Online Gaming: An Emerging Avenue for Exploitation?

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Abstract

Some may argue that the proliferation of personal computers together with the widespread use of the Internet has brought many benefits to society. The popularity of the Internet and its associated online services continues to grow at an exponential rate and consequently, so does the number of avenues for potential exploitation. Prior research has already established that sexual predators and social engineers use the Internet as a means to target and exploit individuals. Indeed, previous studies highlight the significant threats faced by users of instant messaging and social networking facilities. Online role-playing games and virtual environments such as World of Warcraft and Second Life provide yet another platform for users to interact with one another. Evidence suggests that subscribers of such services often become so immersed in such fantasy worlds that their ability to differentiate between the virtual and real world is reduced. This paper investigates the level of threat faced by heavy users of 3D virtual environments and online role-playing games to potential social engineering exploits. The study made use of an online survey to assess the current level of awareness and understanding amongst individuals who spend excessive amounts of time engaging in such environments.

Keywords

Online Role Playing Game, Exploitation, Social Engineering, Online Abuse

1. Introduction

Personal computers are used by billions of people in all aspects of their personal and professional lives. The Internet has facilitated worldwide networking as well as providing 24 hour access to a plethora of information and services. Indeed, Massively Multiplayer Online Role Playing Games (MMORPG's) is one such service that has witnessed unprecedented, global growth over the last five years. According to Elliot (2009) online gaming accounted for approximately 50% of the overall growth of Internet usage in 2008. One notable example is World of Warcraft with 11.5 million subscribers and a stable annual growth rate of 12-13%, excluding aberrant phases such as periodic expansion pack releases (WorldIV, 2009).

Furnell (2008) and Öqvist (2009) suggest that the rapid adoption of these online services, in particular MMORPG's has not been matched by a corresponding embrace of security culture. Previous studies have highlighted the vulnerabilities

inherent in online interaction and organisations aim to protect children from online abuse and potential harm through awareness raising campaigns. Get Safe Online provides information to individuals on how to protect their PC and how to identify safe and secure websites (Get Safe Online, 2009), whilst the Child Exploitation and Online Protection Centre (CEOP) works collaboratively with the Virtual Global Taskforce (VGT), to help protect children from sexual exploitation (CEOP, 2009; VGT, 2009).

It is commonly acknowledged that MMORPG's provide subscribers with an interactive, convenient entertainment platform in which they can engage in a fully immersive fantasy world. In addition, the majority of online games provide users with a platform for worldwide synchronous communication, and thus enabling the compilation of online based communities of like minded individuals (Manninen, 2001). Studies have shown that synchronous interactive online environments such as games, virtual reality environments and instant messaging facilities promote the development of personal friendships and relationships whereas asynchronous communication services such as social networking websites, forums and blogs focus on the wider community (Oqvist, 2009).

The popularity of online gaming continues to grow at an unprecedented rate and this is reflected in the revenue generated by software vendors. Indeed, Blizzard/Activision reported to have generated $5 billion of revenue in 2008 (Blizzard/Activision, 2009). Moreover, research has revealed that individuals and third party websites trade developed and experienced World of Warcraft characters for sums of up to £700. Theses high stakes combined with the ever increasing popularity presents the motivation and potential for online gaming accounts to be compromised. Indeed, key loggers have become common place in online gaming environments and forums in order to capture login credentials and steal user accounts.

The popularity of the global gaming world combined with the commonly acknowledged threats of identity theft, extortion and paedophilia, highlights the level of threat that online gaming subscribers continue to be faced with. This paper assesses the extent of human vulnerability to social engineering through excessive online gaming.

2. Social Engineering in Context

The protection of personal and sensitive data has previously been allied with technical based security measures. However, it is becoming increasingly apparent that technical solutions alone will not solve the problem and that people are typically the weakest link in the security chain (Rabinovitch, 2007). As people are now classified as the weakest link, it is important to ensure a high level of education, awareness and behaviour amongst individuals in order to maximise the protection and security of personal and sensitive data (Mitnick, 2002). Differing personalities inherently bring with them various potential vulnerabilities. These vulnerabilities are often exploited using one or more social engineering exploits.

