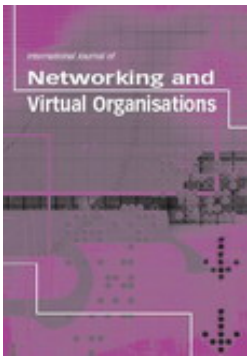

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Value co-creation in virtual game communities: a perspective on social influence theory

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Abstract: The popularity of digital technologies has promoted the emergence of the online game industry. To review the relevant research, we do not simply regard online game players as consumers of game products but as value co-creators in virtual game communities. Social support theory and social influence theory are used to explore the virtual game community. Specifically, this manuscript creatively applies social influence theory to explore the factors influencing two types of value co-creation behaviours, namely player participation behaviour and citizenship behaviour, in virtual game communities. Through structural equation modelling of 491 valid questionnaires, this manuscript found that different social supports influence value co-creation among players to different degrees through three variables of social influence. The findings of this thesis provide insights into how to increase players' participation in the value co-creation process and engage them in building virtual communities.

Keywords: virtual communities; value co-creation; online games; social influence theory; social support theory.

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1 Introduction

According to the market report of Newzoo, the global game market should receive 184.4 billion US dollars in 2022. Although many reasons represented by COVID-19 led to the decline of revenue in the current year, the report is still optimistic about the long-term prospects of the game market. It is estimated that the annual revenue of the global game market will reach US $211.2 billion by 2025, and the compound annual growth rate in the next few years will be about 3.4%. Given the enormous potential of the gaming market, it is unsurprising that the topics of stimulating players' consumption interests and enhancing the vitality of the player community have generated much research activity in recent years. Players have used the internet to form various virtual communities based on game types and series. Players in virtual communities have gradually become the subject of sociological research.

Given that massively multiplayer online role-playing games (MMORPGs) contribute rich social attributes and values, the research conducted on the MMORPG virtual game community is extensive. Furthermore, because MMORPGs have the characteristics of more free game rules and re-creative content, players take the initiative to build player communities and create new gameplay. Such co-creation behaviours have been fully exploited. Therefore, understanding the factors that motivate a player's participation in value co-creation and the influencing elements that contribute to community loyalty are vital to the development and growth of virtual game communities and the continuous and stable operation of games. Such information is of vital importance to game operators and developers.

Upon consulting prior studies, we found that, although researchers are willing to study the factors that affect players' continued use of game products, they have also researched customer-company value co-creation based on games as commodities. However, in the context of virtual communities under value co-creation theory, there still needs to be a gap in the research regarding the simultaneous examination of the participation behaviour and citizenship behaviour of customer-customer value co-creation. However, for operators, the customer participation behaviour that is necessary for the co-creation of the virtual game community's value and the customer citizenship behaviour that provides additional community loyalty follow different models and play a crucial role in the long-term operation of the player community and the game itself (Yi and Gong, 2013). A more comprehensive model of player behaviour from a different perspective also needs to be proposed for academics. Therefore, this research's main contribution lies in exploring how players' social support in the virtual game community affects the co-creation of the two values of player participation behaviour and player citizenship behaviour through social influence. Moreover, this work advises companies to build communities inside and outside the game based on the impact of different types of social support.

Therefore, to advance the research on the value co-creation of virtual communities further, the main aims of this article are the following. First, to test a comprehensive model that combines the social influence and social support of player participation behaviour (PPB) and player citizenship behaviour (PCB) virtual value co-creation behaviours. Second, to evaluate whether antecedents have different effects on the two types of value co-creation behaviours.

The structure of this research is as follows. The second part presents a literature review of virtual communities and value co-creation. The third part discusses social support theory, social influence theory, player participation behaviour, and player citizenship behaviour, then gives related hypotheses. Part four introduces the methods of empirical research. The fifth part presents the results of the data analysis, the sixth part explores the meaning of the results, which contain theoretical and management implications, and the final part discusses limitations and future research directions.

2 Literature review

2.1 Online game community

The virtual community entails the cyber existence of a community. It was first defined as a group mainly communicating via the network. These individuals gather together based on their common interests, values, or goals, share some degree of knowledge and information, and care for each other as friends (Rheingold, 1993). The virtual community is divided into four categories: transaction-oriented for the transaction, interest-oriented for information exchange, relationship-oriented for maintaining relationships in real life, and fantasy-oriented for obtaining entertainment and leisure (Kannan et al., 2000). As a management tool, virtual communities have excellent prospects because they can provide valuable insights for product innovation (Nambisan and Baron, 2009), promote deep and lasting ties with consumers (Bagozzi and Dholakia, 2002), and, through point-to-point problem solving, reduce customer service costs (Prahalad and Ramaswamy, 2004). Enterprises now use different ways and pay the higher price to try to enter virtual communities to promote their products (Spaulding, 2010; Pan, 2020; Priharsari et al., 2020; Chen et al., 2022).

The rapidly mounting popularity of online games enables game companies and players to promote the development of relationships by establishing virtual game communities. Holbrook et al. (1984) first paid attention to and put forward the concept of game consumption. By studying the relationship between emotion, performance, and personality in the game, the authors provided a theoretical basis for studying player experience and behaviour. Online games can improve well-being (Bowman et al., 2022). Subsequent studies on games have put forward a variety of theories from different perspectives on players' contact with the game. In works that examine the factors that prompt players to choose games or to continue playing them, Hsu and Lu have used the technology adoption model (TAM), flow experience theory (Hsu and Lu, 2004), and rational behaviour theory (Hsu and Lu, 2007).

