

**A novel taxonomy of opportunities and risks in massively multiplayer online role playing games**

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# A Novel Taxonomy of Opportunities and Risks in Massively Multiplayer Online Role Playing Games

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## ABSTRACT

The explosion and rapid embrace of Massively Multiplayer Online Role Playing Games (MMORPG) has provided players with unique, fully immersive three dimensional environments in which they can express themselves in a myriad of ways. Players can develop unique skill sets, share knowledge, explore and experiment with various identities and network with like-minded individuals. Evidence suggests however, that these opportunities are accompanied with a number of risks including addiction, desensitisation and threats to the privacy of personal information. This paper presents a novel Taxonomy of opportunities and risks in the specific context of Massively Multiplayer Online Role Playing Games.

## Categories and Subject Descriptors

H.1.2. [User/Machine Systems]: Human Factors. Human Information Processing

## General Terms

Measurement, Experimentation, Security, Human Factors, Theory, Legal Aspects.

## Keywords

Online gaming, MMORPG, Risks, Opportunities, Taxonomy, Role Playing Games.

## 1. INTRODUCTION

Massively Multiplayer Online Role Playing Game's (MMORPG) are unique, fully immersive environments housing populations of characters with their own varying experiences, assets and values [30]. MMORPG's are highly social arenas consisting of platforms where players can chat and interact with one another whilst participating in a fantasy world with like-minded individuals [6]. These environments have evolved from traditional single-player games to global communities in which end users can meet other gamers and build reputations based on their performance and ability to meet common goals [42].

Structural characteristics of MMORPG's differentiate these environments from other online interactive platforms (e.g. instant messengers and email). Players can create one or more visual representations of themselves known as avatars which enable them to experiment with and explore different identities (e.g. gender and class). Avatars hold different sets of professions or roles that the MMORPG provides and the permanence and fluidity of roles varies depending on the design of the

environment [42]. MMORPG environments are infinite both in terms of size and ending. Based on Skinner's [35] theory of behaviourism, goals and rewards typically use a random ratio reinforcement schedule based on operant conditioning [41, 42]. Hence, in the context of MMORPG's, early achievements are quick, almost instantaneous; however as a player progresses in the game the amount of time, effort and level of complexity is increased until progression becomes almost imperceptible.

Several studies have focused on specific opportunities and risks within MMORPG environments. Waters [38] illustrates the benefits of using MMORPG's as a pedagogical tool for educators whilst Cole [8] and Chen et. al [6] highlight the level of social and emotional support fostered between players. On the negative side, Sanders et.al [33], Griffiths and Hunt [16] and Lemmens et. al [20] discuss the detrimental impacts of pathological gaming and Foo et. al (2008) present evidence on motivations related to players characterised as 'griefers' who "stalk, hurl insults, extort, form gangs, kill and loot" [31].

Despite the plethora of research on types of behaviour, motivations and addiction in online gaming environments, little research has been conducted to classify the myriad of opportunities and risks. This paper presents a taxonomy of opportunities and risks in MMORPG environments for vulnerable individuals. This taxonomy has been designed based on analysis of findings from two survey based studies [32, 33] juxtaposed with Yee's [42] classification of motivations for game play. Section 2 introduces the methodology. Section 3 presents the findings of previous studies which were used as a basis for the proposed taxonomy. Section 4 examines existing taxonomies together with their relevance and limitations in the context of MMORPG environments. Section 4 continues and presents the novel taxonomy of opportunities and risks in MMORPG environments and section 5 validates the contents of the proposed taxonomy. Section 6 concludes with the direction for future research.

## 2. METHODOLOGY

Quantitative research methods were utilised by the authors to measure addiction, player behaviour and levels of data disclosure within MMORPG environments. Hammersley [17] proposes that quantitative measurement is most often addressed by means of well-established concepts of validity and reliability. Therefore, the two survey studies conducted by the authors [32, 33] used well-established, reliable and valid constructs. Player behaviour was measured using Bolino and Turnley's [4] Impression Management scale together with Deci and Ryan's [11] Self

Determination Theory construct. Addiction was measured using a 22 item Game Addiction Scale (GAS) developed and validated by Lemmens et al. [24] based on Griffiths and Hunt's [16] original six point behavioural addiction criteria. Risks to privacy were measured using an average score of data types previously disclosed within the MMORPG environments and users were classified as either high or low risk depending on their average score [32]. The three aforementioned scales were adopted as each has been rigorously tested for reliability and validity.