According to Papadaki et. al, (2008), exploiting human weaknesses to perform atypical actions or divulge confidential information has become a long standing problem in the security domain. Moreover, with the implementation of modern security technologies, attackers find exploiting human vulnerabilities more effective and efficient than conventional technological hacking (Twitchell, 2006).

Limited protection can be implemented to protect a user from feeling gullible to divulging information. Unlike physical network infrastructures, no patches or security policies can be applied to improve and protect against human misjudgements.

The social engineering phenomenon is nothing new. Fraud has been in existence for decades with large scale Phishing attacks dating back to 2003 (Furnell, 2008). Cyber criminal activity has become more prevalent over the last five years and numerous investigations have been conducted exploring the avenues in which human vulnerabilities are exploited using different social engineering based attacks (Tipton & Krause, 2003). In the context of this paper the focus is on interactive online gaming environments.

3. Social Impact

It is commonly acknowledged that rapidly emerging technologies such as social networking websites, online blogs, online games and mobile telephones have had a considerable impact on the way in which individuals communicate (Öqvist, 2009). Indeed a study by Hobson (2008) revealed that 1 in 10 Britons use their Internet connection to communicate with friends on Social Networking Services (SNS) such as Bebo, Facebook and Myspace. Salz (2006), points out that these emerging forms of online collaboration and social networking have perhaps facilitated the biggest change in communication within a century.

Cohen (2009) argues that many users of the above mentioned services become easily addicted. In a self reflective report, Cohen describes how his addiction to online blogging increased exponentially after the deletion of his Twitter and FriendFeed accounts.

Evidence suggests that as a society we are witnessing an increase in social and psychological dependencies to online communication services. Davies (2007) suggests that the Internet has provided a platform for cheap, worldwide communication, offering support and easy interaction and that the majority of human beings need social interaction to stimulate happiness and social networking services, text messaging and online blogging help to satisfy that need. Joinson (2002), states that many individuals have a psychological craving for social interaction and in many cases this manifests itself in the development of online friendships and relationships. Griffiths (2000) highlights the degree of anonymity afforded by online services and states that this encourages participants to be more expressive than in normal face-to-face interaction; bringing with it positive and negative social implications.

4. Addiction

The term 'addiction' has been the subject of much research. Young (1997) states that addiction can be divided into two sub categories: substance addiction and behavioural addiction. In a preliminary study by Young (1996), a criteria framework for behavioural addiction was adapted from a pre-existing framework used in the American Psychological Association's Diagnostic and Statistical Manual (DSM-IV) for psychoactive substance addiction. Griffiths (1998), argued that the survey based evidence for Internet addiction collated from Young's framework was remarkably thin and questionable on a number of grounds. In light of the foregoing, Griffiths (1998) developed a six point diagnostic criteria for Internet addiction as shown below.

1. *Salience* — Using the Internet dominates the person's life, feelings and behaviour.

2. *Mood Modification* — The person experiences changes in mood (e.g. 'a buzz') when using the Internet.

3. *Tolerance* — Increasing amounts of Internet use are needed to achieve the same effects on mood.

4. *Withdrawal Symptoms* — If the person stops using the Internet they experience unpleasant feelings or physical effects.

5. *Conflict* — Using the Internet causes conflict with those close to the person, or with their everyday life (e.g. their job, social life, or hobbies).

6. *Relapse* — The addict tends to relapse into earlier patters of behaviour, even after years of abstinence or control.

While much effort has gone into developing diagnostic criteria to assess the prevalence of Internet addiction, models of what makes the Internet addictive are relatively sparse. Young (1997) however argues that three aspects that make the internet potentially addictive are: anonymity, convenience and escape (ACE). This prompted Griffiths (2000) to point out that the internet itself is not addictive; it is merely a medium for which users satisfy other addictions (e.g. online gaming, gambling, pornography).

