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A Computer Game Evaluation Model Based on Relationship between Personality Traits and Game-Related Preferences

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Abstract

Compared with the past, computer game industry in recent years are evolved as one of the most popular entertainment. Therefore, it is important to design, develop and promote computer game in more effective ways. We believe that the relationship between player's personality traits and their game-related preferences follows some regularities. In this research, we comb and summarise relevant theories as well as data from some quantitative surveys so as to identify this personality traits-game preference relationship. A theory model is proposed according to the corresponding relationship for evaluating computer games from three dimensions: Game Type, Game Enjoyment and Game Risk. As a result, by analysing the three aspects of computer game, target customers of the game could be targeted more accurately.

The player-centred idea of evaluating computer games might lead to a new direction of game design and promotion. Currently through case study in the present research, we can see the theory model has been working well on this evaluation. More correlative research is required to be done so as to improve this theory model and to evaluate games through more relevant elements and from more dimensions.

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1 Introduction and Background

Playing, the innate institute of human being, has occupied an important part of human life in both ancient and modern time. To some extent, playing took an indispensable role in the formation of the culture and institution of human society and even the rules and law of the animal societies (Jensen, 2013). In this way, playing is an essential part of human society rather than a pure entertainment activity, with society becoming more and more digital and technical, computer games were developed naturally.

'Computer game' is a term that is familiar to people nowadays, but it was in fact a new created term that contains "computer" and "game" in the early days, this kind of method of naming emphasised both of the elements computer and game. As a newborn industry, the computer game industry was originally started from 1952. Computer games are defined as a kind of digital entertainment where game players can interact with the digital interface and complete different achievements and tasks according to the designed mechanics of games. At that time, computers were quite rare mainly to be used as computing tools for study on sciences or other technology, using computers as entertainment tools was not acceptable enough. Development of computer games thus became much more difficult. With the efforts of excellent programmers and developers, computer game, in a duration less than 40 years, has developed from basic graphics on the screen for the sake of entertainment to a big industry that can be applied to several different fields like playing, education and rehabilitation training etc. and has made incredible economic benefit so far (Wolf, 2008).

Computer game playing in recent years has gradually evolved as one of the most popular entertainment activities not only among young generations but also the old people. People with different backgrounds, nationality, gender and ages play games with different aspirations. These aspirations then fundamentally influence their choices of games as well as other game-related behaviours. In balance, all these elements influenced players' choices and behaviours by determining their personality characteristics.

Players' personality traits influence their game-related behaviours and preferences, these game-related behaviours and the games they choose, in turn influence their real-life behaviours and preferences. Personality traits' effects on game playing have been significant to the computer game field especially game designing. Therefore, based on the differences in aspirations and preferences of games, some existing studies have defined classified player types, analysed some gamers' game preference and did some relevant surveys to prove the relationship between personality traits and players' preference in computer games. There are also a few researches that have investigated the connection between computer games and some of the existing gamers' behaviours in real life such as aggressive behaviours and addiction. However, these existing researches did not delve deeper into the aspects of specific in-game behaviours comprehensively to discuss about how gamers' personality traits influence

their game-related behaviours or how these in-game behaviours also affect these gamers' real life personality traits, which means that these researches currently are mostly one-way researches and are incomplete. Also there's little discussion of how we could integrate these conclusions and apply these study results to the designing and promoting of computer games.

Therefore, in this research, we will specifically distinguish players' game-related behaviours and analyse the connection between personality traits and game-related behaviours/preferences of game players based on some existing models and some results from previous research. By analysing and integrating these previous researches, a computer game evaluation model is preliminarily proposed. This model mainly focuses on customised game designing and promoting. It aims to help the companies design games and recommend games to target audiences more accurately. Moreover, hopefully using this model some relative risks can be more avoidable, for example, this model might help to prevent aggressive people from being exposed to violent computer games or help people with addictive personality traits to avoid addiction.

In this research, we've referred to some frequently-used personality traits models, for example: "The Big Five" personality trait model and game classification such as 'Padia and Ludus' game classification system. Rather than only discuss the relationship between players' computer game preference and personality traits, this study also focuses on creating a multidimensional theory model for the measurement of games according to corresponding personality factors so as to target their most possible audiences precisely. In conclusion, to design, promote games and take precautions against potential risks accordingly.

1.1 Aim and Objective

Game industry is quite a broad field and is related to many other industries as well as many aspects of human life. From many perspectives, we are able to study different features of this industry and the connection between the game industry and others. This research will focus on the connection between players and games (Wolf, 2008). Players' personality traits decide their preference types and gameplay of game while the game they've chosen and playing might also influence their lifestyle and reflect on their real life behaviours and emotion so as to further shape their personalities. Therefore, the main topic of this present research is to propose a theory model for computer game evaluation according to the relationship between player personality traits and game-related preferences.

In the present research, we discuss different types of games, the classification of games as well as personality type models that can be applied to define game players' personality traits. The first objective of this secondary research is to prove the arguments that players' game-related behaviours and real life personalities will influence each other by performing necessary analysis of data and conclusions of selected research. The second objective of this research is to specifically analyse how and what factors of players' personality traits can influence and be affected by games. The third objective of the research is to preliminarily propose a model that can

evaluate computer games according to the conclusions we've got above.

2 Literature Review

As one of the most popular forms of entertainment around the world, computer games can also be defined by a series of features: Rules; Variable, quantifiable outcome; Valorisation of outcome; Player effort; Player attached outcome; Negotiable consequences. These features can define computer games as rule-based games that gamers can get an outcome through making effort with or without consequences in reality. When developing computer games, the developer's work is basically to coordinate these parts in the game. With these parts working together harmoniously, a game will be more likely to provide players with more harmonious and comfortable game experience.

Another simpler defining method of computer games is to regard them as 3 necessary parts: Game setting, Game rules and simulation of vision, touch and hearing. The setting of the game determines the style and storytelling of the game which decides the keynote of a computer game. Simulation of sensory input consists of the art design and music design of the game, including voiceover and some animation effects. For example, *Counter Strike*, a multiple-player first-person shooter series computer game which was firstly released in 1999 as one of the most classical multiplayer first-person shooter games, counter strike has signature art and music design that can be recognised easily that also become a part of its own culture. The representation in this game counter strike is close to scenes in real life and the sound effects and music after these many years have become its specific sound symbol. The rules of the game are the last but not least necessary part of a game, it can be easily understood that every computer game needs to have its basic mechanics and core gameplay. As we all know, computer games are interactive, which means every interaction between the gamers and the game has a set-up consequence, there's set-up causal relationship between the gamer's behaviour and game's reaction. These rules of the game are handled by artificial intelligence with specific codes.

In the early days of computer game's development, most computer games were single player games, until 1958, American physicist William Higinbotham designed the game "*Tennis for Two*" that allows two players to play together. Since then, multiplayer games were gradually unveiled, the concept game classification has appeared, and the period of computer game industry started (Zackariasson and Wilson, 2012).

2.1 Game classification

According to game theory, game can be classified using several different criteria: For example, by games' physical requirements — such as equipment, player number, playing environment and so on; game's structure — player number, player groups, strategy and so on and games' personal requirements — personal skills, fitness level, social skills and so on. Moreover, by strategies, game form and developmental level,

we can also distinguish games. In the present research, we mainly refer to game genre classification and game type classification. With these two classification systems, we can cover most of the important features of computer games we need according to their essential elements that were mentioned above (Borchert, *et al*., 2015).

