

# UNDERSTANDING THE ANTECEDENTS OF VIRTUAL PRODUCT PURCHASE IN MMORPG: AN INTEGRATIVE PERSPECTIVE OF SOCIAL PRESENCE AND USER ENGAGEMENT

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## Abstract

*Although there're studies that investigate the factors affecting the intention to purchase virtual items in virtual worlds, most of these studies focus on the technological factors that enhance user experience (e.g., social presence) while pay less attention to the social factors that facilitate user participation and involvement (e.g., user engagement). To fill this gap, taking MMORPGs as a kind of virtual world, this study examines both the impacts of technological factors and social factors from an integrative perspective of social presence and user engagement. A survey from 214 World of Warcraft players has been conducted to test the proposed research model. The results show that 1) both social presence and user engagement positively influence flow which further leads to intention to purchase virtual products 2) two technological factors interactivity and sociability affect social presence, and 3) two social factors social ties and social identity affect user engagement. Theoretical and practical implications of the study are also discussed.*

*Keywords: MMORPG, Virtual Product, Social Presence, User Engagement, Flow, Purchase*

# 1 INTRODUCTION

In recent years, online games have risen up to be an important part of daily entertainments. The global market of online games on both consoles and PC is expected to reach \$35 billion by 2018, up from \$21 billion in 2012 (Intelligence 2013). According to China internet Network Information Centre, 377 million Chinese people play online games, which make up 58.1% of the internet users in China (CNNIC 2015). Among online games, massively multiplayer online role-playing games (MMORPGs) stands out for its richness in game plots and elements. Unlike other kinds of online games, MMORPGs attract a huge amount of stable users that are willing to pay money for virtual items (CNNIC 2010, 2015).

The popularity and profit prospects of MMORPGs have made it valuable for researchers and MMORPGs' operators to investigate the factors that enhance the participants' intention to purchase virtual items. In previous studies, the act of virtual item purchase has been investigated in virtual worlds such as Second Life (Animesh et al. 2011) and Haboo Hotel (Mäntymäki & Salo 2013). Exploratory and empirical investigations reveal some factors leading to virtual item purchase, including technological factors like interactivity, sociability (Animesh et al. 2011), customisations (Guo & Barnes 2009a; Yee 2006b), decorations (Mäntymäki & Salo 2015); gaming factors like achievement (Yee 2006b), perceived network size (Mäntymäki & Salo 2013), character competency, requirement of quest systems (Guo & Barnes 2009a), effort expectancy, performance expectancy, (Y. Guo & S. J. Barnes 2009), quality of virtual world (Guo & Barnes 2009a); value factors like perceived usefulness (Mäntymäki & Salo 2013), benefits (Mäntymäki & Salo 2015) and perceived values (Guo & Barnes 2009b), and predictable profits (Lin & Sun 2010); and emotional factors, such as flow or enjoyments (Animesh et al. 2011; Guo & Barnes 2009a; Huang 2012; Mäntymäki & Salo 2013). However, few researches have thoroughly investigated social factors, although a number of studies have included social-related variables in their model.

Although technological factors may capture the facilities that are provided by the virtual world, users' intention to purchase virtual product may be not solely determined by these facilities. Specifically, if users have no demand of using these facilities, they may not purchase the virtual products. Therefore, the virtual product purchase behaviour is determined not only by the *technological supply* but also *user demand*. In other words, users can only have the intention to purchase when there is a fit between supply and demand. To fill this research gap, this study tries to propose a research model of virtual product purchase by considering both technological supply and user demand. Specifically, following previous studies that focus on the key role of social presence, we take social presence as the factor that captures the technological supply aspect and investigates its two antecedents: sociability and interactivity. Further, we propose user engagement as the factor that captures the user demand aspect and examine its antecedents (e.g., social ties and social identity) from social influence perspective.

Apart from technological supply and user demand, we also include flow in our research. In previous studies, the results have manifested that flow is the most important mediating factor in explaining the intention to purchase (Animesh et al. 2011; Huang 2012; Mäntymäki & Salo 2013; Shelton 2010). The sense of flow reflects the user's satisfaction with the social states and the supplied technological functions, and will make users tend to have bonds with the platform in further. Thus, flow will not only make users become potential purchasers, but will also let users have higher expectations for those functions requiring for payment. Thus in this research, it's reasonable for us to specifically further include flow in analysing the intention to purchase. Meanwhile, as the flow comes from the users' satisfaction with both technological and social aspects (Animesh et al. 2011; Huang 2012), we also examine the relationship between flow and both technological supply and user demand factors, trying to find out how technological and social factors can influence flow.

