FLOW EXPERIENCE IN COMPUTER GAME PLAYING AMONG THAI UNIVERSITY STUDENTS

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ABSTRACT

This study was based on flow theory of Mihaly Csikszentmihalyi. A cross sectional study was performed to examine flow experience in computer game playing by college students and identified behaviors that lead to positive consequences and addictive behavior. The sample was 478 college students aged 18-24 who usually played computer games. Data were collected by using a computer game addictive behavior assessment consisting of 45 questions and a perception of consequence, from game playing assessment, consisting of 22 questions that had been verified for content validity and reliability with resulting satisfactory values.

Based on Exploratory factor analysis (EFA), the construction of the flow experience can be divided into 2 dimensions including: 1) cognitive flow which is comprised of challenge-skill balance, clear goals and unambiguous feedback, 2) emotional flow which composed of action-awareness merging, concentration on the task at hand, sense of control, loss of consciousness and time transformation. Cognitive flow positively correlated to the perceptions of utility from game ($\beta = .96$). Emotional flow positively correlated to physical and psychological impacts from game ($\beta = .54$). Moreover, it has been found that males were more likely to spend time on computer games than female. However, the finding of this study displayed that time spent on computer game did not as matter as much as what was happening in during playing game.

The findings of this study suggest that flow experience in computer game playing has both benefits and drawbacks. It is recommended that researchers further study examine flow experience in other contexts.

KEY WORDS : FLOW EXPERIENCE / COMPUTER GAME PLAYING

101 pages

ประสบการณ์ความเพลินในการเล่นเกมคอมพิวเตอร์ในกลุ่มนักศึกษามหาวิทยาลัย

FLOW EXPERIENCE IN COMPUTER GAME PLAYING AMONG THAI UNIVERSITY STUDENTS

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บทคัดย่อ

ผู้วิจัยได้ทำการศึกษาปรากฏการณ์การเล่นเกมคอมพิวเตอร์ในกลุ่มนิสิตมหาวิทยาลัย ผ่านแนวคิดทฤษฎีความเพลินของ Mihaly Csikszentmihalyi โดยมีวัตถุประสงค์เพื่อตรวจสอบโครงสร้างของประสบการณ์ความเพลินในบริบทการศึกษาพฤติกรรมการเล่นเกมคอมพิวเตอร์ และตอบคำถามว่าสภาวะการเล่นเกมในลักษณะใดที่จะทำให้ผลลัพธ์จากเล่นเกมนำไปสู่พฤติกรรมที่ก่อให้เกิดประโยชน์ และสภาวะการเล่นเกมในลักษณะใดที่จะนำไปสู่ความหมกมุ่นหรือพฤติกรรมติดเกม ซึ่งได้เก็บข้อมูลจากนิสิตอายุตั้งแต่ 18-24 ปี ที่มีพฤติกรรมเล่นเกมคอมพิวเตอร์ในชีวิตประจำวันจำนวน 478 คน โดยใช้แบบวัดพฤติกรรมการเล่นเกมคอมพิวเตอร์ จำนวน 45 ข้อ (ค่าความเที่ยงทั้งฉบับเท่ากับ .882) และ แบบประเมินการรับรู้ผลจากการเล่นเกมคอมพิวเตอร์ จำนวน 22 ข้อ (ค่าความเที่ยงทั้งฉบับเท่ากับ .919) เป็นเครื่องมือในการเก็บรวบรวมข้อมูล

ผลจากการศึกษาวิจัยพบว่า ภายหลังการวิเคราะห์องค์ประกอบเชิงสำรวจ (Exploratory factor analysis: EFA) โครงสร้างประสบการณ์ความเพลิน แบ่งได้ออกเป็น 2 มิติ คือ มิติด้านความคิด (cognitive flow) ประกอบไปด้วย 1) Challenge-skill Balance 2) Clear goals และ 3) Unambiguous Feedback และมิติด้านความรู้สึก (emotional flow) ประกอบไปด้วย 1) Action-Awareness merging 2) Concentration on the Task at hand 3) Sense of control 4) Loss of Self -consciousness 5) Time Transformation โดยมีความสัมพันธ์กันทางบวกในฐานะเป็น 2 First order factor (correlated) measurement model of Flow Experience ทั้งนี้ประสบการณ์ความเพลินในมิติด้านความคิด (cognitive flow) มีอิทธิพลโดยตรงต่อการรับรู้ประโยชน์จากการเล่นเกม (β = .96) ส่วนประสบการณ์ความเพลินในมิติด้านความรู้สึก (emotional flow) มีอิทธิพลโดยตรงต่อการรับรู้ผลกระทบที่มีต่อจิตใจและร่างกาย อันเป็นผลจากการเล่นเกม (β = .54) นอกจากนี้ยังพบว่าเพศชายมีแนวโน้มในการใช้เวลาในการเล่นเกมมากกว่าเพศหญิง อย่างไรก็ดีผลการศึกษาครั้งนี้การใช้เวลาไปกับการเล่นเกมมิได้เป็นตัวบ่งชี้สำคัญว่าจะทำให้ผู้เล่นได้รับผลไปในทิศทางใด หากแต่สภาวะที่เกิดขึ้นในระหว่างการเล่นเกมจะเป็นตัวบ่งชี้สำคัญถึงผลที่จะตาม

จากผลการศึกษาจะพบได้ว่าการเกิดประสบการณ์ความเพลินในขณะเล่นเกมนั้นสามารถก่อให้เกิดผลทั้งทางด้านที่เป็นประโยชน์และทางด้านที่ส่งผลกระทบต่อจิตใจและพฤติกรรม ดังนั้นจึงควรดำเนินการสร้างความเข้าใจถึงมิติต่างๆ ที่เกิดขึ้นได้จากการเล่นเกมคอมพิวเตอร์ และในการศึกษาครั้งต่อไปอาจนำตัวแปรประสบการณ์ความเพลินไปศึกษาในบริบทอื่นๆ เพื่อพัฒนาเสริมสร้างพลังทางบวกต่อไป

