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Virtual Worlds, Virtual Reality, and Augmented Reality: Differences in Purchase Intentions Based on Types, Users, and Sex

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Abstract

This paper discusses the disparity between two Virtual World (VW) users groups: Social and Game-oriented users. It highlights the difference between the distinct players' behaviors and their purchase intentions in VWs. It then examines the differences in the sexes. The findings are applied to possible conditions in Augmented Reality (AR) and Virtual Reality (VR). This paper sheds light on consumers' behaviors and markets in VWs, AR and VR to increase understanding of a popular pastime and an activity that has an abundance of practical applications. The backbone of the study comes from the Theory of Reasoned Action (TRA) and Flow Theory to explain how the different VW user attributes, such as skill and challenge, play a role in VW purchase intentions. This paper uses a data sample and modified model from Cox (2016) to find significant sex differences between the Social-oriented users and Game-oriented users, by using bootstrapping and Partial Least Squares (PLS), Structural Equation Modeling (SEM), and multi-group analysis. Female Game-oriented users were found to have a stronger relationship between their challenge levels to their VW shopping subjective norms (SN) than male Game-oriented users, while Social-oriented users displayed no significant variances. This means VW, AR and VR game designers, businesses, and researchers should recognize differences in the groups, to design and strategize ways to maximize female Game-oriented players' challenge level in order to flourish VW SN and overall lead to increased sales.

1. Introduction

1.1 Virtual Worlds

A Virtual World (VW) is a cyber world-like environment used for online gaming and entertainment. VW spread across an array of types from Game-oriented worlds called Massively Multi-player Online Games (MMOG)s to Socially-oriented worlds called Massively Multi-player Online Worlds (MMOW) or Metaverses, and then they include everything in-between. One of the most popular types is Massively Multiplayer Online Role-Playing Game (MMORPG) where the characters come from fantasy stories. These computer-based imaginary lands allow users to be whom, or what, they want to be, through a first-person avatar who affects the environment in which they live and play in. Since the VW has different characteristics and roles, their users have different goals and objectives, and they behave differently in game playing and activities. A VW user considers themselves a participant by using a character within a computer-based simulated world. According to Pearce et al. (2009), VW users essentially 'wear' avatars offered by the game designers. Their character may be either a visible 3D being or a textual one, but one we call 'Avatar' as a self-expression and therefore part of the user.

1.2 Augmented Reality (AR) and Virtual Reality (VR)

Similar to VWs, there are also games called AR and VR, which have become quite popular and continue to grow. AR uses GPS, graphics, and / or the likes of to create environments that are a modified or enhanced world, but at the same time still has real-world characteristics. Most of the time, AR is played real-time using location coordinates, constellations, real-world input such as weather, crime, or events. AR has been around for a while, and used for things such as military (Ai & Livingston, 2011), training (Xu, 2006) education (Winn & Jackson, 1999), medical (Henderson, Korner-Bitensky & Levin, 2014), research (NASA, 2001), shopping (Zhu et al., 2004), travel / tourism (Guttentag, 2010), and browsing (Grasset et al., 2012). It hit new heights, recently, with the birth of 'Pokemon Go' (Serino et al., 2016). In addition, VR has become huge. VR is a computer-simulated game with equipment. At times, VR strictly refers to the equipment, but for the purpose of this paper, we discuss it in the context of the system. Jayaram, Connacher, and Lyons (1997) define VR as a natural extension to 3D computing. VR is integrated in learning (Nicholson et al., 2006), training (Dourado & Martin, 2013), entertainment-even pornography (Holden, 2016), and shopping (Olsson et al., 2013), for example. VWs, such as Second Life, BlueMars, and Active World, become VR when headgear is added to the game.

1.3 Money in VWs

Many VWs are free, but a huge amount of money is moved within these worlds. Most VWs either sell items within the game, or allow businesses or players to market items in the game (Oreskovic, 2009). Thousands of people are spending millions of dollars on goods that exist only within the virtual environment (Spence, 2008). The products are a personal expression by means of graphical designs or character (avatar) capabilities. Kim, Shim and Ahn (2011) called VW products "new media elements utilized by members for representation, expression, and communication in online environments".

Additionally, VR has stirred economics as a billion dollar industry (Suellentrop, 2015). In the last 10 years, there has been extensive growth in both the number of users and the Virtual Economy market size (Nazir & Lui, 2016). The majority of the sales comes from young people between the ages 10 to 15. KZero (2015) said this age group accounted for 70% of the 1.4 billion VW users in 2012. AR is experiencing the same phenomenon with young and old. Their projected sales are about \$150 billion by 2020 (Gaudiosi, 2015).

We do not fully understand the user behavior that precedes VW money spending. What type users and user attributes lead to VW purchases? How do these groups differ? Is there a difference within the groups (Social and Game-oriented users) in their shopping behaviors, based on sex? Are these characteristics true for VR and AR games in the same way they are true for VW? This paper discusses VW consumer behaviors in order to highlight specific user groups and characteristics in those groups, and then ties those to VR and AR users.

2. Background

2.1 VW Consumer Behavior Study

Cox (2016) performed a study on VW consumer behavior that developed a model explaining VW user attributes effect on their purchase intentions, relying on the Theory of Reasoned Action (TRA), and Flow Theory. Data came from 331 New York VW users (ages 18 to 68) in survey responses, and validated with Structural Equation Modeling (SEM) with Partial Least Squares (PLS). The majority of the respondents were 30 years old or younger (57%); 142 were over 30 years old (43%), with slightly more males than females. The top VWs played were ‘World of Warcraft’, ‘Second Life’, and then ‘Sims’.