This research has made several theoretical contributions. First, beyond the technology-centred perspective, we propose that virtual product purchase behaviour as a combination of both technological supply and user demand and highlight the importance of user engagement. Second, from the social influence perspective, we propose and empirically examine the impacts of social ties and social identity on user engagement. Third, we empirically re-confirmed the impacts of sociability

and interactivity on social presence in the research context of MMORPGs. Finally, the research emphasizes the strong mediating effect the flow plays in predicting the intention to purchase.

## **2 THEORETICAL BACKGROUNDS**

### **2.1 MMORPG**

MMORPG is defined as “graphical two-dimensional (2-D) or three-dimensional (3-D) RPGs played online, allowing individuals, through their self-created digital characters or ‘avatars’, to interact not only with the gaming software but with other players” (Steinkuehler & Williams 2006). MMORPGs are completely not simply a platform for playing games but also social platforms for people to form relationships (Whang & Chang 2004; Zhong 2011).

World of Warcraft (WoW) is a specific case of MMORPG. In WoW, guilds are important component of the game which have formalized memberships and hierarchical ranks (Bagozzi & Dholakia 2006), and people in the same guild usually appoint fixed time to accomplish tasks (i.e. instances in WoW) together. Guild mechanism provides guild members with more solid connections, and thus guilds can be seen as virtual communities which provides meaningful online social relationships and lead to a participant’s belongingness (Ducheneaut et al. 2007). Gupta and Kim (2004) conclude that virtual communities should share four components, namely “community, location, bonding and a shared objective/purpose.” Like other kinds of virtual communities, guilds in MMORPGs are founded as stable platforms for communicating and cooperating with game players that share same goals. The interaction and cooperation in guilds can enhance the bonds between players and thus, guilds are endowed with social elements. At the same time, guilds in MMORPGs offer the users autonomy of choosing their experiences in their own worlds, and this makes the platforms have wide variety of possibilities of people’s activities (Jung 2011).

In this research, we treat social features as equally important with technological features of MMORPGs. As Yee (2006b) concludes from a survey, the main components of playing motivations include achievement, social, and immersion. This implies that feelings of playing MMORPGs involve both technological and social experience (Caplan et al. 2009; Ducheneaut & Moore 2004). At the same time, a number of previous studies have explored the factors of online social capital (Reer & Kräner 2014) and online game-related relationships (Domahidi et al. 2014), and have proven that online gamers with strong online bonding or bridging social capital tend to develop strong offline social supports (Trepte et al. 2012), which also proves that social features are as important as technological features for MMORPGs. Consequently in this research, we consider both technological and social aspects, which take a further step based on previous researches.

### **2.2 Virtual product purchase**

In recent years, a number of researches have been conducted to investigate the factors of virtual item purchase using empirical investigations. For example, Guo and Barnes (2009a) applied focus groups to investigate the purchase intentions, and the results show that perceived enjoyment, character competency, and the requires of quest system act as the main factors of purchasing virtual items. Meanwhile, Guo and Barnes (2009b) constructed a conceptual empirical model and found that effort expectancy, performance expectancy, perceived value, and customisation had strong relationship with purchase intentions. Animesh et al. (2011) analyzed technological factors (e.g., interactivity and sociability) and spatial factors (e.g., density and stability) and flow in virtual item purchasing in Second Life based on the stimulus – organism – responses (S-O-R) framework, and found that flow played an dominant role in purchasing behaviors. Mäntymäki and Salo (2013) found that perceived usefulness, ease of use, enjoyment, perceived network size and availability have strong impacts on the intention to purchase in Haboo Hotel. Further, Mäntymäki and Salo (2015) suggested that in Haboo Hotel, the most frequently mentioned reasons for purchase among teenagers are benefits of premium membership, decoration and fun. Above all the studies, researchers have explored some antecedents

of purchase intention which can be categorized into several aspects, relating to technology, game, item-value and intrinsic feelings respectively.

However, most of previous studies on virtual product purchase pay little attention to the social factors naturally or unconsciously. However, in MMORPGs, the technological features create the facilities that user needs, and the social features create the user's inner motivation to use the facilities to interact in the game. These two parts are of complementary relationships, so both technological and social features should not be ignored. Previous researches failed to comprehensively consider both the technological and social aspects, and failed to understand how these two aspects jointly affect user behaviors. This study creates a new research model to investigate the purchase intention in MMORPGs by integrating flow, and technological and social influence factors. These three types of factors are discussed in the following parts.

### **2.3 Flow**

In this study, we firstly include flow in the research model that investigates the purchase intentions. The seminal theory of flow is proposed by Csikszentmihalyi (1975), who defined flow as "the holistic sensation that people feel when they act with total involvement." Previous studies applying flow theory to analyze users' online experiences have found that flow has influences on learning, attitudes, intentions and behaviors (Nah et al. 2011). In our study, flow is defined operationally as "the perceived sense of intrinsic enjoyment obtained from interacting with the world" (Animesh et al. 2011; Novak et al. 2000).