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CHAPTER I
INTRODUCTION

1.1 Statement of problem

Computer and technology advancement has been influencing everyday lives in several ways; communication, education, and recreation. Due to the development of new technological devices, personal computer, laptop, tablet, smartphone, etc., technology can eventually serve both functional and economical demands. This comes higher accessibility rate than it did in the past. It has been reported by the National statistical office that in Thailand, there were 22.2 million computer users with 18.3 internet surfers in 2013. In the closer inspection, the computer users has been found 82.3% of computer users were 6-14 years old, 61% were 15-24 years old, and, while 58.4% of internet surfers was 6-14 and 54.1% was 15-24 (Electronic Transactions Development Agency, 2013). To illustrate this, these age groups of users mostly spent their time online with entertainment and game matters. According the research finding, “The study of protective factors against game addiction in child and adolescent”, it has been found that during the school period (term-time), normal children spent in average9 hours a week oncomputer game, while, 16.3 hours/ week were spent by game addicted children. However, during school vacation, it was increasing to 16.6 and 31.2 hours a week in both groups respectively (Pornnoppadol et al., 2009). This has reflected the fact that, Thai children chose to spent their free time on computer game, the more free time is available, the more time children spent on it, resulting in game addiction. It has been currently estimated that 2.5 million Thai children had game addiction problem which was increasing from 13.3% in 2002 to 14.4% in 2012 (National Health Commission Office of Thailand, 2002). This situation has widely happened, it has been demonstrated that American children and adolescents spent 20 hours a week on computer games (Bailey, West & Anderson, 2010). There was 56% of children aged 8-18 used to play Grand Theft Auto (GTA) which contained violence, theft, and sex crime content (Rideout, Foehr&

Roberts, 2010). In Australia, 90-94% of 6-25 years old children played computer game daily (Brand, 2012). As well as, in China, 10.3% of children and adolescents become game addicted (Peng& Li, 2009) which was similar to Singapore (8.7%) (Choo, 2010). In South Korea, many children and adolescents addicted to computer game and some were sent to the behavior therapist. Nevertheless, there found the death caused by acute heart failure due to 80 hours continuing playing online game (Lee, 2004). Game obsession and continuing playing without sleeping and eating might be harmful to physical health (Young, 2009). Khan and colleagues (2009) found muscle pain in wrist, fingers, neck, back, and also epilepsy in game addicted children. Moreover, game obsession displayed mental and behavioral impacts including; isolation, poor interaction in family, spouses, and friends because 10-15 hours of each day were spent on computer game consuming (Usman&Inam, 2013; Prisana, 2012). Some kinds of computer game could lead to aggressive behavior, diminished empathy, and altruism, resulting in lying, stealing as the children have learnt from those games. Children might feel that what happened in game was real, they therefore could escape from unpleasant truth and compensate their disabilities and non-acceptance in their real life (Hongsanguansri&Kateman, 2013; Pornnoppadol, 2012; Connolly et al., 2012; Johnson & Scholes, 2013; Prot et al., 2012; Krahe& Moller, 2010). Computer game has been designed to attract, stimulate, and response mental desire of people, this, as a result, made children and adolescents feel obsessed and addicted (Van Rooij et al., 2011; Griffiths, 2010; Rehbein, Kleimann&Moble, 2010). Game addiction could be seen by several behaviors; obsessing to game, demanding to spend time on game daily, increasing in desire, and anger from being obstructed. These behaviors have been affected to routine life, physical, and mental health, even though, there were attempts to quite playing it, children would not prohibit themselves. The fact was that game addiction was somehow similar to drug addiction even if there was no chemical intake. Playing game, apparently, could benefit for emotional release and unpleasant avoidance (Hongsanguansri&Kateman, 2013; Kuss&Grifiths, 2012).

Accordingly, there came the huge interest to develop prevention program and knowledge to deal with game addiction problem. Since the 21st century, several incidents regarding heart failure death due to continuing playing game have been reported, also, violence, fighting, theft, and raping (Pornnoppadol, 2012: Sublette

&Mullan, 2012). Myriad research have been studied in order to create the alleviation, prevention, and solution both in national and universal levels, particularly, in children and adolescents who closely exposed to online game via several gadgets or even accessed to internet cafe in the community (Usman&Inam, 2003; Conally et al., 2012; Nontachote, Yuthapornpinit&Chaunchaiyasit, 2009). Previous findings mostly aimed to identify the cause and effect of game addictive behavior. Hongsanguansri and Kateman (2013) found many negative consequences of game addiction; imitation of aggressive behavior, violence, lack of empathy, decreasing of altruism, poor development, and physical illnesses. This was due to a biological factor, a neurotransmitter (dopamine in brain reward circuit) stimulating repetitive behavior, obsessive thoughts, which worked similarly to drug addiction. It was crucial that psychosocial factors should be taken into account, as playing game could give children amusement, a sense of achievement, acceptance, aggression ventilation, reality avoidance, and tension release. Moreover, Supakate et al. (2012) demonstrated that environment was correlated with game addiction, since peer pressure, poor family relationship, and low self-esteem, lead to game addiction in children and adolescent. Seemingly, it has been reported that family relationship, self-esteem, environment, and internet accessibility could predict game addiction in children and adolescents (Nontachote, Yuthapornpinit&Chaunchaiyasit, 2009). Besides, there found that time management, growth of Internet cafe business, peer pressure, and personal characteristics (love-to-try habit, seeking excitement, etc.) were associated with game addiction in Thai children (Boonyasane&Pannarong, 2009).

According to the article, ‘Video Games: Good, Bad, or Other?’ (Prot, et al., 0000?)and the finding of Freeman (2008), family context played a vital role on game addiction in children and adolescents. To illustrate this, interactions among family members, family regulation, community, the number of game cafe, the accessibility to those internet lounges, and personal characteristics influenced game addiction behavior. Anderson et al. (2010) agreed to the finding of Huesman (2010) mentioning that playing game was associated with aggressive behavior, poor empathy, less helping behavior. Simply put, game addiction behavior could be studied in two ways; 1) the effects of game addiction which was harmful to cognition, emotion, behaviors, and neurotransmitters in children and adolescents, 2) the causes of game

addiction which was correlated with gender, age, age of onset, level of education, length of consuming, family relationship, personality, loneliness, self-esteem, need of acceptance, daily life satisfaction, and life crisis. The result of the recent study has been integrated to create the guidance preventing game addiction (Pornnoppadol, 2012; Johnson & Scholes, 2013; Sublette &Mullan, 2012; Khan, 2007). In 2007, the national committee of constructive and safe media has been established aiming to initiate the collaboration of developing press legislation, as well as, the Operational Center for Constructive and Safe Media. In the meanwhile, the ministry of culture has launched the 'White game corner' project, aiming to advocate local enterprises to take care of children and adolescents. The ministry of public health, additionally, set up the 'Game addiction prevention center' in Child and Adolescent Mental Health Rajanagrindra Institute (CAMRI) providing treatment and prevention campaign for those with game addiction behavior. Moreover, with the collaboration of private sectors; the Mirror Foundation, the Family Link Foundation, and the Health Promotion Foundation, game addiction problem in Thailand has been watched and handed (NHCO, 2012). It seemed that state organizations emphasized on initiating law and regulation to handle game addiction problem in children and adolescents. To illustrate this, internet and game cafe needed to pay attention on computer users with regards to the restriction of age and time, as well as, parents should be aware that children need to be encouraged to do any other outdoor activities instead of playing game all day and night (Pornnopadol, 2012; NHCO, 2012). However, these regulations were called into question that people could enjoy their freedom of choices Also, to consider that game has been invented to make children happy at the first place is equally important as the fact that playing game at home is safer than committing harmful acts outside (Usman&Inam, 2013). Furthermore, it was crucial that some negative consequences of game addiction might be the impacts of predisposed factors; social and economic differences, capitalism, poverty, domestic violence, etc (Johnson & Scholes 2013; Nielsen & Smith, 2003).

