



## Does a contextualized theory of planned behavior explain why teenagers stay in virtual worlds?



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### ABSTRACT

Academics and business practitioners are intrigued by the factors that foster continued user engagement in virtual worlds (VWs). It is unclear how, and to what extent, existing theories can explain their continued use. As young people constitute the majority of VW users, understanding the reasons for their continued use intentions is important. Taking the distinctive features of VW services into account, such as the visibility of users' actions to other users, we contextualize the Theory of Planned Behavior and investigate the role of teenagers' attitudes, social influences and perceived behavioral control as the determinants of their continued intention to use VW. We then apply a set of constructs from prior Information Systems (IS) literature to decompose these constructs. By analyzing primary data collected from 923 users of Habbo Hotel, a leading virtual world for teenagers, this study confirms the role of users' intrinsic motivation, interpersonal influence and self-efficacy as key constituents of sustained user engagement in VWs. In addition, we demonstrate that decomposing these three established constructs can capture many of the key contextual characteristics of VWs. The study contributes to the literature by showing that IS theories and constructs are appropriate for the VW setting and teenage users.

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### 1. Introduction

Virtual worlds (VWs) are a rapidly emerging socio-technical reality for an increasing number of users, particularly young people. By May 2012, VWs had received 1.9 billion registered users, 60% of whom are between 5 and 15 years of age (kZero, 2012). As an example, Habbo Hotel—the largest VW for teenagers—has attracted 275 million registered users since its inception in 2000 (Sulake Corporation, 2013). The issue of continued use in VWs and other online services is of utmost interest to academics and business practitioners, as only a proportion of the registered accounts remain active, users are hard to retain, and lost users are even more difficult to win back (cf. Schwarz, Schwarz, Jung, Pérez-Mira, & Wiley-Patton, 2012; Sulake Corporation, 2013).

In the literature, VWs are defined as persistent computer-simulated environments in which multiple users interact

simultaneously through avatars (Bainbridge, 2007). VWs embody a variety of functions and activities that tap into the extrinsic and intrinsic motivation contributing to the attitude toward using these systems (Verhagen, Feldberg, van den Hooff, Meents, & Merikivi, 2012). Further, when employing VWs for one of their purposes, users do so through interaction with a changeable group of other people (Chaturvedi, Dolk, & Drnevich, 2011, p. 675). Therefore, we suggest that social influence affects user behavior in VWs (Hau & Kim, 2011). With respect to system controllability, VWs feature simultaneous events that are to be navigated through an avatar. Bearing this in mind, it is reasonable to suggest that VW users need specific skills to control their activity in the system (Goel, Junglas, Ives, & Johnson, 2012).

Although recent studies have provided new and valuable insights into the diverse mechanisms that are unique to the use of VWs (Behm-Morawitz, 2013; Faiola, Newlon, Pfaff, & Smyslova, 2013; Goel, Johnson, Junglas, & Ives, 2011; Mäntymäki & Islam, 2014; Saunders, Rutkowski, van Genuchten, Vogel, & Orrego, 2011), little effort has been made to integrate these perspectives into a single theoretical structure that would explain *why young people engage in VWs on a sustained basis*. To address this gap we adopt the

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**Table 1**  
An overview of studies on post-adoption behavior in virtual worlds.

Focus	Theoretical background	Key constructs	Target group	Author(s)
VW assimilation as a predictor of continued use	Theory of reasoned action	Attitude, ease of use, playfulness, social presence, self-distraction	University students	Schwarz et al. (2012)
Continuous VW use and purchasing behavior	Technology acceptance model	Perceived enjoyment, usefulness, network pressure	Adolescents	Mäntymäki and Salo (2011)
Environmental characteristics of VWs and deep user involvement	Interactionist theory of place attachment	Cognitive absorption	University students	Goel et al. (2011)
Flow and learning in VWs	Flow theory	Flow, telepresence	Adult users	Faiola et al. (2013)
Continuous VW use in the work setting	User-technology-task	Cognitive absorption, work usage, recreational usage	Adult users	Nevo et al. (2012)
Sense of presence and perceived autonomy in VWs	Expectation-confirmation theory	Telepresence, social presence, perceived autonomy	Adult users	Jung (2011)
Satisfaction and commitment as drivers of continued VW use	Dedication-constraint framework of commitment	Satisfaction, affective commitment, calculative commitment	Adult users	Zhou et al. (2012)
The effect of habit on continuous VW use	Theory of habit	Habit, perceived usefulness, enjoyment	Adult users	Barnes (2011)
Social drivers of user retention in VWs	Spatial model of interaction; awareness attention theory	Focused immersion, temporal dissociation, social perception, social awareness	Adult users	Goel et al. (2013)
Hedonic, utilitarian and social gratifications and social influences as drivers of continuous use intention in VWs.	Theory of reasoned action; Uses & Gratifications theory	Perceived enjoyment, perceived usefulness, social presence, status gains outside the VW, secondary sources of information, perceived network size	Adolescents	Mäntymäki and Riemer (2014)

decomposed theory of planned behavior (DTPB) (Hsieh, Rai, & Keil, 2008; Pavlou & Fygenon, 2006; Taylor & Todd, 1995a, 1995b) as it allows us to pursue a theory-based decomposition of attitudes, social influences and system controllability and investigate their effects on the continued use intention of VWs.<sup>1</sup> The data is gathered from the largest VW for teenagers, Habbo Hotel.

This study makes three contributions. First, we shed light on young people's intentions to continue using a VW service. Bearing in mind that young people are the majority of users in VWs, investigating social practices with this group is particularly relevant for further academic pursuits. Second, we provide insights into the roles and relative influences of attitudinal beliefs, social influences, and system controllability as the antecedents of continued VW use. Third, we add to the body of theoretical knowledge of how and to what extent DTPB predicts VW users' continued use intentions.

