The Factors Affecting Perceived Playability of Hardcore and Casual Players in Online Role-Playing Games

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Abstract

Purpose－A new design concept, playability, has emerged and been advocated as a decisive factor for players' gameplay experiences. The present study intends to identify what playability factors might affect players' gaming experiences, particularly from the perspective of individual motivation.

Design/methodolgy/approach－According to the game heuristics and playability design guidelines, the present study developed and managed a wide-scale survey to investigate the determinants of playability, reflecting hardcore and casual players' RPG gaming experiences.

Finding－The survey results revealed that the Gameplay dimension is primary decisive factor leading players to value the playability of an online role-playing game, following by Game Interface and then Game Mechanics. From the hardcore players' point of view, Gameplay is definitely more important than Game Interface, while Game Interface is equally important to Game Mechanics. From the casual players' point of view, Gameplay is positioned at the same critical level as Game Interface while Game Interface has a stronger impact than Game Mechanics.

Research limitations/implications－The results of the present study can merely provide information of which design factors of playability might be deemed important by players from the perspective of individual motivation. In addition, although the

emotion issue is highly related to the psychological dimension of the player's gaming experience, it wasn't included in this investigation due to the limitation of the survey method, and the match between issues of emotion and playability has yet to be specified.

Practical implications and originality/value－From the survey results of the present study, it provides a useful design reference for game developers. What players consider to be a good game largely lies more on the hedonistic level than on the ergonomic level. In other words, usability design in online role-playing game environments comes second to the emotional elements.

Keywords:　playability; player types; role-playing games

影響核心玩家與休閒玩家認知線上角色扮演遊戲可玩性之因素探討

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摘要

自 1980 年起，線上遊戲可說是整個數位娛樂產業中發展最為快速的領域，其中的角色扮演遊戲（Role-Playing Game／RPG）市場，受到多數核心型玩家喜愛。面對激烈競爭，遊戲設計者的挑戰，是如何去創造兼顧基本易用性，與具高度樂趣的遊戲環境；換言之，協助玩家產生遊戲經驗（Gameplay experience），為設計的關鍵。然而，此議題在過往人機互動設計相關研究中，並未有太多著墨。延伸自傳統的易用性觀念，本研究旨在調查角色扮演遊戲中，影響核心型玩家與休閒型玩家，可玩性（Playability）遊戲經驗的設計因素面向。

關鍵詞：可玩性、玩家類型、角色扮演遊戲

1. Introduction

Despite many concerns from various public authorities, with the widespread use of the internet, online games have deeply impacted the life of new generation users in forms of cultural symbols, economy, and technologies (de Aguilera & Méndiz 2003). More than 217 million online players worldwide and one in four internet users frequently visit sites offering with gaming functions (Scott & Porter-Armstrong 2013). This new form of entertainment media transforms users into digital natives (Palfrey & Gasser 2013) on a daily basis - collaborating in a group for a dragon-slaying quest, selling virtual items or property for a living, switching gender or marrying someone they never meet in real life (Yee 2006). Online games have thrived to become one of the primary gateways to the virtual world. With attributes rooted in facilitating communication, information sharing, and problem solving, this new media has induced the divisions of governments, corporations, schools, the military, and other social groups to consider the possibility of applying its advanced technologies to solve problems (Charsky 2010). The understanding for how users might interact with game-based environments is certainly demanded. Compared with other electronic applications developed within the usability regulations, the interaction paradigms and user goals of these game-based environments are very different. Online game designs highlight players' feelings of enjoyment instead of their performances in terms of efficiency, effectiveness, and satisfaction, which define the benchmarks of conventional systems.

A new design concept, playability, has emerged and been advocated as a decisive factor for players' gameplay experiences. However, unlike usability, which has been thoroughly explored by the HCI field over the past decade, playability issues remain relatively unstudied (Olsen, Procci, & Bowers 2011). Without a systematic framework, game designers can merely rely on intuitions and experiences for the design tasks. Also, it is important to differentiate between concepts of playability and sociability based on players' intrinsic motivations - individual motivation and interpersonal motivation. The present study intends to identify what playability factors might affect players' gaming experiences, particularly from the perspective of individual motivation, and it's aiming two goals. First, the way playability fits in the design concept in relation to usability will be explored. And then, the study will continue to investigate the fundamental determinants of playability as viewed by hardcore and casual players in the context of

Massively Multiplayer Online Role-Playing Games (MMORPGs).

2. Literature Review

2.1 Online Role Play Games

"What is a game?" A game is a combination of procedures of human mental activities and body movements and has been recognized as a critical component in human social and cultural development (Raessens & Goldstein 2011). According to Costikyan (1994) and Gredler (1992), computer games are *"a form of art in which participants (players) contest (play) with adversaries by operating through game tokens under constraints (rules) and make decisions in order to manage resources in the pursuit of a goal."* That is, driven by inner motivations, players actively engage the games which provide not only easy amusements but also endeavoring challenges to increase their enjoyment levels.

Digital games have blossomed since the genesis of the internet. The worldwide digital game marketplace has reached $93 billion in 2013, up from $79 billion in 2012, and is expected to reach $111 billion by 2015 (Gartner, Inc. 2013). In addition, ever since 2000, the number of PC game players in the United States had been already three times more than the total number of people who attended amusement parks, and the number of Major League Baseball fans (IDSA 2000). One of the most successful genres of computer games is Massively Multiplayer Online Role-Playing Games (MMROPGs), which are rooted in predecessors such as *Dungeons & Dragons*, *Multi User Dungeons* (MUDs)(Cuciz 2002), and *Ultima Online*. The basic concept of this game genre is that one or more fantasy characters (avatars) are chosen to operate and complete various quests on behalf of the player in a shared virtual environment. To succeed, players have to demonstrate advanced problem solving skills and reasoning techniques.

Although collaboration among players' avatars is commonly encouraged in Player vs. Environment (PvE) mode in online RPGs, it needs to be noted that players also appreciate designs allowing them to play alone (Korhonen & Koivisto 2007), such as the lately introduced Player vs. Player (PvP) mode. The primary difference between First Personal Shooting (FPS) games and PvP in online RPGs is the speed at which a new character matures. In the FPS games, players can be cast straight into a fighting mission right at the beginning, and have access to weapons and capabilities that are roughly similar to all other players in the game. That is, the players can be equipped with mature skills throughout the games but have little room for improvement. However,

in the PvP mode, players are allowed through various means to improve their avatars' skills or levels, and at the same time retain their own personal play styles. FPS Players might find the PvP context more entertaining because it provides not only the battlement with program-controlled monsters or a human-controlled combatant, but also the real challenges from players around the world.

According to Pardo (Blizzard VP of design) (2006), one of the possible features contributing to the enormous success of World of Warcraft (WoW) is the PvP mode. In this mode, players can solo, i.e. play alone, their avatars to the highest level. It is also a natural devolvement that once players no longer need to work as a group to get "experience" (e.g. PvE), the possible way to advance their avatars is by obtaining "epic" gear or a reputation in a more competitive context (e.g. PvP). In response to this special need, the popular online RPG, Dark Age of Camelot (DAOC) refined social systems through a public ranking system to allow PvP play mode, and rewarded players with weapons, armor, transportation, and access to special areas. Similarly, the restriction for shifting between PvE and PvP servers in WoW was lifted in September, 2008, which was also long anticipated by many players. Such new trend has started to have impact on game experience in way that might eventually affect what Jakobsson and Taylor (2003) contend to be the ultimate end-game structural characteristic, the social network design (PvE). That is, since it is much harder for players to achieve the same level in PvP servers as in PvE servers, players with high levels acquired from PvP servers will be greatly admired at the time of team recruiting for PvE missions. Players' leveling concepts and gaming behaviors might thus be transformed.

In general, the gaming functions to support players' individual motivations are essential not only for the PvP mode but also for the PvE mode. Therefore, the value of these functions should not be underrated in anyway than that of the functions crafted from players' interpersonal motivations. Considering the significance of individual motivations, it is necessary to bring into discussion the notion of playability. Playability is the design concept mainly developed for the game-based environment to keep the player's entertainment thresholds low and to enhance satisfaction (Sánchez, et al. 2012; Korhonen 2011). The following section will elaborate the playability concepts, especially from the perspective of individual motivation.