Meanwhile, Wu et al. (2010) employed the perspective of use and satisfaction, and Wu and Hsu (2018) studied the artistic design and role identity of the game itself as influencing factors. Furthermore, Kim and Kim (2018) explored the relational bonds formed by players' perception of justice as a factor. While playing the game itself, Cole and Griffiths (2007) studied the motivation and behaviour of the players, Hussain and Griffiths (2009) studied their attitudes, feelings, and experiences. Mandryk et al. (2020) investigated the influence of game passion on social loneliness and well-being. Overall, researchers have come to regard games as more than mere commodities; indeed, they have firmly situated games within sociology and management. The social capital and related factors inside and outside of games have been widely studied (Trepte et al., 2012;

Kowert and Oldmeadow, 2015; Depping and Mandryk, 2017; Depping et al., 2018; Lee et al., 2021; Wang et al., 2022).

The individuals comprising the virtual game community have become the most exciting members of the virtual community; overall, such communities allow users to indulge in fantasy and entertainment (Hsu and Lu, 2007). However, research on virtual game communities (fantasy-oriented communities) has focused on the interactive mode, teamwork, union structure, etc., based on the game's content. For example, Ducheneaut et al.'s (2006) research found that, in World of Warcraft, player interactions with each other only account for about one-third of the total game time. Although the MMORPG represented by World of Warcraft has created a rich social environment, the social activities of players could be more popular. Therefore, it may be better for game companies to focus on polishing the game's content to provide a better audience experience than encouraging and supporting direct interaction between players (Ducheneaut et al., 2006). In a study on another MMORPG, endless task 2, Shen (2014) pointed out that, although the game mechanism is used to reward social activities, only about half of the players will participate in the fantasy community. In Hu et al.'s (2022a) research on the virtual community of Fantasy Westward Journey Online, they found that the language style of player feedback impacts the idea adoption of the community. The research results on the collaboration between MMORPG players are less optimistic than game makers may believe. Therefore, it is necessary to explore the mechanism and influencing factors of cooperation in games, to optimise them reasonably, and then fully mobilise the enthusiasm of the player-player's value co-creation. Doing so is essential for a game's long-term operation and the wider community's healthy development.

The research of Sirola et al. (2021) pointed out that the game community is still embedded in the game in essence and is an integral part of the game experience. However, it only stimulates the game behaviour and purchase intention. Alternatively, should we pay attention to its role in community attributes. Consumers' perception of virtual communities can significantly and positively affect the innovation of digital products (Ek and Sörhammar, 2022).In order to explore the construction of a virtual game community, Gandolfi et al. (2021) gave a scale to measure community attributes in many aspects. However, although game publishers have invested much money in digital channels for community promotion and construction, the virtual game community as an essential component of the virtual community has been less researched, especially the aspect of value co-creation. Kokko et al. (2018) pointed out the future research potential of the game community's value co-creation and value co-destruction. However, in past works, only Chen (2020) has studied this subject by considering the diversified co-creation experience as an independent variable.

2.2 Value co-creation

Value co-creation theory is based on service-leading logic (Vargo and Lusch, 2008). The theory has changed the traditional conception of consumers as destroyers of the value created by organisations or enterprises by positing that consumers actively create value for enterprises (Ramírez, 1999). As providers of goods and services, enterprises cannot create added value for consumers. More value needs to be created by consumers and enterprises. The role of customers has changed from passive, isolated, and unconscious to a more proactive one (Prahalad and Ramaswamy, 2004). The customer is the 'co-creator' of value (Vargo and Lusch, 2008) and the co-designer and innovation leader of products

(Romero and Molina, 2011). In this way, using customers for innovation can significantly reduce research and development costs and improve the market acceptance of such inventions (Thomke and Hippel, 2002). Moreover, significantly improve member performance (Rodríguez-López, 2021). The role of customers in value creation is becoming increasingly critical.

Given that the interaction among customers will have an impact on customers' perception of the service experience (Martin and Pranter, 1989), the interaction between customers on social platforms such as Facebook and Twitter has become a new mechanism for value creation (Zadeh et al., 2017). Researchers have extensively researched knowledge-sharing behaviour in virtual communities (Rubio et al., 2020; Shirazi et al., 2021; Wang et al., 2022). In the field of management information systems, Lamb and Kling (2003) pointed out that by using products and enjoying services, customers are also building their own identity and interacting with groups or organisations. This shows that value co-creation is also social behaviour, which benefits from sociological research.

In the research on the value co-creation of games, previous studies have discussed extensively how game platforms or developers encourage players or other developers to participate in the game design and sales process from the perspective of games as commodities. For example, Cennamo et al. (2016) studied the value co-creation behaviour of game platforms and developers in game development. Chisty (2014) studied Xbox and EA (two well-known game companies) to guide players in making suggestions on games and services through operating forums. Chen and Chen (2022) discussed his willingness to buy products in the virtual game community from the perspective of self-display. In such cases, manufacturers show consumers their value, which consumers shape. Co-create, amend, and enhance their value propositions through forums and other media. How will the player-player value co-creation behaviour be affected, and what is the operation mechanism? To date, the research needs to provide more insight into these questions.

3 Research path and hypothesis design

3.1 Social support theory

Cobb first proposed social support as an essential factor and goal of interpersonal communication that constitutes a communication network of relationships, love, and respect and is a life pressure regulator (Cobb, 1976). When studying which social support is more important in marriage, Cutrona and Suhr (1992) conceptualised action-facilitation and nurturant support, which is divided into five categories: action-facilitation support, including informational support for providing advice, knowledge, or feedback, and tangible support for providing required goods or services. Nurturant support includes emotional support (communicating love and caring), network support (communicating belonging to a group of persons with similar interests and concerns), and esteem support (communicating respect and confidence in abilities). Although this framework is often applied in health and social care research as a more comprehensive theory, it has been gradually extended to community research, especially in the virtual community. With the rapid development of the Internet and mobile technologies, how a variety of new technologies affect or are affected by social support has become a dynamic research area