Even though the two concepts game type and game genre are sometimes interchangeable, we can still distinguish game type and genre by their different criteria of classification scheme. Game type classification system is to classify games by their different game play, game genre classification system is to classify games by the game's narrative.

Game type classification system mainly divide games in the following types:

Action: games that are based on actions like *The King of Fighters* and The *Legend of Kage*. Action games contain character action games and hybrid action games, in the former kind of game, players' operations are mainly physical actions, this kind of games include common fighting games, shooter games and hack and slash games. These games are mostly pure action games without other kinds of elements. The latter kind of game, hybrid action games, are games that combine action games with some elements from other game genres. For example, action-adventure games, action role-playing games, survival games or multiplayer online battle games. Action games' players usually face challenges like time limitation when completing tasks or requirement of high operations skill level rather than developing any complex strategic plan.

Adventure: To explore or solve puzzles in the game are the core mechanics of adventure games such as *The Secret of Monkey Island* and *King's Quest*. Adventure games were initially developed in the 1970s, early adventure games were based on text, with the development of information technology and the update of computers, adventure games started to use graphical representation. 3D scenes are widely applied to adventure games as well in recent years. Text adventures and interactive fiction, graphic adventures, puzzle games and escape room games are all typical adventure games.

Puzzle: In general, pure puzzle games need inductive reasoning and usually have lower budgets. Their target audiences tend to be older mostly. *Tetris* is one of the most successful puzzle games around the world.

Role playing: In role playing games, gamers are always allowed to separate from their own identity and assume that they are someone else and merge themselves with the character in the game, narration is an essential part of role playing games. The game *Dungeon and Fighter* and *MMORPGS (massively multiplayer online role-playing game)* are both role playing games. With the development of role playing games, the storytelling and character setting are becoming more and more innovative and rich.

Simulation: To simulate the real world in computer games is another kind of game. This type of game provides the gamers a chance to copy activities from real life

without taking corresponding responsibilities. Simulation games give gamers chances to attempt different possibilities of life, usually there are no defined goals in these games, which has given players more freedom while playing. Games like *Sims*, *Arch Rivals* and *Pokemon Snap* are all simulation games.

Strategy: Strategy game is the kind of game in which the player makes decisions through reasoning to solve problems with a core mechanic technology tree. Strategy is always defined in terms of the context of war, games like *Mancala* and Chess are both strategy games. Strategy games usually don't need too much narration even though narrative in games are abundant and diverse these days.

Different from game type classification, game genre classification describes the way of storytelling of games. Genre of a game means the style of narration of the game. All the elements of game narrative including the setting of characters and the story's outline depend on its genre.

Similar to genres of TV series or films, general game genres classify games in the same way. Drama, Crime, Fantasy, Horror, Mystery, Science Fiction. War and Espionage and Western (Eastern, Frontier) are some common game genres. In most cases, a computer game can belong to different genres simultaneously (Grace, 2005).

2.2 Paidia and Ludus

As a big concept, 'play' can be studied in many different perspectives, for example, how playing brings gamers joy and makes players feel meaningful. Playing fills people's daily life— when we do sports, solve sudoku on the underground and have a party with friends, these activities are all able to be regarded as playing. In the present research, we simplify and narrow this concept within computer game playing. People might notice that games can be radically different even though computer games are in the same game type and genre. For example, in the game *Don't Starve*, players are free to decide how they would like to play the game within the rules, there is no concept of win or lose in this game while in the game *Counter Strike*, to win the game, gamers have to fight with their partners against their enemies. In the early time, the distinction between computer game's gameplay was an ambiguous concept. French sociologist Roger Caillois studied several different playing types and games and has proposed four elementary game categories to stand for different types of computer games. These four categories were not only divided by different elements in games but also by their playing styles and target audience. The four categories are Competition, Chance, Role playing and Vertigo. Competition is the kind of games that arouse players' sense of competition. Opposing camps with conflicts always exist in this kind of game. Chance is the kind of game that is filled with uncertainties. Role playing games allow gamers to play the roles of the games and act like someone else. Vertigo is a kind of game that aims at modifying the gamers' perceptions (Jensen, 2013).

Roger Caillois has combined these four categories and two playing styles he defined together to differentiate games— to distinguish the differences of games' playing

styles, Caillois also suggested paidia and ludus theory which was aiming at this problem. He advocated that every form of game exist between two opposing poles: paidia and ludus. Ludus means structured play style, games in ludus form has predefined rules, goals and structures like counter strike, which is easily to be understood. Paidia stands for freestyle of playing, games in paidia form involve player-defined structure and goals. Paidia form is a kind of exploration like when children first start to play. Players are allowed to reshape the characters and create their own gameplay in paidia games (Jarrett, 2016). In conclusion, paidia are computer games with less rules and focus on players' own creation while ludus are computer games with less freedom and more rules and focus on predefined goals. Most games are not strictly a paidia or ludus game, thus in this present, we tend to say they have more paidia or ludus features (Ferro, 2013).

2.3 Computer games' negative and positive effects

2.3.1 General Models and Five Dimensions Approach

As we mentioned above, computer games today have become incredibly popular. According to a survey in 2009, a large number of youth play computer games for 2 hours on average per day (Gentile, 2009). The population of computer game players keeps increasing in these years so that research about computer game's effects on game players become more and more necessary. With the increasing amount of research about computer games' effects, these studies show that these effects refer to many different fields. For example, the side effect of some violent games is that they might to some extent be an inducement of aggressive behaviours, whereas, some action games have positive effects like helping players visual spatial skills. In this research section, we firstly discuss the computer game's effects in two perspectives—the general aggression and the general learning model and 5 dimensions of computer game effects (Prot, *et al*., 2014).

The general aggression model has studied on many domains that are related to violence including violent computer games. This general aggression model integrates a large number of aggression models and has discussed the biological, personological and social factors that might have effects on aggressive behaviours. This model can help to understand both short term effects of computer game violence under immediate situations and long term effects influence the development of aggressive personality. According to this general model, media violence like violent computer games can increase the possibility of short term aggressive behaviours by influencing humans' cognitive and arousal states. These states will also affect people's decision processes which can directly result in impulsive actions and thoughtful actions. Impulsive actions usually mean aggressive behaviours. Players after playing violent games are more likely to give aggressive reactions to respond to external stimuli. Once the person has chosen a kind of reaction state, their feeling, action mode and way of thinking would change a bit at the same time, these changes can finally result in their personality after being in this state for a couple of times (Carnagey and Anderson, 2004).

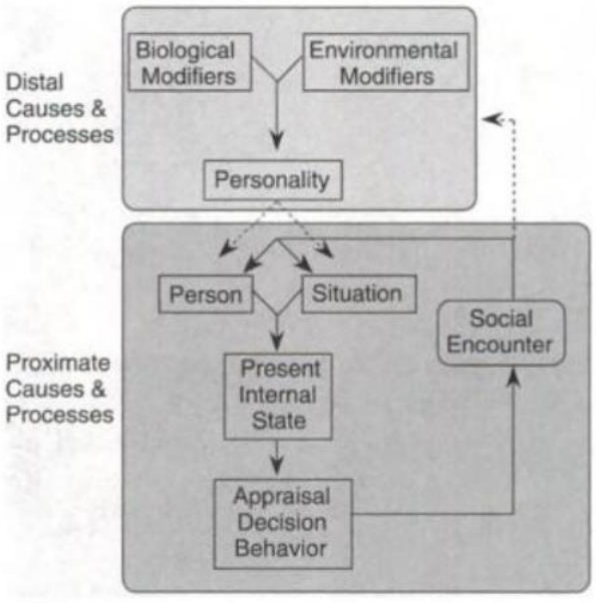


Figure 1 The General Aggression Model

Through the feedback loop in the graph we can see that if one person is exposed to this loop for a long period of time, it will eventually lead to a strong tendency of causing aggressive personality. People who have aggressive personalities will be more likely to react to aggressive behaviours more positively and refuse to avoid having conflicts with other people.