2.2 Beyond Usability?

2.2.1 From Productivity to Enjoyment

In our daily lives, *enjoyment* constantly directs every act of choice and avoidance. For the past 25 years, the primary focus for the field of Human-Computer Interaction (HCI) is the concept of 'usability', which mainly concerns work and work systems (Carroll 2004). In many aspects, usability (ISO9241-11) seems to evolve around optimizing users' behavior rather than their experiences, such as the pleasure coming from aesthetics, narrative, or interaction within a group. Jordan (1998) regarded usability as a concept that did not reflect much of '*the positive feelings such as, e.g. pride, excitement or surprise*.' (p.26) Similarly, Charles et al. (2005) noted that research in User-Centered Design (UCD) has mostly focused on productivity issues. Pioneering researchers like Malone (1980) and Carroll and Thomas (1988) had earlier pushed to incorporate related enjoyment issues into the HCI field, but without much avail (Monk, Hassenzahl, Blythe, & Reed 2002). With the proliferation of digital technology rapidly switching user experiences from work to everyday life, enjoyment can no longer be dismissed from the context of IT development and must be treated as one of the preeminent qualities (Draper 1999). Now the enjoyment and fun issues are starting to attract attention from the HCI community. Current works, such as emotional design (Norman 2004), product and system design for pleasure (Jordan 2000; Porat & Tractinsky 2012 Reinmoeller 2002), relations of usability and feelings of fun (Diah et al. 2010; Hart et al. 2008), affecting and persuasive computing (Fogg 2003; DiSalvo, Sengers, Brynjarsdóttir 2010; Purpura, Schwanda, Williams, Stubler, & Sengers 2011), enjoyable interface for enjoyment and inner motivation (Malone 1984; Shneiderman 2004), aesthetic and usability (Lavie, Oron-Gilad, & Meyer 2010; Shin 2012), Computer Support Cooperative Play (CSCP) (Wadley et al. 2004), game-based learning (Prensky 2001), playability (Federoff 2002; Olsen, Procci, & Bowers 2011), and the notion of "Serious Game" (Charsky 2010), all go beyond entertainment and are applied to training, policy exploration, analytics, visualization, education, and health and therapy.

In general, related studies can be divided into two main themes: (1) complementing or transcending the concept of usability, and (2) review of the theoretical base of usability. The former attempts to switch the approaches from usability-based to pleasure-based (Dillon 2001; Jordan 2000), and the topics involved include emotion, aesthetics, fun, and enjoyment. The latter speculates that the appropriateness of HCI is grounded in the domain of information processing psychology (Bannon 1990; Kuutti 1996). Critics of the existing mainstream knowledge surfaced as this ideological trend drawing extensive discussions. Man-machine interaction nowadays does not just occur

between one system and one singular user. The "human actor" concept was added to the dominant "human factor" discipline (Bannon 1991) to reflect the importance of communication, corporation, and coordination in real practice. Contextual factors (Bargas-Avila & Hornbæk 2011) and recent emotional trends have brought vital changes to design.

2.2.2 From "Easy to use" to "Fun to play"

As enjoyment and fun have become the desirable goals of study, further ontological questions are raised, including whether the topics involved differ in any noteworthy way from designing for usability. According to Frokjaer, Hertzum, and Horbaek (2000), usability consists of three independent measures - efficiency, effectiveness, and satisfaction. Efficiency describes the least amount of resources users expend to complete a task; effectiveness refers to the completeness and accuracy of achieving a goal; and satisfaction represents overall subjective feelings of how pleasant it is to use a system (Shackel 1991). These three measures are mainly dedicated to a single issue: interface. As with other applications, computer game players also have to operate through an interface to interact with objects within such environments. Nevertheless, being easy to use might not equal being fun to play. Entertaining users is a much more complicated job than assisting them to complete tasks easily. For instance, in order to keep intrinsic motivation and to achieve optimal flow experience (Csikszentmihalyi & LeFevre 1989; Deterding, Dixon, Khaled, & Nacke 2011), a fantastical and challenging environment is necessary. With appropriate levels of challenges, players will strive to develop competence by repeatedly practicing new skills which in turn strengthens their desire to remain in the game, and leads to immersion. Apparently, efficiency is not sufficient to illustrate players' cognitive responses based on their personal values. There is a similar problem in the measurement of effectiveness as computer games usually do not have definite endpoints or paths. Even satisfaction, the axis of usability closest to the indicator of subjective feelings, is dependent on the result of productivity rather than the degree of enjoyment (Lindgaard & Dudek 2003). The goals of productivity to make software easy to learn and master are somewhat different from the goals for games, which are usually adjusted to "easy to learn, difficult to master" (Burgun 2012). In the phenomenon of computer games, there are other properties in addition to usability that should be considered to characterize the comprehensive user experiences. In short, the present study falls into "complementing or transcending the concept of usability" theme and particularly focuses on the

playability issue.

2.3 Playability

Playability is a term that depicts a player's individual experience about function, interaction, storyline, and the audio and visual effects of a certain game. It mostly concerns the extrinsic design issues rather than the internal individual matters, like playfulness (Ahn, Ryu, & Han 2007; Chiang & Lin 2010), refer to the cognitive tendency of how easily a player might immerse, imagine, or enjoy a gaming process. Nokia Research Center (2003) proposed a taxonomy to examine playability: context, usability, story, interactivity, and technology. Playability is defined as '*the degree to which a game is fun to play with an emphasis on the interaction style and plot-quality of the game: the quality of gameplay.*' (p17) In sum, playability is a qualitative concept encapsulating guidelines or criteria for the development and evaluation models of computer games.

Järvinen, Heliö, and Mäyrä (2002) (Table 1) categorized playability into four components: (1) functional, (2) structural, (3) audiovisual, and (4) social. The functional component deals with variables of functional operations of playing games. It carries a family semblance to usability with a special focus on entertainment. Regarding the structural component, it defines interaction patterns and structure directed by game stories and game rules. And the audiovisual component creates the special audiovisual effects to attract and target a certain player segment. The former three components appear to capture gaming experiences within the domains of individual intrinsic motivations, the last component focus on interpersonal issues. Through in-game and off-game functionalities, players settle in a group to develop self-recognition and a sense of belonging. The social component represents the systems design of supporting group communication and social presence. The term *sociability* was coined by scholars (Preece 2001; Stenros, Paavilainen, & Mäyrä 2009) in reference to the system-supported social interaction in topics like Computer Support Corporation Work (CSCW) and Computer Support Corporation Play (CSCP) (Ishii et al. 1999). Comparing with the former three components which are closely associated with functionalities and features of a computer game, the social component is apparently of different nature as it is constructed from the individual-based perspective. These four components might still share the same property - usability. The social component will be excluded from further discussion for it is beyond the focus of the present study -

playability.

Table 1：Playability taxonomy

Authors	Playability	Sociability
Jarvinen, Helio, & Mayra (2002)	Functional, Audiovisual, Structural	Social
Clanton (1998)	Game Interface, Game Mechanics, Gameplay	
Fabricatore, Nussbaum, & Rosas (2002)	Entity, Scenario, Hierarchy of goals	
Nokia Corporation (2003)	Context, Usability, Interactivity, Story	
Desurvire, Caplan, & Toth (2004)	Game play, Game story, Game Mechanics, Game Usability	

2.3.1 Dimensions: Game Interface, Game Mechanics, and Gameplay

From the perspective of individual motivation, a more appropriate differentiation of playability developed by Clanton (1998) is widely adopted by most scholars. Clanton classified playability into three dimensions: Game Interface, Game Mechanics, and Gameplay. *Game Interface* refers to the facilities or functions that players operate to interact with the game. It includes hard input devices like a joystick or a mouse, and soft interfaces like icons or entities to control and execute selected tasks during gaming. Players use game interface facilities to configure games, move through game fields, operate game tokens, or compete against program-controlled characters. In other words, game interface is what Rouse (2001) views as the input/output elements during the gameplay period. The designs of these elements profoundly contribute to the player's engagement with a game. Game interface is thus one of the preconditions for achieving game flow experience (Järvinen, Heliö, & Mäyrä 2002).

Game Mechanics refers to the physical or functional aspects of the game, such as animation and programming. How players' tokens and Non-Player Characters (NPC) react (run, fly, fight…) or look like are all examples of possible mechanics. It consists of all levels of operations and covers the programming structure by which units interact within the game environment. Cooperating with high resolution graphics, game mechanics also play an important part in contributing to the vividness of the effects. The objects' physical characteristics are the main focuses of game mechanics, for instance,

the trajectory of firing arrows, the sharp turns of high speed pursuit, and the feelings of correct weight or momentum. In a sense, both *Game Mechanics* and *Game Interface* are relatively close to conventional usability (Federoff 2002).

Gameplay represents the period from when a player enters a game till he / she completes the mission or leaves the game. It represents the specific game construct normally including rules, goals, stories, structure, policies and challenges. Rouse (2000) described gameplay as the degree to which and the nature of how players and games are able to respond to each other. It is driven by the combination of external pace and cognitive efforts. In fact, the *Gameplay* dimension could be viewed as the key cutting point to discriminate between playability and traditional usability.