for scholars. Cummings et al. (2002) pointed out that the internet has fundamentally increased the acquisition and exchange of social support. Still, the social support created by online relationships is less effective than offline relationships. However, with the increasingly close connection between internet technology and our lives, Rozzell et al.'s (2014) research on Facebook has demonstrated that non-close contacts on social media can provide individuals with the same crucial social support as close ones. In the research of Hu et al. (2022b), they found that information signals and emotional signals in the community promote the feedback of the online innovation community. The formation of information support and emotional support is also based on these two signals. Liu et al. (2020) examined the direct impact of social support on value co-creation behaviour in the virtual health community. Simons et al. (2020) confirmed the positive impact of social support from peers in the Whatsapp community on health promotion behaviour. In the virtual game community research, Trepte et al. (2012) have shown that playing video games can create online and offline social support, divided into bridging and bonding according to intensity. Various social supports are more closely related to developing players' roles and life inside and outside the game. They can be expected to fulfil a more important role in a player's play, cooperation, or value co-creation.

Based on the research of Cutrona and Suhr (1992), since network support and practical help also affect individuals by indirectly providing information or emotional support, we use informational support and emotional support as the leading indicators to measure social support in this study.

Informational support refers to providing advice and suggestions or approximating situations to obtain information and support wise decisions. Since MMORPGs often involve complex ways of playing, they require significant time and learning costs to get started. Informational support from others can reduce the cost of players' trial and error. This support may come from close friends (bonding social capital) and can also originate from the other players or experts who share their strategies and suggestions through online channels (bridging social capital). Thus, we propose the following:

H_{1a} Informational support from bonding social capital positively influences subjective norms.

H_{2a} Informational support from bonding social capital positively influences social identity.

H_{3a} Informational support from bonding social capital positively influences group norms.

H_{1b} Informational support from bridging social capital positively influences subjective norms.

H_{2b} Informational support from bridging social capital positively influences social identity.

H_{3b} Informational support from bridging social capital positively influences group norms.

Emotional support refers to providing psychological support, such as sympathy, care, or understanding, so that individuals feel psychologically comforted and are helped when solving problems indirectly. In value co-creation, various difficulties and failures will inevitably arise, and whether attention and affirmation from others in such situations can

motivate players to get out of the difficult situation and continue their value co-creation. Thus:

H_{1c} Emotional support positively influences subjective norms.

H_{2c} Emotional support positively influences social identity.

H_{3c} Emotional support positively influences group norms.

3.2 Social influence theory

Social influence theory (SIT) consists of three processes: compliance, identification, and internalisation. Compliance occurs when a person accepts the influence of others for a favourable response; identification occurs when a person accepts the influence to establish or maintain a satisfactory self-defined relationship with others; and internalisation occurs when group norms are consistent with the individual's value system (Kelman, 1958). This theory was first explored in the study of virtual communities by Bagozzi and Dholakia (2002), which built upon Ajzen's theory of planned behaviour (TPB) by interpreting conformity as subjective norms, identification as social identity, and internalisation as group norms (Ajzen, 1991). It was found that conformity does not apply due to virtual communities' voluntary and anonymous nature. The other two are significantly supported (Bagozzi and Dholakia, 2002). This result has also been widely corroborated in subsequent studies (Shen and Cheung et al., 2011; Tsai and Bagozzi, 2014; Zhou, 2019). The model by Bagozzi and Dholakia (2002) is also widely adopted in studies using social influence theory.

Therefore, this study follows previous research and uses subjective norms, social identity, and group norms to interpret social influence theory.

Compliance (i.e., a subjective norm) refers to the social pressure from others to perform or not perform behaviours. Specifically, in the context of virtual game communities, players are influenced by the expectations of others when they choose to engage in gaming behaviours and value co-creation behaviours. To investigate whether and to what extent subjective norms influence customers' value co-creation, we propose:

H_{4a} Subjective norm positively influences player participation behaviour.

H_{5a} Subjective norm positively influences player citizenship behaviour.

Identification (i.e., social identity) refers to whether individuals can identify as community members by comparing their similarities with others in the community and their differences with those outside it. Gradually, they will depersonalise their will and form an attachment to the group. Thus, we propose the following:

H_{4b} Social identity positively influences player participation behaviour.

H_{5b} Social identity positively influences player citizenship behaviour.

Internalisation (i.e., group norm) refers to some information with specific meanings formed in the community's long-term development and individual participation in the daily behaviour of the community. Individuals and communities consistently perceive these messages. In virtual game communities, group norms refer to the power players give to achieve a specific value co-creation goal jointly. To explore the influence of group norms on value co-creation, we propose the following:

H_{4c} Group norm positively influences player participation behaviour.

H_{5c} Group norm positively influences player citizenship behaviour.

3.3 Player participation behaviour

Yi and Gong (2013) divided customer value co-creation behaviour into customer participation and citizenship behaviours. Customer participation behaviour refers to the individual behaviours necessary for value co-creation, such as information acquisition, information sharing, responsible behaviour, and interactive behaviour. Customer engagement behaviour is a rich research topic on value co-creation in virtual communities. Brodie et al. (2013) have studied consumer engagement in virtual brand communities. Nambisan and Baron (2009) studied value co-creation participation in a virtual customer environment. Bagozzi and Dholakia (2006) studied participation behaviour in a community of Linux users. Bitter et al.'s (2014) research on the virtual brand community from the perspective of Facebook confirmed that interaction with friends would affect customer participation behaviour. Specifically, they found that in virtual game communities, the customer's identity changes to that of the player. Cheung et al. (2015) examined the impact of player participation on game product sales. Snodgrass et al. (2018) studied the effect of player participation behaviours on individual psychological gains. Chuang (2020) examined player participation behaviour's motivational and health factors. Shen et al. (2020) studied the impact of interaction and trust on user participation behaviour in virtual tourism communities. Overall, it is clear that the research on player (customer) participation behaviour as a motive is extensive.