Apparently, earlier findings demonstrated mostly negative consequences resulting in negative perspectives of people towards game playing (Connolly et al., 2012; Paul & Willoughby, 2012). Laws have left the society and regulations deteriorating human's freedom, neglecting the fact that computer game someway

could relief stressful state (Russoniello, O'Brien & Parks, 2009; Wack&Tantleff-Dunn, 2009). Besides, playing game can develop intelligence, in particular, critical thinking, planning, decision-making, problem-solving, creativity, self-esteem, altruism, kindness, and feeling of liberty, etc (Paul & Willoughby, 2012; Przybylski, Ryan & Rigby, 2009; Nielsen & Smith, 2003). This came up with myriad studies focusing on positive consequences (Johnson & Scholes, 2013). Likewise, 'positive psychology', a new perspective of studying psychology shifting from what makes people mentally sick and cure but building strength and mental wellbeing.

Positive psychology aims at developing psychological capacity and gaining constructive experiences (Linley, Joseph, Harrington & Wood, 2007), as well as building self-esteem and mental asset resulting in self-efficiency, wellbeing, and protective factors (Krentzman, 2012; Linley et al., 2007). The congruence of game addictive behavior and the concept of positive psychology can be applied to create psychological strength in children and adolescents. Since, instead of concerning a bad side of some computer game, it can be re-designed to teach and grow positive characteristics; creativity, self-esteem, problem-solving flexibility, problem management, emotional control, in children and adolescents (Adachi & Willoughby, 2012). There found the associations among computer game playing and positive variables in previous studies describing that game playing could lead to several psychological strengths; self-esteem, problem-solving, creativity, optimism, life satisfaction, mental health wellbeing, etc (Johnson & Scholes, 2013; Przylski, Ryan & Rigby, 2009; Russoniello, O'Brien & Parks, 2009). However, there were rooms for further investigations on 1) how these positive characteristics related to game playing and 2) at what state of playing game can lead to proper and constructive behaviors (Boyle, Connolly, Hainey& Boyle, 2012; Chiang et al., 2011). According to the fact that computer game offered fun and enjoyment leading to repetitive behavior and addiction (Yuksel, 2012), scholars, consequently, need to examine the optimal levels of game playing resulting in good conditions and not to be addicted (Chiang et al., 2011; Johnson & Scholes, 2013). Preceding research emphasized the impact of game addiction dichotomously, causing either good or bad consequences. Notwithstanding, game playing brought about both constructive and destructive outcomes (Gentile, 2011). The theory of flow has been considered as a rounded theory to explain both

sides of impact. Flow theory has been developed by MihalyCsikszentmahalyi based on the knowledge of ‘play’ by Piaget, competence by White, personal causation by DeCharms, funktionslust by Groosand Buhler,, and peak performance by Maslow (Engeser, 2012). Flow is a state of concentration or complete absorption with the activity at hand and the situation. It is a state in which people are so involved in an activity that nothing else seems to matter (Csikszentmahalyi, 1997). Flow, accordingly, can explain the state when children are playing game, as the idea of flow is identical to the feeling of being in the zone or in the groove. The flow state is an optimal state of intrinsic motivation, where the person is fully immersed in what he is doing. This is a feeling everyone has at times, characterized by a feeling of great absorption, engagement, fulfillment, and skill—and during which temporal concerns (time, food, ego-self, etc.) are typically ignored. To achieve a flow state, a balance must be struck between the challenge of the task and the skill of the performer. If the task is too easy or too difficult, flow cannot occur. Both skill level and challenge level must be matched and high; if skill and challenge are low and unmatched, then apathy happens (Snyder & Lopez, 2002; Csikszentmihalyi, 1997; 1990). The state of flow is similar to what happens when children are playing computer game causing enjoyment, challenging, reacting, active thinking, feeling, and behaving (Voiskounsky, 2010). However, too much involving in flow such as, over absorbed and engaged can harm children since they might need to obsess with the state of enjoyment but ignore self-care and interpersonal relationship (Chiang et al., 2011). Those children with game obsession feel displayed great demand on playing it and found it difficult to quite even they knew that playing too much game might waste valuable time and ruin relationship with others (Grant et al., 2010; Gentile, 2009); Sa-ngownsri& Gateman, 2013).

Flow is considered as the state leading to either positive or negative consequences depending on the elements of it. Some elements can bring about constructive experiences while some might cause game addictive behavior (Boyle, Connolly, Hainey& Boyle, 2012).

1.2 Research Question and Purposes

Research Question:

At what state of computer game playing, in college students, can cause to constructive and addictive behaviors?

Purposes:

The research question aimed to explore the different types of computer game causing different consequences through the theory of flow. The component of flow was further examined to determine the rounded impacts; amusement, relaxation, cognition, planning, decision-making, or addiction. The present study applied Structural Equation Modeling: SEM to test the relationship of experience of flow while influencing computer game playing outcome empirical evidence.

1. To examine the structure of flow experience in the context of computer game playing.
2. To study to components of flow experience influencing positive behaviors while playing computer game.
3. To study to components of flow experience influencing negative behaviors while playing computer game.

1.3 Expected outcomes

1. The knowledge regarding patterns of flow experience influencing both positive and negative consequences
2. The structure of flow components in the context of computer game playing
3. The applications of planning, preventing, and promoting the constructive impacts of game playing

1.4 Operational definition

Experience of flow can be defined as a state in which people are so involved an activity that nothing else seems to matter; the experience is so enjoyable that people will continue to do it even at great cost, for the sheer sake of doing it.

Computer game playing refers to the perception of consequences after playing computer game, in positive impacts; enjoying, relaxing, thinking, planning, decision-making, creating, or family collaborating, as well as, in psychological and behavioral impacts; compensating, fulfilling, acting out, or addicting.