2.3.2 Categories: Entity, Scenario, and Hierarchy of Goals

Fabricatore, Nussbaum, and Rosas (2002) further narrowed down the individual aspects of playability into three categories: *Entity*, *Scenario*, and *Hierarchy of Goals*. *Entity* refers to avatars or tokens which inhabit the game world. By controlling the avatars, players tele-present themselves in the virtual world. This is different from the conventional means of escape when accessing media like movies, books or music. While playing games, the user has a visible 'agent' residing in the contents to serve as his / her 'virtual body' to execute orders and to endure any consequence of the quests. The avatars do not necessarily have to appear as human beings, but might exist in the form of a mythical creature such as a centaur, or a machine such as a racing car. It basically functions as an interface of the visual signifier to receive and output information in the fictional world (Trepte & Reinecke 2010; van Looy, Courtois, & de Vocht 2012). That is, the avatars embody the player's sense of make-believe as well as define the possible spaces between game stories and their masters by responding according to the rules and contexts of the game (Klevjer 2006). Other than players' avatars, there are various program-controlled tokens that are characterized as either amiable or hostile towards players' actions, namely, the Non-Player Characters (NPC).

Scenario illustrates a responsive environment in which audiovisual elements are essential and are installed to ensure perceptual quality. This category relates closely to perceptive fun as defined by Kim, Choi and Kim (1999). Perceptive fun consists of vividness and imaginativeness. The former is for the creation of reality and the latter equates to fantasy (Malone 1983; Rouse III 2010). There are several elements contributing to vivid scenes. For instance, 3D graphics and viewpoints present surrounding environments which define how players see the world. Whether the

first-person or the third-person viewpoint is the best camera angle to immerse players in the game is undetermined. Rollings and Adams (2003) suggested while the third-person viewpoint provides players to observe their own avatars completely and offers a wider view than the first-person view, the continual shifting of players' roles between actor and observer interrupting their immersive experience. By fixing the player in the first-person viewpoint, players can see events through the eyes of their avatar, and quickly establish relationships between objects and scenes. Taylor (2002), proclaimed a different view. From the perspective of constructing an embodied representation within the game space, he proposed the third-person viewpoint as a better way to help players conceptualizing physical relationships among the player's avatar and the space and objects around it. Beside the game viewpoints, correct visual metaphors corresponding to game stories and spontaneous changes in the movements of character- and field-based orientations are all important factors in creating a dynamic presentation of vividness (Rieber & Noah 2008; Fabricatore, Nussbaum & Rosas 2002).

Sound effects, animation and visual range are elements which provoke imaginativeness. Today, the sound effects of computer games are no longer limited to beeps as they were in the 1980s but are now HiFi quality. Together with high resolution graphics, the background sound and special sound effects could easily stimulate players' imagination. The best examples are like in the movie *Jaw*s, in which the increasing tempo of the music is spine chilling and triggers the viewer to imagine the shark's attack with its huge jaws and sharp teeth. Besides sound, non-interactive animation could also obviously interest users when they enter the game at the beginning or are waiting at the transition points (Clanton 1998). Visual range in a game is related to the amount of information that players are able to see at any one time. In adventure games, unexplored spaces will not be seen until players find them. Arcade games, like basketball games, however, display the full extent of the basketball court, which enables players to be aware of the situation of both teams.

Hierarchy of Goals is related to the complexity, sequence (cause-effect, chronologic), and challenges (Malone 1984) of a game. By careful design, challenges structure the goals of games throughout the main gameplay process from the beginning to the end. They motivate players to actively shape their problem-solving skills and strategic planning capabilities (Stapleton 2004). As a result, players are not only excited by their victories in reaching each stage goal, but also perceive high self-fulfillment due to the acquisitions of new skills or self reputation that make them eager for more challenges from the next level. In other word, this mechanic of balancing capability and

challenges with optimal flow results (Csikszentmihalyi 1998; Hwang, Wu, & Chen 2012) immerses players physically and mentally on their way of marching to the final game goal.

In summary, the *Game Interface* dimension focuses more on the usability and interactivity issues of the three categories of playability. The *Game Mechanics* dimension consists of the functionality and technology aspects, And finally, the *Gameplay* dimension mainly reflects the game story and individual characteristic issues of the three categories of playability (Table 2).

Table 2：The playability elements of the interaction between player and game

Playability (Individual Motivation)	Game Interface	Entity Scenario Hierarchy of goals
	Game Mechanics	Entity Scenario Hierarchy of goals
	Gameplay	Entity Scenario Hierarchy of goals

2.4 Hardcore and Casual Players

Players' characteristics have been widely perceived to have significant implications for game design. In general, scholars tend to think of players as falling into the following two categories - the hardcore and the casual. In the literature, the discussions of hardcore and casual players generally lay particular stress on motivation and social-cultural constructs. Bartle (1996) first classified players of the MUD into a quadrant of achiever, explorer, killer and socializer. Steinkuehler's (2005) proposal of two predominant axes: social interdependence / social dependence and play / efficiency, further provides a structured framework of players' styles. Casual players are similar to explorers (Chao 2008) while hardcore players are similar to achievers and killers (Fritsch, Voigt, & Schiller 2006). That is, casual players might play just for joy. They are less tolerant of frustration when they lack experience. In contrast, hardcore players usually aim to beat the game. They are early adopters who emphasize on goals, story, and delivery of functional capability in games (Rogers 1995). Noted by Ernest Adams (2000), a hardcore player is described as one who takes playing games as more than just

a light entertainment. He / She "*plays for the exhilaration of defeating the game.*" It is the center of their leisure life which requires absolute dedication. As a result, casual players might need a better user interface to reduce errors and cognitive load, whereas hardcore players tend to care more about the challenge issues of a game.

Traditionally, games have always targeted the hardcore audience for appreciation and approval, though it might only cover approximately 10% of the gaming population (Noble, Ruiz, Destefano & Mintz 2003). The game design highly emphasizes the need to meet the intuitional intentions of the minor but vocal hardcore-user market, assuming the same quality would appeal to the much larger casual group. Nevertheless, whether the same game design can provide the stimulation to the casual group remains to be seen. Certainly, the opinions of hardcore players should not be deemed any less important. However, as Norman (1998) has predicted, if a system is only designed to delight sophisticated technological users and neglects to support the needs of normal users, a high acceptability can hardly be expected. It is extremely important to understand not only the differences between the two market segments, but also the playability elements attractive to each of them. This is thus a critical issue demanding further investigation.

2.5 Summary

In the current MMORPG environments, players' actions could be roughly classified into two levels: collaboration action based on interpersonal motivation and competition action based on individual motivation. The former lies in the sociability dimension while the latter falls within the playability dimension. Inferred from the literature, the design philosophy of sociability tends to increase the social interaction rather than the competition among players. The sociability issue should be distinguished from the playability issue. The playability issue in MMORPG mainly concerns how the game system can support a player to face challenges, to compete against others, and to acquire enjoyment.

With games, optimizing the efficiency of behavior alone might not be enough to evoke users' enjoyment experience. Enjoyment comes from playing. Despite progress in the relative heuristic development of playability, scholars actually know little about what factors of a computer game actually impact players' feelings of enjoyment (Hassenzahl, Burmester, & Beu 2001; Squire, Giovanetto, Devane & Durga 2005). In particular, which playability elements, Game Interface, Game Mechanics, or Gameplay,

are comparatively perceived as the principal factors by hardcore or casual players has yet to be unveiled. An investigation on the driving forces embedded in the designs of popular games, such as the MMORPG genre, can highly benefit the developments of future game-based environments (Grice & Strianese 2000).

Based on the literature review above, Figure 1 outlines a conceptual model for the variables of this study.

Perceived Playability								
Game Interface (GI)			Game Mechanics (GM)			Gameplay (GP)		
Entity (GIE)	Scenario (GIS)	Hierarchy of goals (GIG)	Entity (GIE)	Scenario (GIS)	Hierarchy of goals (GIG)	Entity (GIE)	Scenario (GIS)	Hierarchy of goals (GIG)

(Row labels at left: Hardcore Player / Casual Player)

Figure 1：The conceptual model of study variables

There are four research problems developed for guiding the inspection.
1. What are the primary factors that affect players' perceived playability in the MMORPG environment?
2. What are the primary factors that affect hardcore players' perceived playability in the MMORPG environment?
3. What are the primary factors that affect casual players' perceived playability in the MMORPG environment?
4. Comparing hardcore players with casual players, what are the primary factors that might affect these two segments of players to perceive playability in the MMORPG environment?

3. Methodology

3.1 Study Design

The research methodology employed for this study was a large-scale survey to collect focus opinions of how hardcore and casual MMORPG players in Taiwan

estimate the importance of playability in terms of three main dimensions - Game Interface, Game Mechanics and Gameplay, as well as their underlying sub-categories – Entity, Scenarios, and Hierarchy of goals. Surveys are an efficient method to study users' attitudes, values and beliefs. They can explore and establish relationships among variables (Kirk 1995). According to a market analysis research from International Data Corp. (2006), the Asia / Pacific online game market (excluding Japan) has been on an astonishingly rapid growth path. With the emerging IT industries from India and Vietnam, it was estimated that by the end of 2010 this largest online game market in the world would triple the market size in 2006. Mainland China is the focus of the market, but this type of online entertainment service is still just starting to take off. In comparison with Hong Kong or Singapore, undoubtedly, Taiwan represents a relatively mature and completely developed online game market in the Mandarin-speaking area. The survey results of this region could provide valuable information to profit the future development of the global online game industry.

