefulness of AR as a moderating variable in similar cognitive processes (Mütterlein, 2018), specifically in the relationship between flow and brand engagement.

This study provides valuable managerial implications. First, the findings of H1 indicate that managers intending to develop brand experiences in VR-based metaverse environments should focus on designing experiences that enhance perceived absorption. Therefore, we recommend creating interactive and sensory-rich brand environments (Mütterlein et al., 2018), which can foster absorption and positively influence consumers' cognitive engagement with the brand. For instance, managers should create VR-based metaverse experiences that provide realistic visual, auditory, and haptic stimuli, along with authentic interactions with both other users' avatars and the branded environment itself (Vernuccio et al., 2023). Considering the results of H2, we encourage managers to enhance the perceived usefulness of VR technology among consumers through targeted communication campaigns and consumer-oriented events. Specifically, we recommend offering practical demonstrations that illustrate how VR can improve consumers' understanding and awareness of the brand's value proposition, such as showcasing the product manufacturing process. This approach can enhance the perceived usefulness of VR and, in turn, amplify the effect of absorption on cognitive brand engagement during brand experiences in the VR-based metaverse.

Our study presents several limitations, which provide avenues for future research. Specifically, we focused on a sample of Italian Generation Z consumers who participated in a specific brand experience (i.e., Tommy Hilfiger) within a specific VR-based metaverse platform (i.e., Roblox). Since this setting may limit the generalizability of our findings, future studies could extend this investigation to other generational cohorts (e.g., Generation X, Millennials) and different geographical contexts, examining various brand experiences and VR-based platforms (e.g., Horizon Worlds). Second, our study considered only one moderating variable, namely the perceived usefulness of VR, which may oversimplify the phenomenon under investigation. Therefore, we recommend that future research explore other moderating variables that may influence the relationship between absorption in VR experiences and cognitive brand engagement, considering both technological factors, such as the perceived ease of use of VR, and brand-related factors, such as the cause-brand fit of the experience or consumers' prior brand attitudes. Third, the absence of an experimental design limits the ability to draw definitive causal conclusions. Future studies could employ experimental or longitudinal approaches to examine the evolution of cognitive brand engagement over time or in response to the manipulation of variables such as perceived absorption. Fourth, this study focused on a limited set of variables without including control variables. Future

research could investigate how other individual factors, such as attitudes toward the brand or VR, might influence the relationships examined.

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