This study relies on a modified model from Cox (2016) to concentrate on sex differences within the two VW user groups (Social and Game-oriented). This study also incorporates sex-related studies associated with online shopping and gaming, as well as AR and VR knowledge.

2.2 Theory of Reasoned Action (TRA)

The TRA is a popular theory used to explain behaviors. It states that behavior intention comes from a person’s attitude and subjective norms (SN) (Fishbein & Ajzen, 1975). SN are a collection of perceived expectations about the behavior from those who are important to the individual. Attitudes and SN have been scaled to measure behavior intentions in studies such as Paylou and Fygenon (2006), and Yu and Wu (2007).

2.3 Flow Theory

Flow theory is most commonly associated with Csikszentmihalyi (1990). Flow is described as an optimal experience where one is immersed entirely in the situation with great focus and involvement. According to the Flow Theory (Csikszentmihalyi, 1990), the Flow state is controlled by two factors: skills and challenges. Many researchers use Flow to explain behavior during computer use, gaming and shopping. Specifically, Flow has been used to understand internet use, internet shopping (Hsu, Chang & Chen 2011; Lim, 2014), shopping behaviors (Gao & Bai, 2014; Wang & Hsiao, 2012), and gaming enjoyment (Holsapple & Wu, 2008). Csikszentmihalyi (1990) found game playing to be a good example of an optimal experience, or activity, associated with Flow, where a player’s skill was adequate to cope with the challenges involved. In some studies, Flow was found to influence attitude toward online purchasing (Korzaan, 2003), and to influence intentions to play online games (Hsu & Lu, 2003).

2.4 VW Purchase Intentions

Guo and Barnes (2011) explored VW consumer behavior and purchase intentions in order to find factors influencing purchases such as expectancy, character's competency, VW system quality, social influence, virtual item resources, personal real resources, and self-actualization. Jung (2014) looked at purchase intentions in terms of consumer goals. Results from this study indicated goals of socializing, creativity, and escape overlapped with the goals of virtual consumption, meaning users had to buy to fulfil their objectives for partnership in VWs.

3. VW Types

This paper looks at how Social-oriented users and Game-oriented VW users differ when it comes to purchasing intentions. Stangl, Kastner and Polsterer (2012) claimed VW users had different play patterns. Tikkanen et al. (2009) found differences in the VW users based on their ability to create, and their motivations in the world. For instance, they Game-oriented players take part in adventures such as seeking treasures, fighting against monsters, or other goals, while Social-oriented users do not play a predefined role, but individually develop a personal, dynamic character. Additionally, the Social-oriented VWs have no storyline nor designated goals. The Social-oriented users determine their avatar's character, social relationships, and networks for that world. Players who use SmallWorlds may differ from those using Twinity, for example. Metaverse or 'open-ended' worlds versus Game-oriented worlds have different rules and different structures (Pearce et al., 2009), therefore, different characteristics are likely between the two groups. Eisenbeiss et al. (2012) found social interactions, entertainment and escape as the motivational drivers of VW use. Cox (2016) followed this idea regarding the types of users, and tested the difference in VW shopping behaviors between the two groups; Social and Game type VW users.

4. Sex Affects

4.1 Sex Difference in Shopping

A number of studies indicate men and women behave differently when it pertains to shopping. Allison et al. (1980); Golden, Allison, and Clee (1979); Gould and Stern (1989), and Kahle and Homer (1985), all found that biological sex had significant effect on consumer behaviors. Most women were characterized to enjoy the leisure of shopping while many men find it to be more of a chore. Seok and Sauls (2008) found female and male buyers had distinctions in their shopping perceptions associated with trust, brand awareness, prices, awareness of time, and planned purchase. Dittmar, Long and Meek (2004) found men to be more concerned with the functionality of the goods they buy while women shopped for emotional and social reasons. Soomro, Gilal and Jatoi (2011) looked at students' reactions to ads in order to examine the desire for uniqueness and social character among the sexes, finding males giving more preference to unique products, even at very slightest differences, and females experiencing more inner-directed needs in their purchases.

4.2 Sex Differences Online Shopping

A number of studies have focused on the question of whether sex plays a role in online shopping as well (Kolovesnikova, Dodd & Wilcox, 2009). Some studies had conflicting findings. Kolovesnikova, Dodd and Wilcox (2009) found substantial differences in males and females in the way they buy products. Richard et al. (2010) found females liked to explore and navigate when online shopping, while men normally just wanted to find specific items they looked for. Bartel (2000) showed differences in the sexes regarding to risk aversion, while Dittmar et al. (2004) indicated women saw online shopping as more inconvenient. Ronaghi, Danae, and Haghtalab (2013) conducted a more recent study, looking specifically at mobile phone purchases, showing differences between the sexes regarding expectation, wants, needs, and lifestyles. Women cared more for apparent features and men cared for technological features.

4.3 Sex and VW Usage

Some studies looked for sex differences associated with VW usage. Becarra (2008) found sex and ethnicity to be significant predictors for those who used VWs. He used the Sociometer Theory (Leary & Downs, 1995) extended from the Theory of Planned Behavior. Results from their study showed males displayed a greater use of VWs than females, while men were more prone to having

interpersonal relationship within these worlds. Ko et al. (2005) found males more likely to use VWs for gaming pleasure than females, and Zhou, Jin and Fand (2014) found gender differences for continued use in social VWs. Males continued to use mainly for hedonic satisfaction, while females continued to use for a number of reasons, such as social and utilitarian reasons.

