

Does the Experience of Using Metaverse Affect the Relationship between Social Identity, Psychological Ownership, and Engagement?

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Abstract

This research aims to explore the factors that contribute to the formation of social identity within virtual communities in the metaverse from both social and technological perspectives. To achieve these objectives, this research examined the perceived presence, social identity, and psychological ownership of community members within the context of the metaverse and investigated their structural relationships.

Hypothesis testing was conducted using AMOS 22.0 to validate the structural model analysis. The results of this study revealed that the technological elements of the metaverse platform and the social factors within the community were significantly related to perceived presence and social identity. Both factors were found to have a positive impact on community engagement intent. Furthermore, moderated effect of usage time was also significant.

By identifying the factors influencing social identity among metaverse users and examining their impact on member engagement behavior, this research expands the existing knowledge in the field of metaverse-related studies.

Keywords: Metaverse, social identity, user engagement, presence, psychological ownership.

1. Introduction

In the metaverse, people can communicate and interact with each other without restrictions on the boundaries between reality and the virtual world (Dwivedi et al., 2022a). With the increasing interactivity and proliferation of metaverse platforms, the potential for collaboration through the metaverse is also growing. For example, VR devices can provide a more effective collaboration environment compared to previous collaboration platforms, and VR space can improve group members' performance and even

creativity (Dincelli and Yayla, 2022). In addition, it was found that effective team collaboration can be supported through competition or tasks that require team activities such as storytelling, missions, and challenges in a virtual environment (Dincelli and Yayla, 2022). As a result, the concept of virtual teams is gradually evolving, and researchers argue that virtual teams will continue to exist (Chamakiotis et al., 2021).

In the context of community, engagement behavior refers to the unique motivation of community members to interact, cooperate, and voluntarily contribute to online communities or their members (Jin et al., 2017). Engagement encompasses behaviors such as deep involvement, immersion, contribution, and participation, which have been studied factors influencing members' engagement, contribution, and knowledge sharing behaviors in virtual community. For example, members' social identity (Liao, 2017; Tsai and Pai, 2019), and psychological ownership (Lee and Suh, 2015; Kwon, 2020) have been identified as important factors influencing community members' engagement behavior.

Despite number studies expansion engineering behavior in the virtual context, there has been limited in-depth research on the perception and intention of metaverse users. In particular, research considering both technical and social factors of the metaverse platform is insufficient. In addition, few studies have identified the preceding factors that form the social identity of group members in the context of the online community as well as the difference in online community usage time. Since past studies have not empirically identified how an individual's psychological ownership transfers to a collective psychological ownership, it has been difficult to understand the structural relationship between social identity and psychological ownership.

Therefore, this study aims to identify the factors that form the social identity of members in the context of the metaverse community and explore the psychological relationship toward engagement

intentions. To this end, this study aims to identify the technical and social elements of the metaverse community and empirically verify the psychological mechanism of members' intention to engage and moderation effect of metaverse usage time.

Theoretically, this study will be able to contribute to the expansion of the field by identifying users' engagement in the virtual community in the context of the metaverse. Practically, it is proposed to consider the social elements of management and the technical elements of the platform at the same time in order to increase the communication and participation behavior of the virtual collaboration.

2. Literature review

2.1. Metaverse and social-technical perceptions

In the 1990s, metaverse meant a virtual world in which free-moving avatars and virtual humans could interact with each other in real time, but it was later defined as a space where virtual and reality were connected (Barrera and Shah, 2023). In other words, the metaverse concept of web 2.0 meant a space that provides an immersive virtual experience, such as a game environment, but the metaverse concept of the web 3.0 era is developing to allow users to cross the boundary between virtual and reality (Dwivedi et al., 2022b).

Barrera and Shah (2023) identified three factors that can generalize the current metaverse concept: first, the metaverse is a network mediated by technologies such as 3D; second, it involves the blending of physical elements from the real world to extend reality; and third, user experience through the metaverse is considered the most crucial factor for its utilization. Additionally, Dwivedi et al. (2022a) defined the metaverse into four types: environment, interface, interaction, and social value.