## 2. Research background

To choose the relevant theoretical perspectives to explain continued VW use, and to support the selection of viable constructs to measure it empirically, we conducted a context-centric review of the body of research literature on users' post-adoption behavior in VWs. Based on review, a pool of nine empirical studies is summarized in Table 1.

As Table 1 demonstrates, there is no single theoretical framework that dominates the research on the continued use of VWs (Schwarz et al., 2012). Indeed, the review demonstrates that only a few studies have investigated post-adoption behavior in VWs, and that a systematic integrative investigation of the role of attitudinal beliefs, social influences, and system controllability has been lacking. Although the available studies reflect diverging theoretical orientations, the DTPB has not yet been subjected to an empirical investigation in this context. We believe that the nomological structure of the DTPB is well suited to accommodating and expanding upon the constructs that emerged from the review as it offers applicable constructs to address users' motives and goals related to use (Barnes, 2011; Billieux et al., 2013; Mäntymäki & Islam, 2014;

<sup>1</sup> Based on Fishbein and Ajzen's (1975) conceptualization, we adopt behavioral intention as a proxy for measuring actual behavior, and define it as users' intent to continue using a virtual world, which exemplifies instance of use.

Mäntymäki & Salo, 2011; Nevo, Nevo, & Kim, 2012; Zhou, Jin, Vogel, Fang, & Chen, 2011). The DTPB (Taylor & Todd, 1995a, 1995b) draws upon theory of planned behavior (TPB) (Ajzen, 1991) by proposing a decomposition of attitude, subjective norm, and perceived behavioral control into attitudinal, normative, and control beliefs. The attitude is viewed as a function of cognitive beliefs and refers to an "individual's positive or negative feeling (evaluative affect) about performing the target behavior" (Fishbein & Ajzen, 1975, p. 216). Congruently, subjective norm in turn represents the social influences on behavior and refers to the perception about whether others important to an individual believe that he or she should perform a particular behavior (Fishbein & Ajzen, 1975). Finally, perceived behavioral control captures the constraints on behavior and refers to the "perceived ease or difficulty of performing a behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles" (Ajzen, 1991, p. 188).

In our effort to contextualize the theoretical approach to explaining continued VW usage, the attitudes, subjective norms and perceived behavioral control are disaggregated in beliefs that are assumed to be of interest in this research setting. The logic behind the decomposition places specificity before generalization. Hence a deeper reconstruction of the constructs considered to be influential to users' behavioral intentions is achieved (Midgley, 1984). In doing so, we meet important model-building criteria, such as accuracy, depth, predictive power, and originality (Bunge, 1961), thereby contributing to the theoretical and managerial value of our findings.

## 3. Research model and hypotheses

The research model is presented in Fig. 1. The individual relationships in the model are justified on the basis of the IS literature and especially the literature on VWs.

Drawing on the core assumptions of the DTPB, we suggest that behavioral intention to use VWs is driven by three constructs: attitude toward a behavior, subjective norms, and perceived behavioral control. Previous research on VWs has provided accumulative support for this nomological structure. For example, Shin (2009) and Schwarz et al. (2012) demonstrated the positive relationship between attitude and behavioral intention within a VW. Regarding the influence of subjective norms in the VW context, Wu, Li, and Rao (2008) found that normative pressure favoring the use of a VW

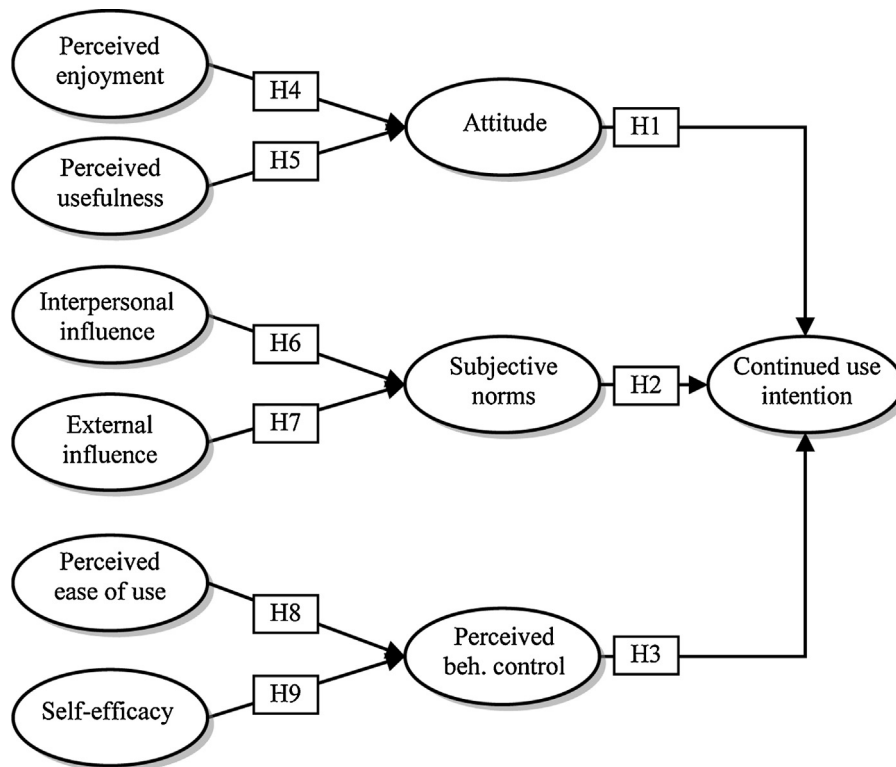


Fig. 1. The research model and hypotheses.

should influence users' use intention. Finally, perceived behavioral control, as defined in the TPB (Ajzen, 1991), reflects the perceptions of internal and external constraints on behavior. In the context of VWs, it can be understood as having the resources available from the environment to use the system (Schwarz et al., 2012) and the degree to which an individual perceives his or her actions as a result of his or her free will (Jung, 2011). Altogether, perceived behavioral control is likely to reduce the cognitive effort associated with the usage decisions and thus contributes to making the use habitual or automatic (cf. Dholakia, Bagozzi, & Pearo, 2004). In sum, the discussion thus far leads us to posit the following hypotheses:

- H1.** Attitude toward using a VW has a positive effect on a user's continued use intention.
- H2.** Favorable subjective norms toward using a VW have a positive effect on a user's continued use intention.
- H3.** Perceived behavioral control of using a VW has a positive effect on a user's continued use intention.