This study of player participation behaviour follows Yi and Gong's scale. It investigates information acquisition, information sharing, responsible behaviour, and interactive behaviour, whereby information acquisition refers to customers seeking information and clarifying service needs while satisfying their other cognitive needs (Kellogg et al., 1997). Information sharing signifies that to successfully co-create value, individuals should provide resources, such as information for the co-created value process (Lengnick-Hall, 1996). Responsible behaviour means that, for individuals to successfully co-create value, they need to cooperate, follow the rules and policies, and accept guidance from the dominant party (Bettencourt, 1997). Interactive behaviour refers to interpersonal interactions between individuals, such as politeness, friendliness, and respect. Value co-creation in the service environment occurs in the social environment. The more pleasant, cordial, and approving the social environment, the more likely customers are to engage in value co-creation (Lengnick-Hall et al., 2000).

3.4 Player citizenship behaviour

Customer volunteering for the company and community was first referred to as customer voluntary performance (CVP) by Bettencourt (1997) and consisted of three dimensions: loyalty, cooperation, and participation. Groth (2005) extended organisational citizenship behaviour to customers and introduced the concept of customer citizenship behaviour, which is defined as a voluntary behaviour performed by customers who are not required to complete production or services but who nevertheless provide benefits to the service organisation through recommendations, feedback, and help. This concept is widely used. There are also separate studies on customer citizenship behaviour. For example, Kim

et al. (2020) studied the impact of corporate social responsibility on customer citizenship behaviour. Gong et al. (2022) studied the impact of in-store retail technology on customer citizenship behaviour. In recent years, research on customer citizenship behaviour has focused more on environmental issues (Hwang and Lyu, 2020). In value co-creation, customer citizenship behaviour refers to voluntary actions by customers to co-create additional value, such as feedback, advocacy, helping, and tolerance, beyond the completion of customer-company value co-creation (Yi and Gong, 2013). Studies on customer citizenship behaviours are now also conducted under this structure, often in conjunction with customer engagement behaviours. For instance, Zadeh et al. (2017) studied the impact of past value co-creation experiences on customer participation and citizenship behaviours; Frasquet-Deltoro et al. (2019) examined the perceived antecedents of customer participation and citizenship behaviour, and the willingness to continue value co-creation.

Similarly, in the virtual game community, players replace the concept of customers in this framework. Given that players have more robust community attributes, they are suitable to be studied through the lens of citizenship behaviour. However, we found that the citizenship behaviour of players has yet to be studied in depth, and there is a significant gap in the literature.

This study of player citizenship behaviour follows Yi and Gong's scale, which investigates feedback, advocacy, helping, and tolerance, where feedback refers to the requested and unsolicited information that customers provide to the company, which allows employees and the company to improve the service creation process in the long run (Groth, 2005); advocacy refers to making recommendations to others, such as friends or family, about a company's service or product; helping refers to customers who assist fellow customers while enjoying the service (Groth, 2005); tolerating signifies customers who are patient when service delivery does not meet their expectations, such as in the case of delays or shortages (Lengnick-Hall et al., 2000).

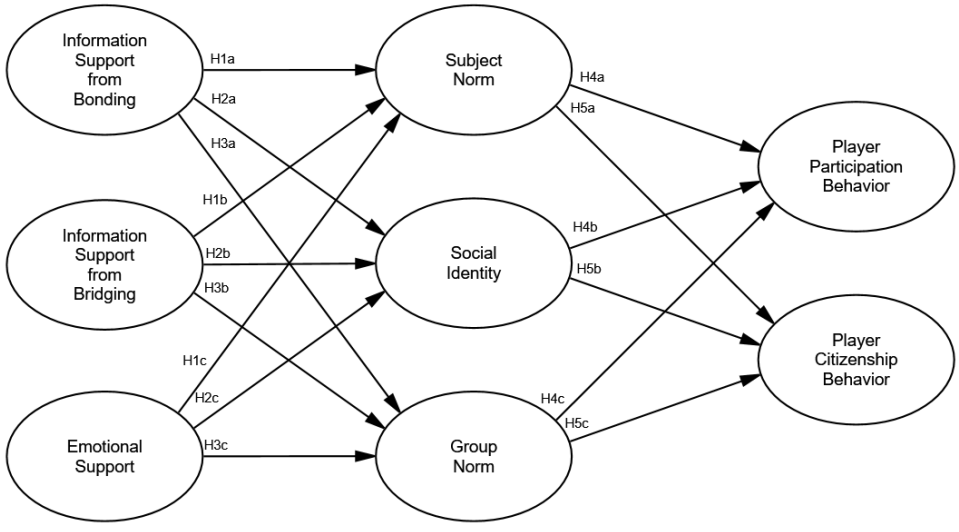
4 Research methodology

4.1 Research model

The research model of this study is shown in Figure 1. This study model contains eight constructs, each measured using multiple questions. All items were adapted from the existing literature to improve the validity of this study. The three items measuring social support were adapted from Cutrona and Suhr (1992). In the social influence theory section, the subjective norms were adapted from the study by Venkatesh and Davis (2000); the social identity and group norms section was adapted from Shen et al. (2011). The information gathering, information sharing, responsible behaviour, interpersonal interaction and feedback, encouragement, helping, and endurance sections were adapted from the study by Yi and Gong (2013). The four latent variables in the PPB and PCB sections will be downgraded for structural equation model complexity and the number of construct considerations.

All the observed variables in this study were measured using a seven-step Likert scale ranging from 1 (completely disagree) to 7 (completely agree). Since this study uses structural equation modelling, the same questions were asked in different formats; the questionnaire details are provided in the appendix.