5. Conceptual Model

5.1 VW Attributes to Intentions to Purchase

Figure 1 shows the conceptual model for this study, with positive links from VW Skill to Shopping Attitude and SN, Challenge level to Shopping Attitude, and Shopping Attitude and SN to purchase intentions. This paper discusses the five hypotheses associated with the model, their results, and later focuses on the differences between the two user groups within this model.

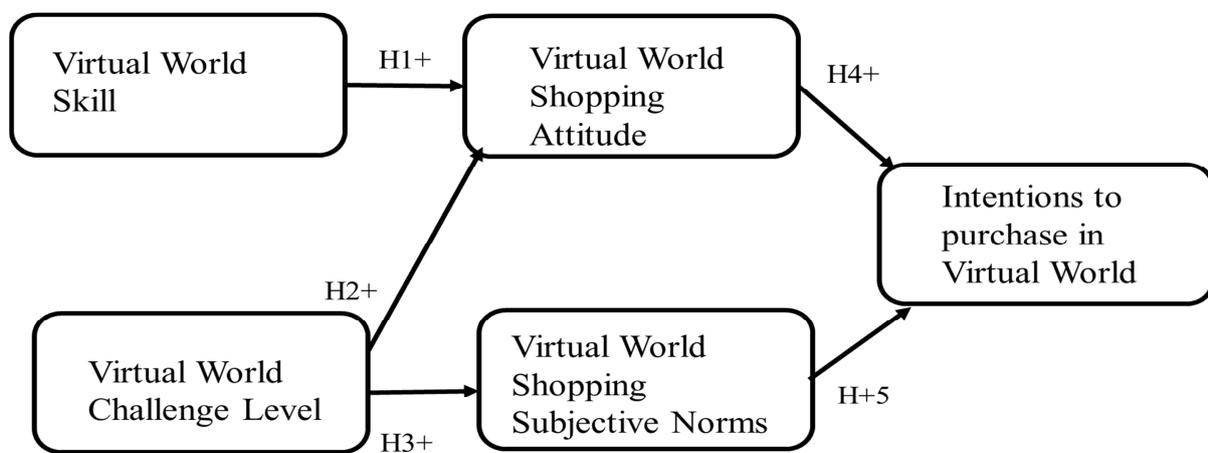


Figure 1: VW User Attribute to Intention to Purchase Model

6. Methodology

Data for this study was borrowed from Cox (2016). The measurement model and structural model were tested and validated. All items were accessed for internal and external validity and reliability, as well as discriminate validity by removing those items below the minimum values (Average Variance Extracted -AVE of 0.5 and item loadings of 0.70), and by ensuring item loadings were greater than their cross loadings. Composite Reliability was assessed to ensure the constructs met the minimum requirement of 0.7. Next, the structural model hypothesis tests were accessed by looking at link Coefficients, T-statistics, and significance, as well as by assessing the variance explained in the model using R-squared values.

This study looked at the differences in the Social and Game-oriented groups by separating the data set, by which VW type the participant identified using, and then by conducting PLS-SEM bootstrap operations, and multi-group analysis on the two groups. Further, to analyze significant sex differences in each group the data was compared by sex, one data set at a time. PLS-SEM bootstrapping and multi-group analysis was performed, once again, accessing significant differences between the sexes, this time.

7. Analysis

7.1 VW User Comparison

VW users were categorized as Game-oriented users and Social oriented users with 169 Game-oriented users (54.2%), and 143 Social-oriented users (45.8%). Of the 143 Social-oriented users, 79 were female (55%) and 64 were males (45%). Of the Game-oriented users, 90 were males (53%) and 79 were females (47%). The majority of survey participants had used VWs for longer than 2 years (38.1%), and over half the participants had used for over a year. Questions pertaining to how many times and how many hours, in the last seven days were generally quantified to three or four times within the week, and approximately 10-30 hours within the week.

Results for the two user groups showed differences when using PLS-SEM and multi-group analysis on the model. Table 1 and Figure 2 present the results of the five hypothesis tests for both user groups (Game-oriented and Social-oriented), and Table 2 presents results of the PLS-SEM bootstrap and multi-group analysis, with two-tailed significance testing. This table shows the path coefficients difference and their p-values. The findings for each hypothesis are addressed below.

Table 1: VW User Types Comparison: PLS-SEM Bootstrap results

Hypothesis	Path Coefficients	T Statistics (O/STDEV)	P Values	H accepted / rejected
H1. Skill positively related to VW shopping attitude				
H1a: Game-oriented	0.217	3.094	0.002	Yes
H1b: Social-oriented	0.432	5.020	0.000	Yes
H2. Challenge positively related to VW shopping attitudes				
H2a: Game-oriented	0.328	3.712	0.000	Yes
H2b: Social-oriented	0.218	2.749	0.006	Yes
H3. Challenge positively related to VW shopping SN				
H3a: Game-oriented	0.393	4.649	0.000	Yes
H3b: Social-oriented	0.427	5.046	0.000	Yes
H4: VW shopping attitudes positively related to intentions to purchase				
H4a: Game-oriented	0.582	8.165	0.000	Yes
H4b: Social-oriented	0.592	9.489	0.000	Yes
H5: VW shopping SN positively related to intentions to purchase				
H5a: Game-oriented	0.253	3.366	0.001	Yes
H5b: Social-oriented	0.191	2.708	0.007	Yes