In virtual communities, flow reflects an emotional state that users have when engaging in the activities in virtual worlds (Kahn 1990; Yee 2006a). In MMORPGs, flow is generated not only by game features in the virtual worlds, but also the gamers' involvement in the virtual communities. Thus, it is implied that both technological features and user's engagement have influences on flow. Further, individuals who experience flow states have more positive subjective experiences and higher likelihood of satisfaction and loyalty (Hoffman & Novak 1996). Meanwhile, previous researches have confirmed that flow serves as an important intermediating role in user's purchase intention in online environments (Animesh et al. 2011; Huang 2012; Mäntymäki & Salo 2013; Shelton 2010). Thus, it is reasonable to argue that the sense of flow can lead to participants' positive affect which further leads to purchase intention in turn. Therefore in this research, we use flow to represent the intrinsic emotion stimulated by participant's technological and social experiences, and treat it as an important factor that leads to the intention to purchase.

### **2.4 Social Presence**

In this research, we adopt the definition of social presence from Qiu and Benbasat (2005) as "the inner feelings of the interactions with virtual objects and other people in the platform." The "interactions" in the definition are mainly about the functions that can be used to interact with the people and objects in the virtual world. In this way, social presence refers to the feelings of the experience of using the functions provided by the platform. Social presence reflects the abundance of technical elements in the virtual world. If users have strong sense of social presence, it can be inferred that the technical elements provided by the platform should be more satisfying. In this research, we use social presence to represent the technological supply factor. It captures the technological constructions of the gaming platforms and further reflects the extent to which the gaming-functions supplied can satisfy the participant's needs.

As social presence has a variety of definitions, as Shin (2013) concludes, presence has been defined in several ways, namely, as the concept of being with others (Heeter 1992), the level of awareness of the co-presence of another human being or intelligence (Nowak & Biocca 2003), and the feeling that one has some level of access or insight into the other's intentional, cognitive, or affective states (Biocca & Nowak 2001), and the extent to which a medium allows users to experience others as being psychologically present (Hassanein & Head 2007). While there are diverse definitions, social

presence commonly refers to the degree to which two people interacting through a technological medium feel as if they are together.

In previous studies, Heeter (1995) found that users enjoyed the experience more when they felt a stronger social presence by “entering another world.” When participants experience social presence through warm and personal interactions with others, they tend to be deeply involved, absorbed, engaged, and engrossed in the interaction. Such engaging interactions make the role playing and identity management activities undertaken by the participants in the virtual world more enjoyable (Animesh et al. 2011; Laffey et al. 2006). In MMORPGs, social presence plays an important role in deciding users’ feelings of interaction, which has been confirmed in various studies (Cyr et al. 2007; Hassanein & Head 2007; Mäntymäki & Salo 2013; Ogonowski et al. 2014; Qiu & Benbasat 2009; Walter et al. 2015). In this research, we use social presence to reflect the technological supply factor, and speculate that it has some connections with flow and purchase intentions.

## **2.5 User Engagement**

User Engagement is defined as “the participant’s intrinsic motivation to interact and cooperate with community members, and to voluntarily contribute to benefit the online community or its members,” which is adapted from and integrated with Algesheimer et al. (2005) and Hsu et al. (2012). Unlike social presence that mainly focuses on technological factors, user engagement specifically emphasizes the user’s inner feelings of the social relationships with others in the virtual world. User engagement concentrative incarnates the social attributes of a platform. Because of user engagement, users are bonded with the platform, thus creating the users’ affective dependency to the platform. With higher engagement, users would likely to care more about their identities, and expect to interact more in the game, thus creating the demands of using the tools and functions supplied.

Based on the above, we employ user engagement to represent the user demand factor, which means the inner feelings of social experience in the virtual communities, and it further reflects how the users are motivated to use the functions to interact in the game. In previous studies of studying purchase intentions, users' affect towards virtual communities has been classified into affective involvement and cognitive involvement (Huang 2012). In this research, we firstly integrate the two involvements of community as user engagement and endow it with social attributes.

As Ray et al. (2014) concludes, engagement is a holistic psychological state in which one is cognitively and emotionally energized to socially behave in ways that exemplify the positive ways in which group members prefer to think of themselves (Kahn 1990; Rich et al. 2010). Based on previous studies, user engagement has been used to analyze the problems in different contexts, like in brand communities (Algesheimer et al. 2005), online communities (Ray et al. 2014) and job performances (Rich et al. 2010). User engagement has also been analyzed as objective factors (He et al. 2014; Hsu et al. 2012). Therefore, as a newly developed variable, user engagement is used to measure the user’s feelings of interacting with others in the platform, and reflect the user's demanding factor for technical functions in further.