The factor analyses were carried out to verify loadings and reliability coefficients of questionnaire items, as well as their validity. A composite reliability of Cronbach's alpha .70 or greater is considered acceptable (Fornell & Larcker 1981). When appropriate, matched sample t-tests and one-way analysis of variance were applied to investigate study hypotheses.

3.2 Instruments

This survey was packaged into two parts: the *Gamer-Dedication Scale* and the *Perceived-Playability Scale*.

3.2.1 Gamer-Dedication Scale

Developed by Ip and Adames (2002), the *Gamer-Dedication Scale* (GD) provides a statistical mechanism to distinguish hardcore and casual players in a very precise way. This method uses the 15 most pertinent factors (Table 3) associated with players' characteristics to classify Players. Subjects circled items on a Likert scale of 1-5 to depict their statements of "strongly disagree", "disagree," "neither disagree nor agree," "agree," or "strongly agree" for each factor item. The self-ranked score for each factor was given its corresponding weighting and used to calculate the subject's overall gamer-dedication score using the formula below:

$$GD = \frac{\sum_{j=1}^{n} w_j s_j}{\sum_{j=1}^{n} 5 w_j} \qquad (n = 15; \text{ s = self-ranked score; w = weight})$$

Table 3：The 15 Factors and associated weightings (Ip & Adames 2002)

Factors of classification	Weighting
1. Play games over many long sessions	10
2. Discuss games with friends/bulletin boards	10
3. Comparative knowledge of the industry	10
4. Much more tolerant of frustration	9
5. Indications of early adoption behavior	9
6. Desire to modify or extend games in a creative way	8
7. Technologically savvy	7
8. Have the latest high-end computers/consoles	7
9. Play for the exhilaration of defeating (or completing) the game	7
10. Hunger for gaming-related information	6
11. Engaged in competition with himself, the game, and other players	6
12. Willingness to pay	5
13. Prefer games that have depth and complexity	3
14. Time started playing games relative to the age of the industry	2
15. Prefer violent/action games	1

A higher score indicates a stronger game-dedication level for a subject. Subjects with GD scores below 30 are *ultra casual* / *non gamers*; those with scores 30-45 are *casual gamers*; with 46-55 are *transitional* / *moderate* gamers; those with scores 56-70 are *hardcore* gamers; and those with scores above 70 are *ultra hardcore* gamers (Ip & Adames 2002). The transitional / moderate gamers were disqualified subjects for the purpose of the present study, and thus were excluded from the data analysis. Only the data of subjects with GD scores lower than 45 (casual players) and higher than 56 (hardcore players) were eligible for further analysis.

3.2.2 Perceived Playability Scale

This instrument includes three parts: *Instruction*, *Basic personal information*, and

Questions. The *Instruction* part describes the purpose of the present study, participants' rights and compensation, and the way to answer the questionnaire. The *Basic personal information* requires subjects to provide information such as age, gender, the names of the main role-play online games they play, and the length of time subscribing to this online game (months, years). The process of developing the *Questions* part is presented here.

Step 1. Collecting the initial set of playability guidelines

The present study adopted game playability heuristics from the past as references to develop the questionnaire. In order to achieve rigorous survey results and enhance content validity, these playability heuristics needed to be verified or at least extracted directly from players, instead of just being deduced from the designers' experiences or theories. This became the criteria for selecting articles during the bibliographic source reviewing process. According to the review of related studies from 1982 to 2004, Malone (1984) experimented on 80 fifth grade subjects and suggested 9 heuristics for designing an enjoyable interface; Federoff (2002) verified 32 game heuristics through field observation and interviews of a game design team. Fabricatore, Nussbaum and Rosas (2002) adopted the grounded theory method and concluded over 148 game design guidelines; Desurvire, Caplan and Toth (2004) validated 43 game heuristics. Thus, the initial set of 232 playability design guidelines was collected.

Step 2. Reviewing the initial set of playability guidelines

An internal review was conducted to identify and combine duplicate items. Six reviewers with strong research backgrounds of user experience and interaction design were invited to review the initial set of playability items. Each of them has at least three years of professional experience on design and development in the computer game industry. The present study adopted the *usability guideline review process* developed by the US Department of Health and Human Resources (2006) as a framework to proceed with the internal review. The process is as follows:

1. Identify and combine duplicate guidelines
2. Identify and resolve guidelines that conflict with each other
3. Determine the 'Relative Importance' of each guideline
4. Determine the 'Strength of Evidence' for each guideline

A 5-point Likert scale with the anchor set from 'not important' to 'very important' was used to rate the 'Relative Importance' of each guideline in the practice of the

MMORPG environment. The inter-rater reliability of 'Relative Importance' was Cronbach's alpha = .92. In the same way as the criteria for estimating 'Strength of Evidence', reviewers used a 5-point Likert scale to rate each guideline (Table 4). The inter-rater reliability of 'Strength of Evidence' was Cronbach's alpha = .87.

Table 4：Strength of Evidence (US Department of Health and Human Resources 2006)

1 - Weak Expert Opinion Support	No research-based evidence; Limited or conflicting expert opinion
2 - Strong Expert Opinion Support	No research-based evidence • Experts tend to agree, although there may not be a consensus • Multiple supporting expert opinions in textbooks, style guides, etc. • Generally accepted as a 'best practice' or reflects 'state of practice'
3 - Weak Research Support	Limited research-based evidence; Conflicting research-based findings may exist; There is mixed agreement of expert opinions
4 - Moderate Research Support	Cumulative research-based evidence; There may or may not be conflicting research-based findings; Expert opinion tends to agree with the research, and a consensus seems to be building
5 - Strong Research Support	Cumulative and compelling, supporting research-based evidence; At least one formal, rigorous study with contextual validity; No known conflicting research-based findings; Expert opinion agrees with the research

Based on the above processes, this internal review reduced the initial set to 80 guidelines.

Step 3. Determining the relevance of guidelines to playability categories

To determine the appropriate category for each guideline, a coder analysis approach was applied here. Three coders were invited to help categorizing these guidelines according to the appropriateness of their attributes into the matrix of playability elements (Table 2). After training, a pretest was first conducted to establish intercoder agreement. Coders independently marked each of 18 randomly selected guidelines from the initial guideline set by a number of 1 to 9 to indicate its playability category (Game interface: entity = 1, scenario = 2, hierarchy of goals = 3; Game Mechanics: entity = 4, scenario = 5, hierarchy of goals = 6; Gameplay: entity = 7,

scenario = 8, hierarchy of goals = 9). This trial session revealed that the intercoder reliability is .74. After discussing each disagreement and coming to a consensus resolution, the intercoder reliability was re-assessed on another random selection of 18 guidelines and achieved Cronbach's α = .93 which fits Fliess' (1981) agreement level of "excellent".

Coders then moved on to the formal categorizing session and began to label these playability guidelines into the relevant categories. The numbers of guidelines for each of these 9 sub-categories of playability are listed on Table 5. The result of intercoder reliability of this formal session was Cronbach's α = .91.

Table 5：Numbers of playability guidelines

	Dimensions	Sub-categories	items	
Playability (Individual Motivation)	Game Interface (GI)	Entity (GIE)	10	Sub total: 26
		Scenario (GIS)	9	
		Hierarchy of goals (GIG)	7	
	Game Mechanics (GM)	Entity (GME)	8	Sub total: 24
		Scenario (GMS)	9	
		Hierarchy of goals (GMG)	7	
	Gameplay (GP)	Entity (GPE)	12	Sub total: 30
		Scenario (GPS)	10	
		Hierarchy of goals (GPG)	8	
				Total: 80

Step 4. Developing questionnaire from guidelines

Based on these 80 playability guidelines, the author developed the *Perceived Playability Scale* (PPS) (see Table 6 for sample items). All question items were mixed randomly. Subjects were instructed in this *Questions* part to rate from 1 to 7 (Figure 1) to best indicate the importance of each playability design issue, and calculated the strengths of the specific subordinate categories that might affect their perceived playability of the MMORPG environment.

Based on your own experience of playing online role-playing games, please indicate the degree of importance from 1 to 7 of the following issues which will affect your gaming experiences.

1 Not important at all	2 Unimportant	3 Not very important	4 Moderately Important	5 Important	6 Very important	7 Extremely important	**Degree of Importance**
24. The appearance should always convey some information about what an entity is wearing or using.							____

Figure 2：Example question item of *Perceived Playability Scale*

A pilot test of 20 subjects was administered to verify the final instrument before it was applied to the complete sample. Based on the results, several items were reworded. Higher scores infer a higher degree of importance.