The general learning model which is similar to the general aggression model contains a variety of learning theories in different domains. According to this general model, human's beliefs, attitudes and affective traits will be changed because of learning experiences. This general model can be used in many human behaviours not only in aggressive behaviours, which means that different media effects from computer games might lead to games in different ways (Barlett and Anderson, 2012) (Gentile, *et al.*, 2014).

The five dimensions of video game effects approach suggests computer games' effects on game players from 5 dimensions which are amount of play, content, context, structure and mechanics (Gentile, 2011). Every dimension might influence gamers differently. For example, playing computer games too much might cause addiction and take the time for other activities, besides, the larger amount of computer game playing means less time for learning and exercises in daily life. The content of computer games might teach game players knowledge or give players information refers to a variety of domains, while developmental and educational games teach the players lots of meaningful knowledge, prosocial games have effects on players sympathy, violent computer games might increase the players' possibility to engage in aggressive behaviours (Anderson and Dill, 2000). The context of computer game playing has a decisive effect on how the game affects the player—the same computer games might have quite different effects on gamers when they play alone and with

accompaniment. The structure and representation of computer games might also cause different effects on players. Fast-paced games might highly increase players' reaction speed and other visual and spatial skills. Last but not least, different computer game mechanics can help players improve skills in multiple fields like the physical therapy that can be provided by exercise games (Prot, *et al*., 2014).

2.3.2 Computer Games' Negative Effects

Apart from research through the general models and 5 dimensions approach, many relevant researches have confirmed that computer games have effects on players in reality. In this section, we divided computer games into violent and nonviolent computer games (Barlett, et al., 2008).

Firstly, much of the existing research that has been done on the violent game effects has focused on the connection between aggression and violent computer games. Conclusions analysis of many researches based on investigates proved that violent game playing can increase the cognitions, affect and behaviours in both short term actions and long term personality development. Playing violent games frequently would lead to aggressive thoughts and result in desensitisation to aggression and violent actions, reduce players' empathy and have antisocial effects on players so as to decrease their likelihood of prosocial behaviours. Correlational research has found that the larger amount of violent game playing, the more positive players' attitude will become towards violence and they would be more likely to be involved in physical fights in real life (Anderson and Dill, 2000). A comprehensive meta-analysis about this topic has reviewed on a large amount of research papers that cross different cultures, longitudinal studies for all outcomes and has included more restrictive methodological quality has found through moderator analyses that culture and gender differences has weak effects on this problem, the findings in this review strongly suggest that being exposed to violent computer games is tend to increase players' aggression (Anderson and Bushman, 2001).

Concentration problems are also related to computer game playing. Several relevant researches have shown that people who play computer games more frequently have more problems with concentration. Among all computer games, violent games are related to more serious problems on concentration (Chan and Rabinowitz, 2006). One of the reasons why computer game playing might be the 'Displacement Hypothesis': this hypothesis indicates that playing computer games displace the time for the development of concentration and self-control. Another possible reason is the excitement hypothesis. The 'Excitement Hypothesis' suggests that computer games have a series of features that give the players high intensity external sensory stimulation which can attract gamers' attention. These high intensity and continuous simulation after playing for a long period of time might raise the gamers' threshold of attention and decrease their persistence. However, things like study and work lack these high-simulation features and might become harder to attract people who are used to playing computer games for a long time (Gentile, *et al.*, 2012). Many researches have proved that long-time computer games playing has negative influences on students' in school performance and grades. These results are to some

extent consistent with the displacement hypothesis and the excitement hypothesis. Research about how computer games relate to concentration problems is still not specific enough though it is proved that there's a causality between computer games' effects and concentration problems, more future research is needed to study this association.

There are also many researches that found that playing computer games too much might be a cause of executive functions impairment (Chan and Rabinowitz, 2006). Moreover, players who play violent games are more likely to ignore the meaning of emotion-related words in a task of correlational research. Computer game playing, especially violent game playing also has negative effects on gamers' proactive cognitive control which is also one type of execution function according to the finding in another research paper.

Another serious problem caused by computer game playing is computer game addiction. Computer game addiction is also studied by many researchers as it can cause great damage to people's lives. Computer game addiction to some extent is considered equal to gambling addiction that can be harmful to not only one person's life but also his or her family and people around him or her. Video game addiction today is not regarded as a pathological state of humans. This state now is quite pervasive. According to relevant papers, youth all around the world has an 8-12% percentage of computer game addiction. Some longitudinal research has shown that these pathological game players always have mood disorders, anxiety disorders, self-control disorder etc. at the same time. Besides, some of these gamers are found to have anxiety, depression, insomnia, relationship problems and poor school and work performance. To encourage researchers to study furtherly on this problem, there is a category of disorder in the appendix of the new Diagnostic and Statistical Manual of Mental Disorders. More research is still needed to be taken to solve this serious problem that does huge harm to those gamers' mental health (Prot, *et al*., 2014).

2.3.3 Computer games' positive effects

After talking about the negative effects from computer games, it is undeniable that computer games have some positive effects on gamers as well. The beneficial effect that playing computer games can help to develop gamers' visual-spatial skill has been mentioned in many previous researches. Playing computer games require gamers to capture every critical spatial information in the duration of playing, which can improve gamers' superiority of visual spatial skills. Research shows that even a few hours of computer game playing can help improve spatial attention and mental rotation. Among different computer games, fast-paced computer games including violent games did better in this improvement. Considering the negative effects from violent games, the improvement from violence has two sides even under this circumstance (Ferguson, 2007).

Unlike violent games, prosocial computer games have more good effects on game players. The main content of this kind of computer game is to help the characters in the game without violent ways like killing the opponents. Experimental results show

that prosocial computer games are effective in decreasing gamers' violent thoughts and behaviours and increasing gamers' prosocial thoughts, behaviours and empathy. Similar to violent games, prosocial computer games would have long term effects on gamers' personality after long-time playing. Plenty of researchers have found that game players who play prosocial games for a long time become more willing to cooperate with people and share, their prosocial behaviours such as helping people and showing empathy to people are also increased(Leiberg, *et al.*, 2011). Moreover, research also showed that prosocial game playing can also lead to the decreasing in the players' tendency to regard others' behaviours as hostile and antisocial thoughts.

Educational computer games are another kind of computer games that bring good effects to game players. This kind of game, according to research, can help teaching in many different subjects. Educational computer games can help the students acquire knowledge in a more entertaining way. Subjects like math and reading can both be taught by educational games (Lämsä, 2018). Some companies also use such educational computer games to train their staff to learn some necessary skills. Educational computer games can also help to teach children and youth some common sense knowledge so as to help people in their daily life and some medical first aid knowledge to respond to emergencies.