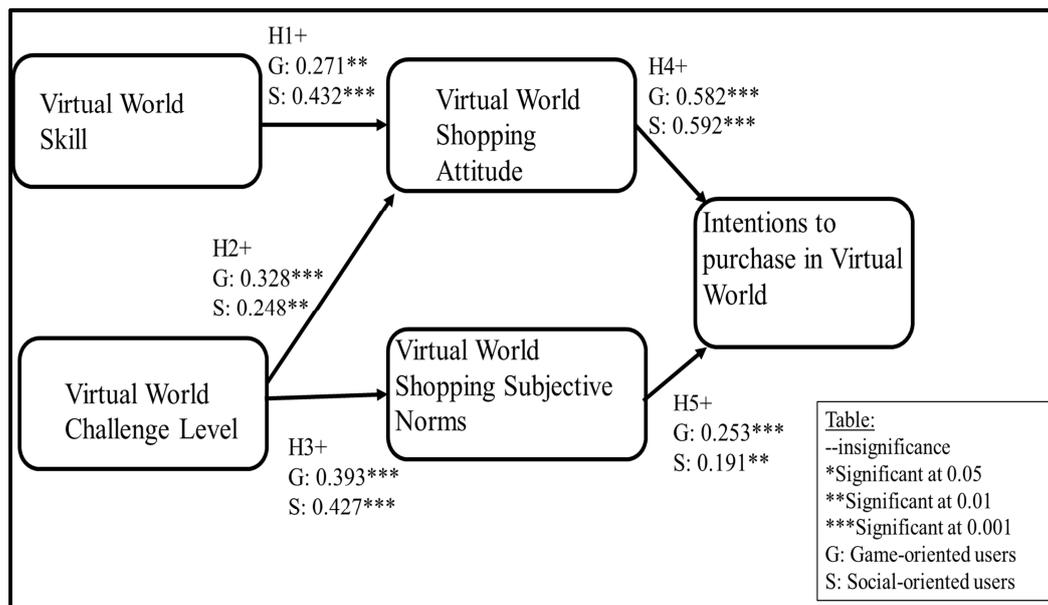


Figure 2: Model Comparison, VW User Type, PLS-SEM Bootstrap Results

Table 2: VW Type Users Multi-group Analysis

Difference between Game & Social-oriented Users	Path Coefficients	P-Values
H1c: VW Skill ---> Shopping Attitude	0.215	0.969
H2c: VW Challenge ---> Shopping Attitude	0.11	0.176
H3c: VW Challenge--->Shopping Subjective Norm	0.034	0.611
H4c: Shopping Attitude--->Intentions to Purchase	0.009	0.54
H5c: Shopping SN--->Intentions to Purchase	0.062	0.274

H1: VW User’s Skill and Shopping Attitude (Supported by Flow Theory)

According to Flow Theory, as skills increase attitudes improve, and if balanced just right with a challenge, the individual enters the state of pleasure (Csikszentmihalyi, 1991). As it pertains to Game-oriented users and Social-oriented users, we look at the following hypothesis:

H1a: There is a positive relationship between a Game-oriented VW user’s skill and their VW shopping attitudes.

H1b: There is a positive relationship between a Social-oriented VW user’s skill and their VW shopping attitudes.

Additionally, we want to know if there is a difference between the two groups, therefore we look at the following hypothesis:

H1c: There is no significant difference between Social-oriented VW user’s skill and their VWs shopping attitudes and Game-oriented VW user’s skill and their VWs shopping attitudes.

From Table 1 and Figure 2, results show both groups have a positive relationship between a user’s skill and their VW shopping attitudes, however, the Social-oriented users have a stronger positive relationship than the Game-oriented users. Additionally, from the multi-group analysis in

Table 2, a p-value of 0.969 indicates there is a significant difference between the two groups per Hair, Sarstedt, Pieper and Ringle (2012). H1c is not supported since significant differences were observed.

H2: VW User's Challenge Level and Shopping Attitude (Supported by Flow Theory)

Flow Theory, once again, supports the belief that as a user's challenge level increases, they will begin to experience enjoyment if it is equally balanced with skill. Therefore, both Game-oriented users and Social-oriented users, we state the following hypothesis:

H2a: There is a positive relationship between a Game-oriented VW user's challenge level and their VW shopping attitude.

H2b: There is a positive relationship between a Social-oriented VW user's challenge level and their VW shopping attitude.

We are also interested in understanding if there is a difference between the two groups; therefore, we look at the following hypothesis:

H2c: There is no significant difference between Social-oriented VW user's challenge level and their VW shopping attitudes, and Game-oriented VW user's challenge level and their VW shopping attitude.

From Table 1 and Figure 2, results show both groups do have a positive relationship between a user's challenge level and their VW shopping attitudes; however, the Game-oriented users have a stronger positive relationship than the Social-oriented users. From the multi-group analysis in Table 2, these differences were not significant. H2c is supported since no significant differences were observed.