Previous studies highlight the dangers of addiction associated with online gaming and the consequential damage which has evolved from excessive engagement. Wiemer-Hastings (2005) states that behavioural addiction to online gaming can often lead to consequences such as failing school, family breakups and relationship problems.

Few studies have been conducted regarding people's vulnerabilities in relation to addiction. It is commonly acknowledged that the anonymity afforded by the internet

makes the process of exploitation more desirable. Moreover, the addictive tendencies associated with online gaming presents a clear emerging avenue for exploitation. In addition, evidence suggests that subscribers of online gaming services often become so immersed in such fantasy worlds that their ability to differentiate between the virtual and real world is reduced (Öqvist, 2009), consequently making them particularly vulnerable to attack.

5. Online Gamers Vulnerability Study

The evidence presented thus far illustrates the potential for harm and exploitation through excessive online gaming. The purpose of this preliminary study was to measure the influence of online gaming addiction on an individual's ability to detect and respond to potential social engineering attacks.

This study made use of an online survey in which respondents were presented with 44 questions relating to their online gaming experiences. The authors recruited respondents collaboratively with leading online gaming vendors through MMORPG forums. In addition, the survey was also promoted through the British Computer Society, the University of Plymouth, the Centre for Information Security and Network Research and Online Gamers Anonymous.

5.1 Assessment Design

The survey consisted of the following six sections:

Section 1: Demographics: This section focused on the specific individual attributes of the respondent. Information such as age, gender, country of origin and employment status was collated. The purpose of this section was to understand if any of the aforementioned attributes affected demographics responses.

Section 2: Environment: The purpose of this section was to ascertain respondents' level of engagement with in house entertainment. Respondents were asked how many hours they spent engaging in online gaming environments and what their communication preference was.

Section 3: Online Gaming Experiences: This section focused specifically on online gaming and assessed respondents' levels of addiction to MMORPG's. The questions were developed in accordance with Griffith's (1998) behavioural addiction framework which facilitated a meaningful analysis.

Section 4: Online Interactivity: This section focused on respondents' online interactivity and sought to establish levels of peer-to-peer engagement. The questions enabled identification of previous and potential social engineering vulnerabilities.

Section 5: Participants Experiences and Advice: Respondents were invited to provide relevant advice, tips and share any positive and negative experiences related to online gaming.

Section 6: Follow-up Discussion: Respondents were invited to participate in a follow up case study and leave their first name and email address in order to discuss their experiences and answers further. This enabled the principal investigator to gain a more qualitative insight into individual reasons for excessive online gaming habits.

5.2 Results

5.2.1. Demographics

The survey assessed a total of 562 respondents regarding their online gaming experiences and their consequential abilities to detect and responded to social engineering attacks.

86% of respondents were male and 14% female. 48% of respondents were aged between 18-21, 29% aged between 22-29, 16% aged between 30-39, 5% aged between 40-49, 2% aged between 50-59 and 1% aged 60 years old or more. 88% or respondents originated from developed countries leaving 12% from undeveloped countries. 96% of respondents currently reside in developed countries highlighting that 8% of the survey population moved from an undeveloped to developed country.

At the time of conducting this study, 35% of participants were employed on a full basis, 10% employed on a part time basis, 45% were University/Higher Education students, 9% were unemployed leaving 1% who were retired.

5.2.2. Environment

52% of respondents had 3 or more computers in their household and 64% had 1 or more games consoles. 100% of the surveyed participants had broadband or fibre optic internet at home. 75% preferred to play computer games over watching television and 21% did not have a preference. Of the total 368 respondents who preferred to play computer games, 78% stated that their main motivation for choice was the greater level of interactivity offered by online games. In addition, 44% like to be in control of a character and 64% like the thinking and responding aspects of gaming. Interestingly, almost half (47%) of the 562 respondents preferred playing offline based games, 29% preferred online role playing games leaving 24% with no preference. Of the total 17 respondents who preferred to watch television, 47% stated that they enjoy passive relaxation and 35% enjoyed being close to other family members when at home.