Considering the definitions and attributes of the metaverse presented in previous studies, the metaverse can be seen as a system that includes both social and technological factors, similar to other ICT technologies. Bostrom and Heinen (1977) proposed the socio-technical system theory, suggesting that the perception of information systems is composed of both technological capabilities and human social aspects. Dwivedi et al. (2022a) suggested that the sociotechnical perspective could be a framework for understanding metaverse user engagement.

Technical factors such as avatars and enhanced AR and VR technologies can help users feel the presence of others while interacting with digital agents (Dwivedi et al., 2022a). Particularly, perceived

presence is one of the key attributes that can define the metaverse and virtual worlds (Oh et al., 2023). In the extended reality world, social presence can be considered a crucial factor influencing users' perceptions, attitudes, and behaviors (Barrera and Shah, 2023).

Additionally, Social interaction in virtual contexts refers to maintaining interpersonal relationships based on ICT (Shih and Huang, 2014). Interactions such as social networks, conversations, and collaborations play a significant role in sustaining the metaverse environment by enhancing human aspects such as creativity, happiness, and authority (Dwivedi et al., 2022a). For instance, Chamakiotis et al. (2021) argued that e-leadership support behavior is important in promoting employee engagement in virtual teams, and revealed that members' interactions and communication narrow differences between them and affect participation and contribution behavior.

Therefore, this study aims to identify the perception of metaverse experience by dividing it into social and technical dimensions and consider these factors as preceding factors that affect the psychological mechanism of user behavior intention.

2.2. Virtual collaboration

In that metaverse can play a central role in social networking (Dwivedi et al., 2022b), an understanding of virtual collaboration in the context of metaverse is meaningful. Therefore, this study focuses on explaining the engagement behavior of metaverse users from the perspective of the virtual community.

In the field of virtual community research, it has been found that psychological perceptions of virtual communities and the identity formed through the use of virtual communities can influence members' positive behaviors. For example, feeling psychological ownership of a virtual community increases the tendency to provide high-quality information in the community (Lee and Suh, 2015), and forming psychological attachment and a sense of ownership in social media are major factors that promote user participation (Kwon, 2020).

In addition, Liao (2017) argued that the value perceived by users of the virtual community has a positive effect on social norms and social identity, and a number of studies have revealed that members' social identity has a positive effect on their intention to participate in the virtual community. Tsai and Pai (2014) also revealed that the more an individual forms an emotional attachment to an organization's goals or positively evaluates his or her values within the organization, the greater the intention to participate in the community.

In this study, we aim to thoroughly examine the role of social identity as a factor influencing the intention to engage in metaverse virtual community. We also intend to establish research hypotheses focusing on psychological ownership as a psychological mechanism.

2.3. Social identity

Social identity refers to how individuals perceive themselves in relation to others or as members of a social group, which is established through relationships with others or groups (Liao, 2017; O'Connor et al., 2015). Tsai and Pai (2014) define social identity as the self-concept formed by individuals as members of a specific group, based on the values and emotional attachment they feel towards the group.

Within the context of belongingness, social identity helps individuals differentiate between their own group and external groups (Shen et al., 2010). Likewise, emotional support and satisfaction within the group can lead to an exclusive attitude towards external groups (Johnson and Lowe, 2015). The boundaries individuals create for their groups not only emphasize commonalities among group members but also highlight differences with members outside the group (Shih and Huang, 2014).

From a virtual space perspective, it has been revealed that factors such as members' social identity or users' sense of belongingness in virtual community influence user engagement and contribution behavior. For example, in research on virtual communities, Shen et al. (2010) argued that a sense of belongingness to the group is fostered when group members exhibit passion, dedication, and identity formation, and that this sense of belongingness can increase immersion and participation in the group. According to a study by Tsai and Pai (2014), the social identity of virtual community members can form a psychological attachment to the community and have positive results on member participation behavior.