H3: VW User's Challenge Level and Shopping SN (Supported by VW literature)

Fuchs, Sornetter, and Thurner (2014) found human society to be layered and nested in groups classified as cliques, sympathy groups, bands, cognitive groups, tribes, etc. VWs are no different. Challenges come from experiences and encounters in the game, which can cause a player to join a group, fan sites, team or share a bond. These groups lead to subgroups, making the SN even larger. Therefore, we investigate the following hypothesis for both Game-oriented and Social-oriented users:

H3a: There is a positive relationship between a Game-oriented VW user's challenge level and their SN, regarding shopping within VWs.

H3b: There is a positive relationship between a Social-oriented VW user's challenge level and their SN, regarding shopping within VWs.

There is also curiosity of determining if there is a difference between the two groups, therefore we look at the following hypothesis:

H3c: There is no significant difference in Social-oriented VW user's challenge level and their VW shopping SN and Game-oriented VW user's challenge level and their VW shopping SN.

From Table 1 and Figure 2, results show both groups have a positive relationship between a user's challenge level and their VW shopping SN. The two group's T-statistic and coefficient are very close (coefficients were: 0.393 & 0.427 for Game-oriented and Social-oriented user respectively, and T-statistics were 4.649 & 5.046 for Game-oriented and Social-oriented users respectively). This similarity is also highlighted in the results of the multi-group analysis in Table 2 showing p-values of 0.611, indicating little difference for a two-tailed test. With no significant differences in the groups, H3c is supported.

H4: VW Shopping Attitudes and Intentions to Purchase (Supported by TRA)

TRA states attitudes affect behavior intentions (Ajzen, 1975). Using this as the foundation of VW user behavior as well, we look at the following hypothesis regarding both Game-oriented and Social-oriented users:

H4a: VW shopping attitudes positively relate to intentions to purchase in VWs for Game-oriented users.

H4b: VW shopping attitudes positively relate to intentions to purchase in VWs for Social-oriented users.

We also want to discover if there are any differences in the two groups by looking at the following hypothesis:

H4c: There is no significant difference between Social-oriented and Game-oriented users regarding their VW shopping attitudes to their intentions to purchase in VWs.

Table 1 and Figure 2, show both groups have a strong positive relationship between a user's VW shopping attitude and their intentions to purchase. Of the five hypotheses, this one is the strongest. The two groups' T-statistic and coefficient are very close (coefficients were: 0.582 & 0.592 for Game-oriented and Social-oriented user respectively, and T-statistics were 8.165 & 9.489 for Game-oriented and Social-oriented users respectively). The two groups show the closest similarity in this hypothesis than from any of the other 4 links. The multi-group analysis in Table 2 shows the coefficient difference is only 0.009 and p-values of 0.54. With these groups being so similar, H4c is supported.

H5: VW SN and Intentions to Purchase (Supported by TRA)

TRA again, support the rationale behind a VW user's shopping SN being positively related to their intentions to purchase in VWs. Ajzen (1975) stated SN affect one's behavior intentions; therefore, we look at both user groups in the hypothesis stated below:

H5a: SN regarding VW shopping positively relate to intentions to purchase in VWs for Game-oriented users.

H5b: SN regarding VW shopping positively relate to intentions to purchase in VWs for Social-oriented users.

It is also of interest to find if there are differences between the two groups regarding these relationships:

H5c: The relationship between SN regarding VW shopping and intentions to purchase in VWs does not differ significantly between Social-oriented users and Game-oriented users.

In Table 1 and Figure 2, results show both groups do have a positive relationship between a user's VW shopping SN and their intentions to purchase in VWs. For this relationship, Game-oriented users show significance at 99.9% confidence, while Social-oriented users do at 99% confidence. Table 2 highlighting results of the two-tailed multi-group analyses indicate there are no significant differences, meaning H5c is supported.

8. VW User Type and Sex

Now that differences have been identified between the Social and Game-oriented users, it is interesting to know if there is a distinction between the sexes and their behaviors within these groups. Yee (2006) found genders might experience different social motivations; therefore, this work further analyzes the data sample from Cox (2016) to determine if there were differences between the sexes when looking at the Social-oriented VW users, and when looking at the Game-oriented user.

The Game-oriented and Social-oriented groups were separated and then individually analyzed, using PLS-SEM bootstrap and multi-group analysis to determine if there were differences in the sexes for each group. Of the Game-oriented users, 90 were males and 79 were females and of the 143 Social-oriented users, 79 were female and 64 were males. These samples met the PLS multi-group analysis sample size requirements per Marcoulides and Saunders (2006), and Costello and Osborne (2005). Results for each group are discussed below.

8.1 Game-Oriented Users Sex Comparison / Differences

Table 3 and Figure 3 highlight Game-oriented males have stronger relationships in challenge level to shopping attitude, and shopping SN to purchase intentions, but females have stronger relationships from skill to shopping attitude; challenge to shopping SN; and shopping attitudes to intentions to purchase. Looking at Table 4, the relationship between challenge and shopping SN is significantly stronger for females than for males. The path co-efficient difference is 0.285 and a p-value is 0.992. Significance for the two-tailed test requires values to be 0.95 and higher or 0.05 and lower in order to be considered significant.