59% of participants' preferred synchronous communication with friends and acquaintances (i.e. voice telephony - 12% and face to face - 47%) leaving 41% who preferred asynchronous communications such as internet messaging (36%) and SMS text messaging (5%). 78% stated that their chosen method of communication has always been the same. Of the 22% who had changed their preferred method of communication, many respondents found internet technologies (e.g. VoIP, instant messengers, online games) cheaper, quicker and less pressurised than more traditional communications. In addition, several respondents stated that the anonymity aspect of asynchronous internet based communications enabled them to

become more confident and expressive. These results compliment the underlying theories of Griffiths (2000) (see section 3).

All of the surveyed respondents engaged with an internet service on a daily basis. Daily activities included playing online games (87%), web browsing (93%), instant messaging (67%), work related research (60%), online shopping (22%) and downloading multimedia content (61%).

Table 1 shows the total number of hours spent online each weekday (including time spent online at work/college/university) and during the weekend (at home). Table 2 shows the total number of hours spent playing online games each weekday and during the weekend (at home).

Hours	Per Weekday	Weekend	Hours	Per Weekday	Weekend
1 - 4	13%	11%	1 – 2	22%	12%
5 - 9	37%	32%	3 – 4	37%	23%
10 - 12	20%	21%	5 – 6	22%	23%
12+	30%	36%	7 – 8	8%	18%
			9+	11%	24%

Table 1: Total hours spent online	**Table 2: Total hours spent playing online games**

As shown in table 1, 60% of respondents spend more than 10 hours online per day during a working week and 57% spent more than 10 hours online at weekends. Table 2 highlights the levels of MMORPG engagement amongst respondent demographics. Indeed, 41% spent 5 or more hours playing MMORPG's each weekday and a quarter (24%) spent 9+ hours playing online games over a given weekend.

5.2.3. Online Gaming Experiences

This section began by asking respondents to list all of the games they played on a weekly basis. Of the 412 respondents, the most widely played MMORPG game was World of Warcraft (81%), followed by Call of Duty (8%). Other online role playing games such as CounterStrike (5%), Diablo (2%), Star Wars Galaxies (2%), Lord of the Rings (1%) and Final Fantasy (1%) were also mentioned. In addition, almost half (45%) of respondents played online games 7 days a week with 42% engaging in MMORPG's between 4 and 6 days a week.

The aim of this section was to measure the levels of addiction inherent in the respondent demographics. This was achieved by asking 26 questions that could be effectively benchmarked against the six point addiction criteria developed by Griffiths (2000) (i.e. salience, mood modification, tolerance, withdrawal symptoms, conflict, and relapse). Participants could select one of the following options to each of the 26 questions: 'All of the Time', 'Sometimes', 'Not at All'. Table 3 shows the questions presented to participants and figure 1 show the results obtained. In addition, figure 2 shows the varying levels of behavioural addiction amongst the participants.

No.	Questions
1	I sometimes find myself arguing with other members of the family because of me playing my game
2	I often find myself in arguments with other family members wanting to use the computer
3	I prefer to socialise with friend's online than to social with friends offline
4	I feel a sense of excitement whilst playing the game
5	I feel a sense of control and enjoy the feeling of success and power when playing the game
6	It is one of my main aims in life to be really good at playing the game
7	I have tried to cut down the amount of time I spend online but find that I still play it as much as before
8	When I am not playing the game I often find myself thinking about the next time I am going to play it
9	I sometimes miss meals because I am too busy playing the game
10	I am sometimes late for appointments/work/school because I am too busy playing the game
11	The game is unimportant in my life
12	I feel that I could live happily without playing the game ever again
13	I find the games I play an exciting discussion topic and often find myself involved in conversations offline
14	I often find myself spending more money than I can afford on the game
15	I enjoy the challenge of learning how to play the game better
16	I find that my social life has at times suffered as a result of playing the game
17	I feel that the game is the one of the most important aspects in my life
18	I find interacting with friends online much easier than interacting with friend's offline
19	Whenever I use a computer for something other than gaming I find myself wanting to play the game
20	I tend to want to spend increasing amounts of time playing the game
21	I often find myself staying up until late in the evening playing the game
22	I feel I would become irritated and annoyed if I could not play the game for more than a few days