VWs provide users both extrinsic and intrinsic value. Bearing this in mind, we follow motivation theory (Deci & Ryan, 2000) to assume that both types of value—namely, perceived usefulness and perceived enjoyment—as likely to influence attitude toward the use of a VW.

We conceptualize perceived usefulness as the degree to which using the VW is perceived to enhance one's performance (Davis, 1989; Hong, Thong, & Tam, 2006; Shin, 2009). Since VWs are essentially social spaces, the enhanced performance can be associated with using the VW to interact and communicate with other people (Mäntymäki & Riemer, 2014).

Perceived enjoyment in turn refers to the extent to which using a system is "perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated." (Davis, Bagozzi, & Warshaw, 1992, p. 1113). The enjoyment that accompanies VW use includes activities such as exploring and manipulating

the appealing environmental attributes (e.g., virtual decoration and fashion shows) and playing various in-world games (e.g., role playing and arcade games).

As recently discussed by Schwarz et al. (2012) VWs can provide users with a sense of enjoyment, pleasure and playfulness, as they can be enjoyable and entertaining to use (Verhagen, Feldberg, van den Hooff, Meents, & Merikivi, 2011). Nah, Eschenbrenner, and DeWester (2011) highlighted the positive link between the enjoyment of use and behavioral intention in VWs. Barnes (2011) as well as Mäntymäki and Riemer (2014) in turn, found a positive link between the perceived enjoyment of using a VW and continuance intention, whereas Verhagen et al. (2012) showed a positive influence of both entertainment value and perceived usefulness on a user's attitude toward the use. Taking perceived usefulness and perceived enjoyment as proxies for extrinsic and intrinsic value, it seems plausible to assume direct and positive influences of the two constructs on attitude toward using a VW. Thus, it seems conceivable to assume that:

- H4.** Perceived enjoyment of a VW has a positive effect on attitude toward using a VW.
- H5.** Perceived usefulness of a VW has a positive effect on attitude toward using a VW.

VW use decisions are influenced by interpersonal and external social influence (cf. Bhattacharjee, 2000). Interpersonal influence, defined as perceived expectation from family, relatives, friends and peers for an individual to perform the behavior of interest (Hsieh et al., 2008), refers to exchanges between two or more individuals or groups that are effective in persuading individuals to change their behavior (Rogers, 2003). In VWs, interaction with the system and the other users occurs through an avatar (Schwarz et al., 2012) in a shared virtual space. Therefore, one's actions are largely visible and hence observable to others. This makes interpersonal influences likely to affect the behavior to be performed (Goel et al., 2011). External influence in turn involves media such as radio,

television, or newspapers, which are important in disseminating awareness of a given innovation (Rogers, 2003). This two-sided influence consisting of interpersonal and external sources has been confirmed by other research on computer-mediated behaviors (Yuan, Cosley, Welser, Xia, & Gay, 2009). VWs put considerable efforts into creating awareness of their existence via online advertising (e.g., placement of banners) and social media (e.g., Twitter, Facebook), suggesting that VW users are confronted with both interpersonal and external influences. In sum, this leads us to postulate the following hypotheses:

**H6.** Interpersonal influence has a positive effect on subjective norms for using a VW.

**H7.** External influence has a positive effect on subjective norms for using a VW.

According to TPB, perceived behavioral control is driven by one's beliefs about his/her ability to perform the behavior in question (Ajzen, 1991). In the VW context, perceived behavioral control can be affected by the social environment, i.e. the other avatars with whom the user is interacting in real time, and the physical environmental element—particularly the audio-visually rich system interface (Verhagen et al., 2011).

To more closely scrutinize the constituents of perceived behavioral control, we follow Taylor and Todd (1995b) and decompose perceived behavioral control into control beliefs. To capture the characteristic aspects of system controllability in the VW context, we employ self-efficacy and perceived ease of use as the control beliefs. Self-efficacy refers to the degree of self-confidence an individual has about his/her capability to execute a behavior (Bandura, 1977) and has long been suggested as a key determinant of behavioral control (Hsieh et al., 2008). The positive association between self-efficacy and perceived behavioral control has been extensively validated also by prior IS research (Hsieh et al., 2008; Lee & Kozar, 2008; Taylor & Todd, 1995b).