Exergame brings benefits to people by creating a virtual exercise environment for people and contributing to people's psychological health. A research in the US shows that children who spend a period of time on exergames show more enthusiasm in parents and paediatricians alike than those who spend equal time on other entertainments (Rideout, *et al.*, 2010). Exergames can also help improve players' quality of life especially when they have difficulties in going out which can be extremely helpful to players' psychological health (Whitehead, *et al.*, 2010).

2.4 Personality Traits and Models

The concept of personality traits first appeared about 2400 years ago in the early time of human history. Aristotle had described some personality features with levels for measurement. His student had written a book about 30 different personality traits after years. This concept is all over human's everyday life, there are tens of thousands of expressions about personality traits in English as well as other languages. Personality traits are stable qualities of people. Even though people might behave differently depending on the environment, they would still have a true character that can hardly be changed under any circumstance. Also, people with different personality traits might have totally different reactions when facing the same situation. People's personality might be influenced by their gender, role in the society, background, people around them (environment) and even nationality. On the contrary, humans' personalities have non-negligible effects on their behaviour. For example, people who have personality traits like cowardice might be easier to manipulate and harder to refuse others. Some research has divided humans' personalities as favourable, neutral and unfavourable traits that respectively contain personalities like honest, changeable and cruel (Matthews, *et al.*, 2003).

To study the connection between people's personality traits and behaviours we are able to distinguish a person's personality trait by looking at his/her behaviours or predict a person's behaviours by his/her personality traits. The most straightforward way of measuring people's personalities is to ask them to fill in some simple questionnaires that have questions about if they feel better in a lively occasion or when they stay alone. The personality traits can be measured directly by assessing people's behaviours as well. For example, if this person is enthusiastic about joining some clubs and parties or some other group activities, he/she cannot be an introvert people, on the contrary, if a person prefer to stay alone and is not conversable most of time, there's little chance that this person is a extravert person. Research shows that some personality traits are obviously connected with some certain behaviours. For instance, people who have impulsive personality traits might react faster to external stimuli, people who have test anxiety can hardly focus on the test tasks. However, only by simple questionnaires and behaviours measurements, only general results can be obtained and can be hard to summarise. Verbal reports then became a popular way of measuring people's personality traits. In a human's daily life, a large amount of words that are related to personality traits are used in our daily conversation. These common words more or less relate to some human characters. By analysing these expressions, the concept of dimensions of personality has been proposed. People found that some different words or expressions can be related to personality traits in the same aspect or dimensions. Since people's verbal expressions are not always accurate enough, some "new-created" personality traits models start to combine the behavioural assessment and verbal expressions assessment that include self-report and peer assessment together. With such assessments, the accuracy of personality traits tests is significantly improved. The results of personality traits tests can be applied to many problems. For instance, using a person's personality traits test result, it can be easier to predict his/her in school or in work behaviours—that's why more and more companies are using personality tests during job interviews. The results of the personality test sometimes can help to avoid risks by detecting some personality traits of potential criminals so that relevant departments which are responsible for society safety can pay close attention to people with such personality traits. With the development of these kinds of personality traits tests, the rating systems for assessing personality traits' level were developed. Therefore, with more specific results, people's behaviour can be more likely to be predicted more specifically.

Big Five personality traits is a suggested taxonomy for personality traits which firstly appeared in the 1980s as psychological trait theory. This model was defined by different researchers that use the method factor analysis of verbal descriptors of human behaviours. Their research study is based on plenty of relevant verbal descriptors. By using factor analysis to the data from self-estimations and peer ratings, they find those potential factors of different personalities. According to the Big Five personality model, five main personality attributes are needed to be tested when estimating a person's personality trait. They are openness to experience, conscientiousness, extraversion, agreeableness and neuroticism (Barrick and Mount, 1991).

Openness to experience is people's personality traits about their creativity, emotion, curiosity and imagination. People who are sensitive, creative and open to new things are more likely to get high levels in this dimension. People who have a higher level of openness to experience always have extraordinary thoughts, some of them are keen on breaking through themselves and take part in some extreme activities. However, this factor of their personality has both good and bad sides— though compared with those people who are conservative, people with high level openness to experience are usually more innovative and willing to try new things, their possibilities of taking drugs are higher than people who have lower level of openness experience too.

Conscientiousness is a kind of personality trait that is related to self-control, rational, goal-oriented and reliable. Different from the openness to experience people, conscientious people tend to abide by the rules all the time, since they prefer to have plans for most things, their behaviours are mostly conventional and predictable in daily life. The disadvantage of this personality trait is that people with high conscientiousness are always regarded as too hidebound and can be hard to convince. This personality trait takes a bigger percentage in older people than the youth.
Extraversion is about a person's tendency to get along with people. The most prominent feature of extraversion is that they are more likely to have interaction with people and really enjoy group activities. People with high level extraversion are usually conversable and enthusiastic. Opposed to the extravert people, the introvert people always tend to be quiet and closed. Most of them lack social interactions. However, people with higher introversion are always more independent than people with high extraversion. They need less connection with the external world, which doesn't mean they are not prosocial. These two personality traits in the same dimension both have good sides and bad sides. In general, most people are not pure extraversion or introversion but have both introvert and extravert features in their characters.

Agreeableness is a kind of personality trait that describes to what extent a person tends to be consistent with others. People with these personality traits always treasure the relationship with others are more likely to compromise when getting along with other people. They usually have good qualities like generous, easy-going, optimistic and tolerant. On the contrary, those people who have a high level of disagreeableness most of the time tend to stick with their own interests and opinions. Generally, they might be regarded as people who are difficult to get along with. Disagreeable people are less likely to trust other people or expose themselves to others. People with high disagreeableness sometimes can be more competitive and aggressive so that they also be treated as not reliable. Some research shows that people with a high level of agreeableness always have good relationships with their team members in work, personality traits like agreeableness and sense of responsibility are both significant features in work performance.

Neuroticism is people's stability of their emotions, it's about people's ability to adjust their emotions. People with high level neuroticism generally are not capable of tolerating high pressure and anxiety. Neurotic people can be suspicious and defensive since they tend to misinterpret other people's intentions. People who have high level neuroticism tend to stay in a bad mood most of the time, negative factors like high

pressure might cause more serious effects on them. Moreover, people with this personality trait might spend plenty of time and energy in dealing with their negative emotions so as to affect their performance in study and work. Conversely, people who have lower levels of neuroticism are usually more calm, they are easily satisfied, emotionally stable and more likely to experience more positive things in their daily life (Allam, 2017).

2.5 Connection between Players' Personality Traits and Game-related Preferences.

With the concept of gamification becoming more popular, behaviours in our daily life are becoming more and more gamified, the boundary between human's real life and computer games is gradually dissolving. Similar to personality traits in real life, the concept of player types in game appeared, this concept contains computer game players' a variety of in-game behaviours including their preferences of games, their interaction ways in the games and their motivations for playing games. Some researchers suggested that game players' types in computer games are closely related to their personality type in real life. When a computer game player chooses a computer game to play, his/her decision is affected by his/her mood, state and preferences in real life. Even though temporary feelings might also influence people's game-related behaviours, the reason why they keep enjoying some specific games is still related to their stable personality traits. In other words, it is their personality traits that result in their patterns of behaviours related to computer games. For example, in light of some research, a person with high level neuroticism might be more likely to choose adventure games while those who have high level extraversion tend to choose strategy games. Correlative research has already obtained some relevant results from different points of view. People tend to engage in one kind of computer games because these kinds of games provide them with some things that are consistent with their belief at the moment or constantly (Hartmann and Klimmt, 2006).