3. Research model and hypotheses

3.1. Social and technical perception in metaverse

It is important to provide a rich communication environment for members who cannot face each other due to the use of ICT (Reed and Knight, 2010). Moreover, when using technologies such as VR and AR, a smooth communication environment plays an important role in increasing the immersion of

interaction. Presence refers to the perception of being together or interacting with others (Shen et al., 2010). High presence means feeling a strong sense of being together and interacting despite physical distance. Presence is an important factor that influences users' perceptions in the extended reality world, particularly in the metaverse (Barrera and Shah, 2023).

Perceived controllability of the platform refers to that users have ability to control and utilize the platform (Kwon, 2020). From the perspective of interaction, it also refers to the ability of users to influence communication in an instrumental way, using their own volition to participate in communication (Xiang and Chae, 2022). For example, in the context of e-commerce experiences, using a touchscreen to manipulate instead of a mouse provides a greater sense of controllability (Kwon, 2020). Furthermore, when the platform is easily controllable, the cost of learning and setting up features for better experiences decreases (Xiang and Chae, 2022). Therefore, when virtual members have the ability to control the metaverse environment according to their communication intentions and goals, a higher sense of presence is likely to be experienced.

H1a: There will be a positive relationship between the perceived controllability of the metaverse platform and presence.

Platform interactivity refers to the degree to which a user interacts with a virtual object, and is evaluated by how quickly the function of the system responds, how various functions are provided, and how well it implements (Jin et al., 2017). The interactivity of a platform is involved with system's technological ability and the experiential aspects based on technology (Hu et al., 2016). The interactivity of the system can cause the user to experience telepresence and to feel immersed in a virtual environment (Barrera and Shah, 2023). The platform's interactivity can make users to experience telepresence of virtual objects, which facilitates smooth social interactions with other users, therefore users will feel a sense of proximity to others as if they were physically present.

H1b There will be a positive relationship between the perceived interactivity of the metaverse platform and presence.

The interaction among community or group members can be perceived as a social element of virtual collaboration. Social support primarily refers to emotional stability, a sense of belonging, and the provision of both tangible and intangible assistance for

identity formation by managers or organizational leaders (Chiu et al., 2015). Oh et al. (2014) argued that social support from online social interaction is closely related with sense of community, referring people who frequently upload to SNS feel relatively more connectedness to other users.

Chiu et al. (2015) stated that individuals who receive comprehensive social support in online communities tend to be more dedicated and invest themselves more in the community. In addition, interactions with online community members allow users to focus on forming their group's identity, and users can experience a sense of belonging through these networks (Wang et al., 2019). Therefore, social support fosters positive attitudes among group members within the group, leading to a positive relationship with social identity.

H2a There will be a positive relationship between social support within metaverse community and social identity.

Social self-efficacy refers to the self-perception of one's ability to form and maintain relationships effectively in social networks, which is essential for effective social behavior (Hossain et al., 2021). Research suggested that people with high social self-efficacy in the metaverse environment have a low level of loneliness (Oh et al., 2023). Several studies have argued that identity can also be shared and recognized while sharing tasks and goals through interaction and communication between group members (Cheng and Guo, 2015). Therefore, if group members believe that they are capable of effectively managing social relationships through interaction with others, they are more likely to form social identities.

H2b There will be a positive relationship between social self-efficacy within metaverse community and social identity.

3.2. Psychological mechanisms for user engagement in metaverse

Shen et al. (2010) argued that when the social presence in the virtual community is strong, online community members would perceive high possibilities to develop social relationship or communicate more effective social interaction with others. Furthermore, social presence in the virtual context is largely involved with social interaction, so social presence has impact on more supportive interaction among metaverse users (Oh et al., 2023). As mentioned above, social support in an online

environment can lead to commitment to the community (Chiu et al., 2015). Therefore;

H3 Presence in metaverse is expected to have a positive relationship with social identity in metaverse community.