Computer game refers to any kinds of online/ offline game accessing via technological devices; personal computer, video-game player, mobile phone, smartphone, tablet, and computer notebook.

Adolescent refers to college students aged 18-24 who play any kinds of computer game in daily life through any technological gadgets.

Average hour of playing game refers to the amount of time (hours per week) an individual spends on game playing via any kinds of technological equipment.

Type of computer game refers to either online or offline computer game.

CHAPTER II
LITERATURE REVIEW

2.1 Theory of Flow

2.1.1 Historical background

The word, ‘flow’ was coined by MihalyCsikszentmihalyi (1975) who put so much effort studying and investigating several groups of people; athletes, artists, musicians regarding their personality and other related factors which motivated continuing participation. This idea should be applied to people’s lives in order to overcome daily obstacles and pursue happiness. Life in the modern world was full of chasing money, power, fame, honor, and personal satisfaction. As humans were struggling to achieve things in life, they spent most time pursuing authentic happiness under the pressure. Still, some people lived their lives with only one goal, to achieve happiness and explore meaning of life. On this ground, the notion of being joyful while doing things in life is a drastic temptation which was in contrast to what has been said in primitive psychology. Psychoanalysis and behaviorism for instance, emphasized on conditioning, reinforcement, punishment, or instinctive and sex drive which omitted the fact that individuals can think and be motivated to behave due to past happiness experiences (Engineer, 2012).

Flow has been early studied by interviewing the artists; painter, modeler, sculptor, etc., and found that this group of people were interestingly able to spend very long time doing their masterpiece without outside pressure. They just only felt into and fascinated things they did resulting in inner peace and happiness. Later, the research has been expanded to study in other occupational background, for example; doctors, song composers, dancers, mountain climbers, baseball players, and chess candidates, etc. Likewise, the result showed the same state of satisfaction, enjoyment, and intrinsic motivation lied within (Csikszentmihaly, 1975). This theory based on the concept of how people can balance between their abilities and the challenge of specific tasks

(Csikszentmihaly, M. &Csikszentmihaly, I., 1988). The curiosity why people can keep completing some tasks without any extrinsic motivations initiated the exploration of flow components. These are 1) involvement in an activity, 2) clear goals every step of the way, 3) immediate feedback to one's actions, 4) action and awareness are merged, 5) sense of accomplishment with intrinsic motivation (Csikszentmihaly, 1975). Later, scientists indicated other elements of flow such as; the sense of time becomes distorted--feeling that time past by so quickly (Csikszentnihalyi, Abuhamdeh& Nakamura, 2005).

Concept of flow theory

Because the perspective of behaviorism and psychoanalysis have been focusing human's behavior which is mainly the result of external factors, reinforcement, or psychosexual development, there came the attempt to explain individual's action by internal motive and desires. Existentialism has been first introduced to the society after the World War II, there was a new paradigm shift of psychology--emphasizing on wellbeing and psychological assets rather than diseases and cure (Snyder & Lopez, 2002). Additionally, it was vitally important to explore the reason why during a harsh time of life, some people were stuck in sadness and sorrow while some were looking forward with hope and internal drive to overcome obstacles (Csikszentmihalyi, 1975).

Hebb and Berlync (1995) introduced the term 'optimal stimulation' describing that the proper arousal is the key factor of intrinsic motivation and behavior, new arousal in particular, could cause enjoyment and excitement. On the contrary too much exposure to new situation and challenges could be stressful. Mihaly, on this ground, tried to balance the optimal level of being enjoy with personal capability and challenges and originated the theory of 'flow (Csikszentmihaly, M. &Csikszentmihaly, I., 1988).

The term 'competence' was proposed by White (Engeser, 2012) referring to the ability to conquer environment when individual were in new situation. The feeling of achievement happened after overcoming difficulties resulting in joyfulness and potential. Flow, likewise, was considered as a sense of mastering and ability to manage challenges in life.

‘Personal causation’ can be defined as the feeling towards accomplishing new tasks due to self-determination theory (Deci& Ryan, 1985) focusing on intrinsic motivation as mentioned in the theory of flow.

‘Play’, according to the concept of play motivation, noted that individuals always seek for pleasure through self-evaluation, skill development and life experiences. These factors are considered as the positive reinforcements and rewards to create repetitive behavior (Piaget, 1951). The theory of flow applied the concept of autotelic experience which was talking about the power of positive consequences from the very first experience (Csikszentmihalyi, 1990).

‘Peak experience’ refers to the best moment in one’s life, happiness, and satisfaction (Maslow, 1964). Both ‘flow’ and ‘peak experience’ can bring enjoyment and cheerfulness, ‘peak experience’ is all or nothing phenomena while ‘flow’ gradually increase in degree. Moreover, ‘peak experience’ relates to beliefs, meditation, and ritual similarly to loss of self-consciousness of flow, while ‘flow’ can lead an individual to integrate with activities better than ‘peak experience’ (Csikszentmihalyi, 1975).

2.1.2 Definition of flow

The theory of flow has been continuing studying based on the concept of motivation, cognition, self-competence, and happiness experience. Previous research aimed to explore what was in between difficulty and challenge and found that there were several factors relating to the state of flow. Later, the study displayed those factors namely, goal-oriented behavior, concentration, self-satisfaction, and internal positive reinforcement (Jackson & Marsh, 1996). The result conformed to the theory of autotelic experience (Csikszentmihalyi, 1990; 1996) used to describe people who were internally driven, with a sense of purpose and curiosity. This determination was an exclusive difference from being externally driven, where things such as comfort, money, power, or fame were the motivational force. According to Csikszentmihalyi, flow was consequently occurring when an individual perceived a balance between the challenge of an activity and his or her own skills. In other words, flow happened when both, challenges and skills, are high. However, flow can be defined differently due to various social contexts (Hoffman & Novak, 1996).

According to the American Psychology Association: APA (Vandenbos, 2006), flow can be defined as the state of being fully involved to enjoyable activities such as, sport, art, or reading. Flow occurs when people completely focus and enjoy challenging task with the sense of self-capability, concentration, and achievement resulting in intrinsic motivation to accomplish over again.

Csikszentmihalyi (1988) noted that flow wasa operational mental state of a person his performance and an activities were fully immersed with a feeling of highly energy focus, full involvement, and enjoyment in the process of the activity.

Webster Trevino and Ryan (1993) mentioned that flow was a mental characteristic composed of 4 elements; control, concentration, curiosity, and intrinsic motivation.