In the previous studies, some researchers have focused on game player's choices of computer games or their preferences of computer games. A study in 2006 suggested that people with different personality traits have different personality factors such as some tendencies including global action tendencies, general aggressive tendencies, general competitive tendencies, general risk, challenge, achievement tendencies and general fantasy and escape tendencies. These different tendencies might lead players to choose different kinds of computer games. For example, some computer games are about some content that involves fighting against the opponents, people with general competitive tendencies might be more motivated to play this kind of games when these games are consistent with their beliefs. Some players who have general aggressive tendencies might be more attracted by computer games with aggressive elements and fast paced acting (Hartmann and Klimmt, 2006). Some studies applied Big Five Personality Traits in 2010 has found out that people with high level neuroticism and low level of agreeableness, conscientiousness are more likely to be attracted by computer games with violent elements, people with high level extraversion tend to prefer casual, music and party games and enjoy role-playing and people with high level conscientiousness usually show interests to those sport, racing and flight simulation games.

Also, some research aims at studying personality types-like player types. Bartle in the 1990s has developed a typology of computer game players in light of the responses from the Multi User Dungeons MUD players of his questions on online forums that has divided the game players into four categories: Achiever, Socialiser, Explorer and Killer (Bartle, 1996). This typology classified game players' playing types mainly according to the reason why these players enjoy the computer games. The Achievers means that players enjoy the computer games because of the sense of achievement the games could bring to them. Most of them like setting goals in the games and making progress by achieving their set up goals. The Socialisers' aims of playing games are mainly to interact with other players in the computer games. They enjoy getting along with other people, making friends and sometimes learning from other people. Compared with the Socialisers, the Explorers are more likely to prefer to interact with the world or environment in the computer games rather than other players in the games. As the name of this category indicates, they are enthusiastic about exploring new areas of the environment in the virtual game world. While the Socialisers like to interact with other players in a good way, the Killers tend to enjoy interacting with other players in negative ways such as attacking other players in the games, disturbing other players or even killing other players.

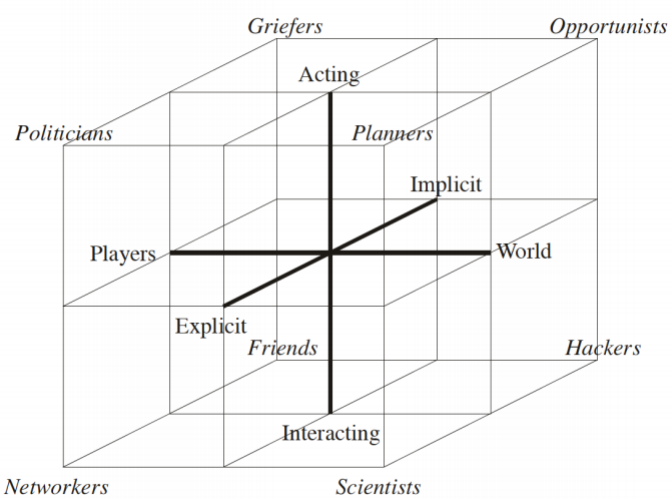


Figure 2 Bartle's Player Types (Developed)

Bartle then developed a more comprehensive model that included more subtypes based on this player typology. Another similar computer game players' typology is proposed by Fullerton. In her book, the categories of the player types are more specific: The Competitor, The Explorer, The Collector, The Achiever, The Joker, The Artist, The Director, The Storyteller, The Performer and The Craftsman. Except the categories that have been mentioned in Bartle's typology, the rest of these categories are describe like this: The Competitor are the computer players who aim at acting better than other players in the game, their pleasure of playing mostly come from being better than other players and no matter how they play the games and what elements the games contain. The Collector usually enjoys collecting items and knowledge in the games, they especially like to collect some sets that are set in the games. The Jokers never

play seriously in the games, the way they enjoy the computer games is to get fun from playing itself. However, this unserious attitude might displease or disturb other gamers who take the game seriously. The Jokers don't like to make the games competitive. The Artists are the kind of game players that dedicate much of creating and designing in the computer games, they are mostly driven by their innovation ability and creativity. The Directors are the people who are eager to control and direct the playing of computer games. The Storytellers love creating the world in their imagination that is ideal and dreamlike. The Performers enjoyment in the games mostly comes from other players as well. In computer games, they focus on showing themselves to the others rather than playing the games. The last category is the Craftsman, this kind of game players like to build and do crafts in the games, they are like engineers in the games and are interested in figuring things out (Ferro, *et al.*, 2013).

It is worth noticing that according to Bartle's study, computer game players are usually not expected to stick with only one player type but switch between different types. This phenomenon might be explained by players' different personality traits. Therefore, as we mentioned, players' personalities can be generalised by different combinations of the Big Five personality factors rather than fixed personality types. Similarly, the traits of game players can be better described by players' type traits that are more dynamic than types.

2.6 Game Study

To establish the connection of different personality traits and game elements, it is necessary to do analysis and studies on specific games. The target of game study and analysis is not only the game itself but also its culture, players and data. The content of the game's design is the most important part of the analysis. According to the book Game Research Methods, games can be studied qualitatively and quantitatively. In the current research, we mainly analyse computer games qualitatively based on results of previous research. There are many existing types of game analysis today, for example: comparison analysis, game interpretation, game history analysis and game case study. However, in the early time when it firstly appeared, the concept of the game analysis frameworks was not clear enough. Lankoskh, the author of Game Research Method has named the fundamental game analysis at that moment as form study of game. In this research, we use game analysis frameworks which are relevant to games' definitions to study on our cases (Lankoski and Bjork, 2015).

During the development of game analysis, many academics have proposed their point of views upon the game analysis frameworks. Espen Aarseth set game criticism, analysis and history as equally important topics with game system design, game interactive narrative. He suggested that game analysis should include three perspectives' analysis: 1. Gameplay including players behaviours, game strategy and motivation. 2. Game Structure including game rules and simulation rules. 3. Game World including narrative texts and design of levels (Aarseth, 2012). Lars Konzack has divided the games into several different hierarchies: Hardware, Program code, Functionality, Game play, Meaning, Referentiality and Social-culture. Every hierarchy in his opinion can be analysed individually (Konzack, 2002). Craig A. Lindley asserted

that games and gameplay, game narrative and game simulation form a three dimensional model that can be used to define games. This 3D model can be further developed and add some new dimensions. He believed that this 3D model is beneficial to the designing of computer games (Lindley, 2003). Clara in 2005 started The Game Ontology Project which aimed to establish a framework that can be used to describe, study and analyse games. This is also the start point of the game analysis framework (Zagal, 2011). Mia Consalvo has attempted to find a kind of game analysis methodology tool that can analyse games qualitatively. In her opinion, games should be analysed from four perspectives: Object Inventory, Interface Study, Interaction Map and Gameplay Log. With this methodology tool, she had studied games such as *Lining Large*, *House Party* and *Hot Date* (Consalvo, 2006). In 2007, Aki Jarvinen and Steven Malliet proposed two quite similar analysis frameworks which were respectively applied ludology and another framework that shared similar structure with the applied ludology framework. The applied ludology analysis framework developed by Aki Jarvinen has defined game elements. It asserts that games is a system containing components, environment, ruleset, game mechanics, theme, information, interface, players and contexts (Jarvinen, 2007). The analysis framework that was developed by Steven Malliet classified all the elements above as two aspects— representation and simulation. Steven had also applied his analysis framework to 11 violent computer games (Malliet, 2007).