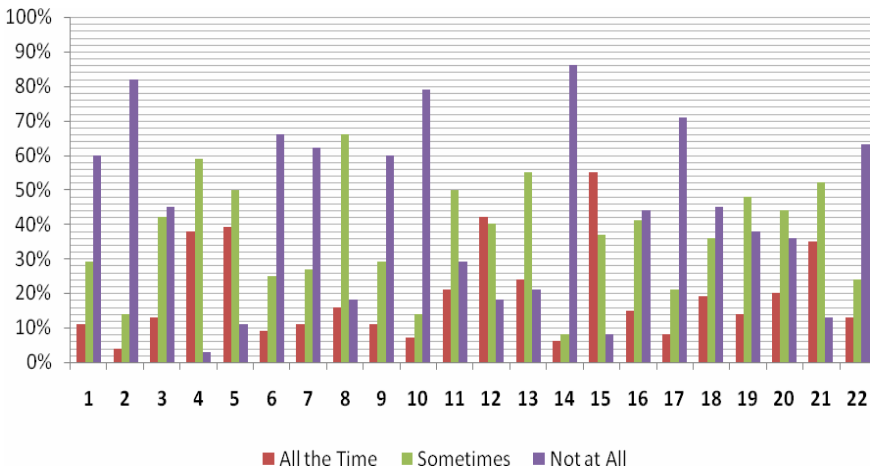**Table 3: Online Gaming Experiences**

Figure 1: Online Gaming Experiences Results

Table 3 and Figure 1 illustrate that a significant number of respondents show are addicted to MMORPG's. 18% of respondents felt that they could not live happily

without playing their game and 82% often felt themselves thinking about their game when not actually playing it. In addition, 79% felt the game was important in their life and over half (56%) felt that their social life had been affected as a result of playing online games.

Many respondents showed an increase of tolerance levels as a result of playing the game. Indeed, 64% found that they spent increasing amounts of time online and 87% frequently found themselves staying up playing late into the evening.

Over half (55%) of the respondents stated that they found interacting with friends online far easier than offline interaction and this outcome supports Joinson's (2002) theory of individuals craving social interaction and consequential development of online friendships and relationships.

Of the 562 respondents only 12% found themselves spending more money than they could afford on MMORPG's, however over a quarter (28%) of respondents felt that their game was the most important aspect of their lives. In addition, just over a third (34%) claimed that becoming exceptionally proficient in the game was one of their main aims and priorities in their life.

The results were further analysed against Griffiths' (1998) six point behavioural addiction criteria and the results are detailed in figure 2.
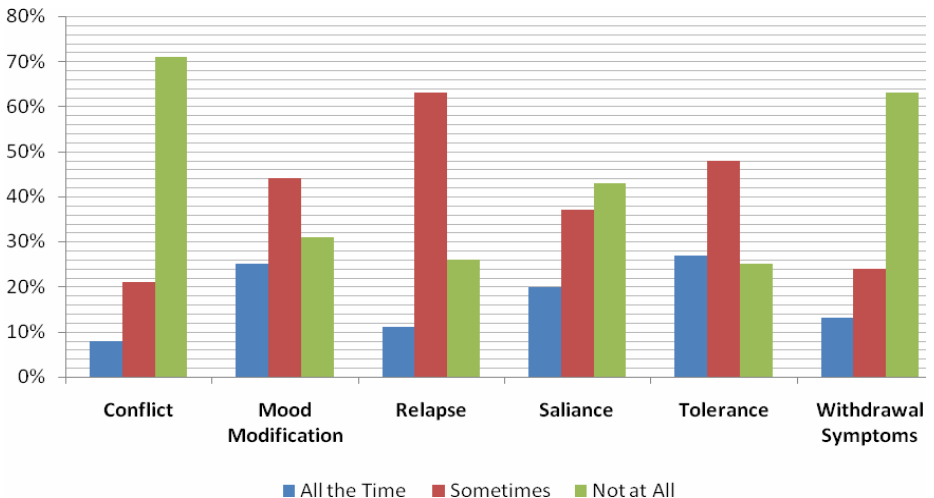