In the context of online social interaction environments, several existing studies have highlighted the role of interaction on users' behavior or attitudes, and rich interaction allows users to share and communicate their emotions, attitudes, perceptions and experiences with others (Obeidat et al., 2020). The more interactions they have, the more likely group members are to experience a sense of presence (Barrera and Shah, 2023). Conversely, the stronger they feel the presence, the more group members will participate in the formation of interpersonal relationships. Therefore, the sense of presence through the metaverse will increase the intention of engagement.

H4 Presence in metaverse is expected to have a positive relationship with user engagement intention toward metaverse community.

Social identity encourages individuals to perceive themselves as part of a group through shared consciousness (Shen et al., 2010). As group members become emotionally committed to the group, they perceive a stronger sense of connectedness with others and are motivated to contribute to the group's benefit (Tsai and Pai, 2019). Furthermore, in the context of virtual communities, social identity plays a crucial role in motivating members to contribute to the community (Shen et al., 2010).

H5 Social identity is expected to have a positive relationship with user engagement intention toward metaverse community.

O'Connor (2015) stated that social identity formed in game-based communities enables players to experience a psychological sense of community. According to the theory of psychological ownership, when group members share common values and construct collective identity, psychological ownership can be transferred to the group level (Pierce et al., 2010). In other words, when social identity is formed among members of a metaverse community, their psychological ownership of the community is also likely to increase.

H6 Social identity is expected to have a positive relationship with collective psychological ownership toward metaverse community.

Research on virtual communities and psychological ownership has shown that psychological ownership formed in virtual communities has a positive impact on the level of contribution to the community (Lee and Suh, 2015), knowledge-sharing behavior (Jiang et al., 2022), and participation intention (Kwon, 2020; Kumar and Nayak, 2019).

H7 Collective psychological ownership of metaverse community is expected to have a positive relationship with user engagement intention toward metaverse community.

3.3. Moderation of using experience

Khan (2017) argued that the experience of using media can have a positive effect on individual perception, and that the higher the amount of media usage time, the better users understand and use the features of the site. According to social identity theory, when a group member shares common goals with other users on a social network, he or she forms an emotional bond with others (Wang et al., 2019). Therefore, as users spend more time engaging in social exchanges and activities in the metaverse community, they will be able to feel more emotional relationships with others in the community.

Oh et al. (2023) proposed that time spent in the metaverse will be positively linked to their social presence. In addition, from the perspective of customer co-creation values, users' active participation in the community can lead to behavior of sharing their feelings and recommending information to others (Zhang et al., 2017). In other words, the longer people spend time in the metaverse community, the more likely they are to be active and engage deeper in the metaverse community to create common value. Thus, the amount of metaverse experience will moderate the user engagement and other perceptions overall. The research model is shown in figure 1.

H8 the group with higher metaverse usage time will have higher overall positive perceptions in the metaverse than the group with lower usage time.

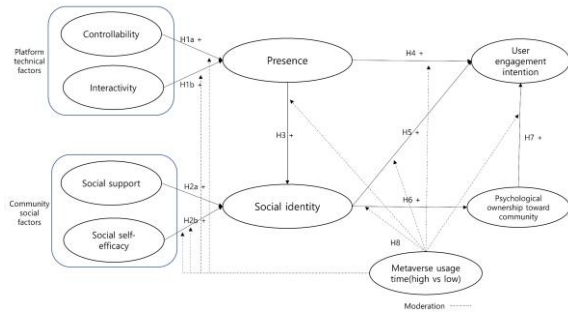


Figure 1. Research model.

4. Research

4.1. Measurement development

This study aims to gather data through a survey questionnaire to investigate the perceptions and psychological variables of virtual team members in the context of the metaverse. The measurement items of previous studies were referred to and modified to fit the research when measuring the latent variables of the research model. Platform controllability was measured based on Kwon (2020), interactivity was based on Jin et al. (2017), social support and social self-efficacy of metaverse community were based on Oh et al. (2023). Additionally, presence was based on Obeidat et al. (2020), social identity on Bruner and Benson (2018), psychological ownership on Kumar and Nayak (2019), and user engagement intention was modified based on Shao and Chen (2021). The metaverse usage time, which is a moderation variable, measured the average metaverse usage time per day. Users of less than 2 hours were classified into low groups and users of more than 2 hours were classified into high groups.