# **3 RESEARCH MODEL AND HYPOTHESIS**

## **3.1 Research Framework**

Based on the literature review, we propose our research model by integrating both the technological supply and user demand: interacting experience as “technological supply” factor and user’s engagement as “user demand” factor. The interacting experience is referred as “social presence” in this research, which includes interactivity and sociability as its antecedents, while the engagement is referred as “user engagement” in this research, which includes social ties and social identity as antecedents. Meanwhile, we include flow in our research, and speculate that it plays an intermediary role between the two factors and the intentions to purchase.

The research model is illustrated in Figure 1. The detailed demonstrations of the hypotheses are presented in the next part.

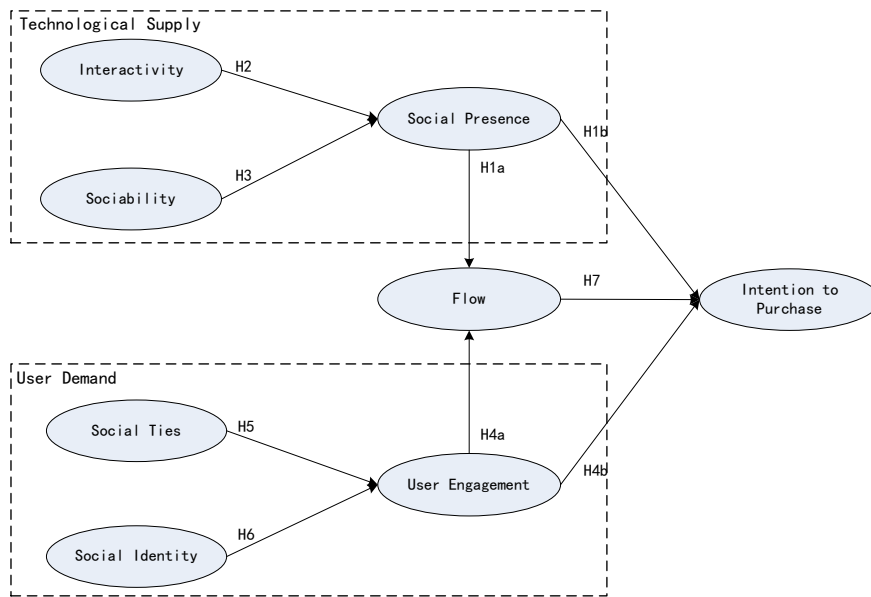


Figure 1. Research Model

### 3.2 Social Presence

In this research, social presence is used to represent the technological supply factor, and interactivity and sociability are taken as its antecedents. Social presence is defined as the inner feelings of the interactions with virtual objects and other people in the platform (Qiu & Benbasat 2005). Lombard and Ditton (1997) have emphasised that the enjoyment and delight are the most prominent psychological states of social presence. With higher sense of social presence, players will be more satisfied and further feel more enjoyment from the platform. Further, prior empirical studies have also confirmed the relationship between social presence and flow (enjoyment) in virtual environments or e-commerce environments (Cyr et al. 2007; Hassanein & Head 2007; Mäntymäki & Salo 2013; Ogonowski et al. 2014; Qiu & Benbasat 2009; Walter et al. 2015). Therefore, we propose that:

H1a: Perceived social presence is positively related to flow.

At the same time, strong feelings of social presence will make users be more satisfied with the virtual world, thus creating the possibility of purchasing. Further, higher degree of social presence reflects the good quality of the technological elements of the virtual world, thus would possibly make users want to purchase and experience the functions. Moreover, social presence will also make users become more caring about their identities on the platform, thus can make users pay more on their avatars (Animesh et al. 2011). Therefore, we propose that:

H1b: Perceived social presence is positively related to the intention to purchase.

#### 3.2.1 Interactivity

Interactivity is the extent to which users can interact with virtual objects and participate in modifying the landscape or content of a mediated environment in real time (Steuer 1992). In avatar-based interactive environments, users can customize a wide range of their avatars' physical features via interactivity features (Jin 2009), and through these features participants interact with others in the virtual world and make themselves real, which leads to their engagement with the virtual world (Taylor 2002).

When inhabiting the virtual world, users' ability to interact with the virtual environment can further make them feel that they are embodied in the virtual world by improving the various technological

online experiences (Huang 2012; Lehdonvirta 2009; Martin 2008). Furthermore, the high sense of ability to control users' avatars that created by a good level of interactivity can enhance the sense of enjoyment (Jiang & Benbasat 2007), and makes the virtual experience playful (Hoffman & Novak 1996; Novak et al. 2000). The sense of active control and the playful virtual experience can reflect the good state of facility construction, and would improve the feeling of interacting on the platform. Thus, we posit that:

H2: Perceived Interactivity is positively related to social presence.