3 Discussion and Case Study

3.1 Discussion

The narratology and ludology debate is a long standing disagreement in the game field. Some researchers that hold the point of view: “Games are always stories'' believe that games can be interpreted in the same way as novels or films with narrative theories. The scholar, Janet Murray who claimed that ‘Games are always stories’ support the narratological approach of computer games’ analysis, she claimed that: “Stories can be participatory” and had linked some traits of computer games to narratives so as to prove her argument. Conversely, the ludologists’ attitude towards this are: “The computer game is simply not a narrative medium” and denied the point of view that the meaning of the computer games can be analysed in the literary method, they believe that games should be interpreted in specific game terms and the meaning of the games can be converted just rely on game’s mechanics and rules. They suggested that the studies of games should focus on the abstract and formal systems, mechanics and rules of games should be studied instead of games’ narration or representational elements (McManus and FeinStein, 2006).

Nevertheless, the scholars who study on both of the areas proposed different perspectives toward this problem. The ludologist Gonzalo Frasca firstly provided the opinion that narratology and ludology can be applied at the same time to game studies. He said that even though games and stories have a number of elements in common, people should still study games in a specific way which contains the narratological approach as well as the ludologic approach as complement. In this research, we both

analyse our games in narratological and ludologic approaches (Frasca, 2013).

Narratology is a study frame of narrative and narrative structure. The word narratology originated from the French word narratologie but narratology nowadays was developed by some Russian Formalists. Narratology was widely applied to literary, film theory and drama theory and criticism and has been applied to computer games' narrative analysis from about 2001. Computer games today have formed their unique culture that can affect cultures of other art forms like literature and drama. However, in the area of computer games, narratology is not the same with narratology in those other art forms in my opinion. Narratologists who study games mainly treat the storytelling of the computer games more important than its characteristics as pure entertainment. They basically regard computer games as a new form of medium that can include dramas, narratives, paintings and can be applied to several different domains. The narratologists believe that it's immersion give the players good interactive experience in the games, also, as the players in the games can transfer to someone else and obtain the sense of empowerment in the game after their behaviours result in the virtual world in the games, they like the games because they like experiencing the story of the games (Fludernik, 2009).
Ludology is a game study approach that focuses on the shift onto the mechanics of computer games. It asserts that the core of the computer games is the rules and mechanics and it is reasonable to ignore the content of the game since they are "incidental". Ludologists entirely regard stories and computer games as two individual systems with different functions and purposes. Ludology treats computer games more as a pure entertainment rather than interactive stories (Nacke, 2009).

One of the most common analysis frameworks for ludology is the MDA framework. This framework was originally proposed by Robin Hunicke, Marc LeBlanc and Robert Zubek. The three letters M, D and A respectively stand for mechanics, dynamics and aesthetics. It is widely used by game developers in the duration of development and analyses computer games from the point of view of designers instead of players (Hunicke, *et al.*, 2004). This framework considers the different point of views of players and developers. MDA analysis framework analyses the games from the view of aesthetics not only when analysing aesthetics itself but also when analysing dynamics and mechanics on how they generate the aesthetics.

Formal, Dramatic and Dynamic Elements framework is another game analysis framework for ludology that seeks to help in developing the games. This framework is presented by Tracy Dullerton and Chris Swain in their book. This framework used to be used in analysis of film studies, it mostly concentrates on specific tools that are applied to help the games' idea and development (Fullerton, *et al.*, 2004). The three elements formal, dramatic and dynamic elements respectively stand for 1. The elements that can be used to distinguish games from other forms of mediums. Formal elements' function is to structure the game. Game rules, game resources and game boundaries are all formal elements. 2. Dramatic elements are the narrative of the games. These stories make the computer games more coherent and make the game mechanics more understandable. Drama elements are able to make the games more relatable emotionally. 3. Dynamic elements refer to players' in-game behaviours,

relationship and strategy when playing etc.

The third game analysis framework for ludology is the elemental tetrad. Mechanics, Aesthetics, Technology and Story are 4 basic elements of this framework. Mechanics here means the interaction rules in the game, which is similar to the form elements in the second framework. Aesthetics in the elemental tetrad are the sensory representations of computer games. The art design of the characters and the music of the games are both aesthetics. Technology element is the technology that has been applied in the games which refers to hardware, software, algorithm and codes. In this research we won't pay too much attention to the technology of computer games. The last element of the elemental tetrad is story. This element is actually the same as the dramatic elements in the second framework (Schell, 2008).

In this research, we use a game analysis framework which refers to the three analysis frameworks above. By selecting some elements that are required in our study from the three different frameworks and combining them with other essential elements that are related to game classifications and genres. We study different games in the case study chapter and match the traits in the results with corresponding personality traits in the Big Five Factor Model. In this way, we are able to apply the theory model on analysing existing computer games and conclude what target audience it should be recommended to and to figure out potential risk in advance so as to reduce specific games' exposure to risky player groups.

In this chapter, we establish the theory model for evaluating computer games according to different computer game factors which have correlations to the five personality dimensions in the Big Five Factor Model. The analysis framework refers to the MDA, Elemental Tetrad, Formal, Dramatic and Dynamic Elements framework for ludology as well as a narratological framework developed by Jim Bizzocchi (Bizzocchi, 2007) and the "key elements of games" framework that was introduced by A.Rollings and E.Adams for classify the genres of computer games (Rollings and Adams, 2003).

Table 1 Bizzocchi's Narratological Framework

Elements	Description
Storyworld	The environment of the game story
Character	The characters in the game world
Emotion	The emotions shown by the game narrative
Narrative Interface	How the narrative sensibilities reflect on the interface design
Micro-narrative	Smaller moments of narrative flow and coherence in a broader context of game play

In this chapter, we use the game types that were mentioned in chapter 2 for reference to differentiate the computer games. Most of the time, a game can have one type and are included in many game genres, but in this model, we would analyse the games' not only main type but also "subtypes", which can help us to more specifically analyse the games. The game types we use include Action, Adventure, Puzzle, Role Playing, Simulation and Strategy as basement. To adapt it according to our requirements, we add some subtypes and non-classical game types that were summarised from some research papers like Sports computer games and survival computer games in this game type list for complement. In light of previous research, different traits of Big Five personality traits are positively or negatively correlated with the types of the game. For example, strategy computer games are always preferred by players with high extraversion and high openness to experience (Zammitto, 2010). Apart from computer game types, preference of playing method of computer games is also related to players' personality traits. For instance, players with high extraversion might prefer competitive multiplayer games to cooperative games. In addition, players with different personality traits are usually motivated by different enjoyments in computer games. Enjoyment inside games such as the social function of games attractive to people with high extraversion (Zammitto, 2010) (Graham and Gosling, 2013) (Bildtgard, 2014) (Nagle, *et al.*, 2016) (Park, *et al.*, 2011). In this theory evaluation model, 3 dimensions of computer will be evaluated which are type and method, enjoyment and characteristics that might have bad effects like addiction and aggressive behaviours (Hyun, *et al.*, 2015) (Lemmens and Hendriks, 2016) (King, *et al.*, 2019) (Fishman, 2018) (Griffiths, 2008) (Hasan, *et al.*, 2013) (Prot, *et al*., 2014). The

corresponding relationships between players' personality traits and different game-related preferences/behaviours are shown in the three tables below.