4.2. Data collection and sample

To verify the proposed model, this study collected data from Koreans using metaverse through online survey for two months from April 2023. A total of 328 responses were used for the analysis. Table 1 summarizes the demographic characteristics of respondents.

Table 1. Demographic characteristic.

Demographic categories		n	%
Gender	Male	144	43.9%
	Female	184	56.1%
Age	20-29	78	23.8%
	30-39	120	36.6%
	40-49	84	25.6%

Experience of Metaverse Platform	More than 50	46	14.0%
	Naver Zepeto	190	57.9%
	Roblox	144	43.9%
	Fortnite	77	23.5%
	Horizon(Meta)	36	11.0%
	ifland	65	19.8%
	Others	11	3.4%
Use Time in Metaverse Platform per Day	Less than 1hour	70	21.3%
	1-2 hours	82	25.0%
	2-3 hours	112	34.1%
	Over 3 hours	64	19.5%
Total	328	100.0%	

4.3. Measurement model analysis

For statistical analysis, this study used AMOS 22.0. First, Table 2 shows the results of the overall fitness from the confirmatory factor analysis and the overall results were found to meet the threshold value.

The CFA test reveals that the factor loadings ranged from 0.75 to 0.88 and Cronbach's α above 0.76, and composite reliability(C.R.) above 0.84, demonstrating the reliability of measurement indicators. Additionally, AVE and C.R. values are above the threshold 0.5 and 0.7, respectively, demonstrating the convergent validity. To verify discriminant validity, the value of the correlation coefficient and the AVE square root of each latent variable were compared. The result shows that the correlation coefficient was smaller than the value of the AVE square root of each latent variable, securing discriminant validity. Table 3, 4 and 5 shows the results of measurement model analysis.

Table 2. Goodness of fit.

	NFI	GFI	AGFI	CFI	RMSEA	χ^2/df
Model	0.944	0.958	0.913	0.962	0.028	1.861
Threshold	≥ 0.9	≥ 0.9	≥ 0.8	≥ 0.9	≤ 0.05	≤ 3.0

Table 3. Results of reliability.

Latent Variable	# of Items	AVE	C.R	Cronbach's Alpha
Controllability	3	0.68	0.86	0.84
Interactivity	3	0.69	0.87	0.80
Social Supports	3	0.66	0.86	0.76
Social Self-Efficacy	3	0.71	0.88	0.83
Presence	3	0.65	0.85	0.81
Social Identity	3	0.73	0.89	0.82

Intention to Engagement	3	0.68	0.86	0.91
PO toward community	3	0.64	0.84	0.89

Table 4. Results of convergent validity.

Construct	Items	S.E	Loading	t-value
Controllability	con1	0.13	0.84	20.14
	con2	0.11	0.83	4.74
	con3	0.09	0.80	15.21
Interactivity	int1	0.12	0.76	16.47
	int2	0.11	0.82	10.80
	int3	0.10	0.91	9.27
Social Supports	ss1	0.08	0.78	13.42
	ss2	0.10	0.84	6.58
	ss3	0.08	0.82	14.11
Social Self-Efficacy	sse1	0.06	0.88	12.38
	sse2	0.10	0.86	14.70
	sse3	0.08	0.79	5.56
Presence	pre1	0.16	0.83	9.24
	pre2	0.11	0.77	11.24
	pre3	0.10	0.81	12.27
Social Identity	si1	0.09	0.85	11.63
	si2	0.12	0.84	13.32
	si3	0.10	0.87	15.00
Intention to Engagement	ip1	0.05	0.88	13.22
	ip2	0.12	0.75	12.76
	ip3	0.08	0.84	11.81
Psychological Ownership toward community	pop1	0.09	0.83	11.73
	pop2	0.13	0.76	9.85
	pop3	0.16	0.81	9.27

Table 5. Results of discriminant validity.