Table 6：Sample items of playability questionnaire

Dimension	Category	#	Question item	Resource
Game Interface	Entity	12.	A player should always be able to identify their score/status in the game	Federoff, 2002
		54.	Player's should perceive a sense of control and impact onto the game world.	Desurvire et al., 2004
	Scenario	4.	The interface should embody *emotionally appealing* fantasies	Malone, 1984
		27.	When using a third-person view, use the representation of the player's token (i.e., motion and appearance) to transmit information about what it is doing.	Fabricatore et al., 2002
	Hierarchy of goals	8.	The interface provide *performance feedback* about how close the user is to achieving the goal	Malone, 1984
		73.	Minimum information regarding progress should include data about failures, to allow the player to learn from his or her own errors.	Fabricatore et al., 2002
Game Mechanics	Entity	34.	Use motion to transmit information about the consequences of interactions such as a fight,	Fabricatore et al., 2002

			because it is a clear and immediately perceived means.	
		61.	Mechanics/controller actions have consistently mapped and learnable responses.	Desurvire et al., 2004
	Scenario	55.	Mechanics should feel natural and have correct weight and momentum	Federoff, 2002
		23.	Game should react in a consistent, challenging, and exciting way to the player's actions (e.g., appropriate music with the action).	Desurvire et al., 2004
	Hierarchy of goals	47.	Temporarily freezing the game flow while the player is reading a map may benefit beginners, but it compromises the realism of the game.	Fabricatore et al., 2002
		35.	The Player can easily turn the game off and on, and be able to save games in different states.	Desurvire et al., 2004
Gameplay	Entity	71.	One reward of playing should be the acquisition of skill	Federoff, 2002
		64.	The interface embody *metaphors* with physical or other systems that the user already understands	Malone, 1984
	Scenario	39.	Limit the length of noninteractive animated sequences to avoid disruptions in the game flow.	Fabricatore et al., 2002
		51.	Provide consistency between the game elements and the overarching setting and story to suspend disbelief.	Desurvire et al., 2004
	Hierarchy of goals	18.	The outcome of reaching the goal is uncertain	Malone, 1984
		30.	Vary the difficulty level so that the player has greater challenge as they develop mastery.	Desurvire et al., 2004

3.3 The Sample Group

According to the survey result of internet usage in Taiwan (MIC annual report 2006), 73% of internet users' primary activities were computer gaming. Among them, over 64% of users were dedicated to the online game genre. The majority of online gamers was the student group aged from 15 to 19 which makes up 56.4% of the total computer game population. Taking this into consideration, the present study selected Taiwanese senior high school students aged between 16 and 18 as the major sample pool. According to Comrey (1973), a sample size of 100 is poor, 200 is fair, 300 is good, 500 is very good, and 1,000 is excellent. The survey questionnaires were distributed to six randomly chosen senior high schools from around Taiwan. A total of 1,540 questionnaires were distributed. In all, 942 responses were received, giving a response rate of 61%.

As described above, the *Gamer-Dedication Scale* was used to help determine player segments of either hardcore or casual. According to the GD scale authors, subjects with GD scores above 55 were identified as hardcore players and those with scores below 46 were identified as casual players. As a result, after removing 297 invalid subjects who either were not online role-play gamers or who were identified as a player level of transitional / moderate, 665 subjects' survey data were eligible for further statistical analysis. The average age was 17.6. The proportions of online role-play game subscription were: World of Warcraft[1] - 27%, Lineage II[2] - 25%, Maple Story[3] - 19%, Ragnarok Online[4] - 18%, and Cabala Island[5] - 11%. Among them, 48% of subjects (317) were identified as hardcore players (GD mean = 61.87) while 52% were casual players (348) (GD mean = 32.30). Nearly 62% of subjects were male (412) while 38% were female (253).

3.4 Procedure

In preparation for this survey, firstly, according to the cluster sampling process, the present study retrieved the list of all Taiwan national senior high schools from the web site of the Taiwan Ministry of Education. These schools were clustered into north,

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1   World of Warcraft (http://www.wowtaiwan.com.tw)

2   Lineage II (http://lineage2.plaync.com.tw)

3   Maple Story (http://tw.beanfun.com/Maplestory/main.aspx)

4   Ragnarok Online (http://ro.gameflier.com)

5   Cabala Island (http://www.cabala.im/)

central and southern regions based on their locations. The researcher then randomly selected (by drawing lots) two schools from each region. A total of six senior high schools were chosen. After acquiring the agreement of school administrators and class instructors, the researcher or trained assistants went to classes in person and conducted the survey. In addition to giving details of the study purpose and the way to answer this survey, all students were also notified that a lottery would be held at the end of the project. This strategy significantly motivated students to complete the survey. The average time to complete the survey was 54 minutes. The period of data collection for this survey was from February 18 to June 30, 2007.

4. Results

4.1 Discriminant Validity and Convergent Validity

According to the results, the *Gamer-Dedication Scale* showed a relatively high construct reliability of .89. Means and standard deviations of subjects' GD scores were: casual player (Mean = 1.38, 0.85; SD = 0.27, 0.13), and hardcore player (Mean = 0.90, 0.87; SD = 0.08, 0.11). Pearson's *r* test of correlation was performed to test the *Perceived Playability Scale* (PPS) for the reciprocal relationship among 9 playability dimensions. Table 5 shows a correlation matrix of variables. No significant inter-correlation (Table 7) was found to indicate the possibility of multi-collinearity existing among these 9 sub-categories of playability. In addition, except for the loading of 2 question items (items 16 and 74) being lower than 0.5 which were thus omitted, the remaining 78 question items were eligible for further analysis. The internal reliability of each of the composite constructs was measured by Cronbach's α coefficient, which were all within the acceptable level (Cronbach's α > 0.8) (Nunnally 1978).

The measurement model of confirmatory factor analysis (CFA) was applied to measure the construct validity of the 9 playability categories by using LISREL 8.12. As Hair, Anderson, Tatham, and Black (1995) suggested, the goodness of fit index (AGFI), the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the normed fit index (NFI), are indices that could more correctly reflect a model fit. It is generally suggested that both NFI and CFI be larger than 0.9, while RMSEA lower than 0.1 is considered as statistically well-accepted (Diamantopoulos & Siguaw, 2000). The results (Table 8) of the modified version of PPS acquired better model fit indices (AGFI = 0:84; RMSEA = 0.072; CFI = 0.93; NFI = 0.92), which were all within acceptable limits (Brown & Cudeck, 1993; Fornell & Lacker, 1981). Therefore, it may

be concluded that these 121 questions have appropriate convergent validity and converged nicely into the 9 corresponding categories of playability.

Table 7：Correlation matrix among 9 sub-categories of playability

	GIE	GIS	GIG	GME	GMS	GMG	GPE	GPS	GPG
GIE	1.00								
GIS	0.40	1.00							
GIG	0.32	0.37	1.00						
GME	0.41	0.39	0.46	1.00					
GMS	0.34	0.44	0.27	0.38	1.00				
GMG	0.24	0.40	0.36	0.45	0.47	1.00			
GPE	0.48	0.23	0.42	0.30	0.39	0.25	1.00		
GPS	0.43	0.22	0.36	0.29	0.46	0.30	0.35	1.00	
GPG	0.47	0.41	0.38	0.42	0.33	0.43	0.27	0.38	1.00

GIE, Game Interface-Entity; GIS: Game Interface-Scenario; GIG: Game Interface-Hierarchy of goals
GME: Game Mechanics-Entity; GMS: Game Mechanics-Scenario; GMG: Game Mechanics-Hierarchy of goals
GPE: Gameplay-Entity; GPS: Gameplay-Scenario; GPG: Gameplay-Hierarchy of goals
* $p < .05$
** $p < .01$

Table 8：Goodness of Fit Measures

Fit statistics	80-item of PPS	78-item of PPS	Threshold
p-value	0.000	0.000	>0.05
AGFI	0.81	0.84	>0.80
RMSEA	0.067	0.072	>0.06
CFI	0.93	0.93	>0.90
NFI	0.91	0.92	>0.90

Since there was only one variable, the subject's game dedication level (hardcore vs. casual), in the present study, multiple t-tests were applied to analyze the data. The null hypotheses of each research question were examined and only the significant results are reported as follows.

4.2　Research Question 1:

"What are the primary factors that affect players' perceived playability in MMORPG environments?"

From the results of the paired sampling tests of the three playability dimensions (Table 9), *Gameplay* (mean = 5.362) was significantly more important than *Game Interface* (mean = 5.253)($t_{(665)}$ = 8.190, p = .000) and *Game Mechanics* (mean = 5.192)($t_{(665)}$ = 8.654, p = .000); *Game Interface* was significantly more important ($t_{(665)}$ = 2.569, p = .000) than *Game Mechanics*. The null hypothesis was rejected. There were significant effects among *Game Interface*, *Game Mechanics* and *Gameplay* which would influence players' perceived playability. Apparently, *Gameplay* was perceived as the primary playability dimension by players affecting their experiences of the MMORPG environment.