Ghani and Deshpande (1994) proposed that flow had two components; a continuing attention span and a balance between the challenge of an activity and an individual's own skills.

Hoffman and Novak (1996) revealed that flow was a state occurring during doing activities. It caused a sense of joyfulness, reducedself-assessment, while increased concentration through continuing process. An individual felt inner rewarded with a balance of challenge and his or her personal skill.

Chen (2006) explained that flow was a positive feeling towards any involved activities led by intrinsic motivation in the condition of optimal levels of personal capability and difficulty of the task.

All in all, flow could be defined as the state of personal happiness, satisfaction, and enjoyment during accomplishing optimal challenging task. People felt fully involved while doing things, so things around seemed less attractive. Afterwards, they became self-satisfied and internally rewarded resulting in repetitive behavior due to intrinsic motivation rather than outer force. Flow might relate to different life activities happening in all genders, ages, races, and nations. As a result, the term, 'flow', might come with several definitions varying from its components and academic context.

2.1.3 Elements of flow

According to Csikszentmihalyi (1988, 1990, 1996), flow referred to an optimal psychological state when a person engaged to an activity with challenge-skill balance, often resulting in immersion and concentrated focus on a task. This could result in deep learning and high level of personal and work satisfaction. Flow was a sense of adequate skill to cope with the challenges at hand in a goal directed, rule bound action system providing clear clues. Concentration was intensely highand there was no attention left over to think about anything irrelevant or to worry about problems. Consciousness disappeared, and the sense of time became distorted. An activity that produces such experiences was so gratifying that people were willing to do for its own sake, with little concern for what they would get in return, no matter it was difficult or dangerous. There were nine elements of flow (Csikszentmihalyi, M., 1975; Csikszentmihalyi, M. &Csikszentmihalyi, I., 1988; Jackson & Marsh, 1996; Whitmore, 2005) as follow;

1) Challenge-skill balance refers to the ability to evaluate one's own capability towards upcoming tasks and challenges. Both challenge and skill needs to be in the optimal level, which is slightly higher than usual attempt. Too little challenging task in high performance state might create boredom, while; too difficult task with low performance might lead to anxiety and stress. Individuals can maintain flow by choosing optimal challenging task. Considered those two conditions people can feel better relaxed, challenged, resulting in pride and self-development.

2) Action-awareness merging referred to the state which people are so involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it.

3) Clear Goals referred to a performance when an individual knows the goal and believes that the certain behavior in question can achieve that goal. Flow, therefore, is the state during attempting to complete the goal since both interest and attention are directed in one destination.

4) Unambiguous Feedback refers to a state of recognizing physical changes, such as ; internal organs, connectedness, joint, clear visibility, hearing, odor, and taste, which all are the consequences of flow.

5) Concentration on the task at hand refers to intense concentration that there is no attention remains to consider anything irrelevant or to worry about problems , consciousness thus disappears.

6) Sense of Control refers to the state when one is doing some activities with a sense of worry-free and feeling relaxed. In this psychological state--the challenge-skill balance, certain consequences seem no more matter.

7) Loss of consciousness refers to a psychological state when someone keeps away from consciousness. Simply put, when feeling self-conscious, one becomes aware of even the smallest of his actions. The awareness can impair one's ability to perform complex actions and feeling of flow.

8) Time Transformation refers to a state when the sense of time becomes distorted. If an activity producingany experiences is so gratifying, people are willing to do it and feel that the time pasts too quickly or slowly without any sense.

9) Autotelic experience is a word composed of two Greek roots: auto (self), and telos (goal). An autotelic activity is what peopledo something for its own sake because to experience it is the main goal. Applied to personality, autotelic denotes an individual who generally does things for their own sake, rather than to achieve any external goals.

According to those nine components, flow could be divided into two parts. The first one was ‘flow condition’ considered as a key factor to flow. The other was flow characteristic, a psychological phenomenon happening during the state of flow (Koehn, 2007).

1) Flow condition, such as; challenge-skill balance, clear goal, etc.

2) Characteristic of flow, such as; concentration, action-awareness merging, sense of control, loss of consciousness, transformation, etc.

These two parts of flow are beneficial to foster flow. Flow condition, in particular, can be manipulated and created through managed environment.

Flow is a continuing state varying in levels, degrees, and frequencies. A low degree often comes with uncomplicated task called ‘micro flow’. It usually occurs in daily life activities, temporally and unstructured tasks, for instance; listening to music, reading books, watching television, etc. Micro flow helps people feel naturally relaxed. The deeper one, the macro flow, which will happen in more challenging and

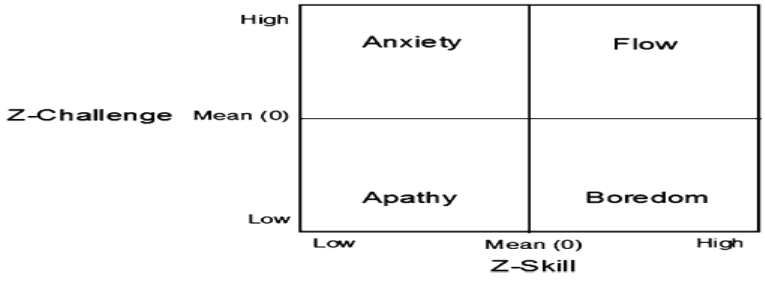
complicated tasks; playing sports and working, for instance. It relies on both mental and physical competence as well as the challenge-skill balance. Macro flow can help an individual have psychological and physical development (Csikszentmihalyi, M., 1975; Koehn, 2007). However, the important factor of fostering flow is personality, a person who can build up his or her intrinsic motivation, mindfulness, concentration, and challenge-skill balance, are more likely to experience enjoyment and flow (Csikszentmihalyi, M. &Lefevre, 1989; Csikszentmihalyi, M., 1990)

2.1.4 Flow Model

Apart from being explained through various definitions, flow has been studied via the flow model describing elements, process, and brief theoretical matter (Buason, 2012). The model of flow has been developed to draw a clear picture of it in twocategories:

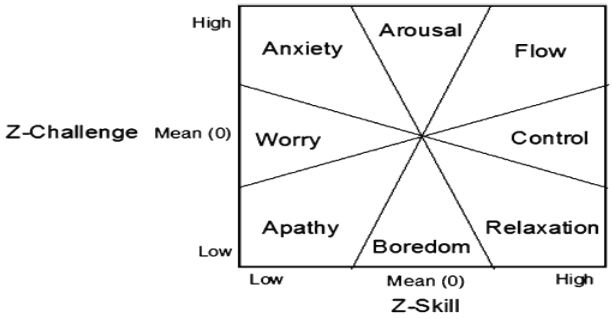
1) Flow channel segmentation model has been constructed by the experience sampling method, which collected flow experience at times. The result displayed a better understanding of what creates flow and positive emotions, especially the levels of challenge-skill balance must be higher than usual.