Figure 2: Six Point Behavioural Addiction Criteria Results

Figure 2 suggests that many of the surveyed respondents were behaviourally addicted to MMORPG's. Notably, almost a third was experiencing an increase in tolerance levels on a daily basis and the evidence suggests that a quarter of respondents were suffering from constant mood modification. In addition, 63% often found themselves relapsing when trying to cut down the amount of time playing MMORPG's.

A further aim of this section was to stimulate self reflection amongst participants regarding their online gaming experiences. The study used the following four questions in order to understand respondent's awareness and attitudes to their online gaming habits.

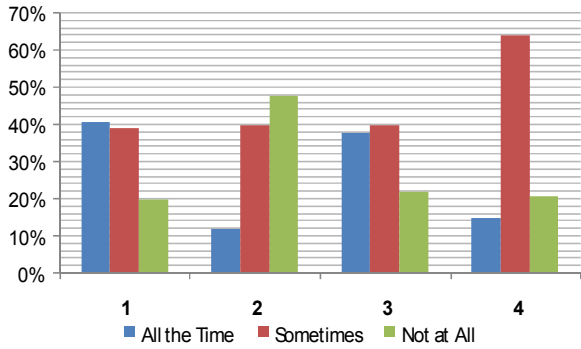| No.	Questions
1	I do not feel I am 'addicted' to the game
2	I find that playing the game is more exciting than going out with friends
3	I do not see a reason to cut down the number of hours I spend playing the game
4	I do not think about the game when I am not playing it

Table 4: Self Reflective Questions   **Figure 3: Self Reflection Results**

As illustrated in figure 2, the self reflection questions produced varying results. 20% of respondents openly admitted that they were addicted to MMORPG's, 39% were unsure, leaving 41% who believed they were not in any way addicted. Moreover, 22% of respondents felt a need to reduce the number of hours spent playing MMORPG's and 38% did not believe they were spending excessive amounts of time playing online games.

The final aim of this section was to establish the impact of online gaming on participant's lifestyles. 50% of respondents were actively involved in sports or other activities outside of the home/workplace however 20% of these participants felt that the time spent partaking in recreational activities had been affected by their online gaming. 40% of participants stated that they were previously involved in recreational activities; however, their reasons for stopping were varied. Common reasons included: lack of time, change in health conditions, pressure of job and most importantly, the convenience of online entertainment.

5.2.4. Online Interactivity

This section began by establishing who and how online gamers interact with. Over half (53%) of the respondents stated that they mainly interact with friends they have met online and 94% work collaboratively with other anonymous players to complete tasks, gain new powers and achieve higher levels within the game. Moreover, 96% of respondents talk to fellow players about matters which are not relevant to playing the game.

80% felt that they had formed close friendships with people whilst engaging in MMORPG's and 44% of these friendships were purely online based. In addition, 57% of respondents had been asked by online based friends to meet in person.

86% of participants had been asked to divulged personal and sensitive data whilst engaging in MMORPG's. The most commonly requested information included age (76%), location (75%), name (65%), and email addresses (50%). 41% of respondents had received requests for personal pictures, 38% were asked about their relationship status and 21% had been asked to divulge their telephone numbers. In addition, 10% of respondents were asked to reveal their passwords, 24% their place of work and 7% family details such as their mother's maiden name.