Table 9：Playability dimensions and sub-categories

Dimension	Mean	t	p		Sub-category	Mean	t	p
Game Interface	5.253	-8.190	.000		Entity	5.334	1.569	.117
Gameplay	5.362				Scenario	5.298		
Gameplay	5.362	8.654	.000		Scenario	5.298	6.567	.000
Game Mechanics	5.192				Hierarchy of goals	5.159		
Game Interface	5.253	2.569	.000		Entity	5.334	7.543	.000
Game Mechanics	5.192				Hierarchy of goals	5.159		

P* < .05　　P** < .001

For the sub-categories (*Entity*, *Scenario*, and *Hierarchy of Goals*)(Table 10), players obviously weighted *Entity* (mean = 5.334)($t_{(665)}$ = 7.543, p = .000) and *Scenario* (mean = 5.298)($t_{(665)}$ = 6.567, p = .000) as more important issues than *Hierarchy of Goals* (mean = 5.159) in affecting their perceived playability of an online role-play game. In other words, *Entity* is equal to *Scenario* ($t_{(665)}$ = 1.569, p = .117) which were both ranked higher than *Hierarchy of Goals* as critical design issues affecting the perceived playability of an MMORPG environment.

As for the effects of sub-categories under each playability dimension, in *Game Interface*, the analysis (Table 10) suggested a significant effect ($t_{(665)}$ = 4.477, p = .000) existing between *Hierarchy of Goals* (mean = 5.330) and *Entity* (mean = 5.219) in

affecting the perceived playability of the *Game Interface* dimension. *Hierarchy of Goals* was also a much more critical issue ($t_{(665)}$ = 3.283, p = .001) than *Scenario* (5.180) in determining the playability value of *Game Interface*.

When it came to comparing the effects of these three sub-categories in the *Game Mechanics* dimension, *Entity* (mean = 5.416) obviously outscored *Hierarchy of Goals* (mean = 4.790) ($t_{(665)}$ = 11.864, p = .000) in impacting the perceived playability of this dimension. Similarly, *Scenario* (mean = 5.415) was considered superior to *Hierarchy of Goals* in affecting the playability value of *Game Mechanics* ($t_{(665)}$ = 13.309, p = .000).

In the *Gameplay* dimension, players viewed *Entity* (mean = 5.538) and *Hierarchy of Goals* (mean = 5.357) equally ($t_{(entity / hierarchy of goals)}$ = 1.010, p = .313) and both were more important than *Scenario* (mean = 5.300) ($t_{(scenario / hierarchy of goals)}$ = .427, p = .209; $t_{(entity / scenario)}$ = .273, p = .108) in influencing the playability level during the *Gameplay* period.

Table 10：Comparisons of sub-categories within playability dimensions

	Game Interface			Game Mechanics			Gameplay		
	Mean	t	p	Mean	t	p	Mean	t	p
Entity	5.219	.333	.739	5.416	.446	.641	5.538	.427	.209
Scenario	5.180			5.415			5.300		
Entity	5.219	-4.477	.000	5.416	11.864	.000	5.538	1.010	.313
Hierarchy of Goals	5.330			4.790			5.357		
Scenario	5.180	-3.283	.001	5.415	13.309	.000	5.300	.273	.108
Hierarchy of Goals	5.330			4.790			5.357		

$P^* < .05$　$P^{**} < .001$

4.3 Research Question 2:

"What are the primary factors that affect hardcore players' perceived playability in MMORPG environments?"

According to the statistical results, hardcore players apparently prize *Gameplay* (mean = 5.496) as the significant dimension when compared with *Game Interface* (mean = 5.391)($t_{(317)}$ = 6.635, p = .000) and *Game Mechanics* (mean = 5.356)($t_{(317)}$ = 6.106, p = .000) in affecting the perceived playability of the MMORPG environment. As for the sub-categories (*Entity*, *Scenario*, *and Hierarchy of Goals*), hardcore players

viewed *Entity* (mean = 5.484) as being equal with *Scenario* (mean = 5.479) ($t_{(317)}$ = .249, p = .803) for their degrees of affecting playability, and both dimensions exhibited stronger impacts ($t_{(entity / hierarchy of goals)}$ = 6.846, p = .000; $t_{(scenario / hierarchy of goals)}$ = 6.517, p = .000) than *Hierarchy of Goals* on hardcore players' perceived playability.

In terms of which sub-categories under the three playability dimensions affect hardcore players' perceived playability of the MMORPG environment (Table 11), overall, *Hierarchy of Goals* (mean = 5.462) was viewed as the significant sub-category of the *Game Interface* dimension compared to *Entity* (mean = 5.355, $t_{(hierarchy of goals / entity)}$ = 2.846, p = .005) and *Scenario* (mean = 5.357, $t_{(hierarchy of goals / scenario)}$ = 3.457, p = .001).

In the *Game Mechanics* dimension, hardcore players reported *Entity* (mean = 5.625) as being a more dominant sub-category ($t_{(317)}$ = 10.416, p = .000) than *Hierarchy of Goals* (mean = 4.901) in affecting perceived playability. Also, *Scenario* (mean = 5.601) stood out as a stronger sub-category ($t_{(317)}$ = 10.018, p = .000) than *Hierarchy of Goals*. Among these three sub-categories, *Entity* was ultimate important one to hardcore players when helping to determine the playability level.

Table 11：Comparisons of sub-categories within playability dimensions-hardcore players

	Game Interface			Game Mechanics			Gameplay		
	Mean	t	p	Mean	t	p	Mean	t	p
Entity	5.355	.064	.949	5.625	1.104	.270	5.532	2.698	.007
Scenario	5.357			5.601			5.459		
Entity	5.355	2.846	.005	5.625	10.416	.000	5.532	3.158	.001
Hierarchy of Goals	5.462			4.901			5.460		
Scenario	5.357	3.457	.001	5.601	10.018	.000	5.459	.105	.840
Hierarchy of Goals	5.462			4.901			5.460		

P^{*} < .05　P^{**} < .001

Likewise, the findings indicated that in the *Gameplay* dimension, *Entity* (mean = 5.532) posited the most significant effect on hardcore players' perceived playability compared to the other two sub-categories ($t_{(entity / scenario)}$ = 2.698, p = .007; $t_{(entity / hierarchy of goals)}$ = 3.158, p = .001). *Scenario* (mean = 5.459) and *Hierarchy of Goals* (mean = 5.460) worked equally importantly in the dimension of *Gameplay*.

4.4 Research Question 3:

"What are the primary factors that affect casual players' perceived playability in MMORPG environments?"

According to the statistical results, it is confident to say that casual players give equal weight to *Gameplay* (mean = 5.227) and Game Interface (mean = 5.215) ($t_{(348)}$ = - .598, p = .126), both of which are estimated to be more important than *Game Mechanics* (mean = 5.037)($t_{(348)}$ = 6.441, p = .000).

As for the sub-categories (*Entity, Scenario* and *Hierarchy of Goals*), overall, *Entity* (mean = 5.183) was deemed by casual players to be a more determinant sub-category than *Scenario* (mean = 5.116)($t_{(entity / scenario)}$ = 2.261, p = .025) and *Hierarchy of Goals* (mean = 5.042)($t_{(entity / hierarchy of goals)}$ = 3.441, p = .001). Apparently, the critical level of *Hierarchy of Goals* was not so high ($t_{(scenario / hierarchy of goals)}$ = 2.024, p = .045) to the casual players.

In terms of the sub-categories within each playability dimension (Table 12), casual players rated *Hierarchy of Goals* (mean = 5.182) as a more dominant sub-category than *Scenario* (mean = 5.070, $t_{(hierarchy of goals / scenario)}$ = 2.873, p = .005) in the *Game Interface* dimension. *Entity* was equally important to both *Scenario* and *Hierarchy of Goals*.

In the *Game Mechanics* dimension, casual players deemed *Entity* (mean = 5.266) to be the most prominent sub-category compared to *Scenario* (mean = 5.162) ($t_{(entity / scenario)}$ = 2.219, p = .028) and *Hierarchy of Goals* (mean = 4.683)($t_{(entity / hierarchy of goals)}$ = 8.607, p = .000) in affecting their gaming experiences. Evidently ($t_{(scenario / hierarchy of goals)}$ = 8.465, p = .000), *Scenario* was prioritized secondly and *Hierarchy of Goals* was treated as the sub-category with the least impact by casual players in this dimension.

In the *Gameplay* dimension, no significant result was found. This result suggests that casual players tend to rate the degree of importance of all three sub-categories equally.