Figure 1 Research model



4.2 Data collection and sampling

An online questionnaire survey was conducted with active Final Fantasy 14 players in China, and 491 valid questionnaires were obtained. The data were collected through the Final Fantasy 14 forum in NGA [one of the largest online communities for ACG (anime, manga and games) in China], gamer chat groups, and in-game online recruitment. We selected chat groups with a large base of people and influence and small union groups, respectively; in-game recruitment was conducted through the in-game recruitment board function. In-game recruitment was performed through the game's built-in recruiting board. It is worth noting that Final Fantasy 14 is a massive multiplayer online role-playing game (MMORPG) released in 2013 by Square-Enix. MMORPGs have more potent community attributes due to their high-intensity role-playing content, and Final Fantasy 14 is one of the most successful MMORPGs in the MMO industry in recent years. It won the best community support and continuous operation award in the 2022 TGA (The Game Award). These two awards are closely related to the players, which show that this game has performed well in encouraging the players to create value together. Its popularity has also spurred many players to participate in value co-creation activities, making the game especially suitable for this study.

We provided the respondents with gifts such as virtual currency during data collection to improve the questionnaire's response rate, reliability, and validity. The descriptive statistical status of the valid questionnaire is as follows: (i.e., gender, age, continuous game time, average daily game time, and the number of friends) as shown in Table 1.

Table 1 Descriptive statistical analysis

Measurement		*Frequency*	*Percentage (%)*
Sex	Male	264	53.8
	Female	227	46.2
Age	18-	11	2.2
	18~24	315	64.2
	25~29	123	25.1
	30~34	32	6.5
	35+	10	2.0
Continuous game time	Six months-	57	11.6
	Six months to one year	83	16.9
	One to two years	133	27.1
	Two years+	218	44.4
Average daily game time	1 hour-	68	13.8
	1~3 hours	225	45.8
	3~5hours	137	27.9
	5hours+	61	12.4
Number of friends in-game	Rarely	185	37.7
	Less	140	28.5
	Average	132	26.9
	More	21	4.3
	A lot	13	2.6
	Total	491	100.0

5 Analysis of results

Due to the number of questions in the questionnaire, to ensure the research model's structure is manageable, we processed each of the four dimensions of PCB and PPB by taking the average. After processing, the specific data analysis consisted of two steps; the first part was a validated factor analysis (CFA) of the data. The results are shown in Table 2. All the indicators' factor loadings, except GN2, ISE, and TOL, were more significant than 0.7, and the topic reliability was greater than 0.5, indicating good data reliability. GN2 is slightly smaller than the indicators, and ISE and TOL lose a part of their fitness due to the averaging method used in the descending order. However, we still chose to keep these two groups of variables because they are essential indicators, as demonstrated in previous studies. The factor loadings of each of the four dimensions in the two constructs of PCB and PPB are similar in proportion to previous studies (Yi and Gong, 2013). The average variance extracted (AVE) was all greater than 0.5, the composite reliability (CR) figures were all greater than 0.7, and the square roots of AVE were all greater than the associated differential validity, indicating good convergent validity.

Table 2 Confirmatory factor analysis (CFA)

Structure		*UnStd.*	*S.E.*	*t-value*	*P*	*Std.*	*SMC*	*C.R.*	*AVE*
IS1	IS1_1	1				0.872	0.76	0.907	0.766
	IS1_2	1.008	0.037	27.075	***	0.925	0.856		
	IS1_3	0.923	0.04	23.23	***	0.825	0.681		
IS2	IS2_1	1				0.833	0.694	0.879	0.708
	IS2_2	1.275	0.058	21.927	***	0.913	0.834		
	IS2_3	1.15	0.06	19.183	***	0.772	0.596		
ES	ES1	1				0.903	0.815	0.943	0.847
	ES2	1.081	0.029	36.652	***	0.965	0.931		
	ES3	0.992	0.032	30.68	***	0.891	0.794		
SN	SN1	1				0.964	0.929	0.887	0.798
	SN2	0.84	0.044	19.003	***	0.817	0.667		
SI	SI1	1				0.82	0.672	0.888	0.726
	SI2	1.14	0.049	23.392	***	0.926	0.857		
	SI3	0.906	0.045	20.354	***	0.806	0.65		
GN	GN1	1				0.886	0.785	0.792	0.658
	GN2	0.715	0.05	14.353	***	0.729	0.531		
PPB	ISE	1				0.625	0.391	0.821	0.536
	ISH	1.887	0.139	13.565	***	0.81	0.656		
	RB	1.324	0.103	12.871	***	0.742	0.551		
	PI	1.495	0.117	12.827	***	0.738	0.545		
PCB	FE	1				0.745	0.555	0.823	0.54
	AD	1.022	0.061	16.756	***	0.808	0.653		
	HE	0.779	0.049	15.757	***	0.755	0.57		
	TOL	0.764	0.059	12.921	***	0.619	0.383		

Table 3 tested common method bias and formed a first-factor explanatory power of 33.319% < 50%, which concluded that this study was not significantly affected by common method bias.

Table 4 carries out the test of discriminant validity. The main diagonal line is marked as the square root of the AVE. We find that most correlation coefficients are less than 0.65 and less than the square root of the convergent validity AVE of the corresponding variables, indicating that each latent variable has a certain degree of discriminant validity.

In the subsequent data analysis, we performed the structural equation model using AMOS 26.0 software. The results of the research are shown in Figure 2. The partial fit indices of the model are presented in Table 4. Except for GFI, slightly lower than the recommended value, all other fit indices are within the recommended value, indicating a good model fit.