### 3.2.2 Sociability

Along with interactivity, sociability is then carried out as the features of technological stimuli. Definitions of sociability vary across computer-mediated communication perspective (Preece 2001) and user-experience perspective (Theng et al. 2010), depending on the primary focus of authors, process, features, perception, or combined approaches (Shin 2013). In this research, we adopt the definition from Kreijns et al. (2007), who described it as "the extent to which the virtual environment is able to facilitate the emergence of a social space."

In online communication, sociability is about the technological supports of communications among community members (Preece 2001). When the degree of sociability increases, it will be more competent to facilitate a "sound" social space, which "includes the good relationships, strong group cohesiveness, trust, respect and belonging, satisfaction, and a strong sense of community" (Kreijns et al. 2007). Also, Qiu and Benbasat (2005) state that in the virtual world with higher degree of sociability, users are more likely to enjoy a higher level of social presence. Hence, we posit that:

H3: Perceived sociability is positively related to social presence.

## 3.3 User Engagement

In this research, user engagement is used to represent the user demand factor, and social ties and social identity are taken as its antecedents. User engagement is defined as "the participant's intrinsic motivation to interact and cooperate with community members, and to voluntarily contribute to benefit the online community or its members" (Algesheimer et al. 2005; Hsu et al. 2012).

A participant with higher user engagement has higher degree of motivation in interacting and contributing in the virtual world. It makes the users become more attached to the virtual world and feel the virtual world as enjoyable, increasing users' inner feelings of flow. At the same time, a participant with higher user engagement would search for more chances to interact and contribute more in the virtual world. That creates more needs for tools and facilitates in the platform and thus, the participant may purchase virtual items to make some tools or functions available. Therefore, although there're not many theories about the relationship between community engagement and flow or the intention to purchase, we posit these two hypotheses for inspection:

H4a: Perceived user engagement is positively related to flow.

H4b: Perceived user engagement is positively related to the intention to purchase.

### 3.3.1 Social Ties

In many social researches, social relationships are measured by tie strength (Granovetter 1973). According to Granovetter (Granovetter 1973), tie strength can be described as "a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie" and social ties are operationally defined as "the overall strength of the connections with others in the virtual world."

In virtual worlds, the strength of social ties can reflect the participant's interaction and the intensity of emotions with friends online. People's frequent interacting with others is positively related to the strong interpersonal attachments (Suh & Shin 2010). Further, interpersonal attachments with others will enhance the organizational commitment (Yoon et al. 1994), through which we infer that in virtual

worlds, strong ties will motivate participants to interact and cooperate with members in virtual community (i.e. user engagement). Therefore, we posit the hypothesis about the social ties below:

H5: Social ties are positively related to user engagement.

### 3.3.2 *Social identity*

Apart from social ties, social identity is used to symbolize the social influence in the virtual world. Social identity refers to a user's self-esteem and commitment to community (Dholakia & Chiang 2003; Huang 2012; Hwang 2008; Kwon & Wen 2010). In this research, we refer the Hsu's definition of online community identification as "a sense that people view themselves as a member of the online community and feel emotionally connected with other participants in the online community" (Hsu et al. 2012), and the "online communities" refers to the guilds in WoW.

Members who have identifications with a community tend to adopt its norms and values (Stets & Burke 2000), and are inclined to share the characteristics like attitudes, behaviours and orientations in the group (Van Knippenberg & Hogg 2003), i.e. the communal identity and self-identity overlaps. The overlaps makes the members inside the community have interactions continuously (Algesheimer et al. 2005), thus making the participants engaged with the community. Moreover, previous researches have confirmed the positive relationships between social identification and user engagement (He et al. 2014; Huang 2012; Ray et al. 2014; Suh & Shin 2010). Therefore, we posit that:

H6: Perceived social identity is positively related to user engagement.

## 3.4 **Flow**

In this research, we speculate that flow is an intermediating factor between the supply and demand factors and the intentions to purchase. In our research, flow is defined as the perceived sense of intrinsic enjoyment obtained from interacting on the platform (Animesh et al. 2011; Novak et al. 2000).

People experiencing flow tend to have positive feelings of satisfaction and loyalty (Hoffman & Novak 1996). With satisfaction and loyalty, participants will have more expectations about the virtual community and would like to use more items or tools in the virtual world. Further, a higher degree of satisfaction and enjoyment should more likely to make the users feel that it's worth to pay. Thus, the participants will be more likely to purchase the virtual items to fulfil the expectations aroused by the satisfaction. Meanwhile, flow will arouse users' feelings that the virtual world is important for them. Such perceived importance will make the participants pay more attention to their identities, increasing the needs to purchase virtual products in the virtual environments (Animesh et al. 2011) so as to maintain their avatars being in satisfying states (Guo & Barnes 2009b). Therefore, we posit that:

H7: Flow is positively related to intention to purchase.