2) Causal model was explained by the activity/survey research conducted via flow assessment tool in order to explore the empirical hypothesis relationship. The main factors of the early step of flow model development were challenge-skill balance and the flow experience data collection. It has been found that flow would occur when a person's skill and challenge of the task must be balanced but it should be slightly higher than usual. Too complex task with low capability might result anxiety, while, too easy task in skillful hands might create relaxing state or boredom. However, too easy task with low challenging seemed to cause uninteresting and apathy.



Picture 2.1. The quadrant model of the flow state (Engeser, 2012)

Later, relying on the concept of challenge-skill balance, the model has been expanded into eight characteristics (four has been added; control, stimulate, relax, and worry).

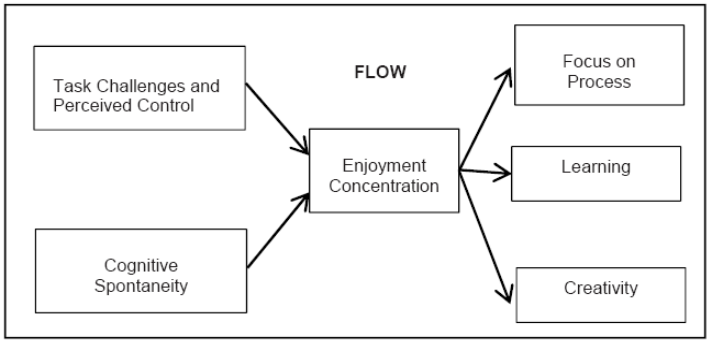


Picture 2.2. The experience fluctuation model or Octant model (Engeser, 2012)

According to the study of Teng and Huang (2012), it has been revealed that personal skill was positively associated with flow and boredom, in other word, high skill and high challenging could lead to greater flow, while, a skillful person with low challenging task caused boredom. On the contrary, skill was negatively associated with anxiety, that was, the more skillful an individual was, the less anxious he became. Challenging and obstacle was positively related to flow and anxiety but negatively related to apathy. Simply put, high challenging task could decrease apathy but increase interest, while, low challenging task caused low interest. Although the result of previous study conformed to the concept of challenge-skill balance, the different aspects still appeared. No matter how perfect the challenge-skill balance was, too many times individual needed to start it over again could result in boredom. In addition, skill was independent to challenge.

2) *Causal model*. Apart from being explained by the basic concept of challenge-skill balance, flow has been studied by causal model through activity/ survey research (Engeser, 2012). Flow model was, consequently, studied in several contexts, however, flow has been focused on satisfaction, enjoyment, and engagement to ongoing activity. In the state of flow, people could feel relaxed, low-tension, and nothing seemed to matter (Csikszentmihalyi, M., 1988). In the present study, flow has been studied as the independent, dependent, and intervening variables (Obada, 2013) in the area of computer and technology, as well as, game addictive behavior.

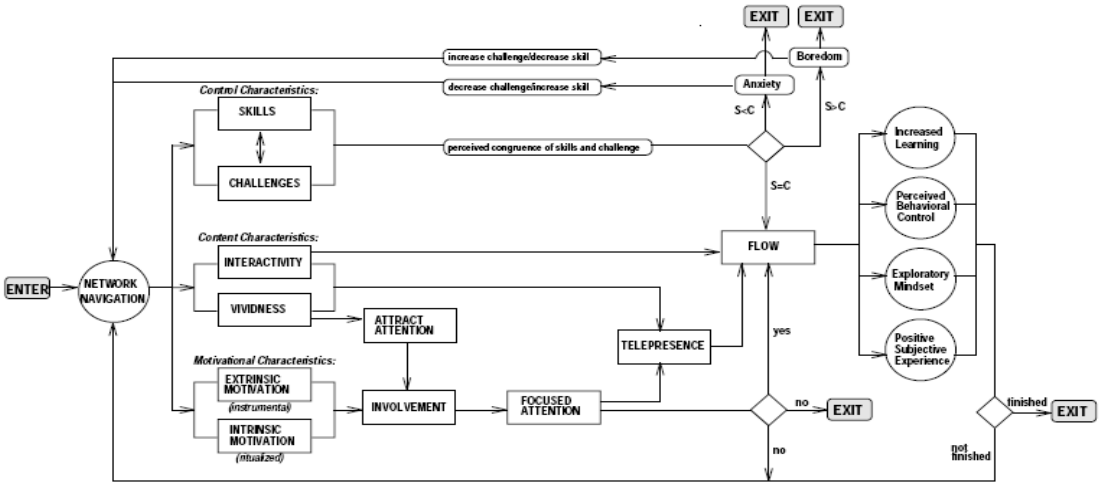
Studies related to flow and computer technology has begun in the early 90s, thus there were many methods to examine flow structure and concept. This resulted in different definitions and models of flow (Obada, 2013). According to Ghani (Finneran& Zhang, 2005), flow model has been developed to explore the human-computer relationship. It was believed that flow could be seen with many factors; 1) the perception of challenge-skill balance 2) pattern of thought (enjoyment, positive experience, concentration).



Picture 2.3. Model of Flow in Human Computer Interaction (Finneran& Zhang, 2005)

According to this model, too complicated task could create stress, anxiety, or boredom. An individual might feel that the task could not be finished; as a result, the perception of challenge-skill balance is the key consideration to assess flow.

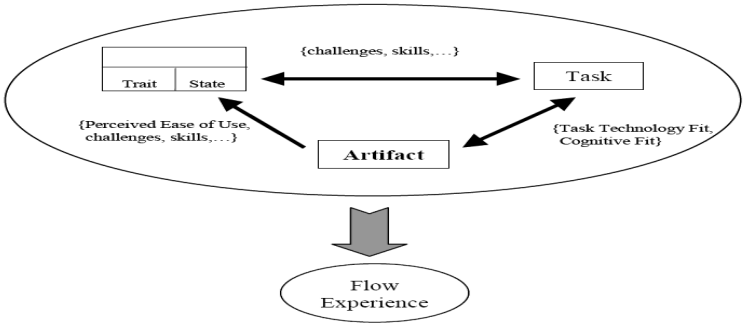
However, Hoffman and Novak (1996) developed flow model from online experiences based on the fundamental concepts of Csikszentmihalyi regarding; challenge-skill balance, high concentration, authentic interaction, involvement, goal directedness,andpositiveexperience.