Table 3 Common method bias test

Component	*Initial eigenvalue*			*Total % of sums of squared loadings*
	Total	*% of variance*	*Initial eigenvalues %*	
1	7.996	33.319	33.319	33.319
2	2.830	11.793	45.112	
3	2.198	9.158	54.270	
4	1.583	6.596	60.866	
5	1.358	5.658	66.524	
6	1.215	5.064	71.588	
7	.977	4.072	75.660	
8	.815	3.397	79.057	
9	.620	2.585	81.642	
10	.565	2.355	83.997	
11	.448	1.866	85.863	
12	.430	1.791	87.653	
13	.394	1.644	89.297	
14	.372	1.550	90.847	
15	.343	1.429	92.276	
16	.302	1.259	93.535	
17	.270	1.125	94.660	
18	.261	1.087	95.748	
19	.233	.970	96.718	
20	.200	.832	97.550	
21	.174	.725	98.275	
22	.161	.672	98.947	
23	.149	.619	99.566	
24	.104	.434	100.000	

Table 4 Differential validity analysis table and the square root of AVE

	IS (bonding)	*IS (bridging)*	*ES*	*SN*	*SI*	*GN*	*PPB*	*PCB*
IS (bonding)	*0.875*							
IS (bridging)	0.172	*0.841*						
ES	0.462	0.090	*0.920*					
SN	0.502	0.136	0.546	*0.893*				
SI	0.305	0.340	0.380	0.421	*0.852*			
GN	0.287	0.221	0.341	0.442	0.498	*0.811*		
PPB	0.187	0.204	0.301	0.306	0.395	0.661	*0.732*	
PCB	0.379	0.394	0.429	0.426	0.622	0.506	0.577	*0.735*

Figure 2 AMOS estimation results

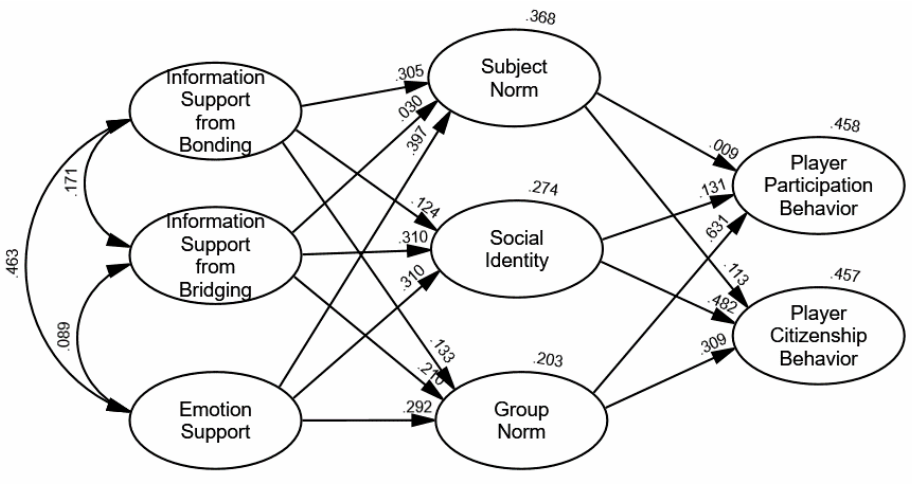


Table 5 Model fit index

Fit index	χ^2/df	*GFI*	*AGFI*	*CFI*	*RMSEA*
Recommended	<3	>0.9	>0.8	>0.9	<0.08
Actual	2.867	0.896	0.866	0.941	0.062

Table 6 Regression coefficient

		Hypothesis	*UnStd.*	*Std.*	*S.E.*	*C.R.*	*P*
IS (bonding)	SN	H_{1a}	0.319	0.305	0.047	6.812	***
IS (bonding)	SI	H_{1b}	0.106	0.124	0.043	2.449	0.014
IS (bonding)	GN	H_{1c}	0.088	0.133	0.037	2.394	0.017
IS (bridging)	SN	H_{2a}	0.045	0.03	0.059	0.762	0.446
IS (bridging)	SI	H_{2b}	0.384	0.31	0.058	6.651	***
IS (bridging)	GN	H_{2c}	0.2	0.21	0.047	4.223	***
ES	SN	H_{3a}	0.401	0.397	0.044	9.14	***
ES	SI	H_{3b}	0.257	0.31	0.042	6.181	***
ES	GN	H_{3c}	0.187	0.292	0.035	5.372	***
SN	CPB	H_{4a}	0.003	0.009	0.014	0.215	0.83
SN	CCB	H_{4b}	0.07	0.113	0.027	2.601	0.009
SI	CPB	H_{5a}	0.049	0.131	0.018	2.788	0.005
SI	CCB	H_{5b}	0.362	0.482	0.039	9.315	***
GN	CPB	H_{6a}	0.307	0.631	0.033	9.222	***
GN	CCB	H_{6b}	0.301	0.309	0.049	6.095	***

For the three constructs of social support, the informational support from bridging social capital has a weak correlation with others because the source differs from the informational support and emotional support from bonding social capital. At the same time, the informational and emotional support from a strong relationship and bonding

social capital has a relatively high correlation. However, it is still below 0.5, indicating that the essentially different two have a certain degree of differentiation.

According to Figure 2 and Table 5, we can conclude that Hypotheses H_{1a}, H_{2b}, H_{2c}, H_{3a}, H_{3b}, H_{3c}, H_{5b}, H_{6a} and H_{6b} are significant at the 0.001 level of significance, Hypotheses H_{4b} and H_{5a} are significant at the 0.01 level, Hypotheses H_{1b} and H_{1c} are significant at the 0.05 level, and Hypotheses H_{2a} and H_{4a} are rejected.

By analysing the significance and regression coefficients, we surmise that information and emotional support from bonding social capital can influence subjective norms to 0.305 and 0.397. Compared with indirect informational support from experts, the information and support received from fellow individuals can build trust more directly and, therefore, have a more significant influence on the subjective norms of individuals. As such, players are more likely to be influenced by the opinions of important people in bonding social capital when making decisions.