Table 3: VW Game-Oriented Users Sex Comparison PLS-SEM Bootstrap

Hypothesis (Game-oriented users)	Path Coefficients	T Statistics (O/STDEV)	P Values	H accepted / rejected
H1a. Skill positively related to VW shopping attitude				
Males	0.288	2.851	0.005	Yes
Females	0.335	4.212	0.000	Yes
H2a. Challenge positively related to VW shopping attitudes				
Males	0.409	3.636	0.000	Yes
Females	0.387	5.168	0.000	Yes
H3a. Challenge positively related to VW shopping SN				
Males	0.315	3.114	0.002	Yes
Females	0.600	9.530	0.000	Yes
H4a: VW shopping attitudes positively related to intentions to purchase				
Males	0.489	4.747	0.000	Yes
Females	0.706	8.459	0.000	Yes
H5a: VW shopping SN positively related to intentions to purchase				
Males	0.352	3.302	0.001	Yes
Females	0.127	1.256	0.210	No

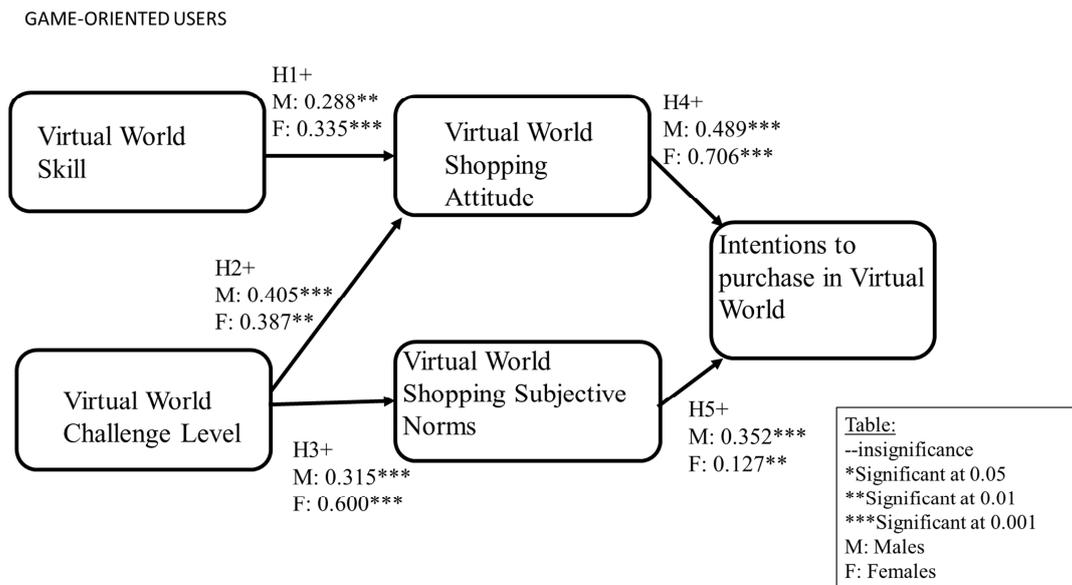


Figure 3: Model Comparison, VW User Type Sex Comparison PLS-SEM Bootstrap Results

Table 4: VW Game-Oriented Users Sex Comparison Multi-group Analysis

Game-oriented Users: Males versus Females Differences	Path Coefficients	P-Values
H1c: VW Skill ---> Shopping Attitude	0.047	0.659
H2c: VW Challenge ---> Shopping Attitude	0.022	0.433
H3c: VW Challenge--->Shopping Subjective Norm	0.285	0.992
H4c: Shopping Attitude--->Intentions to Purchase	0.217	0.949
H5c: Shopping SN--->Intentions to Purchase	0.225	0.07

8.2 Social-Oriented Users Sex Comparison / Differences

Table 5 and Figure 4 highlight there is a distinction in the two groups in how the sexes behave for Social-oriented versus Game-oriented users. For Social-oriented users, this time, we see males have stronger relationships in skill to shopping attitude, and challenge level to shopping SN, while females have stronger relationships for challenge level to shopping attitude; shopping attitudes to purchase intentions; and shopping SN to purchase intentions. Looking at Table 6, however, we see no evidence of any significant differences for any of the 5 relationships in the two sexes. Significance for the two-tailed test requires values to be 0.95 and higher or 0.05 and lower to be considered significant, and all of the displayed p-values are between these threshold values.

Table 5: VW Social-Oriented Users Sex Comparison PLS-SEM Bootstrap

Hypothesis (Social-oriented users)	Path Coefficients	T Statistics (O/STDEV)	P Values	H accepted / rejected
H1. Skill positively related to VW shopping attitude				
Males	0.564	7.268	0.000	Yes
Females	0.458	5.044	0.000	Yes
H2. Challenge positively related to VW shopping attitudes				
Males	0.252	2.670	0.008	Yes
Females	0.313	2.638	0.009	Yes
H3. Challenge positively related to VW shopping SN				
Males	0.521	5.821	0.000	Yes
Females	0.466	4.795	0.000	Yes
H4: VW shopping attitudes positively related to intentions to purchase Social-oriented				
Males	0.575	5.063	0.000	Yes
Females	0.633	10.517	0.000	Yes
H5: VW shopping SN positively related to intentions to purchase				
Males	0.182	1.543	0.123	No
Females	0.187	2.489	0.013	Yes