In addition to the quantitative method outlined above, participants were invited to provide more qualitative data on their personal experiences in online gaming environments, thereby gathering a subjective in-depth insight into their feelings, experiences and motivations of behaviour which could not necessarily be captured by the objective quantitative approach [27]. For the minimisation of risk and optimisation of opportunities to be effective, a sound understanding of the factors involved is required. Therefore, the combination of both quantitative and qualitative approaches provided both breadth of coverage and depth of understanding.

Empirical findings on player behaviour, basic needs satisfaction, behavioural addiction and levels of data disclosure in MMORPG environments were sought through two online surveys. The first survey which recruited a total of 362 participants from the west (USA, UK, Europe), investigated risks related to pathological gaming and its causal relationship to privacy and levels of data disclosure.

The second survey consisting of 188 Singaporean gamers built on the findings of the first survey and sought to identify specific behaviour types and levels of needs satisfaction in online gaming environments. These findings positively or negatively influenced the probability of the identified opportunities and risks found in the first study. In addition, addiction and data disclosure were measured in the second survey to facilitate a cross-national comparison. Both surveys were supported by semi structured telephone or online interviews.

The empirical findings of the aforementioned studies were, amongst others, juxtaposed with Yee's [42] classification of motivation for game play and the classification of opportunities and risks put forward by Livingstone and Haddon [26]; further developed by Hasebrink et. al. [18]. The opportunities and risks that emerged from the data are described in Section 3.

### 3. FINDINGS

Evidence collated from previous studies [6, 42, 18] together with the aforementioned survey findings [32, 33] suggests that factors unique to MMORPG environments create emerging opportunities and risks for gamers. Examples included significant positive correlations between levels of addiction to MMORPG's and levels of data disclosure ( $r(N=188) = .286 p <.001$ ) and positive correlations between levels of data disclosure, self-promotion

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( $r(N=188) = .347 p <.001$ ), ingratiation (a strategic attempt to get someone to like you in order to obtain compliance with a request) ( $r(N=188) = .285 p <.001$ ) and intimidation ( $r(N=188) = .257 p <.001$ ).

The data collected was evaluated to ascertain participants perceptions of opportunities and risks inherent in online gaming environments and these are detailed in Table 1. It should be noted that this is not a description of all opportunities and risks but a list generated by participants.

**Table 1. Opportunities and Risks in MMORPGs**

Opportunities	Risks
Peer to peer learning and team work	Pathological use / addiction
Leadership skills	Social dependency to MMORPG's
Problem solving	Desensitisation to violent and sexual scenes
Engagement with emerging technologies	Social isolation from real world
Expression/experimentation of identity through role-playing	Cyber bullying (including silent bullying <sup>1</sup> ), harassment, stalking
Networking with like-minded individuals	Social engineering, hijacking of accounts, fraud, virtual crime
Diversity of cultures	Meeting strangers, being groomed
Widening participation	Tracking / harvesting personal and sensitive data
Diversity of roles, character types and guild memberships	Peer persuasion and justification for pathological use
Exchange of knowledge and ideas amongst players	Bullying or harassing another
Being inspired to participate in a socially equal environment	Self-destructive behaviour / neglect of real life responsibilities
Knowledgebase to facilitate learning of game play techniques	Bullying or harassing another gamer
Creation of user generated add-ons and plug-in for increased optimisation and game play experience	Adverse change in mentality, real life norms, morals and values
Development of unique skill sets including creativity, imagination and innovation	
Raising of self confidence	
Giving and receiving support with other players	
Increased self-disclosure (anonymity and structural characteristics of the MMORPG)	
Sense of empowerment,	

<sup>1</sup> Silent bullying refers to repetitive attacks against an individual's character causing damage and hindering progress in game, without the transmission of voice or text cues.

achievement and success	
Escapism from real life	
Entrepreneurial / business skills	

#### 4. DEVELOPMENT OF A NOVEL TAXONOMY

Whilst there is a plethora of literature available on specific aspects of MMORPGs, no taxonomies exist in which the opportunities and risks in virtual world environments are defined in a cohesive and holistic fashion.