Social identity, emotional support, and informational support from bridging social capital are influential, with an explanatory level of 0.31. In contrast, informational support from bonding social capital only offers support of 0.124 at a significance level of 0.05. This indicates that in MMORPGs with more social components, the formation of identity and cohesion among players mainly depends on the emotional support through built-in character expressions or rich communication exchanged via chat channels. Moreover, it can further depend on the informational support provided by experts to help players have a better game experience and participate in value co-creation by sharing information more broadly. Informational support from bonding relationships may be taken for granted as an essential resource that does not contribute to social identity formation.

On the other hand, group norm is similar to social identity, with emotional support and informational support from bridging social capital playing an explanatory role with values of 0.292 and 0.210, respectively. Informational support from bonding social capital giving consent with a coefficient of 0.133 at the 0.05 level of significance indicates that more intimate emotional communication and solid informational support enable players to participate in cooperation or value co-creation with other players in a more anticipatory state and with sufficient psychological readiness. As a result, the formation of group norms is facilitated. Compared with the superficial identification of social identity, group norms are more deeply internalised. Hence, the path coefficient of social support on group norms is lower than that of social identity.

Among the effects of social influence on value co-creation behaviour, many previous studies (Shen et al., 2011; Tsai and Bagozzi, 2014; Zhou, 2019) have consistently determined that subjective norms fail to influence the behaviour of community members significantly, and this is evidenced again by the rejection of H_{4a} specifically in this study. In terms of subjective norms, since value co-creation is a deliberate act (rather than a mandatory one), players can choose to play, cooperate, and participate in value co-creation. Others' opinions do not make a player's will compulsory to transfer. Even if they do not participate in value co-creation content, players can still satisfy their own game needs by playing quests, production, and through other single-player games. Thus, the effect of subjective norms on the player participation behaviour component of value co-creation in virtual game communities is not significant. Social identity and group norms, respectively, explain player participation behaviours to the extent of 0.131 and 0.631, which is understandable. For people with a solid social identity, their daily playing

behaviours are more actively engaged in the community to cooperate and achieve value co-creation with others. The formation of community norms relies on players' consensus and internalised beliefs in long-term value co-creation, such as not cheating, hacking, or engaging in real-money trading that affect other players' gaming experience or actively contribute to cooperation. This also entails that subjective norms play a vital role in influencing and restricting player participation behaviour.

For player citizenship behaviours, social identity and group norms are accounted for by a path coefficient of 0.482 and 0.309 at the 0.001 level of significance. In comparison, subjective norms are presented with a path coefficient of 0.113 at the 0.01 level of significance. Social identity holds the highest degree of influence on player citizenship behaviours. The sense of belonging formed by players through social identity in the virtual game community makes players draw their real friends to the value co-creation process or to make more friends by helping others in and out of the game through value co-creation. The sense of loyalty also compels players to stay in the game even when they cannot attain a satisfying gaming experience. Given that the game design of Final Fantasy 14 does not emphasise competition and the player base is young, the player community atmosphere is relatively friendly and dynamic relative to other MMORPGs, thus creating a welcoming game environment that encourages active participation in value co-creation. The group norms formed in such an environment influence subjective and positive player citizenship behaviour.

6 Theory and management insights

This paper investigates player participation behaviour and citizenship behaviour in virtual game communities based on social support theory and social influence theory.

We believe that this paper has the following three contributions: first, the research results demonstrate that informational support from bonding social capital significantly affects subjective norms in virtual game communities and no significant effect on social identity and group norms. Informational support from bridging social capital significantly affects group norms and social identity and has no significant effect on subjective norms. Moreover, emotional support significantly affects subjective norms, group norms, and social identity. For player participation behaviour, group norms play the most vital role in influencing, followed by social identity; on the contrary, social identity plays the most substantial role in influencing player citizenship behaviour, followed by group norms; subjective norms cannot significantly influence player participation behaviour but can partially influence player citizenship behaviour. These results enrich the existing research.

Second, academically, the most significant contribution of this paper is its application of social support theory and social influence theory to the value co-creation of virtual game communities, a more collaborative and complex virtual community. The examination reveals that the social influence process experienced by players in the virtual game community is influenced by informational support from various parties and emotional support from friends. On the other hand, we have specifically applied the two significant models of value co-creation, customer participation behaviour, and customer citizenship behaviour to virtual game communities, proposed the concepts of player participation behaviour and player citizenship behaviour and found that they are also influenced by subjective norms, social identity, and group identity of social identification

theory in different paths and to different degrees. This has divided the value co-creation in the game community into more detail. Future research can be conducted in-depth based on these two different directions.

Thirdly, in practice, we give the following suggestions for different subjects: for game developers, attention should be paid to the construction of a game's mentor system, as a sound mentor system can provide informational support to newcomers, which helps them become familiar with the game content faster and form certain subjective norms. Secondly, attention should be paid to developing and maintaining in-game buddy and union systems. A robust social system has become increasingly important in any online game. The informational and emotional support that such a system provides can significantly influence players' social identity and group norms, both of which are essential for encouraging the participation and citizenship behaviour of players' value co-creation. An online game with good social features can play a crucial role in enhancing players' stickiness from the bottom up. Finally, developers should focus on constructing in-game communication platforms so that players can communicate in various situations effortlessly. They should also enhance the design of the action or macro for players to express their emotions fully. Many players are initially drawn to online games because the emotional support they receive in real life is inadequate. Therefore, it is critical to creating environments and features in games that facilitate emotional support transfer.

For game operators, the following insights can be drawn. Firstly, they should encourage players to actively participate in value co-creation by organising more activities inside and outside the game. For instance, they can attract players to participate through reward systems and diverse task designs, which require players to obtain information or seek cooperation, thus facilitating the formation and strengthening of informational support among players. Secondly, operators should acknowledge the contribution of famous players (such as streamers) who significantly influence the community. They will use their experience and skills to make strategies and videos for other players' reference and appreciation. This value co-creation behaviour can guide other players and influence their subjective norms, group norms, and social identity, thus prompting others to participate in value co-creation.