# 4 **RESEARCH METHODOLOGY**

## 4.1 **Measurements**

In this study, we choose WoW, the most popular MMORPG in the world as the research setting. The purchasing platform in WoW provides only game-unrelated products (i.e. decorations, clothes, etc). This helps us exclude commercial factors and the task-oriented or game-oriented factors in the intention to purchase. Moreover, its guild mechanism bonds users together, making guilds in WoW representative virtual communities. Therefore, it is appropriate to choose WoW as the research setting. For the measures of the constructs, we either adopt previously validated scales or develop new scales based on widely accepted theories.

In this research, interactivity is measured with the self-developed items based on three important factors (i.e. speed, range and mapping) proposed by Steuer (1992). Sociability is measured with the items adopted from Kreijns et al. (2007). The construct of social ties is measured with the items



adopted from Gilbert and Karahalios (2009). Social identity is measured with the items adopted from Bhattacharya et al. (1995). The measurement items of social presence and flow are adopted from Qiu and Benbasat (2005) and the items measure user engagement are adopted from Algesheimer et al. (2005). Intention to purchase is measured with the items adopted from Van der Heijden and Verhagen (2004). All the constructs are measured using multiple items, based on seven-point Likert scales.

## 4.2 Data collection procedure

The data was collected through online survey in November 2014. Every participant of the research was asked to fill in a self-administered survey. Only participants who had played WoW for more than six months and were playing WoW then would be selected as the samples. With the online survey tools, participants were forbidden to submit or move on to the next part of the survey while there were missing data. Therefore no response had missing data, and 290 responses in total were obtained. Among these responses 214 responses were validated and used in the data analysis.

Table 1 exhibits the demographic information of the samples. Over 90% of respondents were males and about 80% of responses were in the 22-35 age range. Most participants had bought virtual items at least on one online platform.

Demographics		Frequency	Percent (%)
Gender	Male	196	91.6
	Female	18	8.4
Age	21 or younger	14	6.5
	22-25	30	14.0
	26-30	79	36.9
	31-35	58	27.1
	36 or older	33	15.4
Occupation	Student	24	11.2
	Working	188	87.9
	Unemployed	1	0.5
	Other	1	0.5
Education	High school	4	1.9
	Undergraduate	192	89.7
	Postgraduate or higher	18	8.4
Times spent per day (on average)	Less than 1 hour	18	8.4
	1-2 hours	96	44.9
	2-4 hours	83	38.8
	More than 4 hours	17	7.9
Have bought virtual items on any online platform	Yes	195	91.1
	No	19	8.9

Table 1. Demographics of Participants (N=214)

## 5 RESULTS

Structural equation modelling (SEM) was used to analyze the data because SEM facilitates simultaneously testing the interplay between various exogenous and endogenous constructs (Anderson & Gerbing 1988). Specifically, SmartPLS 3.0 is used in the analysis.

### 5.1 Measurement Model

Reliability and validity analyzes are preformed to validate the measurement model. Table 2 shows all Cronbach's Alpha, Composite Reliability (CR) and Average Variance Extracted (AVE) of the constructs. Reliability is assessed based on Cronbach's Alpha and Composite Reliability (CR) scores. As shown in Table 3, Cronbach's Alpha and Composite Reliability (CR) for all the constructs were

above the recommended threshold value of 0.7 (Nunnally et al. 1967), suggesting high construct reliability.

Construct	Mean	S.D.	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Interactivity	4.870	1.228	0.960	0.965	0.714
Sociability	5.012	1.050	0.916	0.929	0.569
Social Identity	5.115	1.322	0.935	0.949	0.755
Social Ties	4.889	1.289	0.904	0.928	0.721
Social Presence	4.768	1.199	0.913	0.931	0.660
User Engagement	4.744	1.045	0.879	0.917	0.734
Flow	5.474	1.092	0.938	0.947	0.641
Intention to Purchase	5.199	1.174	0.887	0.922	0.747

Table 2. The Measurement Model Statistics

The validity examination includes the examination of convergent validity and discriminant validity. Convergent validity is examined by checking average variance extracted (AVE) and the factor loadings of the items adopted in each construct. The item loadings of the indicators ranges from 0.569 to 0.755, which are well above the threshold value of 0.5 (Fornell & Larcker 1981). Discriminant validity is assessed by comparing the square root of the every AVE of a construct with the inter-construct correlation coefficients (Fornell & Larcker 1981). As seen in Table3, all of the diagonal elements in bold font were the square roots of AVEs, and were found to be greater than any other corresponding rows or column entries (inter-construct correlation coefficients).