There are five taxonomies that are connected with online risk and privacy; the Privacy Goals Taxonomy [1], Young people and risk online [29], Taxonomy of Privacy [36], A Taxonomy for Risk Assessment [2] and Comparing Children’s Online Opportunities and Risks across Europe [18]. The first taxonomy [1] mainly focuses on privacy of data for business and commerce and identified risks are categorised into seven classes of threat. The second taxonomy put forward by O’Connell and Bryce [29] focuses on the online risks faced by teenagers and behaviours are represented in terms of physical, psychological and social well-being of children and young people. The third taxonomy [36] identifies privacy harms and problems. Four categories and many sub categories are identified including: Information Collection, Information Processing, Information Dissemination and Intrusion. The fourth taxonomy developed by Atkinson et. al. [2] focuses on risk assessment for two vulnerable groups: teenagers and domestic abuse survivors. Three risk categories were identified in terms of the potential impact where damage to personal privacy could take place: Propensity for Harm, Divulging Personal Information and Unauthorised Intrusion. Furthermore four categories were identified where risks to individuals manifested themselves: E-Sociability, Data Boundaries, Access Control and Technological Impact. The proposed framework aimed to provide consistency to experts responsible for evaluation of risk. The fifth taxonomy put forward by Livingstone and Haddon [26] and further developed by Hasebrink et. al. [18] classified children’s online risks and opportunities. The horizontal axis of their taxonomy reflected three modes of online communication: one-to-many (i.e. child as recipient of mass-distributed content); adult-to-child (i.e. child as participant in an interactive situation predominantly driven by adults); and peer-to-peer (i.e. child as actor in an interaction in which s/he may be initiator). The vertical axis was divided into two categories: opportunities and risks, with four sub categories in each. Opportunities category encapsulated: Education learning and digital literacy, participation and civic engagement, creativity and self-expression and identity and social connection. Risks category incorporated: commercial, aggressive, sexual, values.

Hasebrink et. al. [18] further developed the taxonomy proposed by Livingstone and Haddon [26] and took into account that opportunities and risks are transactional results of access, usage, the child’s role and underlying communicative motives. Access refers to the location in which a child can engage online and usage is concerned with the kinds of services used and for what purpose. In addition, positive and negative consequences were identified as a result of specific behaviours defined within the taxonomy.

Whilst these taxonomies provide sound coverage of the Internet environment, they do not adequately address the unique

opportunities and risks inherent in MMORPG environments identified in Table 1. The novel taxonomy of opportunities and risks is introduced and discussed in the following section.

#### 4.1 Taxonomy Structure

The first stage of development analysed the applicability and suitability of Livingstone and Haddon’s [26] taxonomy structure, including the three modes of communication (one-to-many, adult-to-child and peer-to-peer) and the categorisation of risks and opportunities. This structure was analysed in conjunction with findings from the two studies conducted by Sanders et. al. [32, 33]. The structure and category labels were considered appropriate except that the scope of ‘children’ was widened to incorporate teenagers and young adults. The horizontal axis labels were therefore substituted with the string of ‘vulnerable individual’ in place of ‘child’. The scope was widened to vulnerable individuals as previous studies highlighted that a wide age range of participants engage and interact in MMORPG environments [32, 33, 42]. In addition, the evidence base for the proposed taxonomy put forward by Sanders et. al. [32, 33] consisted of responses from adult participants (i.e. over the age of 18). Van Evra [37] asserts that using adult-originated or official accounts of children’s experiences in lieu of direct research with children must be recognised as problematic. In light of the foregoing the evidence base was not considered representative of children’s experiences and perceptions.

The ‘Values’ category was adjusted to include morals, norms and lifestyle as according to findings by Griffiths and Hunt [16] and Sanders et. al. [32, 33], addictive elements specific to MMORPG environments can in some cases cause a change to an individual’s norms, morals and lifestyle (e.g. self-destructive behaviour resulting from MMORPG addiction).

#### 4.2 A Novel Taxonomy of Opportunities and Risks in MMORPG Environments

Combining evidence from studies by Sanders et. al. [32, 33], Yee [42] and Griffiths and Hunt [16], 20 opportunities and 13 risks were identified from participant responses (Table 1). The second stage of development refined the aforementioned opportunities and risks and structured them into the taxonomy shown in Figure 1.

The probability and impact of the opportunities and risks identified in our taxonomy are subject to three influencing factors: access, usage and motivations. Hasebrink et. al [18] notes that access and usage are two necessary conditions for any positive or negative experience related to the internet. In addition, Yee’s [42] highlights the wide variation of player motivations and reinforces the appeal of MMORPG’s to such a diverse range of people.