According to TPB, the ease or difficulty of performing a behavior is a key component of perceived behavioral control (Ajzen, 1991). Thus, it is plausible to assume that perceived ease of use affects one's perceptions of control in using the technology (Mathieson, 1991). Hence, drawing on the logic of TPB, prior IS studies have considered perceived ease of use, defined similarly as here as the degree to which a person believes that using a particular system is free of effort (Davis, Bagozzi, & Warshaw, 1989), as a control belief (Brown & Venkatesh, 2005; Hsieh et al., 2008; Pavlou & Fygenon, 2006). Against this backdrop, we can expect self-efficacy and perceived ease of use to have a positive influence on perceived behavioral control in the VW context and hypothesize:

**H8.** Self-efficacy has a positive effect on a user's perceived behavioral control in using a VW.

**H9.** Perceived ease of use has a positive effect on a user's perceived behavioral control in using a VW.

## 4. Empirical research

### 4.1. Data collection

The data were collected via an online survey that targeted Finnish users of Habbo Hotel. With 273 million registered users, Habbo Hotel is one of the most popular teen-oriented VWs. A total of 8918 Habbo Hotel users accepted the invitation to participate in the research. Of these, 3265 completed the online questionnaire, yielding an approximate completion rate of 37%. The respondents were not offered incentives of any kind. To ensure the best possible quality of the responses, only the respondents who answered all questions were included in the analysis. As we focused particularly

**Table 2**  
Distribution of respondents in the sample ( $n=923$ ).

Category		Frequency	Percent
Gender	Female	560	60.7
	Male	363	39.3
Age	13	342	37.1
	14	262	28.4
	15	150	16.2
	16	93	10.1
	17	43	4.7
	18	33	3.6
Experience	1–6 months	60	6.5
	6–12 months	53	5.7
	1–2 years	151	16.4
	2–3 years	153	16.6
	3–4 years	185	20.0
	4–5 years	170	18.4
	More than 5 years	151	16.4

on teenagers, and 90% of Habbo Hotel users are between 13 and 18 years of age (Sulake Corporation, 2013), only respondents within this age range were analyzed. After applying these criteria, the final sample used for the analyses consisted of 921 respondents. Table 2 presents a profile of the final sample in terms of gender, age, and experience with Habbo Hotel.

### 4.2. Measurement

The constructs were measured using multi-item scales with a 7-point Likert scale. To ensure validity and reliability of the measurement, established scales from IS literature were adopted. Given that all constructs were psychological, a reflective measurement was used. The measurement items with attendant references appear in Table 3. Given that most of the respondents were teens, and following good research ethics, identifiable personal information (e.g., user names) was not collected, which obviated the need for parental approval. The data were analyzed using structural equation modeling (SEM) with Amos 21 software. A covariance-based approach was selected over a component-based approach as we wanted to test the research model in terms of both its predictive power and fit with the empirical data. Maximum likelihood estimation was employed as it has been proven capable of providing reliable results with large samples and being robust to violations of multivariate normality. The measurement model's goodness-of-fit was investigated by using the common threshold values (GFI; TLI; CFI > 0.90; SRMR < 0.08; RMSEA < 0.08) (cf. Bagozzi & Yi, 2012; Hu & Bentler, 1999). The indices indicated a good model fit (GFI = 0.90; TLI = 0.95; CFI = 0.96; SRMR = 0.050; RMSEA = 0.052).

Convergent validity was examined by computing and examining the indicator factor loadings, composite reliabilities, and average variances extracted (AVE). Convergent validity was further confirmed as all indicator factor loadings exceeded the value of 0.70, the composite reliabilities exceeded the value of 0.80, and the AVEs were above the value of 0.50 (Fornell & Larcker, 1981). Table 4 summarizes the tests for convergent validity.

To examine discriminant validity, we tested whether the AVE for each construct was higher than the squared correlation between it and all other constructs (see Table 5) (Fornell & Larcker, 1981). This criterion for discriminant validity was met. To further test for discriminant validity, we investigated item cross-loadings.<sup>2</sup> Each item loaded higher on its intended construct than any other

<sup>2</sup> Item-level correlation matrix is included as a supplementary document.

**Table 3**  
Constructs and items.

Construct	Item	References
Attitude (ATT)		
ATT1	All things considered, using <VW name> is. . .	
ATT2	Extremely bad. . .good	(Ajzen, 1991)
ATT3	Extremely dissatisfying. . .satisfying	
ATT4	Extremely displeasing. . .pleasing	
ATT4	Extremely terrible. . .delightful	
Perceived usefulness (PU)		
PU1	Using <VW name> . . .	
PU2	Helps me to stay in close touch with my friends	(Davis et al., 1992)
PU3	Helps me to stay in close touch with people I know.	
PU4	Helps me to make new friends more efficiently.	
PU4	Comes in handy for my communication	
Perceived enjoyment (ENJ)		
ENJ1	It is enjoyable to use <VW name>.	(Davis et al., 1992)
ENJ2	It is fun to use <VW name>.	
ENJ3	It is entertaining to use <VW name>.	
Subjective norm (SN)		
SN1	People who influence me think I should use <VW name>.	(Ajzen, 1991)
SN2	People who are important to me think I should use <VW name>.	
SN3	People who are important to me use <VW name>.	
Interpersonal influence (INT)		
INT1	My family thinks I should use <VW name>.	(Ajzen, 1991; Bhattacharjee, 2000; Hsieh et al., 2008)
INT2	My friends think I should use <VW name>.	
INT3	People I communicate with most often think I should use <VW name>.	
INT4	My relatives think I should use <VW name>.	
External influence (EXT)		
EXT1	I feel pressure from media and commercials to use <VW name>.	(Bhattacharjee, 2000)
EXT2	I feel encouraged by media and commercials to use <VW name>.	
EXT3	I feel persuaded by media and commercials to use <VW name>.	
Perceived behavioral control (PBC)		
PBC1	I have the resources, knowledge, and ability to use <VW name>.	(Ajzen, 1991; Taylor & Todd, 1995a)
PBC2	I can use <VW name>.	
PBC3	I know how to use <VW name>.	
PBC4	Using <VW name> it entirely within my control.	
Self-efficacy (SE)		
SE1	I feel comfortable using <VW name> on my own.	(Taylor & Todd, 1995a)
SE2	I can easily operate in <VW name> on my own.	
SE3	I feel comfortable using <VW name> even if there is no one around me to tell how to use it.	
Perceived ease of use (PEOU)		
PEOU1	Using <VW name> to communicate with others is clear and understandable.	(Davis, 1989; Davis et al., 1989)
PEOU2	Navigation through the menus and toolbars in <VW name> is easy to do.	
PEOU3	It is easy to learn how to use all that is provided in <VW name>.	
Continued use intention (CUI)		
CUI1	I intend to continue using <VW name> during the next three months.	(Ajzen, 1991; Taylor & Todd, 1995a)
CUI2	I intend to continue using <VW name> frequently during the next three months.	
CUI3	I will keep on using <VW name> in the future.	

constructs, thereby providing additional support for discriminant validity (Fornell & Larcker, 1981).