	UEG	FLW	PUR	INT	SOC	SID	SPR	STI
UEG	<b>0.857</b>							
FLW	0.564	<b>0.801</b>						
PUR	0.589	0.580	<b>0.864</b>					
INT	0.369	0.447	0.284	<b>0.844</b>				
SOC	0.441	0.457	0.415	0.389	<b>0.754</b>			
SID	0.497	0.593	0.576	0.375	0.438	<b>0.869</b>		
SPR	0.422	0.529	0.418	0.308	0.404	0.376	<b>0.812</b>	
STI	0.412	0.499	0.454	0.068	0.237	0.439	0.394	<b>0.849</b>

Table 3. Construct Correlations and Discriminant Validity

\*UEG refers to “User Engagement”; FLW refers to “Flow”; PUR refers to “Intention to Purchase” INT refers to “Interactivity”; SOC refers to “Sociability”; SID refers to “Social Identification”; SPR refers to “Social Presence”; STI refers to “Social Ties”

## 5.2 Structural Model

The hypotheses are tested by using PLS-SEM method, using SmartPLS 3.0 to analysis the sample data. Figure 2 exhibits the path coefficients, t-values and explained endogenous variables’ variances ( $R^2$ ) for the structural model. As shown in Figure 2, eight of the nine paths have been supported. Interactivity, sociability is significantly associated with social presence (H2,  $\beta = 0.177$ ,  $p < 0.001$ ; H3,  $\beta = 0.335$ ,  $p < 0.001$ ). At the same time, social ties and social identity is found to be significantly related to user engagement (H5,  $\beta = 0.241$ ,  $p < 0.001$ ; H6,  $\beta = 0.391$ ,  $p < 0.001$ ).

The results shows that the relationship between social presence and flow is supported (H1a,  $\beta = 0.354$ ,  $p < 0.001$ ), however social presence is found not significantly related to intention to purchase (H1b,  $\beta = 0.092$ ,  $p = 0.105$ ). User engagement were significantly associated with flow (H4a,  $\beta = 0.414$ ,  $p <$

0.001) and intention to purchase (H4b,  $\beta = 0.367$ ,  $p < 0.001$ ). Finally, flow had a significant impact on intention to purchase (H7,  $\beta = 0.326$ ,  $p < 0.001$ ).

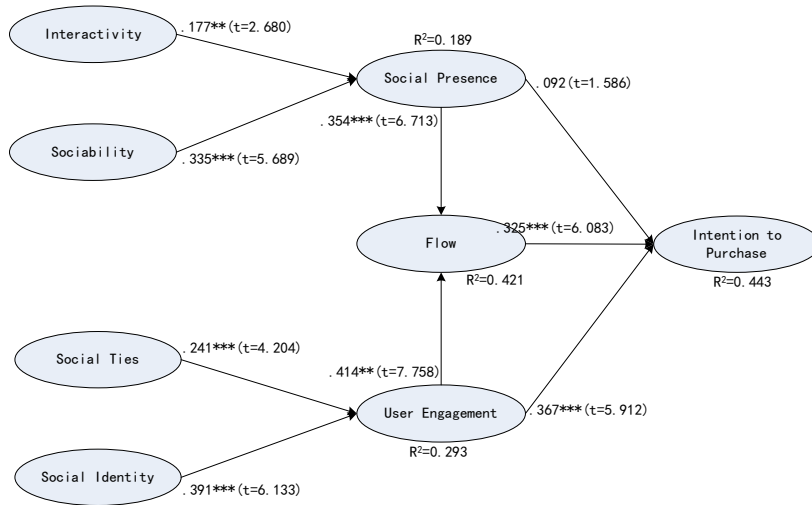


Figure 2. Results of the Structural Model

In this research model, approximately 18.9% ( $R^2 = 0.189$ ) of the variance in social presence, 29.3% ( $R^2 = 0.293$ ) of the variance in user engagement, and 42.1% ( $R^2 = 0.421$ ) of the variance in flow were explained by the antecedent variables. Overall, the structural model explained approximately 44.3% ( $R^2 = 0.443$ ) of the variance in intention to purchase.

## 6 DISCUSSIONS

### 6.1 Key Findings

In this research, we propose a research model to examine the positive influences of technological (i.e. technological supply) and social (i.e. user demand) factors on the intention to purchase and several interesting findings can be derived from the results.

On the technological aspect, the results show that in the MMORPGs, the interactivity and social presence correlates significantly, indicating that when a participant has the ability to manipulate the virtual world (including speed, range and mapping), the participant will feel a strong sense of social presence. Further, the strong relationship between sociability and social presence has been proven, indicating that in MMORPGs, the improvements of the social functions can increase feeling of the interactions.

On the social aspect, the results show that there're strong relationships between social ties and user engagement. The results show that the increased tie strength will increase the participant's perceived intimacy inside the community and finally increase the engagement of community. Also, social identity has strong relationships with user engagement, indicating that social identity will increase the intimacy between the participants in the virtual community, and then increase the enjoyment the user receives in the MMORPGs.

