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(Full Paper)

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ABSTRACT

This study investigates the three dimensions (cognitive, relational, and structural) of social capital within social, gaming, and mixed virtual world platforms. Utilising ANOVA in examining data collected from three different virtual worlds' users (Second Life, World of Warcraft, and Entropia Universe). Finding supports no significant differences between cognitive (shared values and language) and relational (trust) social capital between the different virtual world platform. However, there are significant differences in structural social capital (network ties) between the different types of virtual world platforms. The study findings help virtual world operators, developers, and business in understanding the social capital dimensions needed to build stronger social capital, and trust, between the virtual world community participants, developers, and business.

Keywords: Social capital dimensions, virtual world platforms, cognitive, structural, and relational social capital.

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INTRODUCTION

Virtual communities including Social Network Sites (SNS), are under massively increasing growth phases. Their growth leads to the innovative, and different types of virtual platforms such as Virtual Worlds (VWs), Virtual Realities (VR), and Augmented Reality (AR). These platforms are supported of leading technology companies such as Google, Apple, and Microsoft (Apple Inc., 2018; Ron Amadeo, 2018). A variety of communication tools allow more immersive communication channels within such virtual platforms. Here, VR glasses, Voice-to-Text chats, voice and video chats, and even VR full body suites such as the TeslaSuit (Javelosa, 2016; Teslasuit, n.d.) are now operational within these platforms.

These newly developed communications and interaction tools create new opportunities, and support interactive social communications. These personal experiences include workplace communities - especially those with remote interaction and collaboration approaches that work and communicate virtually in such a distributed environment (Wang *et al.*, 2014).

A wide variety of technologies across virtual platforms - including Massively Multi-player Online Games (MMOGs), allows the unique shared experience between thousands of virtual platform participants. This not only develops a personal level of relationship, but it facilitates a form of feeling and touching between participants (Gallace and Spence, 2010; Lehdonvirta, 2009; Nazir *et al.*, 2016; Nazir and Lui, 2016; Williams *et al.*, 2009).

The developed tools in the virtual platforms also indirectly affect the economic systems within these virtual worlds (VWs) (Nazir *et al.*, 2016; Virtual Sense, 2014). The expectation of the increasing popularity of the VWs can lead to more business transactions in such virtual platform (Guo and Gong, 2011; Nazir *et al.*, 2016; Salomon and Soudoplatoff, 2009). The economic system in VWs can include both transactions within the borders of the virtual platforms, or a trade between the real world and the VW. Here, in-game virtual currencies can exchange for real-world currencies, or vice versa. This creates an economic and mechanistic academic research interest as to how virtual and real monies can be exchanged securely (Hallett-Hook, 2008; Heeks, 2009; Hunter, 2006; Lehdonvirta, 2005; Nazir and Lui, 2017, 2015).

The exchange rate on the virtual platforms can be different from one VW to another. For example, Second Life (SL), has a free exchange rate market for its Linden Dollar (L\$) based on supply and demand on the currency, whilst Entropia Universe (EU) has a fixed exchange rate of 1 US\$ to 10 EDP (EU currency) (Nazir *et al.*, 2016). Platform development remains a key element to the success of Real Money Trading (RMT) in the virtual worlds.

As a result of the platform development, a lot of improvement reached SNS, VW, VR, and AR. In the last few years, Apple, Microsoft, and Google have developed their mobile, tablet, laptop, and desktop computer systems by incorporating powerful graphics cards and processors - specially designed to run virtual and augmented reality systems smoothly (Apple Inc., 2018; Ron Amadeo, 2018).

Previous studies investigate the influence of virtual platforms and SNSs on developing social capital, and on investigating the influence of social capital dimensions (cognitive, relational, and structural social capital) (Alqithami and Hexmoor, 2012; Chen *et*

et al., 2017; Hau and Kang, 2016; Lee, 2014; Liu *et al.*, 2016). Some studies find relational social capital (trust) strongly interlinks with cognitive social capital (shared language) and structural (network ties) social capital (Alqithami and Hexmoor, 2012; Nazir, 2017). Other studies find stronger network ties and developing a shared language can strengthen the relational social capital within virtual teams and communities (Alqithami and Hexmoor, 2012; Chen *et al.*, 2017; Nazir, 2017).

Chen *et al.* (2017) investigate the quality of the virtual platform (website quality), social capital dimension, and customer loyalty (loyalty to seller). They conclude cognitive and structural social capital positively and directly influences relational social capital, but it also positively influences customer loyalty (both directly and indirectly) through relational social capital.