#### 4.3. Results

The results of the analysis are presented in Fig. 2.

The fit of the structural model to the data was found to be good (GFI = 0.90; TLI = 0.95; CFI = 0.95; SRMR = 0.071; RMSEA = 0.057). Overall, the results provide support for all of our nine hypotheses. However, with respect to H5 that pertains to the effect on perceived usefulness on attitude, the standardized path coefficient was weak and hence the effect size small. In addition, the effect on perceived usefulness was not significant among the female respondents or across users with different levels of experience. Table 6 summarizes the implications of the results for our hypothesis testing.

The predictive value of the structural model was rather strong. The amount of variance explained by the model in the continued use intention (45.7%) supports the use and further investigation of the three basic DTPB constructs in a VW context and among

teenager users. Attitude was the strongest predictor of continued use intention, followed by perceived behavioral control and subjective norms. The selected beliefs explained 54.2% of the variance of the attitude, 73.8% of the variance of perceived behavioral control, and 66.5% of the variance of subjective norms. As such, these findings confirm the predictive value of the proposed decomposed beliefs in VW settings.

To validate our results and to rule out common method bias (CMB), we adopted a marker variable technique. The equations from Malhotra, Kim, and Patil (2006) were used to calculate the CMB-adjusted correlations. The CMB-adjusted results were consistent with the original data; the results for hypothesized relationships remained, and the R-squared dropped only marginally. This indicated that CMB is not likely to distort the results.

To further investigate whether the core components of TPB, attitude, subjective norms and perceived behavioral control, mediate the influence of beliefs on the dependent variable, continued use intention, we followed Baron and Kenny (1986) analysis to test for mediation among our latent variables. In the test, the

**Table 4**  
Means, standard deviations, item loadings and reliability statistics.

	Mean	Std. Dev.	Loading	Composite Reliability	Cronbach's Alpha	AVE
ATT1	5.002	1.669	0.860	0.936	0.935	0.758
ATT2	4.447	1.601	0.859			
ATT3	5.078	1.685	0.927			
ATT4	5.113	1.716	0.894			
PU1	4.650	2.153	0.877	0.929	0.931	0.754
PU2	4.573	2.158	0.888			
PU3	4.844	2.052	0.865			
PU4	4.571	2.144	0.870			
ENJ1	5.014	1.717	0.885	0.937	0.936	0.714
ENJ2	5.573	1.590	0.921			
ENJ3	5.411	1.614	0.931			
SN1	3.422	2.076	0.905			
SN2	3.247	2.011	0.949	0.916	0.911	0.702
SN3	3.451	2.056	0.798			
EXT1	2.847	2.087	0.863			
EXT2	3.316	2.127	0.787			
EXT3	3.110	2.147	0.883	0.882	0.878	0.682
INT1	3.029	1.852	0.937			
INT2	3.295	2.076	0.790			
INT3	3.487	2.097	0.780			
INT4	2.955	1.833	0.944	0.895	0.920	0.722
PBC1	5.856	1.630	0.705			
PBC2	6.403	1.266	0.961			
PBC3	6.430	1.254	0.971			
PBC4	6.156	1.406	0.805	0.923	0.912	0.751
SE1	6.320	0.375	0.925			
SE2	6.344	1.316	0.950			
SE3	6.313	1.371	0.897			
PEOU1	5.863	1.616	0.898	0.946	0.946	0.719
PEOU2	5.806	1.699	0.876			
PEOU3	5.934	1.606	0.855			
CUI1	5.483	1.895	0.854			
CUI2	4.897	2.116	0.878	0.908	0.906	0.697
CUI3	5.274	1.946	0.895			

independent variables must account significantly for the variations in the presumed mediators. Second, the mediators must affect the dependent variable. Third, the independent variable must be shown to affect the dependent variable. If all of these conditions hold in the predicted direction, mediation occurs when the effect of the independent variable on the dependent variable reduces when the mediators are added to the model. The test supported mediation in all paths except the one from perceived enjoyment to the continued use intention. The result is consistent with prior knowledge on the influence of behavioral beliefs on behavioral intention reported widely in studies using the TPB (cf. Taylor & Todd, 1995b).

Finally, we investigated the potential moderating effects of gender, age, and length of experience with the VW in the hypothesized relationships. We applied the procedures advanced by Jöreskog and Sörbom (1993) by splitting the sample into two subgroups and using a chi-square difference test to ascertain the presence of intergroup differences. For experience and age, the mean values were used to split the data into two subgroups. The analysis indicated

that the formation of the subjective norm was influenced by experience so that interpersonal influence clearly outweighed external influence among the more experienced respondents. However, among less experienced respondents, interpersonal and external influence exerted equal influence on the subjective norm. The results of testing the model with different subgroups, and the identified moderating effects are presented in Table 7.