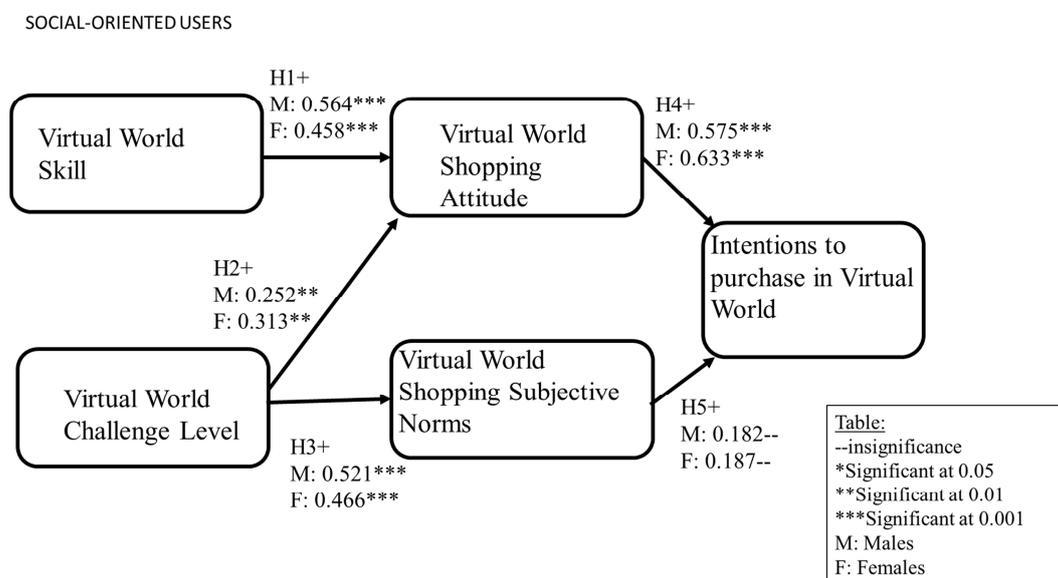


Figure 4: Model Comparison, VW User Type Sex Comparison PLS-SEM Bootstrap

Table 6: VW Social-Oriented Users Sex Comparison Multi-group analysis

Social-oriented Users: Males versus Females Differences	Path Coefficients	P-Values
H1c: VW Skill ---> Shopping Attitude	0.106	0.199
H2c: VW Challenge ---> Shopping Attitude	0.062	0.669
H3c: VW Challenge--->Shopping Subjective Norm	0.055	0.334
H4c: Shopping Attitude--->Intentions to Purchase	0.058	0.665
H5c: Shopping SN--->Intentions to Purchase	0.005	0.528

9. Results

Final results show both Game-oriented and Social-oriented user attributes: challenge level and skill positively lead to VW shopping intentions through shopping attitudes and SN. The two groups (Game and Social) behave differently when it comes to the relationship between skill and shopping attitude. Social-oriented users have a stronger positive relationship in this link than Game-oriented users do. In addition, when looking at sex differences in each of the groups, we found female Game-oriented have a stronger positive relationship when it comes to their challenge level to their shopping SN.

9.1 Implications

It is important for researchers, game designers, entrepreneurs, and businesses understand how and why positive VW shopping attitudes and shopping SN have an influence on purchase intentions in both Game-oriented and Social-oriented users. Additionally, it is important for those stakeholders to understand there are some differences between the two groups and even sex differences within the groups and that these same traits may apply to AR and VR users. User attributes lead to positive VW shopping attitudes and SN in VWs and should have similar effects in VR and AR. This knowledge allows designers to focus and prioritize efforts when shaping their games. It also helps businesses to build a strategy for profits in VWs and it presents models and knowledge that researchers can apply toward and test in other related studies. Depending on the type of VW used, player attributes are weighed more when it comes to purchasing intentions. This may be true as well when it comes to overall play, to collaboration, learning, continued use in VWs, etc. By understanding, that these games are different and therefore players should be considered different, stakeholders can then recognize how attributes affect purchasing differently.

The link between skill and shopping attitude is stronger for Social-oriented users than it is for Game-oriented users. Game designers should look at ways to boost skills for users in order to produce more sales. This could include help screens and tools or motivating players to help other players. When it comes to VR, this may be especially true because VR accounts for skill required to use the equipment, and the environment goes from 2D to 3D adding complexity to maneuvering.

Further, results show VW attitudes and SN affect behavior intentions to purchase for both Game-oriented and Social-oriented users. SN are different in Game-oriented versus Social-oriented worlds. When it comes to the sex within the Game-oriented users this is true as well. Knowing these SN are important to purchase intentions, designers, and VW businesses can look at ways of influencing user’s VW encounters, advertisements, groups, etc. Doing this can be different for the two groups. Social-oriented VWs present opportunities in different ways than Game-oriented VWs. A Game-oriented VW may build an enemy that becomes an SN for the player. The player sees this enemy with powerful tools, while in Social-oriented VWs a player may go into a prestigious club and form SN from characters in this setting. AR puts another spin on this because it incorporates

real-life into Virtual life. ARs can take you to real-world physical locations and affect your SN by facilitating not only VW SN but new physical relationships at common places.

SN failed to link to VW user's skill in both types of users (Game-oriented and Social-oriented) but was successful with linking to challenge level, especially for Game-oriented VW female users. This is interesting that females may be stimulated by challenges stronger than males, in order to develop SN. VW shopping SN were also found to be positively related to user challenge level in both types of VWs. Stakeholders can incorporate schemes to monitor challenge-level, so one is constantly challenged then presenting purchase opportunities in these games, in order to draw sales. For Game-oriented VWs, this might mean allowing a player to purchase a team- weapon or acquire a power to use after conquering a team-goal, or in a Social-oriented VW by socially challenging a player to speak at a rally or perform at a concert. Using game design to allow the player to be surrounded by other players, who are spending money in those circumstances that challenge the player. This can definitely be true for AR and VR as SN are not only real-life humans, but come in shape of advertisements and publications, and attributes of avatar characters.