Although some past studies investigate social capital dimensions in VWs (e.g. Alqithami and Hexmoor, 2012; Chen *et al.*, 2017; Hau and Kang, 2016; Lee, 2014; Liu *et al.*, 2016), each only investigates one type of VW platform, or one particular VW. For example, Chen *et al.* (2017) investigate Second Life (SL) as the main VW platform in their study, whilst (Hau and Kang, 2016) studied Aion Game Chosun (Korean VW game) as their main VW platform.

In summary, previous studies research social capital dimensions in the virtual communities either as one VW platform, or as a specific Massively Multiplayer Online Role-Playing Game (MMORPG) (Chang and Chuang, 2011; Lefebvre *et al.*, 2016; Lu and Yang, 2011; Nov *et al.*, 2012; Striukova and Rayna, 2008; van den Hooff and de Winter, 2011; Wang and Chiang, 2009).

This study investigates the strength and the development of social capital dimensions, and compares them across different virtual platforms. Particularly, whether cognitive social capital (shared language), relational social capital (network ties), and structural social capital differ considerably on social capital dimensions, and engage the different virtual platforms – Gaming VWs (GVWs), Social VWs (SVWs), and Mixed VWs (MVWs).

This study contributes to the research area by examine and comparing social capital dimensions (cognitive, relational, and structural social capital) on three different virtual platforms – World of Warcraft (WOW) representing GVWs, Second Life (SL) representing SVWs, and Entropia Universe (EU) representing MVWs.

LITERATURE REVIEW

Virtual Reality & Virtual Worlds

Social capital is the ability of community, team, and group to utilise set of resources (embedded in the ongoing social relationship amongst people) towards achieving a desired goal or outcome (Adler and Kwon, 2002; Coleman, 1988; Nahapiet and Ghoshal, 1998; Portes, 1998). Social capital is an essential factor for stronger social communities, and researchers such as Fornoni *et al.* (2012) and Stam *et al.* (2014) also argue social capital between a team and/or staff is essential for entrepreneurial success (Smith *et al.*, 2017).

Social capital is considered a key element for the success of both communities and entrepreneurs (Huvila *et al.*, 2010; Murphy, 2011). Social capital also enhances communities and entrepreneurs in different ways - such as; identifying market opportunities (Uzzi, 1997), collecting information and influence (Adler and Kwon, 2002), providing support and improving outcome through hardship times (Rogers, 2016), avoiding failure (Westhead, 1995), strengthening the community, and enhancing competitiveness (Özcan, 1995; Smith *et al.*, 2017).

Social Capital Theory

Social capital theory (SCT) provides a theoretical perspective for investigating benefits directly obtained by organisations and/or communities through their social network and relationship. SCT supports community relationship characteristics by focusing on the flow of shared resources - which also enables the investigation of performance differentials both with, and between communities (Carey *et al.*, 2011; Koka and Prescott, 2002).

Some researchers question whether social capital exists in e-commerce and virtual platforms. They suggest social capital developed as a result of cooperative behavior among the users and participants of the social network - which is characterised by frequency interaction, and close structures associated with shared backgrounds (Wasko and Faraj, 2005). At the same time, the new virtual platforms can now provide richer communication media, and can replace the traditional face-to-face interactions. There is now accumulated evidence that consistently supports social capital as existing in online/virtual contexts (Huang, 2016; Steinfield *et al.*, 2008).

Previous studies investigate the effect of social capital on individuals' behavior in the virtual online platforms, including community engagement (Ganley and Lampe, 2009), knowledge sharing (Hau and Kang, 2016; Wasko and Faraj, 2005), and virtual connectivities (Nazir, 2017). However, to the best of our knowledge, no studies have yet focused on the effect of virtual worlds on social capital dimensions and especially through a comparison between different types of VW platforms.

In this study, we focus on the relationship between the different VWs platforms/types (GVWs, SVWs, and MVWs) and social capital dimensions (Cognitive, relational, and structure social capital).

Social Capital Dimensions

Previous studies (Chen *et al.*, 2016; Lin, 2011; Nahapiet and Ghoshal, 1998; Wang *et al.*, 2016) suggest three main social capital dimensions (cognitive, relational, and structure) exist. Local communities in New South Wales (Australia) studied by Onyx and Bullen in 2000 applied six social capital constructs under the theme “participation in networks”, “reciprocity”, “trust”, “social norms”, “the commons”, and “proactivity” (Law and Chang, 2008). Hau and Kang (2016), Striukova and Rayna (2008), and Wagner *et al.* (2014) use “trust” to measure relational social capital, “ties” for structural social capital, and “shared goals” for cognitive social capital.