Picture 2.4. A Model of network navigation in a hypermedia CME (Hoffman & Novak, 1996)

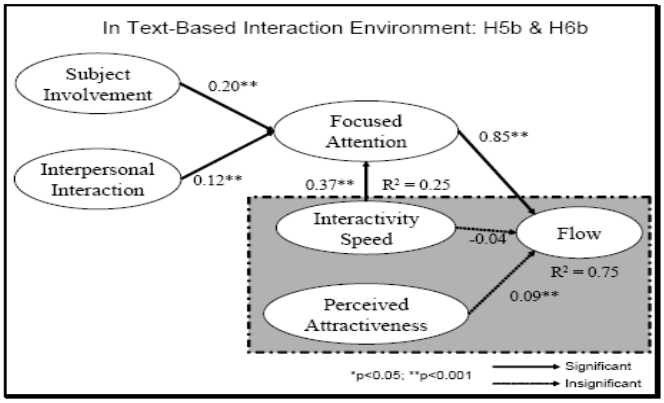
However, the flow model has been adapted since it claimed that the stimulating and challenging activity essentially caused flow. This new model displayed factors to foster flow; 1) skill/ ability to manage the task 2) levels of challenging/ stimulating, and 3) Concentration. Besides, computer using experiences, pattern of interaction, perception, sense of authenticity, and flow experiences should be taken to account (Novak, Hoffman & Yung, 2000).

The study of Finneran and Zhang (2002) penetrated that personal characteristic, challenge of task, and computer device have mutually impacted each other and fostered flow. To illustrate this, an individual with high competence, positive thinking towards the task, together with the readiness of computer technology/ devices, state of flow would be more likely to occur.



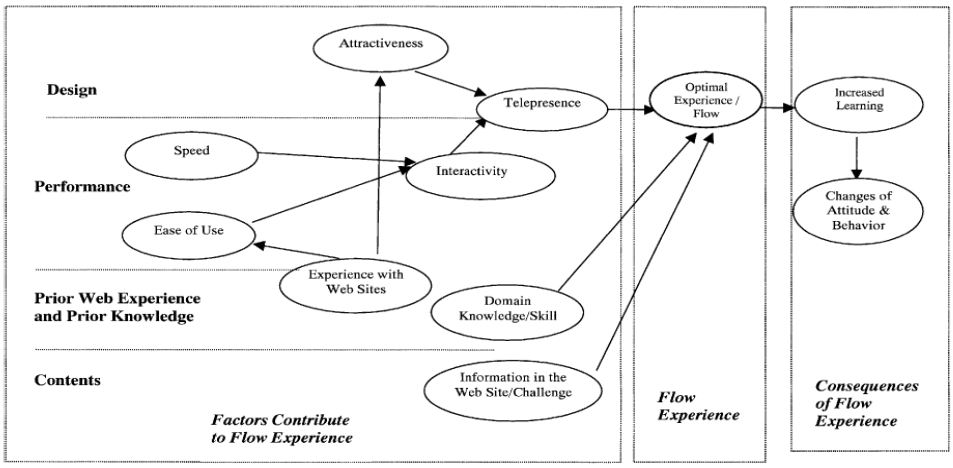
Picture 2.5. Person-Artifact-Task Model for Studying Flow within a Computer-Mediated Context (Finneran& Zhang, 2002)

Ting et al. (2007) studied flow as a variable in the area of communication. By sending online texts, though it was not so attractive like picture and voice message, it could cause flow somehow. The purpose of this study was to examine factors causing flow. The result showed that talking with people can lead to flow, however, it must be a continuing conversation. Moreover, chatting with online people seemed to be more attractive as shown in the flow model below:



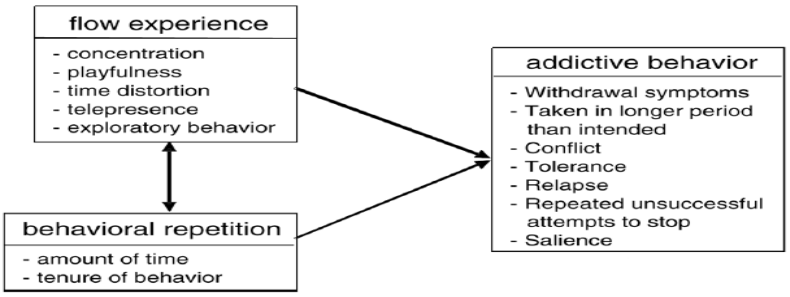
Picture 2.6. Structural model Text-Based communication environment

Skadberg and Kimmel (2004) constructed the flow model displaying both cause and effect of flow experience. This study investigated flow on Internet surfing experiences and demonstrated that enjoyment and time distortion from flow requires computer skill and knowledge. Online chatting, furthermore, provided the sense of authenticity through its practical application. Besides, the positive consequence of previous experience together with the quick response of interfered the relationship of users and the online world.



Picture 2.7. Flow model in the context of a virtual tour Web site for nature tourism interpretation (Skadberg& Kimmel, 2004)

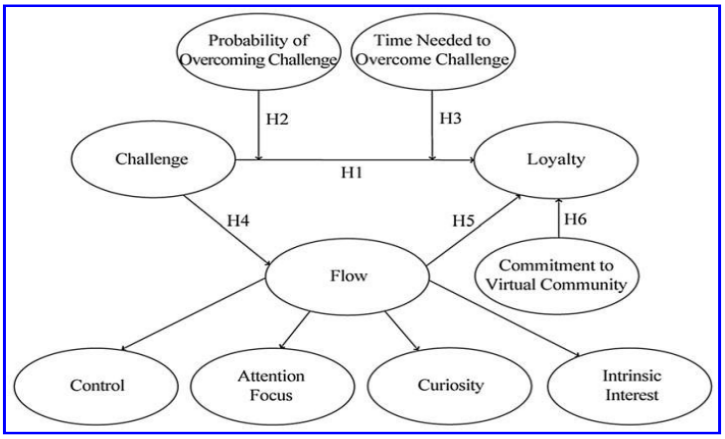
According to the study of Chou and Ting (2003), flow model has been investigated to explain game playing behavior in order to understand the cause of game addiction. Conforming to rational addiction theory, obsessive game consuming leads to addiction. Likewise, for those who really enjoyed playing game,and time distortion with the state of flow were more like to addict to it. Flow was, consequently, considered as a major condition to be addictive.