Opportunities		One to Many Content: Vulnerable individual as recipient of mass distributed content	Adult to Child Contact: Vulnerable individual as participant in an interactive situation predominately driven by adults	Peer-to-peer Conduct: Vulnerable individual as actor in an interaction in which he/she may be initiator	Positive Consequences
ACCESS, MOTIVATION AND USAGE	Education learning and digital literacy	Presents challenges, raises confidence, develop unique skill sets	Contact with other player who share one's interest	Peer-to-peer learning and team work	Develop skills and problem solving abilities
	Participation and civic engagement	Widening participation	Exchange of knowledge and idea amongst players	Concrete forms of civic engagement	Concrete forms of civic engagement
	Creativity and self-expression	Diversity of roles, character types and guild memberships	Being inspired to participate in a socially equal environment	User generated add-on, plug-ins and enhancements	Creation, engagement and exploration
	Identity and social connection	Information to enhance game play experiences	Networking with like minded individuals	Expression and experimentation of identity	Identity, self expression and social networking

Risks		One to Many Content	Adult to Child Contact:	Peer-to-peer Conduct:	Negative Consequences
ACCESS, MOTIVATION AND USAGE	Commercial	Addictive advertising, rewards and incentives	Tracking/harvesting personal information	Account hijacking, virtual mugging and social engineering	Virtual crime, financial and privacy loss
	Aggression	Desensitising to violent, gruesome, harmful content	Being bullied, harassed or stalked (including 'griefing')	Bullying or harassing another	Desensitisation, increased aggression and harm
	Sexual	Desensitisation to sexual/intimate scenes	Meeting strangers, being groomed	Erotic role play. Exposure to sexual conversation	Desensitisation and sexual harm
	Values, morals, norms and lifestyle	Addiction and self destructive behaviour	Unwelcome persuasion and justification of obsessive/addictive behaviour	Social dependency to MMORPGs and real life social isolation	Time, addiction and dependency

**Figure 1: Novel Taxonomy of Opportunities and Risks in MMORPGs**

Access refers to the physical location where a vulnerable individual engages with the online gaming environment. Physical locations include the home, school or with friends [18]; each of which change the potential probability and impact of the defined opportunities and risks. For example, the home environment may

be subject to parental control whilst the school environment could maximise educational and learning opportunities.

Motivation and Usage refers to player motivations for game play and duration of engagement. Yee's [42] classification of motivations juxtaposed with studies on addiction and data disclosure [32, 33] revealed that motivation for game play and duration of engagement change the potential probability and impact of the defined opportunities and risks. For example, a player that is classified as primarily motivated by social facets of the game could be more likely to develop a social dependency to MMORPG's. Moreover, a player motivated by achievement is more likely to engage in the environment for excessive amounts of time increasing the likelihood of addictive and self-destructive behaviour. In addition, the greater amount of time invested in MMORPG play, the greater the probability of experiencing certain opportunities and risks [18].

Consequences, "Actions have consequences" [25] and the last column in our taxonomy (Figure 1) highlights the positive and negative consequences which may arise from embracing one or more of the identified opportunities and risks. Incidences of each positive and negative consequence were validated using empirical data [32, 33]. Section 4.3 examines the theories and supporting data for each element of the novel taxonomy.

### 4.3 Content Validation

Taxonomy Category	Opportunity/Risk	Supporting Data & Theories
Education learning and digital literacy	Presents challenges, raises confidence, develop unique skill sets	In line with previous research [42, 20] participants reported their enjoyment of challenges presented in game and increased levels of confidence and self-esteem. Furthermore, findings [33] showed that structural characteristics of the game facilitated the development of what players perceived to be unique skill sets. For example 66% of participants stated that the game provided them with a sense of purpose and invoked a feeling of being valued and respected [34].
	Contact with other players who share one's interest	Evidence suggests [33] that a significant proportion of players engage in online gaming environments who are predominately motivated by the highly social element. For example, Sanders et. al. [32] found that 53% prefer to socialise within MMORPG environments than with real world offline friends and 80% had formed particularly close friendships with other