Table 12：Comparisons of sub-categories within playability dimensions-casual players

	Game Interface			Game Mechanics			Gameplay		
	Mean	t	p	Mean	t	p	Mean	t	p
Entity	5.093	.699	.486	5.266	2.219	.028	5.191	1.072	.025
Scenario	5.065			5.160			5.123		

Entity Hierarchy of Goals	5.093	-1.672	.069	5.266	8.607	.000	5.191	-1.961	.052
	5.182			4.683			5.262		
Scenario Hierarchy of Goals	5.065	-2.873	.005	5.160	8.465	.000	5.123	-2.655	.201
	5.182			4.683			5.262		

P* < .05　P** < .001

4.5　Research Question 4:

"Comparing hardcore players with casual players, is there any difference among playability dimensions and sub-categories that might affect their perceived playability in the MMORPG environment?"

From the statistical analyses (Table 13), it can be concluded that hardcore players value both playability dimensions and sub-categories within each dimension as more important issues than casual players in impacting their perceived playability of the MMORPG environments. In other words, dimensions of *Game Interface* (F = 74.965, p = .000), *Game Mechanics* (F = 43.587, p = .000), and *Gameplay* (F = 52.319, p = .000) may all generate more effects on hardcore players than on casual players in the impact on their feelings for the playability of an MMROPG. The *Gameplay* dimension possessed the strongest effect. Similarly, compared to casual players, hardcore players highlighted the three sub-categories within each dimension, *Entity* (F = 39.354, p = .000), *Scenario* (F = 47.028, p = .000), and *Hierarchy of Goals* (F = 32.492, p = .000) as having significantly profound impacts on their gaming experiences.

Table 13： Playability dimensions and sub-categories - Hardcore players vs. Casual players

Dimension	Mean		F	p	Sub-category	Mean		F	p
	H	C				H	C		
Game Interface			74.965	.000	Entity			90.924	.000
	5.391	5.215				5.484	5.183		
Game Mechanics	5.356	5.037	43.581	.000	Scenario	5.479	5.116	73.251	.000
Gameplay	5.497	5.227	52.319	.013	Hierarchy of goals	5.274	5.042	18.958	.000

P* < .05　P** < .001

H: Hardcore　C: Causal

To analyze further in terms of the *Game Interface* dimension, all three sub-categories were appraised higher by hardcore players than by casual players (Table 14) for the effects that may significantly affect the *Game Interface* dimension. The following analyses of the *Game Mechanics* dimension and the *Gameplay* dimension revealed consistent results. The intensities of the three sub-categories in governing these two playability dimensions were all statistically scored higher by hardcore players than by casual players. Both the foremost and the irrelevant sub-categories were found in the *Game Mechanics* dimension. The former was *Scenario* (mean = 5.601) marked by hardcore players and the latter was *Hierarchy of Goals* (mean = 4.672) marked by casual players.

Table 14：Comparisons of sub-categories within playability dimensions - Hardcore players vs. Casual players

	Game Interface				Game Mechanics				Gameplay			
	Mean		F	p	Mean		F	p	Mean		F	p
	H	C			H	C			H	C		
Entity	5.355	5.039	39.354	.000	5.565	5.266	59.140	.000	5.532	5.191	84.001	.000
Scenario	5.357	5.065	47.028	.000	5.601	5.160	51.739	.000	5.459	5.123	50.472	.000
Hierarchy of Goals	5.462	5.181	32.492	.000	4.901	4.683	4.672	.000	5.460	5.262	16.240	.000

$P^* < .05$ $P^{**} < .001$

H: Hardcore   C: Causal

5. Discussion

5.1 The Chief Playability Dimension: Gameplay

The survey results validate and are consistent with Federoff's (2002) and Clanton's (1998) conclusions that the *Gameplay* dimension is primary decisive factor leading players to value the playability of an online role-playing game, following by *Game Interface* and then *Game Mechanics*. That is, enjoyment issues (*Gameplay*) are more important than usability issues (*Game Interface* and *Game Mechanics*) and determine

whether an online role-playing game has offered a good quality of playability. Also, how players might control and interact with games is more important than the physical or functional aspects of the game

Gameplay is the structural issue of a game that describes how an individual's efforts might interact with game storylines and rules to construct the basic interaction patterns and yield abundant variations. Juul (2002a, 2002b) has seen the story structures from the perspectives of *progression* and *emergence*. Progression structure requires players to go through a sequence of narrated incidents (Short 2001) based on the main story theme predefined by designers, whereas emergence structure consists of the variations constructed in the process of interacting with different professions of players' avatars, which are unexpected by game designers. Interactive storytelling (Crawford 2004) is the term used to describe such an issue. According to Crawford (2004), interactive storytelling is "*a form of interactive entertainment in which a player adopts the role of protagonist in a dramatically rich environment.*" Players get involved in the game at two levels (Braun 2002; Mateas & Stern 2000). The first level is to interact with the main theme of the game (progression structure) and the second level is to cooperate with others (emergence structure), actively encoding the story contents (Hagebölling 2004). Both levels of game stories reinforce the players' will to keep coming back to the game (Adams 2004). To some extent, game story is the key feature that can certainly create fantasy for players and which increases the emotional appeal of the game system. In fact, fantasy is the foremost feature Malone (1981) identified as not only ruling the game and triggering the player's intrinsic motivation, but also as having an overt form of control over a player when compared to the *Game Interface* and *Game Mechanics* dimensions (Schell 2003).

The other important issue of the *Gameplay* dimension is individual effort. According to flow theory (Csikszentmihalyi 1998), immersion can be viewed as the optimal experience of play. Whether one can easily acquire such experience during gameplay sessions might largely rely on the player's individual characteristics. Steuer (1995) views the immersion experience from the perspective of mental manifestation rather than from that of technological hardware. It is human's imagination and mindset that allows for mutual acceptance of illusory space (Biocca & Levy 1995). Technology only speeds up this process. Frederic (2001) conceptualizes gameplay as a progressive process of flow experience which highly demands players' emotions to direct their attention and cognitive capacity, so as to concentrate on the game tasks. Although this is initially a player's investment, at some point the game must offer something that makes

it worth playing, such as stories.

In addition, individual efforts in gameplay should also include personal cognitive traits, such as self-forgetfulness-consciousness style (Cloninger, Przybeck & Svrakic 1993) and playfulness characteristics (Hackbarth, Grover & Yi 2003; Chiang & Lin 2010), which strongly relate to personal willingness to suspend disbelief (Coleridge 1817). By suspending disbelief, players tele-present themselves in the virtual world. Their ideas, feelings and wishes thus appear in consciousness so as to receive *virtuality* as *reality* (Csikszentmihalyi 1978). Curiosity is another individual characteristic mentioned by Malone (1984). Together, interactive storytelling and individual characteristics cooperate to facilitate players' experience status in gameplay evolving from engagement to engrossment and finally to total immersion (Brown & Cairns 2004).

5.2 The Chief Sub-categories of Playability Dimensions: Entity and Scenario

From the study results of the playability sub-categories, it seems that *Entity* might be equally important to *Scenario* and both are valued more highly than *Hierarchy of Goals* in any playability dimension by both hardcore and casual players. In other words, for Taiwan region players, the functions and representations of players' avatars or Non-Player Characters (NPCs), as well as the vividness of the audiovisual effects, could be stronger factors than task challenges in affecting the quality of game playability.

With more and more environments run on virtual platforms for collaborative work purposes, avatars have become the center of users' experiences. The first step to take part in an online role-playing game is to construct an avatar which naturally becomes the primary interface to mediate between the player and the virtual world. An avatar is a digital agent that visually represents and acts on behalf of the player. This is true especially in an interactive storytelling context, where players rely heavily on their 'virtual bodies' to execute commands, receive action results, create vicarious identification, and simulate emotional responses (Castronova 2003).

The avatar is considered to be the major interface to connect a player's experience with possibilities afforded by MMROPGs (Sundblad & Wyver 2000). McKeon and Wyche (2006) concluded from their study of Second Life that avatars are the player's locus of identity. An avatar is not simply an extension of the player's body, but is the main part of the action and thinking in the digital world (Salen & Zimmerman 2003;

Wolf, 1997) which creates the effect of fictional agency. As Salem and Earle (2000) suggest, the rich expressiveness of embodiment agents strengthens players' communication performance. Players apply the given repertoires like crafting / fighting skills, body postures, facial expressions, and hand gestures to humanize their avatars from fully artificial at the low end to fully human at the high end (Blascovich 2002).

High resolution graphic and audio effects (*Scenario*) are considered as another equally important playability issue like Entity. According to Brown and Cairns (2004), to speed up player's immersion level, the first and foremost thing is to attract their attentions in the gaming engagement stage. The sensorial elements like audio and visual representations are essential to trigger oriented response (OR)(Bradley 2008) and activate players' emotional paths. In addition to give a rich sense of joy, the sensorial elements will also stimulate players' curiosity instincts and drive them to explore further of the surroundings (Dillon 2010) which is highly important for the set up of the possible hostile moments (e.g. awful monsters) to induce players' survival instincts with consequence of excitement to battle and confront challenges. In short, designs of vividness (Malone 1984) should emphasize both the player's avatar as well as the surrounding sensorial representations. This also explains why players prioritize *Entity* and *Scenario* in the *Game Mechanics* dimension, since this dimension is assumed to function as simulating precisely the physical characteristics of objects in the real world.