As the studies investigated in this literature review show, social capital dimensions may be framed under three constructs (cognitive, relational, and structural). This study uses these as first-level social capital constructs. Table 1 indicates shared language (cognitive), trust (relational), and network ties (structural) are widely applied social capital constructs in past studies (Hau *et al.*, 2013; Nahapiet and Ghoshal, 1998; Wang *et al.*, 2016)

Table.1: Grouping Social Capital Studies

Social Capital Constructs Social Capital Components Social Capital Studies	Cognitive			Relational				Structural	
	Shared goals	Shared language	Shared vision	Identification	Norms	Obligation	Trust	Network configuration	Ties/social interaction
Lefebvre <i>et al.</i> , 2016		✓	✓				✓		✓
Wang <i>et al.</i> , 2016		✓					✓		✓
Chen <i>et al.</i> , 2017		✓					✓		✓
Lee, 2014					✓		✓		
Hau <i>et al.</i> , 2013	✓						✓		✓
Carey <i>et al.</i> , 2011				✓		✓	✓		✓
Hau and Kim, 2011	✓						✓		✓
(Lin, 2011)		✓		✓	✓	✓	✓	✓	✓
van den Hooff and de Winter, 2011		✓			✓	✓	✓		✓
Chow and Chan, 2008	✓						✓	✓	
Pearson <i>et al.</i> , 2008		✓	✓	✓	✓	✓	✓		✓
Tsai and Ghoshal, 1998			✓				✓		✓

Social capital dimensions include cognitive, relational, and structural social capital (Hau *et al.*, 2013; Nahapiet and Ghoshal, 1998). The cognitive dimension in social capital is measured through “shared language” (Chen *et al.*, 2016; Wang *et al.*, 2016). Shared language can help community members to understand their common goals and behave properly within their community (Tsai & Ghoshal, 1998), as shared language provides a common understanding by developing common/shared paradigms, values, stories and terms (Nahapiet & Ghoshal, 1998). Cognitive capital, hence measure the level of common terms, language and understanding of the end-users within the community (Nahapiet & Ghoshal, 1998; Tsai & Ghoshal, 1998).

The relational dimension in social capital is measured through “trust” (Chen *et al.*, 2016; Wang *et al.*, 2016). Trust has been articulated as an essential element of relationship. Nahapiet and Ghoshal (1998) referred to the relational dimension as “the kind of personal relationships people have developed with each other through a history of interaction” (Nahapiet & Ghoshal, 1998, p. 1035). Relational capital, hence measure the level of trust and confidence between end- users within the community (Nahapiet & Ghoshal, 1998; Tsai & Ghoshal, 1998).

The structural dimension in social capital is measured using “network ties” (Chen *et al.*, 2017; Wang *et al.*, 2016). Network ties is the essential factor for structural capital, which includes network characteristics such as social interaction ties, tie strength and centrality. The structural capital, hence measure the strength of the relationship between end-users within the community (Nahapiet & Ghoshal, 1998).

METHODOLOGY

Instrument Development

This study investigates whether the build of cognitive, relational, and structural social capital dimensions does differ among the different types of VW platforms. Target participants are active users of SL (SVWs), WOW (GVWs), and EU (MVWs). Hence, an online questionnaire is a suitable research design as it allows the researcher to reach a global population within each of specifically targeted VW.

The online questionnaire is shared globally through the Survey Monkey platform. The online questionnaire is based on 5-Point Likert Scale - 1 (strongly disagree) to 5 (strongly agree). It takes around 10 – 15 minutes to complete. It remained alive online for three months. Its shared distribution is through direct URL addressing into SL, WOW, and EU related communities' platforms - such as: Facebook groups, forums, and Instant Messages (IM) with the VWs platforms.

The piloted and validated questionnaire measurement items (developed from instruments used in previous studies) did deliver the target constructs. Specifically, cognitive social capital measurement items are adapted from (Chang and Chuang, 2011; Chen *et al.*, 2017; Chiu *et al.*, 2006; Wang *et al.*, 2016), relational social capital measurement items are adapted from (Chang and Chuang, 2011; Chiu *et al.*, 2006), and structural social capital measurement items are adapted from (Chang and Chuang, 2011; Chiu *et al.*, 2006).

Data Collection

The online questionnaire delivered a total of 613 responses. After eliminating duplications, incomplete responses, and inconsistencies, the final usable sample size for this study was 274 responses. Factor reduction engaged SPSS 22. Constructs developed were validated for dimensional and construct reliability. All variables exceeded recommended Cronbach Alpha empirical research acceptance levels of > 0.60 (Hair *et al.*, 2010).