The results show that social presence and user engagement has strong relationships with flow, but only user engagement and flow significantly relates to the intention to purchase. The relationship between social presence and intention to purchase is not significant. This result is consistent with prior studies (Animesh et al. 2011; Mäntymäki & Salo 2013). One possible explanation is that the impact of social presence on intention to purchase is fully mediated by flow (Animesh et al. 2011).

## **6.2 Theoretical and Practical Implications**

This research has various theoretical implications. First, we empirically examine the role of social presence and flow in virtual product purchase in the research context of WoW which is a novel research context and find that the results are in consistent with previous studies (Animesh et al. 2011; Huang 2012; Mäntymäki & Salo 2013). This suggests that the research findings from MMORPGs may be generalized to other kinds of virtual worlds (e.g., Second Life).

Second, this research proposes a new framework to investigate the factors influencing the intention to purchase by integrating the social presence perspective and user engagement perspective. Specifically, we identify these two factors respectively as the technological supply and user demand factors and point out that users' virtual product purchase behavior is a combination result of technological supply and user demand. It enriches the previous literature on virtual product purchase by highlighting the important role of user engagement.

Third, this study investigates the antecedents of social presence and user engagement. Specifically, the empirical results confirm that interactivity and sociability are two key predictors of social presence, and social ties and social identity have significant impacts on user engagement. Future research can further examine the proposed research findings in other virtual worlds.

Fourth, this study reveals that the impacts of social presence on purchase intention are fully mediated by flow, while user engagement has both direct impact on purchase intention and indirect impact on purchase intention via flow. This suggests that social presence can influence virtual product intention only when it can be transformed into flow. In contrast, when users have a sense of engagement in the virtual world, they may purchase the virtual products even if the flow is not achieved.

Besides the theoretical implications, this research also has some practical implications for operators of the virtual worlds. To increase the user's purchase intention, the operator of the virtual world should keep the humanization in operation, massive elements in manipulating and the high velocity in responding in the virtual world. Meanwhile, the operators should pay more attention to the enjoyment that participants can get, and then to enhance the user engagement in the virtual communities. That cannot be easily achieved by simply improve the social communicating tools in the virtual world, but could be reached through the perfection of the mechanisms supporting and improving the interactions and connections between the users. Regular connections would be helpful for keeping stable online friendships in the long term. In all, the operators of the virtual worlds need to consider many categories of positive stimuli to finally increase the participant's intention to purchase.

## **6.3 Limitations and Suggestions**

This research has several limitations. In this study, we choose World of Warcraft as the research setting. However, it may not be proper to extend the results to other kinds of MMORPGs, or other kinds of virtual worlds. At the same time, the result is based on the sample collected in China via online survey, and most of the respondents are males. This composition fits the reality, but it neglects some parts of players especially women players. In future research, it is interesting to see whether the findings of this study are applicable to other populations and research contexts.

Second, we treat MMORPGs as a kind of virtual world based on its social aspects and virtual character. Throughout the study, we construct the research model based on some theories of virtual worlds, and extend the research result of MMORPGs to the virtual worlds. Although the reliability has been confirmed in this study, the MMORPGs and other kinds of virtual worlds (Second Life, etc.) still have obvious differences. Whether the theories and research results can be generalized to other kinds of virtual worlds still needs to be validated in further studies.

Third, as we argue that users' intention to purchase is a combination result of technological supply and user demand in this research, we didn't include some economic factors such as perceived values (Guo & Barnes 2009b) and predictable profits (Lin & Sun 2010). In further research it is better to

integrate the economic factors in analysing the intention to purchase, to make the model more comprehensive.

Finally, as this research treats the MMORPGs as a kind of virtual world, we did not consider many technological factors that relate to games, nor did we include a game-related factor. This is because of the massiveness of the components of a game, and these elements cannot be simply categorized into a small number of constructs and thus we consider only the interactivity and sociability as the facility aspects to simplify the research model. This needs to be improved in further studies.

## **7 CONCLUSION**

In this research, we create a new research model by integrating social presence perspective and user engagement perspective and identifying the antecedents of these two factors by examining the roles of interactivity, sociability, social ties and social identity. Meanwhile, we figure out that flow serves as an important mediating factor between social presence and intention to purchase. The research findings enrich the literature on virtual product purchase in virtual worlds and shed light on how operators can improve the design of virtual world to increase users' intentions to purchase virtual products.

## **ACKNOWLEDGEMENTS**

The work described in this article was supported by the grants from the National Natural Science Foundation of China (Project No. 71201118) and Hubei Province Science and Technology Support Program (Project No. 2014BDF106).

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