89% of respondents had previously divulged personal and sensitive data within a MMORPG environment. Data such as age (81%), location (77%) and name (67%) were the most common with other types of information such as relationship status (35%), email addresses (48%) and places of work (25%) that had also been divulged. 38% of the surveyed participants sent personal pictures to online friends upon request and 22% have previously disclosed personal telephone numbers. Alarmingly, 10% admitted to divulging passwords within online gaming environments and 7% have previously given out family details such as their mother's maiden name.

45% of respondents had previous become suspicious of one or more other players in a MMORPG environment. Typical suspicions included, stealing of online game currency, online stalking, sexual harassment, social engineers, paedophiles, bad language, aggressive arrogant rude behaviour, request for face-to-face meetings, spamming and racist comments.

5.2.5. Participants Experiences and Advice

The information and advice proffered from the survey participants was somewhat varied. Many respondents acknowledged that online gaming has negatively affected their real world social interaction and many feel that they have become withdrawn, depressed. In addition, when presented with a chance to freely express themselves many participants acknowledge that they spend an excessive number of hours engaging in MMORPG environments. The aforementioned acknowledgements are contradictory to the results obtained in the self reflection questions in section 5.2.4 suggesting that participants proffered more qualitative data than when faced with the closed questions. Other participants noted that online gaming is a convenient and easy form of social stimulation and entertainment, however, many respondents admitted that they have previously neglected their friends, family and children due to online gaming. Some even reported that they lost their jobs, homes and families as a result of excessive engagement. Positive aspects included meeting new people from a diverse range of cultures, forming of new friendships and relationships and developing hand to eye co-ordination.

6. Conclusions

This paper provides clear evidence of the dangers associated with excessive online gaming. Indeed, the above evidence suggests that a subscriber to MMORPG's can become easily addicted and such addictions are having a detrimental effect on an individual's real world social life. In addition, the results suggest that there is a

distinct lack of awareness regarding personal privacy within online gaming environments. This paper argues that the addictive nature of MMORPG's combined with a lack of awareness of the need for the protection of personal and sensitive data presents an emerging avenue for exploitation. Indeed the following anecdotal statement proffered by a surveyed participant highlights the need for information security awareness within online gaming environments:

"Someone asked to meet me who lived near my suburb. I met him randomly in World of Warcraft and he was very nice, but then he wanted to meet up after we had chatted for only a few hours (and exchanged photos/chat on Ventrilo). He was also really hot and I would have loved to go to his house but it was too weird, but he was respectful and stopped messaging me after I said no (to you know what). And a certain player I know of, he's a Guild Master. In his guild, if you want him to do something for you, then you need to send him pictures of your genitals (male only). He 'bids' on your offer of sexual images and offers gold. Extremely creepy, sounds very strange over microphone and has very, VERY weird discussions with people on Ventrilo. I know of him through Offline friends who joined his guild, they found it very funny"

Previous studies have highlighted the excessive number of hours game play required to reach a level in which users can participate in 'Player versus Player' (PvP) and Player versus Environment' (PvE) combat. This addictive catalyst combined with real world social pressures supports the level of addiction inherent in many MMORPG subscribers.

The participant experiences provided a valuable insight into the myriad of positive and negative implications associated with online gaming. Indeed, the principal investigator intends to re-run the same study with minors aged between 12 and 18 years old in order to establish the level of addiction inherent in teenagers and the consequential vulnerabilities associated with youngsters engaging and interacting with MMORPGS's.

Respondents were invited to participate in a follow-up discussion regarding their online gaming experiences and related survey responses. Of the total 562 responses collated thus far, 260 people (46%) have agreed to be contacted further. The qualitative responses collated from the intended follow up discussions will help in the building of an effective awareness raising framework to manage online gaming experiences.

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