		MMORPG players.
	Peer-to-peer learning and team work	Collaborative co-operation significantly increases the rate of progression in game [8] and respondents highlighted the importance of working as part of a team [33]. In addition, the majority of gamers preferred to learn in-game techniques and enhance knowledge through peer observation.
<b>Participation and civic engagement</b>	Widening participation	It is commonly acknowledged that some players perceive MMORPG's as an environment in which all players are equal. Janger [22] notes that online gaming is an effective way for some individuals to deal with certain disabilities. In line with Yee's [42] work on escapism, Connell [9] asserts that MMORPG's provide an arena for the less able to experience a sense of freedom from real life physical constraints.
	Exchange of knowledge and ideas amongst players	Participants reported that whilst the main focuses of conversations were directly related to game play, a wide range of issues were discussed amongst players. Indeed, 96% of respondents discussed personal issues not related to game play [32].
	Concrete forms of civic engagement	Evidence suggests [32, 33] that MMORPG's have caused a shift change in communication preferences with 53% of players preferring to socialise within online gaming areas as opposed to face-to-face contact; 52% found playing an MMORPG more exciting than going out with friends and 51% found interacting with online friends easier than conversing with real world friends [32].
<b>Creativity and self-expression</b>	Diversity of roles, character types and guild memberships	Players commented on the appeal of the diverse roles and character types within the game [33]; with 31% of players owing 5 or more different avatars. Experienced players capitalise on the strengths of certain characters to compensate for the weaknesses of others within their collection of avatars. Other players

		highlighted the different challenges associated with different guild memberships.
	Being inspired to participate in a socially equal environment	In line with Yee's [42] research on achievement, players are often inspired by highly skilled guild members and feel encouraged to participate. In addition, the online gaming arena is perceived by many as an environment in which players are equal and free to express themselves in forms unavailable in a real world context [42].
	User generated add-ons, plug-ins and enhancements	MMORPG environments such as World of Warcraft provide players with the opportunity to create user-generated content such as add-ons; plug-ins and macro scripts enabling players to personalise and enhance game play experience [10] as well as developing their innovation and creativity skills.
<b>Identity and social connection</b>	Information to enhance game play experiences (e.g. forums, public chat channels)	Online gaming environments are typically supported by public chat channels and forums. Players regard these facilities as important knowledgebase for both synchronous and asynchronous sharing of information with one participant referring to the World of Warcraft forum as "an encyclopaedia of game play techniques" [40].
	Networking with like-minded individuals	MMORPG environments provide players with a fully immersive environment in which like-minded individuals can network and co-operate together to achieve shared goals. Online gamers typically have shared common interests strengthening player to player relationships.
	Expression and experimentation of identity	Many gamers experiment with their online gaming identities for a myriad of reasons including materialistic benefits and varying levels of respect from peers. Findings by Hussain and Griffiths [16] suggest that the online female persona has a number of positive social attributes in a male-oriented environment.

		Their study also revealed that 57% of gamers had engaged in gender-swapping, similar to the findings of Sanders et. al. [33] who found 56% of players had previously gender-swapped. Other players prefer to use their character as a channel to express their true feelings, emotions and real life personalities [21].
<b>Commercial</b>	Addictive advertising, rewards and incentives (e.g. free trials)	It is commonly acknowledged that subscriber based MMORPG environments (e.g. World of Warcraft, Everquest) offer free monthly trials to potential new customers and gamers who recently deactivated their account. Some participants highlighted the dangers of such methods to individuals with a predisposition or previous record of pathological gaming. Yee [41, 42] states that goals and rewards typically use a random ratio reinforcement schedule based on operant conditioning. Hence, early achievements are quick, almost instantaneous; however as a player progresses in the game the amount of time, effort and level of complexity is increased until progression becomes almost imperceptible.
	Tracking/harvesting personal information	Participants reported sophisticated gamer profiling through MMORPG servers [33]. A significant proportion of players also regularly searched social networking websites (e.g. Facebook, MySpace) to reveal the true identity of other [33]. Thus increasing the opportunity for exploitation of vulnerable individuals. In addition, Hayes [19] highlights gamers concerns of insecure or compromised game servers.
	Account hijacking, virtual mugging & social engineering	Many respondents perceived account hijacking and virtual mugging to be the most common risks in MMORPG's with these risks rising exponentially with character level and experience [32, 33]. The term "Virtual mugging"