Variable	1	2	3	4	5	6	7	8
1.	0.82							
2.	0.26	0.83						
3.	0.27	0.38	0.81					
4.	0.17	0.27	0.28	0.84				
5.	0.27	0.31	0.28	0.24	0.80			
6.	0.34	0.30	0.35	0.25	0.33	0.85		
7.	0.46	0.27	0.32	0.38	0.31	0.49	0.83	
8.	0.26	0.35	0.24	0.34	0.20	0.41	0.32	0.80

Note: Diagonal elements (bold figures) are the square root of Average Variance Extracted (AVE).

1. Controllability; 2. Interactivity; 3. Social support; 4. Social self-efficacy; 5. Presence; 6. Social identity; 7. Intention to engagement; 8. Psychological ownership toward community

4.4. Structural model analysis

After grouping the data by the length of metaverse usage (i.e., high, low) the direct effects model was tested for each of the two groups and the results are shown in Table 6 and 7. All of the main paths were significant for each group with variation in the strength of the paths according to high and low group.

Table 6. Results of Hypothesis Test (High Group in Use of Metaverse Platform, n=176).

Hypothesis	Effects	Std. β	t-value	Results
H1a	Controllability → Presence	0.293**	4.022	S
H1b	Interactivity → Presence	0.358**	5.276	S
H2a	Social Supports → Social Identity	0.425**	6.951	S
H2b	Social Self-Efficacy → Social Identity	0.399**	7.004	S
H3	Presence → Social Identity	0.470**	6.882	S
H4	Presence → Intention to Engagement	0.466**	8.525	S
H5	Social Identity → Intention to Engagement	0.468**	7.506	S
H6	Social Identity → Psychological Ownership toward Community	0.382**	6.002	S
H7	Psychological Ownership toward Community → Intention to Engagement	0.516**	8.369	S

Note: S: Supported, **: p<0.01

Table 7. Results of Hypothesis Test (Low Group in Use of Metaverse Platform, n=152).

Hypothesis	Effects	Std. β	t-value	Results
H1a	Controllability → Presence	0.198**	3.153	S
H1b	Interactivity → Presence	0.252**	3.884	S
H2a	Social Supports → Social Identity	0.372**	5.039	S
H2b	Social Self-Efficacy → Social Identity	0.309**	5.879	S
H3	Presence → Social Identity	0.401**	6.753	S
H4	Presence → Intention to Engagement	0.347**	5.992	S
H5	Social Identity → Intention to Engagement	0.355**	4.753	S
H6	Social Identity → Psychological Ownership toward Community	0.377**	5.242	S
H7	Psychological Ownership toward Community → Intention to Engagement	0.288**	5.220	S

Note: S: Supported, **: p<0.01

Table 8. Multi-Group Differences.

Usage time	Path	Std. β	S.E	t-value	Group Difference	
					t-value (p-value)	Result
High	Controllability → Presence	0.293	0.041	4.022	1.738	Yes
		0.198	0.035	3.153	(0.042)	
High	Interactivity → Presence	0.358	0.044	5.276	2.050	Yes
		0.252	0.023	3.884	(0.02)	
High	Social Supports → Social Identity	0.425	0.019	6.951	2.135	Yes
		0.372	0.015	5.039	(0.01)	
High	Social Self-Efficacy → Social Identity	0.399	0.038	7.004	1.778	Yes
		0.309	0.031	5.879	(0.04)	
High	Presence → Social Identity	0.470	0.028	6.882	1.982	Yes
		0.401	0.019	6.753	(0.02)	
High	Presence → Intention to Engagement	0.466	0.046	8.525	1.893	Yes
		0.347	0.042	5.992	(0.03)	
High	Social Identity → Intention to Engagement	0.468	0.046	7.506	2.057	Yes
		0.355	0.026	4.753	(0.02)	

High	Social Identity → PO toward	0.382	0.059	6.002	0.063	No
Low	Community	0.377	0.051	5.242	(0.475)	
High	PO toward Community → Intention to	0.516	0.049	8.369	3.068	Yes
Low	Engagement	0.288	0.056	5.220	(0.00)	

Note: PO: Psychological ownership

After verifying the direct effects, a multi-group moderation analysis was conducted to evaluate if metaverse usage time (high, low) significantly affects the difference in paths between two groups. Referring Keil, Tan, Wei, Saarinen, Tuunainen, and Wassenaar (2000), we calculated t-value differences for each pair of usage time on the main paths, and Table 8 shows the group differences.