## 5. Discussion and conclusions

Our objective was to investigate how and to what extent attitudinal beliefs, social influence, and perceived behavioral control predict users' intentions to remain engaged in VWs. To achieve this goal, we adopted the DTPB to develop an integrative research model grounded and conducted an analysis on large-scale empirical data concerning VW users' perceptions and intentions. Hence, this study contributes to the research on other VWs by contextualizing and empirically testing DTPB in explaining the users' decision-making.

**Table 5**  
Squared correlations between the latent constructs (AVEs in the main diagonal).

	ATT	CUI	ENJ	EXT	PBC	PEOU	INT	SE	SN	PU
ATT	0.758									
CUI	0.298	0.697								
ENJ	0.514	0.546	0.714							
EXT	0.114	0.065	0.104	0.682						
PBC	0.066	0.203	0.154	0.001	0.751					
PEOU	0.203	0.348	0.371	0.028	0.480	0.697				
INT	0.159	0.167	0.216	0.350	0.015	0.060	0.722			
SE	0.041	0.172	0.116	0.000	0.686	0.401	0.006	0.719		
SN	0.228	0.205	0.282	0.388	0.015	0.093	0.604	0.004	0.702	
PU	0.336	0.359	0.545	0.223	0.078	0.171	0.350	0.047	0.410	0.754

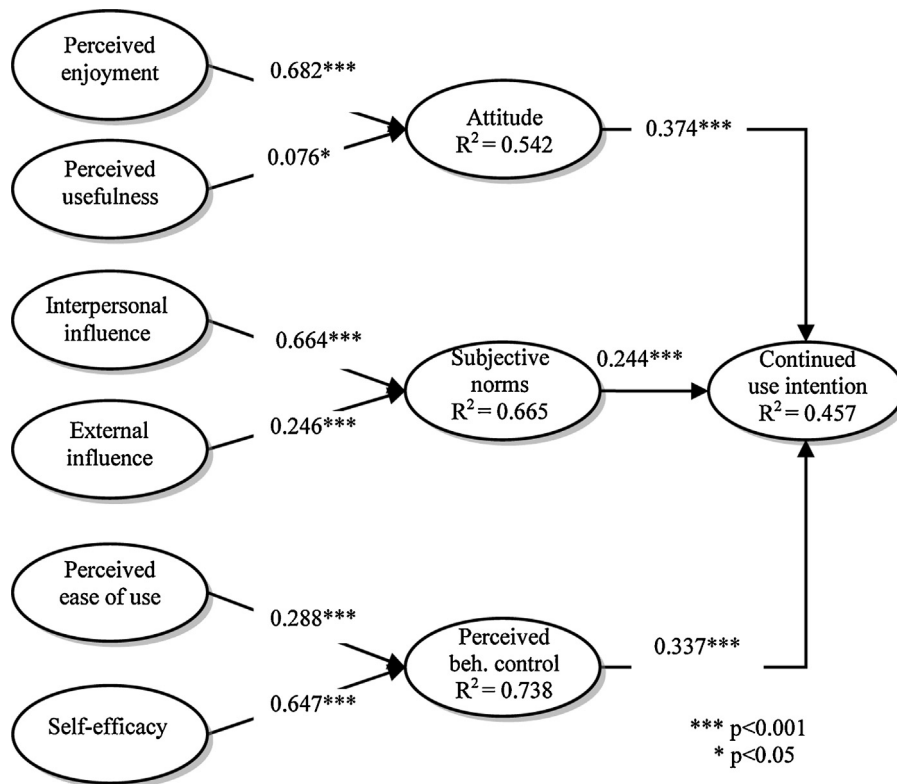


Fig. 2. Structural model of the study and results of the analysis.

Table 6 Summary of the hypotheses testing.

Hypotheses	Result
H1: Attitude → Continued use intention (+)	Supported
H2: Perceived behavioral control → Continued use intention (+)	Supported
H3: Subjective norms → Continued use intention (+)	Supported
H4: Perceived enjoyment → Attitude toward using a VW (+)	Supported
H5: Perceived usefulness → Attitude toward using a VW (+)	Supported
H6: Interpersonal influence → Subjective norms (+)	Supported
H7: External influence → Subjective norms (+)	Supported
H8: Perceived ease of use → Perceived behavioral control (+)	Supported
H9: Self-Efficacy → Perceived behavioral control (+)	Supported

The results demonstrated that all core components of planned behavior, attitude, subjective norms, and perceived behavioral control exert direct and significant influence on the continued use intention in a teen-oriented VW setting. In particular, the results corroborate the importance of the attitude and perceived behavioral control as key determinants of VW continuance intentions.

Further, all decomposed beliefs with the exception of perceived usefulness clearly add to their endogenous constructs. Intrinsic motivation, referents, and self-efficacy exert particularly solid effects on their corresponding endogenous constructs and can thus be labeled as strong indirect determinants of continuance intentions. When a VW is enjoyable and comfortable to use, and the perspective is supported by the positive opinions of friends and other referents, the quality of usefulness does not seem to be among the principal underlying constructs that stimulate the key beliefs supporting continued VW usage. Bearing in mind that similar characteristics pertain to many social online services, this finding provides online service developers with useful information beyond the field of VWs.

5.1. Theoretical implications

The study contributes to the prevailing theories of IS use in two important areas: the context-specific adaptation of the existing theories predicting continued IS use in general (Hong, Chan,

Table 7 Test of the moderating effects: gender and experience (significant differences in bold).