Table 2 Relationship between Preferences of Game Types and Personality Traits

Game Types	**Personality trait dimensions**
Adventure	High Openness to experience High Neuroticism
Action	High Neuroticism High Extraversion
Strategy	High Extraversion High openness to experience
Horror/Survival	High Neuroticism
Role Playing(except horror games)	High openness to experience
Simulation Vehicle	Low Consciousness
Simulation AI	High Openness to experience
Puzzle	High Openness to experience High consciousness
Sports	High Neuroticism Low agreeableness

Table 3 Relationship between Players' Game Enjoyments and Personality Traits

Enjoyments	Personality trait dimensions
Social Motivation	High Extraversion High Agreeableness
Achievement Motivation	High Extraversion
Immersive Motivation	High Openness to experience High Neuroticism
Strategy Motivation	High Extraversion

Table 4 Relationship between Games' Risk Factors on Players and Personality Traits

Computer games' side effects	Factors	Personality trait dimensions
Addiction	High Score Desire to beat your enemies Desire to beat the tasks Role Playing Exploration Social experience/Relationship	High Consciousness
Aggressive	Violent Narrative/Background Violent Animation Violent Operations	High Neuroticism (especially with low agreeableness and consciousness)

3.2 Case Study 1

Don't starve is a computer game that supports both single player and multiple players mode. In the game, the players are asked to survive by keeping certain values of health and sanity in a set up world. The environment of the world can be set by the players

themselves within the limit of the constraints of rules. Players can choose the seasons, animals, the length of daytime and night and the temperature changes in the world. The game revolves around Wilson, a scientist who went into a dark and gloomy world. In this world, he can be killed by dark, cold, monsters or low sanity values. Players will have to collect specific items in the game for eating, dressing and building in the game. It's also necessary to defeat a variety of monsters in the game in order to obtain necessary resources like cobwebs and bird eggs.

Apart from the default character Wilson, the player can also choose to use other characters that will only be unlocked after the players have survived long enough in the game. Each character in the game has his/her own story that is always related to their particular skills. Choosing different characters in the game will directly influence players' ways of playing in this game and further change their game experience. For example, Wilson, as the default character of the game, has no particular skill but his beard for keeping warm in a cold environment and no obvious drawback. As the first character in the game, he's quite average in ability, this also made the balance of this character. Willow is another character in this game. She has a great lighter that can make a fire to keep warm, illuminate and cook. It is worth mentioning that Willow is immune to fire, when she gets close to fire, her sanity value will significantly increase. Willow can also create a litter bear to help her to protect herself from losing sanity value. The drawback of Willow is that she would set fire randomly when her sanity value is too low. Wendy is another popular character in this game. Her character setting is an orphan girl who lost her family. She is always with her twin sister Abigail who is already dead but exists in the form of a ghost. Like Willow's teddy bear Bernie, Abigail in the game works as Wendy's protector as well. However, compared with Bernie, Abigail is quite aggressive. She not only protects Wendy but also attacks other animals and monsters for Wendy. Abigail's damage from the attack is high and will increase with time in a day. Players as Wendy can also find particular resources that can help to increase Abigail's damage and enhance other attributes of her. The drawback of Wendy is that her base damage is much lower than Abigail's, therefore when Abigail is "dead", Wendy would lose protection until Abigail revive. Wendy is a relatively complex character and not friendly to new players. There are a lot more interesting characters in Don't Starve, each of them has their unique skills and drawbacks in the aspect of living or fighting.

Due to the nature of this game that *Don't Starve* inclines to the Paidia game, the choice of character can significantly influence the players' way of playing. For example, the players who selected Willow would choose to rely more on fire and will have to collect and create more wood and fuel during playing while players who choose Wigfrid— a pure combat character that only eat meat might have to collect plenty of meat and mainly obtaining foods by killing animals rather than collecting plants and fruits. Since Wigfrid has great base damage, players who choose her will not need to build their home in a secluded place specifically.

In *Don't Starve*, there are plenty of exploration elements, the whole game is to some extent driven by exploration of the character. Therefore, *Don't Starve* can firstly be defined as an adventure game which is also its main type. The narrative of Don't Starve

is quite special. The game doesn't have a story for the main part of the games, all the stories are in characters' introduction to pave the way for its character setting to introduce skills and drawbacks for different characters. From this point of view, with 23 playable characters, *Don't Starve* can be regarded as a role-playing computer game. Also, from the styles of background stories and the art, music design of the game, *Don't Starve* can also be defined as a horror/survival computer game.

In terms of the game's motivation and enjoyment, even though *Don't Starve* has multiplayer mode, generally it is still regarded as a single player game because of its original design in the first version. Therefore, social experience is not considered as one of the enjoyment in *Don't Starve*. Similarly, leadership motivation is not one of the enjoyments of this game. *Don't Starve* is famous as and popular with its great art and music design that give players immersive experience. Therefore, an immersive experience is one of the enjoyments of the game. As a paidia game, *Don't Starve* didn't set up many build-in tasks for the players. However, due to its mechanics and rules, players must keep the sanity and health value of the character in a variety of changeful environments that have different threats to the character such as extreme high or low temperature or monsters. To achieve the goal of staying alive in the game, the players always have to figure out some specific effective ways of collecting food, defeat and expel the monsters and find a place to live without bad environmental impacts. Excellent players in *Don't Starve* always choose to maintain livestock, growing foods, hunting animals and building their own house and farm in the game. These activities refer to a series of challenges with high difficulty so many players enjoy *Don't Starve* because of the sense of achievement when they conquer all those difficulties and owe their places for living.

As we mentioned in the previous section, the side effects of games contain addiction, anxiety and aggressive behaviours. *Don't Starve* is a game with horror elements, the art style and music inside it are able to bring emotions like depression and anxiety to susceptible players. Also, this game has a certain number of addictive factors. Firstly, people can build their own properties in the game, this mechanics is similar to a score system, players might be engrossed for hours for completing their work in game. Secondly, the role playing element in the game can be another addictive factor. *Don't Starve* allows the players to act as the character in the game and decide their daily lives as well as apply the skills of the characters. This is also a kind of simulation to some extent, the players might be likely to attach to the characters emotionally so as to have closer connection with the characters and be addicted to the game. Finally, exploration is another important element of *Don't Starve*. To explore and light up the dark world in the game can help the players to obtain the enjoyment of achievement and exploration. The thrill of exploration can be quite compelling. Even though *Don't Starve* contains a certain amount of PVE fight, its animation design in this duration is soft without any explicit violent and bloody frames and are not likely to cause aggressive tendency.

In conclusion, according to the analysis above, as an adventure game with subtype survival and role playing, people with a high level of neuroticism, openness to experience are more likely to be interested in the game *Don't Starve*. In terms of the

enjoyments in the game, players with a high level of extraversion and openness to experience might be more likely to be interested in this game. Considering the addiction factors inside *Don't Starve*, this game should be prudently recommended or promoted among people with high conscientiousness who have more possibilities to be addicted to the game even though *Don't Starve* cannot be defined as an "addictive easy" computer game.