Knowing specifics about the different types of VWs allow a designer to prioritize efforts. For Social-oriented players, their skill had the strongest relationship to their shopping attitude, while for a Game-oriented player, their challenge level had the strongest relationship to their shopping attitude. Understanding these intricacies focuses developers on designing tools to develop those attributes with the strongest links to shopping attitudes.

9.2 Recommendations for Future Research

Research should attempt to explain why the link from skill to attitude is stronger for Social-oriented users than for Game-oriented users, in order to understand consumer behaviors and to understand other behaviors, such as impulse buying, continued use, intentions to collaborate, etc. Future research should look at all money spent, both inside and outside the game, to help businesses profit. This money includes real or virtual dollars spent on items used for Cosplay (costumes and events to look like VW characters), equipment (applications and equipment), and upgraded accounts items, for example. For future research, studies should look at AR and VR users to see how and why these users decide to make purchases as well. Future research can also tackle what specific 'Game-type' navigation tools and programming techniques may be involved in improving skill and challenge, and for the different groups like Game-oriented users and Social-oriented groups. This research would need to focus on system specific tools and traits that improve the overall game experience and profits. There may be other significant groups involved in AR and VR, such as Tool-oriented users - those who use the game not as a game, to help them find something, understand something, or make something. Popular Tool-oriented AR apps can be used for mapping crime locations, star constellations, finding your vehicle, spying, and decorating, for example (Chandra, 2013). User attributes leading to purchases may be different for these type applications due to their different goals.

Researchers should obtain this data by reaching out to a large plethora of VW users, AR users, and VR users, worldwide and of all ages, to fully gauge the population. Data can be obtained through a survey, but additionally, by performing a longitudinal study to observe a player's skill and challenge development, while watching shopping attitudes and SN, would provide a better understanding of flow.

Cox (2016) saw more females playing Social-oriented VWs and more males playing Game-oriented, similar to Pearce et al. (2009), and found some differences in the sex behavior amongst the different game types. What was missing was a look at Avatar gender identification. Researchers may have an opportunity to look at differences between users based upon what gender they assign to their avatars or game character, not only VWs but AR and VR. Players who are characterizing themselves

as females may have different shopping attitudes than those who are characterized as male, animals or genderless.

In addition, now that there is a better explanation for VW Game-oriented and Social-oriented user attributes to purchase intentions, businesses would be attentive to know if either of these user type expenditures lead to real-world expenditures. It may be true that some products are 'tried out' on avatars before the VW player finds similar 'real-world' products, such as tattoos or more risqué clothing to try for themselves. This is a very interesting idea for VR because VR can be used conceptually as a dressing room to try on attire before an individual makes a purchase.

10. Conclusion

There are distinct differences between Game-oriented and Social-oriented users. Cox (2016) displayed the consumer behavior differences between these groups, while this research took it a step further to look at sex differences within those groups and tied the findings to VR and AR subsets. Skill to shopping attitude is a stronger relationship for Social-oriented users. Therefore, Social-oriented VW designers should pay close attention to developing tools that improve skill for these types VWs. Researchers should continue to look at differences in these groups, in other behavioral situations and VW activities. There was a difference between Game-oriented female users and Game-oriented males when it came to their challenge level and shopping SN. Females had a much stronger relationship between the two, meaning being challenged in the game is very closely tied to increasing the shopping supportive body of surroundings of a female game player. Additionally, because of the closeness VWs have to VR, and AR, researchers should test the consumer behavior model on these applications, and test the sex differences in these groups as well. VWs, VR and AR continue to grow. These games should be personalized for each type of user to improve the shopping attitudes for the different groups.

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Appendix A

Virtual World Consumer Behavior Questions
Skill (Composite Reliability = 0.898; Average Variance Extracted = 0.597)
S1. I consider myself very knowledgeable about good searching techniques in Virtual Worlds.
S2. I consider myself very knowledgeable about good searching techniques in Virtual Worlds.
S3. I consider myself competent in finding what I want in Virtual Worlds.
S4. I consider myself as knowing more about using the Virtual Worlds than most users.
S6. In the last 7 days, how much time would you say you spent using this Virtual World?
S7. In the last 7 days, how many times did you use this Virtual World?
Challenge (Composite Reliability = 0.915; Average Variance Extracted = 0.783)
C1. Virtual Worlds challenge me to perform to the best of my ability.
C2. Virtual Worlds provide a good test of my skills.
C3. Virtual Worlds stretch my mental capabilities to the limits.
A1. I like to shop in Virtual Worlds.
A2. Virtual World shopping makes me happy.
A3. I feel excited when I shop Virtual Worlds.
SN (Composite Reliability = 0.889; Average Variance Extracted= 0.667)
N1. Most people who are important to me think that I should purchase products from Virtual Worlds in the future.
N2. The people in my life whose opinion I value would approve of my shopping in Virtual Worlds in the future.
N3. The media supports Virtual World shopping.
N4. Experts support Virtual World shopping.
Purchase Intentions (Composite Reliability = 0.938; Average Variance Extracted= 0.792)
P1. I am considering making purchases in Virtual Worlds.
P2. I seriously contemplate buying in Virtual Worlds.
P3. I seriously contemplate buying in Virtual Worlds.
P4. I am likely to make future purchases in Virtual Worlds.