Subgroup	Gender		Experience		Age	
	Female (R <sup>2</sup> 41.1%)	Male (R <sup>2</sup> 51.8%)	1 month – 3 years (R <sup>2</sup> 40.9%)	More than 3 years (R <sup>2</sup> 42.9%)	13 & 14 (R <sup>2</sup> 45.3%)	15–18 (R <sup>2</sup> 46.4%)
ATT → CUI	0.391***	0.332***	<b>0.284***</b>	<b>0.404***</b>	0.421***	0.288***
SN → CUI	0.230***	0.255***	0.253***	0.210***	0.223***	0.275***
PBC → CUI	0.304***	0.396***	0.357***	0.320***	0.311***	0.392***
PU → ATT	n.s.	<b>0.152**</b>	n.s.	n.s.	0.109*	n.s.
ENJ → ATT	0.679***	0.665***	0.696***	0.676***	0.659***	0.688***
INT → SN	0.711***	0.521***	0.480***	0.594***	0.541***	0.694***
EXT → SN	0.153***	0.395***	0.470***	0.238***	0.299***	0.245***
PEOU → PBC	<b>0.252***</b>	<b>0.313***</b>	<b>0.549***</b>	<b>0.184***</b>	0.298***	0.265***
SE → PBC	<b>0.697***</b>	<b>0.615***</b>	<b>0.391***</b>	<b>0.751***</b>	0.620***	0.691***

Thong, Chasalow, & Dhillon, 2014) and the users' post adoption behavior in VWs in particular (Goel, Johnson, Junglas, & Ives, 2013; Merikivi, Verhagen, & Feldberg, 2013; Verhagen et al., 2012; Zhou, Fang, Vogel, Jin, & Zhang, 2012). Our study demonstrates that VW users' continued use intentions can be predicted to a significant degree by using the DTPB, if adjusted to fit in the context. As a wide-ranging approach, the DTPB is susceptible to adaptations (cf. Merikivi et al., 2013), as its application contributes to our understanding of belief structures at different levels of abstraction (cf. Taylor & Todd, 1995a). In general, this study highlights the applicability of established IS theories and constructs, which serves as a baseline for arriving at an in-depth understanding of the continued use of teen-oriented VWs.

With regard to the post-adoption behavior in VWs, our study underlines the importance of perceived behavioral control, which is of course linked with system controllability. Both perceived ease of use of the online service and self-efficacy play a key role in our context. This observation is particularly interesting since our respondents were experienced VW users who have grown up with information technology (see Palfrey & Gasser, 2008) and since VW operators have paid substantial attention to developing user-friendly navigational mechanisms and user interfaces to sustain user attraction (Goel et al., 2011).

Our findings underscore users' confidence in operating within the constantly evolving social setting as a key component of user experience in VWs. In grasping users' confidence in operating in the VW, self-efficacy goes beyond technical rationality as it incorporates more controlling elements of user experience such as the activities of other users. Building on Baumeister and Leary (1995) findings about the significance of the feeling of a sense of belonging and fit in a peers group, our findings endorse that adolescents will conform to activities of a particular group by participating in the same activities as their peers. Taken together, interpersonal influence and subjective norms emphasize the nature of VWs as social systems in which the sense of belongingness is among the key factors that influence continued use intentions. This finding is so universal that it is reasonable to suggest that it generalizes across cultures and demographic groups.

## 5.2. Practical implications

To lead the VW service operators through the sharp decline in active users, our findings lead to three practical recommendations. First, facilitating enjoyable activities related to extrinsic goals is of tremendous importance since it reinforces user engagement. For example, Habbo Hotel rewards its users with a virtual currency for sustained participation and game play. This currency enables users to purchase virtual items that elevate a user's status, both within the Habbo Hotel environment and in real life. Thus, playing games in Habbo Hotel can be instrumental in fulfilling the extrinsic goal of higher social status, also suggesting that in some situations extrinsic motives could warrant further attention.

Second, to facilitate social influence of focal users – an important factor in behavior (Spero, 2004) – VW operators can implement features that provide users with the means to gather information about the beliefs and values held by other users (e.g., board of likes and dislikes, user profiles, score boards). Functions that automatically update user profiles based on usage behavior and preferences can support establishing bonds among VW users thus increasing the sense of community among active users.

Finally, users are willing to spend time to gain control over VWs, as long as doing so does not substantially disturb engagement in the activity itself. Thus, giving VW users the sense of “being in control” must be held as an important design principle for VW operators. Given the importance of self-efficacy over ease of use, we suggest empowering users to utilize social features

that make them feel comfortable rather than those that make VW usage easier. In order to maintain users' perceptions of self-efficacy, designers should refrain from making radical changes when incorporating new features in VW environments that are already in use.

## 5.3. Limitations and avenues for further research

Our study has several limitations. One limitation is that data collection was delimited to users of a single VW in a single country, so we did not compare the findings across cultural or geographical boundaries. More research is needed to investigate whether the results will remain valid for other VWs and in other cultural contexts. In addition, because all of the respondents in our study were teenagers, the findings noted herein must be interpreted with caution when considering users in other age categories. We therefore suggest cross-context research (Hong et al., 2014) to increase the generalizability of the results. Finally, as the present study captured a short-term snapshot of continued use intentions, longitudinal research efforts should be conducted to determine the validity of the proposed model and findings over time.

Our study gives rise to several avenues for further research. It focused on a single aspect of post-adoption behavior: user intention to continue VW use. However, other important VW post-adoption behaviors such as word-of-mouth and repurchase behavior could also be of considerable interest and there is a call for their future examination (Animesh, Pinsonneault, Yang, & Oh, 2011; Kim & Son, 2009). We also believe that unfolding the construct of referents would yield valuable information about the social influence of “virtual” compared to “real” friends in the general social IT system context. Regarding the role and nature of social influence, beyond normative pressure alone, a large number of users and those within one's social circle are likely to make interaction and communication in the VW more lively. Such an informational influence, defined by Deutsch and Gerard (1955) as the “influence to accept information from another as evidence about reality” (p. 629), might therefore differ by the size of the VW. In sum, further research could empirically segregate the normative and informational influences and facilitate a deliberate examination of the extent to which the presence of other users, known and unknown, affect user decisions regarding continued VW use.