		refers to the use of software applications that run over the web, known as bots, to defeat other player's characters and take their items [19]. 4% of participants also observed the use of social engineering techniques to obtain account credentials and personal information [32].
<b>Aggression</b>	Desensitising to violent/ gruesome/ harmful content	The effect of violent and gruesome content in videogames is a widely researched subject [12, 13]. Wei [39] found sustained relationships between exposure and pro-violent attitudes and empathy when exposure was examined simultaneously with gender, computer use, and Internet use. In line with these findings, participants echoed similar views in the context of vulnerable individuals.
	Being bullied, harassed or stalked (including 'griefing')	Cyber bullying in online interactive environments (e.g. Instant Messengers) is not a new phenomenon, however, MMORPG's have been identified as a unique platform for new approaches of cyber bullying [7]. Players report frequent acts of unacceptable behaviour, including harassment and cyber stalking. In addition many players highlighted the emerging problem of 'griefing' [33]. It is defined as unacceptable, persistent behaviour and is typically targeted at inexperienced gamers by those with more knowledge of the gaming environment [7]. Griefing takes many forms and can be achieved without the transmission of voice or text cues.
	Bullying or harassing another	In line with Yee's [42] classification, positive correlations were found between players who were predominately motivated by 'achievement' and the use of intimidation, with 26% of participants exhibiting high levels of intimidation in game [33]. Whilst a number of online games (e.g. World of

		Warcraft, Runescape) have implemented anti-cyber bullying features built into games, evidence suggests their effectiveness is limited.
<b>Sexual</b>	Desensitising to sexual/intimate scenes	Previous research has highlighted the damaging effects of exposure to cybersex and sexually intimate scenes, with a particular concern on children and other vulnerable individuals [34, 26]. Reinforced by participant views, such exposure could bring a potential for harm [33].
	Meeting strangers, being groomed	In line with Joinson's [23] theories of hyper personal interaction, online gaming environments are unique arenas in which players are forced to collaborate to achieve complex tasks. Trust is an integral facet of the game and is further reinforced by the mythical and chivalric setting [42]. Indeed, participants acknowledged these unique factors as potentially advantageous for individuals with darker motives [32].
	Erotic role play. Exposure to sexual conversation	Erotic role play and sexual conversation is a commonly acknowledged facet of MMORPG game play [28] and psychologists highlight the potential damaging and desensitising effects of engaging in such behaviour [39].
<b>Values, morals, norms &amp; lifestyle</b>	Addiction and self-destructive behaviour	Addiction to MMORPG's is one of the most widely researched areas of online gaming environments [16, 24] with more recent research identifying positive correlations between addiction and personal data disclosure [32, 33]. In addition, a plethora of research has uncovered the negative real life ramifications of pathological gaming including, financial loss, impact to family life and friendships, increased depression, anxiety and damage to career to name a few [32].
	Unwelcome persuasion & justification of	Twinned with addiction and addictive advertising, pathological gamers reported

	obsessive and addictive behaviour	significant peer pressure from other guild members when attempting to reduce their hours of game play with 29% unsuccessfully attempting to cut down their hours spent playing MMORPG [32]. In addition participants highlighted frequent justification of pathological gaming tendencies amongst players [33, 3].
	Social dependency to MMORPG's and real life social isolation	In line with Yee's [42] work on social motivations, many studies highlight the impact of MMORPG's on real world social interaction with 53% of participants preferring to socialise in MMORPG environments than real world offline environments and 51% finding interaction with online friends easier than real world friends [32].

## 5. CONCLUSIONS

This study maps out the different forms of opportunities and risks and validation is provided through the use of empirical data from a range of reliable and credible sources. In addition, positive and negative consequences are identified as a result of encountering one or more opportunities and risks.

For academics, our taxonomy serves as a basis for future research into opportunities and risks in Massively Multiplayer Online Role Playing Games. From an industrial perspective, gaming companies could utilise this taxonomy when developing new games and expansion packs to maximise the potential opportunities to gamers whilst minimising the potential risks.

It is, however, important to note the limitations of this taxonomy. Firstly, players may engage in MMORPG environments for a number of different reasons, some of which may change throughout their time of engagement. With this in mind, Yee's [42] classification was not explicitly defined in the proposed taxonomy as further qualitative research is required to correlate opportunities and risks with motivations and usage. Secondly, the prevalence and associated impact of the identified opportunities and risks was not investigated, providing scope for a future ethnographical study which would further validate the contents of the taxonomy as well as understand the actual level of risk in comparison to perceived risk. Thirdly a cross-national comparison of findings would reveal any cultural biases.

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