The moderation effect of metaverse usage time in H8 was partially supported. There were significant differences in most routes, but there was no difference for the path between social identity and psychological ownership toward community (t- value 0.063, p = 0.475). This result indicated that the engagement behavior of the metaverse user varies depending on the usage time.

Overall, people with longer hours of metaverse use perceived more presence and social identity, and the intention to engage in metaverse community was also higher. However, the relationship between social identity and psychological ownership toward the community did not differ by usage time.

5. Conclusion

5.1 Discussion

As a result of the study, all hypotheses except H8 were supported. This result indicates that technical factors such as controllability and interactivity of the metaverse as well as social factors of the metaverse can affect the formation of users' social identity. In addition, social identity has a positive relationship with the intention to engage in the metaverse community, which would be caused by psychological ownership toward the community.

The moderating effect of high and low metaverse usage time(H8) was partially supported. The path between social identity and community psychological ownership was not moderated by usage time. According to psychological ownership theory, if members of a group share common values, psychological ownership can be transferred to the collective level (Pierce et al., 2010). Considering that the path coefficient of the direct effect is significant in both groups, it can be assumed that once social identity is formed, it may mean the possibility of transferring

to a collective(community) psychological ownership regardless of the time of use.

In addition, what is interesting about the multi-group analysis results is that there is a relatively large difference in t-values between groups of H4, H5, and H7. These results mean that as the metaverse usage time increases, the effect of engagement intention is significantly strengthened. These results can be seen as supporting the existing theory that the increase in social media experience causes user commitment and engagement. As the moderation effect of usage time is not significant for H6, this may prove a strong relationship between social identity and collective psychological ownership.

5.2 Implication

This study proposes the following implications. Theoretically, it can contribute to expanding metaverse research in that it first identifies the preceding factors of users' community engagement behavior in the context of metaverse. Second, by identifying factors that can affect the social identity of metaverse community members at the technical level, it was proved that IT technology can affect the psychological response and identity formation of users. Third, it can provide a basis for supporting the psychological ownership theory by empirically identifying the positive relationship between the social identity of community members and collective ownership.

Practically, The role of the platform to better engage members in the metaverse is proposed, specifically increasing the psychological ownership toward communities, tasks, or missions, and shaping social identity well. Second, in order for users to form social identity in the metaverse space, it will be important to pay attention at the platform as well as community manager level to strengthen community social support and social connection within the group. Third, it is suggested that developing equipment and improving system design in an effort to increase interaction and presence between platforms and users which would lead users' positive responses and engagement. Fourth, in order to increase the intention to participate in the metaverse community, users should spend a lot of time using the metaverse platform. To do so, challenges such as the compatibility among metaverse, lack of equipment, and connection with reality problem must be solved.

5.3 Limitations and future research

Although this study was conducted in the context of metaverse, there is a limitation that the metaverse equipment currently exists is insufficient to give users an immersive sense of presence. In the future, it is proposed to conduct research using more advanced metaverse technology.

In the context of an information system, the social elements in platform services may also be related to presence. Therefore, in future research, it will also be meaningful to identify the relationship between the social elements of the platform and the presence.

Furthermore, in the future, it is hoped that the future study will be conducted in consideration of various variables that may affect user engagement in addition to the time of use of the metaverse. For example, there would be several types of activities such as playing sports, games, shopping, and socializing in metaverse service. Thus, it would be interesting to see how different types of activities impact the relationship.

6. References

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