This study has shown that existing theories and constructs are indeed adaptable to explaining to the contextual characteristics of “new” types of IT use even by teenagers. Our results offer a solid empirical basis for the claim that the IS research has the tools to explain users' intentions and behavior pertaining to continued use of VWs. However, at the same time, a considerable proportion of the variance in our endogenous constructs remained unexplained. This leaves a large space for future research to formulate new constructs, models and theories. Therefore, we suggest further research to concentrate on two areas specific to the VW-context: the concept and facets of presence and the acceptance of various revenue models by the users.

First, with regard to presence, given its conceptual breadth and the linkages between social presence, telepresence and co-presence (Lombard & Ditton, 1997), additional research examining the interplay among presence, motivation, social influence and system controllability would extend the understanding of social dynamics and user experience in VWs. Second, VWs use a variety of methods to collect revenue from users, such as access fees or subscriptions for premium accounts. It is likely that the perceived and actual cost of continued use is a salient construct determining the post-adoption of VWs. Hence, we encourage future research to investigate the role of fees and revenue models in continued VW use.



## Appendix A. Item-level correlation matrix.

	INT	CUI	PEOU	SE	PBC	EXT	SN	ENJ	PU	ATT
ATT1	0.343	0.470	0.387	0.175	0.222	0.290	0.407	0.616	0.499	<b>0.860</b>
ATT2	0.343	0.469	0.387	0.174	0.222	0.290	0.407	0.615	0.498	<b>0.859</b>
ATT3	0.370	0.507	0.418	0.188	0.239	0.313	0.439	0.665	0.538	<b>0.927</b>
ATT4	0.357	0.488	0.403	0.182	0.231	0.302	0.424	0.641	0.519	<b>0.894</b>
PU1	0.467	0.525	0.421	0.189	0.249	0.415	0.558	0.648	<b>0.877</b>	0.509
PU2	0.472	0.531	0.426	0.191	0.252	0.419	0.565	0.655	<b>0.888</b>	0.515
PU3	0.460	0.518	0.415	0.186	0.245	0.409	0.550	0.638	<b>0.865</b>	0.502
PU4	0.463	0.521	0.418	0.188	0.247	0.411	0.553	0.642	<b>0.870</b>	0.505
ENJ1	0.412	0.654	0.539	0.302	0.368	0.286	0.468	<b>0.885</b>	0.654	0.635
ENJ2	0.428	0.681	0.561	0.314	0.383	0.297	0.487	<b>0.921</b>	0.680	0.660
ENJ3	0.433	0.689	0.567	0.318	0.387	0.301	0.492	<b>0.931</b>	0.688	0.668
SN1	0.703	0.410	0.274	0.061	0.110	0.564	<b>0.905</b>	0.479	0.576	0.429
SN2	0.737	0.430	0.288	0.064	0.116	0.592	<b>0.949</b>	0.502	0.604	0.450
SN3	0.620	0.362	0.242	0.054	0.097	0.497	<b>0.798</b>	0.422	0.508	0.378
EXT1	0.511	0.219	0.145	-0.009	0.034	<b>0.863</b>	0.538	0.278	0.408	0.291
EXT2	0.466	0.200	0.133	-0.008	0.031	<b>0.787</b>	0.490	0.254	0.372	0.265
EXT3	0.523	0.224	0.149	-0.009	0.035	<b>0.883</b>	0.551	0.285	0.417	0.298
PBC1	0.072	0.317	0.489	0.584	<b>0.705</b>	0.028	0.086	0.293	0.200	0.182
PBC2	0.099	0.432	0.666	0.796	<b>0.961</b>	0.038	0.117	0.399	0.273	0.248
PBC3	0.100	0.436	0.673	0.804	<b>0.971</b>	0.038	0.118	0.403	0.275	0.251
PBC4	0.083	0.362	0.558	0.667	<b>0.805</b>	0.031	0.098	0.335	0.228	0.208
SE1	0.071	0.384	0.586	<b>0.925</b>	0.766	-0.009	0.062	0.316	0.200	0.188
SE2	0.073	0.395	0.602	<b>0.950</b>	0.787	-0.009	0.064	0.324	0.205	0.193
SE3	0.069	0.373	0.568	<b>0.897</b>	0.743	-0.009	0.061	0.306	0.194	0.182
PEOU1	0.209	0.505	<b>0.855</b>	0.541	0.593	0.144	0.259	0.521	0.411	0.385
PEOU2	0.215	0.517	<b>0.876</b>	0.554	0.607	0.148	0.265	0.533	0.421	0.395
PEOU3	0.220	0.530	<b>0.898</b>	0.569	0.623	0.151	0.272	0.547	0.431	0.405
CUI1	0.366	<b>0.895</b>	0.528	0.372	0.402	0.227	0.406	0.662	0.536	0.489
CUI2	0.359	<b>0.878</b>	0.518	0.365	0.395	0.223	0.398	0.649	0.526	0.480
CUI3	0.350	<b>0.854</b>	0.504	0.355	0.384	0.217	0.387	0.632	0.511	0.467
INT1	<b>0.937</b>	0.383	0.230	0.072	0.096	0.555	0.728	0.436	0.499	0.374
INT2	<b>0.790</b>	0.323	0.194	0.061	0.081	0.468	0.614	0.368	0.420	0.315
INT3	<b>0.780</b>	0.319	0.191	0.060	0.080	0.462	0.606	0.363	0.415	0.311
INT4	<b>0.944</b>	0.386	0.231	0.073	0.097	0.559	0.733	0.439	0.502	0.377

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