For both game developers and operators need to distinguish between player participation and citizenship behaviour. Player participation behaviour is more influenced by group norms, reflecting the consistency of goals among players. Therefore, the design of in-game gameplay, levels, and rewards, as well as out-of-game activities, should attempt to meet players' shared goals so that they can promote participation behaviour through the internalisation of group norms. However, player citizenship behaviour is mainly influenced by social identity. Social identity formation relies on the emotional support formed in active or passive socialisation and the company's ability to solve operational problems immediately. It is essential to investigate beforehand, communicate, and give feedback afterward in the development and operation phases to ensure continuous participation in value co-creation.

For players, they can establish normative community rules and culture to ensure that the community's communication follow the correct values and promote friendly interaction among community members. Players can participate in various activities in the community and have beneficial exchanges with other members to enhance the understanding and recognition of value co-creation. Players can actively speak in the

community, express their ideas and views, and respect others. Inclusion of differences and active acceptance of members from different backgrounds and cultures to promote value co-creation within the community.

7 Limitation and future research

The limitations of this paper are as follows: firstly, we only chose a specific online game, which emphasises the social attributes of MMORPGs while ignoring the objective fact that MMORPGs are not currently the most popular type of online game. Thus, it is necessary to conduct cross-game and cross-type comparisons in the future. In addition, to further improve the model of this study and make it more general, it can be applied to other virtual communities in the future (e.g., fan virtual communities, metaverse communities, etc.).

Secondly, the data source of this study is limited to Chinese players, which needs to account for players from different cultural backgrounds. In addition, the data collection took place at the end of the game's expansion pack release, with fewer new players overall and more loyal players remaining active, which may be a source of bias. Future studies could conduct dynamic data collection over a certain period by dividing the period into different phases. By doing so, the relationship between the study variables in each phase can be analysed, and it is also possible to clarify how the relationship between variables changes over time.

Third, the cross-sectional design of the structural equation model limits the examination of the critical characteristic of the online game player group's mobility. Therefore, future research requires a more longitudinal exploration to study the development of individual player behaviour.

Fourth, the subjective norms of social influence theory may be influenced by factors that are not easily quantifiable, such as the different personal characters. Such factors cannot be explained well under SEM. Future research could use non-quantitative methods to conduct more in-depth studies.

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Appendix

Questionnaire

Factor		*Measurement item design*	*Reference*
Informational support	IS1-1	The technical guidance given by my relatives and friends is very helpful to me	Cutrona and Suhr (1992)
	IS1-2	The playing methods recommended by my relatives and friends (such as RP, copy whole life, etc.) are very helpful to me	
	IS1-3	The method of earning gold coins recommended by my relatives and friends is very helpful to me	
	IS2-1	The technical guidance given to me by the official website, microblog, NGA, SU and other public data stations is very helpful to me	
	IS2-2	The playing methods recommended to me by the official website, microblog, NGA, SU and other public information stations are very helpful to me	
	IS2-3	The methods of earning gold coins recommended to me by official websites, Weibo, NGA, SU and other public data stations are very helpful to me	
Emotional support	ES1	My relatives and friends often praise me and emphasise my importance to them	
	ES2	When I tell a story, my relatives and friends are good at listening and responding	
	ES3	My relatives and friends will take the initiative to care about my recent situation	
Subjective norms	SN1	People who are important to me think I should actively participate in the cooperation.	Venkatesh and Davis (2000)
	SN2	Experts who will affect my behaviour encourage me to actively participate in cooperation	
Group norms	GN1	Please evaluate your cooperation with others as one of the game players	Shen et al. (2011)
	GN2	Please evaluate how much you think other players are involved in cooperation	
Social identity	SI1	In my opinion, FF14 players keep close contact with each other.	
	SI2	I think the FF14 player community is a cohesive whole.	
	SI3	As an FF14 player, I am proud.	

Questionnaire (continued)

Factor			*Measurement item design*	*Reference*
Player participant behaviour	Information seeking	ISE1	I will take the initiative to ask other people in the game some questions	Yi and Gong (2013)
		ISE2	I will actively search for information in forums and data stations to solve problems	
		ISE3	I will take the initiative to try different ways of playing through learning	
	Information sharing	ISH1	I can clearly explain what I want my teammates to know	
		ISH2	I can give appropriate information to others	
		ISH3	I can answer all questions related to cooperation	
	Responsible behaviour	RB1	In cooperation, I can complete the tasks I should complete	
		RB2	In cooperation, I can achieve goals as expected or beyond expectations	
		RB3	I strictly abide by the rules of the game	
	Interaction behaviour	PI1	In cooperation, I can communicate with others in a friendly way	
		PI2	In cooperation, I can communicate with others politely	
		PI3	In cooperation, I will not act rudely towards others	
Player citizenship behaviour	Feedback	FE1	If I have any good ideas for cooperation or operation, I will put them forward.	
		FE2	If I think I have enjoyed a good game experience, I will tell him	
		FE3	If I encounter problems, I will let customer service know	
	Advocacy	AD1	I will tell others some positive things about FF14	
		AD2	I will recommend others to try FF14	
		AD3	I will encourage others to keep playing	
	Helping	HE1	If other players need my help, I will help them	
		HE2	If other players encounter difficulties, I will help them	
		HE3	I will give some suggestions to other players	
	Tolerance	TO1	If I am dissatisfied with the quality of a game update or activity, I will continue to love it	
		TO2	If a version of the game takes too long to update, I will continue to love it	
		TO3	If I have to enjoy updates that are lower than I expected, I will be willing to adapt.	