3.3 Case Study 2

The second computer game we analyse using the theory model is another game that is on Steam: *Overcooked 2*. *Overcooked 2* is a multiple player cooperative computer game. In this game, at most four players can play together to run a restaurant. Players will have to collect, chop, cook the foods then put them on the plates and serve the dishes, finally wash the plates with tilt of the space, the floors moving and changeful obstacles around like moving conveyors. The key to completing every dish in time is to make the work division properly and design a series of actions and routes for cooperation in advance. The difficulty of the game is the timing system, the players have to cook a certain amount of different dishes in time so that they have to pay attention to the dishes that are being cooked in the pot in case they are overcooked and burn the kitchen. By correctly serving required dishes, the players then can obtain up to three stars in each level, after the players' stars reach two, they will be able to access the next level or re-play this level to get more stars. In this duration, the difficulty will increase as the level goes up.

Overcooked 2 is defined as a cooking simulation game in its introduction. However, after analysing, we would define it as a strategy game and action game. Even though the background of *Overcooked 2* is cooking simulation, the key of playing the game is to generate proper strategy according to the situation to correctly, accurately design the order of the cooking, the routes of movements and to cooperate with your partners in the game. Players' ability of overall planning is greatly required in *Overcooked 2* as a strategy game. The reason why *Overcooked 2* is considered as an action game is that the movements of players are significant in this game, the players' skill of controlling the movements of characters is a decisive factor of the game's completion. It's not enough to only have a good strategy when playing, skillful manipulations are necessary for supporting the strategy's execution. This game contains no narrative or complex background setting and it is worth mentioning that though there are characters in *Overcooked 2* as well, these characters have no background stories or different skills. They have different images that are anthropomorphic images of different animals. The characters themselves don't have any extra meaning, the choice of character should only be based on the player's preference. Therefore, role-playing games are not considered as the subtype of *Overcooked 2*.

As for the enjoyments/motivations in *Overcooked 2*, first of all, achievement motivation is the most important enjoyment in the game. By making a great strategy, greatly executing it and keeping improving it, players can complete and serve more dishes in good order and obtain more scores so as to get more stars for each level. To

gain more stars and reach a higher level can be great motivation to encourage the players to keep working on the game and provide a sense of achievement for them. Secondly, there might also be some people who enjoy generating strategy for the game since *Overcooked 2* is a game that greatly relies on the player's strategy and operations. The duration of generating strategy for beating the game is joyful and motivates some players to keep going in the game as well thus strategy enjoyment is another enjoyment in *Overcooked 2*. Thirdly, Social experience is another important enjoyment in the game. Since *Overcooked 2* is a multiplayer game, it cannot be played alone. One of the most important designs of the game is to allow the players to cooperate with their friends/partners in the game. Therefore, this game can also be a social tool, this function of social provides social enjoyment for the players and this enjoyment is significant for attracting some players too.

As a ludus, strategy, turn-based game, the desire of beating the game and winning high scores can be the most possible factors that make this game addictive. The set of every level is quite interesting, the developers skillfully set the difficulty to a reachable level through the players' efforts. This would strongly increase players' desire to win the game and get all three stars. Also, because of this "beatable" setting, players' desire to overcome the difficulties and beat the game would be inspired as well. This desire therefore can also be an addictive factor in this game. In conclusion, *Overcooked 2* cannot be counted as an addictive easy game with only two factors that might cause computer game addiction. As for the side effects of aggressive behaviours in real life, *Overcooked 2* has no violence elements in this game. Therefore, it wouldn't have bad effects to increase players' aggressive tendencies.

In conclusion, the game *Overcooked 2*, from the perspective of game type, might be more popular among people with a high level of extraversion, openness to experience (and probably high neuroticism). From the perspective of enjoyment, players with high extraversion and high agreeableness might be more likely to be interested in the game. Finally Overcooked with two addictive factors cannot be regarded as an addictive easy game. Without aggressive factors in the game, Overcooked 2 is not a violent game as well. The risky level of playing this game can be regarded as low.

4 Methodology

This methodology chapter of the qualitative thesis is about the research methods and techniques that have been applied to this research such as literature review.

Even though the relationship between computer game players' personality traits and some game-related behaviours and preferences has been proven for years, this is still a relatively new perspective of game study. It's because most existing research papers focus narrowly on players' preferences of game types/genres and ignore other elements inside computer games. To apply the results of different research practically, a more comprehensive model is established in this thesis. Factor analysis is mainly used in computer game evaluation according to different dimensions of the evaluation model. For establishing this theory model for computer game evaluation, we've

reviewed research papers in the fields of game classification, personality traits model, the relationship between game-related preference, game-related risks and players' personality traits. Moreover, for making the theory model, we also reviewed some research papers about game study and game analysis frameworks.

Based on the existing analysis frameworks and theoretical results of selected research papers that have more reliable investigation samples that are obtained through literature review, the theory model could preliminarily be applied to evaluate computer games in three dimensions: Game Type, Game Enjoyment and Game Risk.

5 Conclusion and Future Development

In this research, we mainly discussed the relationship between the gamers' personality traits and game-related preference as well as the possible risks that might be caused by computer game playing. In the background section, we expounded the views that a theory model should be developed for recommending and promoting computer games accurately to their target audience and for detecting potential side effects that might be caused by specific computer games to players' real life. In the literature review section, we reviewed research papers which refer to game types/genres, computer games' effects to human's life, personality traits, previous studies about the relationship between game preference or in-game behaviours with players' personality traits and research about game study(analysis). In the present research, we propose a theory model that analyses computer games from three dimensions: game type, game enjoyments and game risks- and also refers to analysis frameworks for narratology and ludology according to previous research. This theory model is quite basic since the results of previous research are not comprehensive enough and the investigation samples are not large enough.

To further develop the theory model, firstly, more analysis dimensions should be added to the model. For example, the playing method: online, offline, single player, multiplayer games. Secondly, more quantitative research is required in this field since there are still some limitations in existing research. Because of the effects from different sizes of investigation sample or other non-negligible elements, some data and conclusions of similar research about relationship between game preference and personality traits conflict with each other- even though some research suggested that elements like gender and other background have slight effects on this personality traits-game preference relationship. Therefore, some questionable elements or traits had to be deleted. As for the risk dimension of the model, addiction and aggressive tendency are only two most common risks of computer game playing that are being focused. There are several other risks/side effects that can be caused by computer game playing such as depression and anxiety. However, studies about computer games' side effects mostly focus their effects on aggressive behaviours as well as game addiction. There are currently few studies about their side effects like anxiety and depression etc.. These traits in the 'risk dimension' of the model had to be ignored currently because of the lack of supporting conclusions. This suggests that studies about the relationship between the side effects of computer game playing in real life

and players' personality traits are infrequent currently. Similarly I noticed that, about the problem of computer game addiction, current researches mainly focus on factors in players' real life that might cause addiction rather than addictive factors inside different computer game— the possibilities that players become addicted to computer games are not the same since different games might have different addictive factors, only when a game has enough addictive factors and are consistent with the players' belief, the players would be more easily to be addicted to the game. For example, Angry Birds is a game that is interesting but not addictive because it contains less addictive factors. Conversely, some computer games are addictive-easy because they manage to contain almost every possible addictive factor inside in order to attract players. These computer games are always interesting but players, especially players with addictive-easy personality traits should consider the risk before playing this kind of game and take precautionary measures.

This basic theory model represents the idea of evaluating computer games according to the relationship between personality traits and game-related behaviours so as to promote and take necessary precautionary measures in advance. This player-centred customised idea will be a future direction for computer game development. Even though some dimensions and traits of the model are yet to be provided, in future development, with more relevant research results and possible quantitative analysis, this theory model can be developed more comprehensively, and specifically, more game-related factors would be added to this model.

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