Table 1 summarises the final outcome of this survey validation process. The final 274 surveys are reserved in the database (acceptance rate is 74.8%) to be examined, and for testing normality and outliers.

Table 1: Total Number of Responses (N = 365)

Filter No.	Filter Name (Description)	Total Invalids	Remaining Responses
1	Declined to take the survey	9	356
2	Not completed / missing data	22	334
3	Survey duration (less than 10 min)	29	305
4	Comment field was not in English	14	291
5	Duplicated IP address	17	274
Total number of valid responses after five filters = 274			

RESULTS

Table 2 summarises the study's demographics (n = 274) across the different VWs types (SL, WOW, and EU). Overall, the male population (57%) outweighs the female (43%) population across investigated VWs platforms. About 79 per cent of those participating in the VW is under 45 years old.

Table 2: Respondent Demographics (profile)

Demographic Measure	Percentage (%)
Gender	
Female	43.1%
Male	56.9%
Age	
18 to 24	23.7%
25 to 34	30.7%
35 to 44	24.8%
45 to 54	14.6%
55 or older	6.2%

Table 3 summarises the survey global respondents collected from each virtual world community.

Table 3: Total Valid Responses from Different VWs

VW	No. of Responses
SL	85
EU	75
WOW	114
TOTAL	274

ANOVA Results

The research hypotheses applies ANOVA with post-hoc analysis. Table 4's cognitive, relational, and structural social capital dimensions in the different VW platforms (SL, EU, WOW) indicates no significant differences between cognitive and relational social capital across the different VW platforms. However, considering structural social capital dimensions, there is a significant ($p < 0.05$) difference between EU and both SL and WOW.

Table 4: ANOVA with Tukey HSD Test for Social Capital (Cognitive, Relational, and Structural)

Construct	Main VW	Compared VW	Mean Differences	Std. Error	Sig.
Cognitive					
Cognitive	SL	EU	.014	.109	0.99
		WOW	-.140	.099	0.33
	EU	SL	-.014	.109	0.99
		WOW	-.154	.103	0.29
	WOW	SL	.140	.099	0.33
		EU	.154	.103	0.29
Relational					
Relational	SL	EU	.015	.123	0.99
		WOW	.097	.111	0.65
	EU	SL	-.015	.123	0.99
		WOW	.082	.115	0.75
	WOW	SL	-.097	.111	0.65
		EU	-.082	.115	0.75
Structural					
Structural	SL	EU	.670*	.1402	0.00
		WOW	.233	.126	0.15
	EU	SL	-.670*	.140	0.00
		WOW	-.436*	.131	0.00
	WOW	SL	-.233	.126	0.15
		EU	.436*	.131	0.00

* The mean difference is significant at the 0.05 level

This significant difference in structural social capital between EU and both SL and WOW can be because EU, as a platform, is a mixture of socialising and gaming activities - where EU participants in such platforms develop specific social capital activities suites. The mixed nature of the EU VW also makes it a very different VW environment to game-oriented only (WoW) platforms and social oriented (SL) only platforms.

CONCLUSION

The study of cognitive, relational, and structural social capital dimensions in a specific VW platform has been studied before (Reer and Krämer, 2014; Yoon, 2014; Zhong, 2011). However, whether cognitive, relational, and structural social capital differs across different VW platforms, has before this study, remained unpredictable.

It remains useful to investigate the influence of different VWs types and their individual effects on cognitive, relational, and structural social capital dimensions. A better understanding of such influences provides developers and business with a better way of offering customised products and services. This allows developers to consider the build of higher levels of trust, and the build of

a stronger social capital relationship among VWs platforms participants. This may, in-turn, build high levels of customer trust and ongoing loyalty.

This study also addresses the gap that differences in social capital dimensions do exist between gaming, social, and mixed VW platform participants and their behaviour(s). Overall this study shows *significant differences in structural social capital dimensions* do exist across different types of VWs (EU versus WoW of SL). In contrast, this study shows no significant differences between cognitive and relational social capital dimensions. Thus, cognitive and relational social capital can be treated identically by platform developers, but structural social capital needs to be treated specifically for the VW involved.

LIMITATIONS & FUTURE RESEARCH

This study chooses only SL to represent SVWs, only EU to represent MVWs, and only WOW to represent GVWs. This study also did not consider the demographics or the background differences of the respondents. Further segmentation of respondents, and a larger study, may together provide further insights. Future extension studies can include additional VW platforms. This can provide further understanding and generalisation and also provide further validation.

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