It is surprising, however, that *Hierarchy of Goals* (Challenges) overall did not acquire as much attention as expected from players. This result might due to the particular attributes of MMROPGs. Unlike single player games such as first shooter games or console games, in which players are promoted by defeating levels of challenges mostly by themselves, MMROPG players have to rely on other professional characters to survive. Even though most MMROPG games do offer instance dungeons similar to the turn-based mode, they still demand players and the groups they are part of to carry out especially for some important quests. The main purpose still aims to foster tacit understanding among group members, which is important for the future success of major in-game events. The computing 'personas' (Deray 2002) - avatars mediated among players, are therefore the essential issue.

5.3 Casual vs. Hardcore Players

To compare these two types of players at the dimension level, generally, hardcore players give more credit than casual players to each dimension and sub-category of

playability. From the hardcore players' point of view, *Gameplay* is definitely more important than *Game Interface*, while *Game Interface* is equally important to *Game Mechanics*. From the casual players' point of view, *Gameplay* is positioned at the same critical level as *Game Interface* while *Game Interface* has a stronger impact than *Game Mechanics*. Obviously, hardcore players prize *Gameplay* since they tend to be more like achievers (Lazarro 2004). Barr, Noble, Biddle & Khaled (2002) indicated that achievers in the video game genre deem progression and challenges (hierarchy of goals) as the incentive for playing games, whereas in the online role-playing game genre, they place greater value in the features of avatars that could lead them into the game stories. The same results can be inferred about the *Gameplay* and *Game interface* dimensions. As mentioned earlier in the literature section, because hardcore players are so serious about playing games, they are not aliens but inhabitants (Prensky 2001) in these virtual worlds. For them, gaming is the center of life. How rich or full of fantasy a game story is, will not just set or color the way of their cyber life, but will also have a great effect on how they might earn a living there. Similarly, interface

With a completely different attitude toward games from hardcore players, casual players are more like explorers by nature. They are simply looking for fun and consider online games as just another alternative for their leisure hours. Therefore, this group of players not only requires a fantasy game story but also demands a good design of *Game Interface* that matches the adage 'easy to learn, hard to master'. In particular, this preference strongly effects how these casual players think about *Hierarchy of Goals* in the *Game Interface*. Since they are not prepared to put up with too much frustration, either out of less experience or less ability, a user interface with good usability can effectively ease their cognitive load and allow them to concentrate on the challenging tasks in the game.

Second to *Entity*, both groups significantly emphasize the *Scenario* (audiovisual) effects in all three playability dimensions. Fabricatore, Nussbaum and Rosas (2002) indicated that players perceive game playability from the process of interacting with games. They divide the information that might be managed by players during the process into two types: functional and ambient information. Functional information facilitates players to understand and control the game system during gameplay. It is based on the player's cognitive operations that have long been the focus in the usability era. The playability dimensions of *Game Interface* and *Game Mechanics* are devoted to offering such types of information. In the present study, players are concerned with functional information from the perspective of the entity interface. Ambient information

works in a very different way that provides perceptual and emotional information designed to cultivate the atmosphere for attracting and maintaining players' attention. The audiovisual elements are a type of ambient information capable of directing players' perceptual responses and arousing their emotions (Frederic 2001). Accompanying the internal characteristics (imagination ability, willingness to suspend disbelief, etc.), this external factor forms the foundation to engage players in the game world, and ultimately achieves the optimal 'flow experience' (Csikszentmihalyi 1975; Csikszentmihalyi & LeFevre 1989).

6. Conclusion

Kim, Choi, and Kim (1999) proposed a model for fun game design. They divided the model into two parts: perceptive fun and cognitive fun. Perceptive fun includes vividness and imaginativeness, whereas cognitive fun includes challenge and satisfaction. From the survey results of the present study, it seems that both casual and hardcore players determine the playability quality of an online role-playing game mostly from the perspective of perceptive fun. What players consider to be a good game largely lies more on the hedonistic level than on the ergonomic level (Hassenzahl, Platz, Brumester, & Lehner 2000). In other words, usability in online role-playing game environments comes second to the emotional elements. This result basically supports Ye and Ye's (2004) gameplay model (Figure 3). There are four layers of game attributes affect a good playability experience: usability layer contains game mechanics forming the basic ground; game layer refers to game interface and gameplay that provide the main way to access contents and present sensorial information; the genre layer differentiates game types, like console game, MMROPG, mobile game; finally, the emotion layer depicts subjective emotional responses or joyful levels that is shaped by the previous layers.
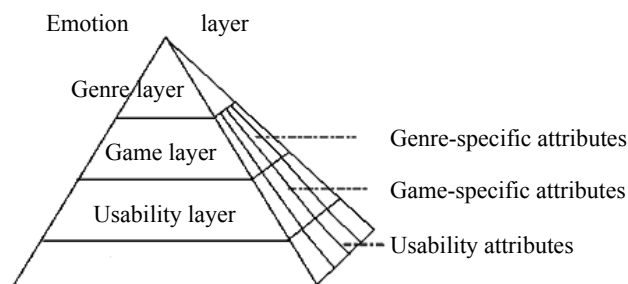

Figure 3：Gameplay Model (Ye & Ye 2004) (p2)

By telepresenting in the online game worlds through avatars, players become actively involved in the process of interactive storytelling for interesting choices and skill development corresponding to task requirements. If, at the end, this gaming process is to result in an enjoyable experience, it must be based on two prerequisites: story and entity. A great game story keeps players engaged and increases satisfaction. A good design of the avatar interface makes the inevitable bond between the virtual and real worlds transparent and releases users to concentrate on their challenging tasks.

A safe and 'easy to use' environment can not completely satisfy players. They will constantly seek feelings of pleasure and enjoyment. Epicurus in his *Letter to Menoeceus* remarked that humans are born by nature to pursue a pleasurable life. This provides us with a model of what to reject or accept. For the past decade, the hardcore design concept of interaction design has been the notion of usability (Carroll 2004) that is based on the cognitive framework to develop interactive systems matching users' mental models, reducing cognitive loads, and enhancing performance. This notion has contributed tremendously to the software industry. Rubin (2002) noted that usability from the past has evolved through three waves of development. The first wave started during WWII with producing usable or highly productive systems like fighter cockpits as the main goal. The point was not how to reduce pilots' cognitive loads but how to improve system performance (Bannon 1991; Lindgaard 2002). The second wave of development surfaced in the 1980s. The practices of evaluation and methods of usability engineering boomed (Weiss 1995) and began to take user experience into account. Mayhew (1999) described this wave of usability as '*a discipline that provides structured methods for achieving usability in user interface design during product developments.*' (p.3) Now, the third wave of usability stands on a transitional point that user experiences of daily life are important and should no longer be ignored. New usability (Thomas & Macredie 2002) has to provide designers and researchers with a foundation to cover contemporary usability issues such as living room systems, entertainment technologies and mobile devices. Playability is seemingly similar to usability but with substantial dustinction. The results of the present study might only partially shed light on its focus. The relationships between frameworks of game design and traditional HCI concepts have not been sufficiently defined, but will definitely yield an exciting future.

7. Limitations and Future Research

It should be restated again that the results of the present study can merely provide

information of which design factors of playability might be deemed important by players from the perspective of individual motivation. In addition, although the emotion issue is highly related to the psychological dimension of the player's gaming experience, it wasn't included in this investigation due to the limitation of the survey method, and the match between issues of emotion and playability has yet to be specified. Future research should integrate emotional elements, such as Norman's (2004) three layers of emotional design - visceral, behavioral, and reflective, to examine playability in a more exclusive way.

Furthermore, enhancing social interactions among MMROPG team members has been proposed to be one of the crucial tasks (Kim 2000). Investigations of what design dimensions or factors mean to players based on interpersonal motivation are an urgent need. Such study has its roots in the past works of Computer Supported Cooperative Work (CSCW) and might be extended to a new development concept - Computer Supported Cooperative Play (CSCP) that defines gaming experiences as '*mutual engagement by two or more individuals in recreational activity mediated by a computing environment.*' (Wadley et al. 2003, p1). Possible topics such as what functions and interaction styles could be used to support information awareness for different game characters. Design for sociability (Preece 2001) has laid out a fresh research area which demands further exploration. Other topics like 'how different professions of avatars might behave in what patterns during interactive storytelling of an online role-playing game?', 'what awareness information different professions of avatars are need on their players' interfaces?', and 'how an avatar can be designed for the purpose of enhancing the player's self identity?' are all valuable research issues as well.

Finally, unlike usability, playability lacks a substantial theoretical foundation. There are at least more than four theories - emotion, distributed cognition, activity theory, and flow theory, which might relate to the construct of game playability. It is in a keen on developing an appropriate theoretical framework for future research.

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