Picture 2.8. Conceptual model in research: The Role of Flow Experience in Cyber-Game Addiction (Chou & Ting., 2003)

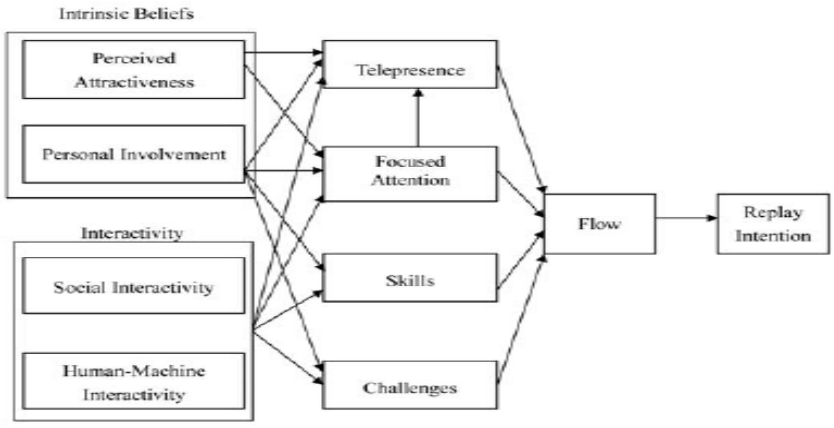
Teng (2012) studied the loyalty to online game and reported that the relationship among challenge, loyalty, and repetitive game-playing would be stronger if a person spent enough time on it. Additionally, more challenging game caused higher state of flow, loyalty, and continuing attraction to play it over again. In this

model, flow is composed of curiosity, concentration, ability to control, and intrinsic motivation.



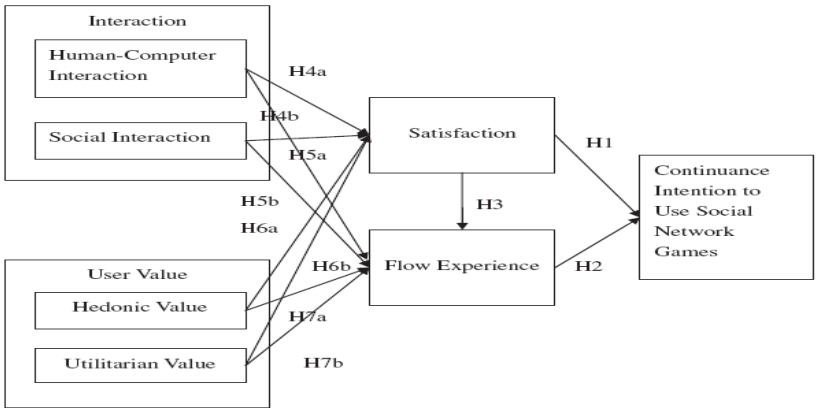
Picture 2.9. Conceptual model in research: How Do Challenges Increase Customer Loyalty to Online Games? (Teng, 2012)

Liu and Chang (2012) studied flow experience as an intervening variable among online game players examining whether interaction and internal belief variables have impacts on flow and repetitive behavior. The result demonstrated that flow experience has a predictive ability on obsessive game playing. The key factors behind this were sense of authenticity (telepresence), concentration, challenge-skill balance, and the social interaction of computer game and game player.

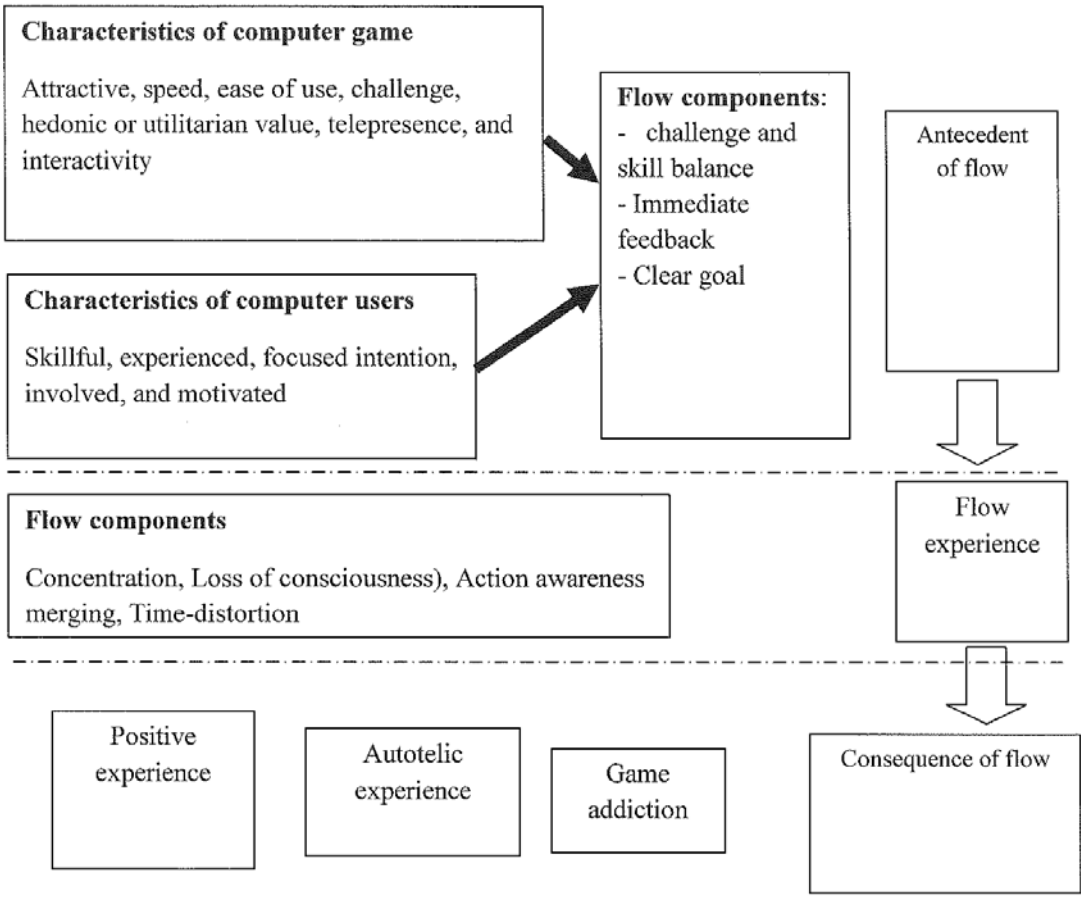


Picture 2.10.Conceptual model in research: Measuring The Flow Experience Of Players Playing Online Games (Liu & Chang, 2012)

Chang (2013) created flow model to fulfill the understanding of game playing via social media. The study indicated that there were two main factors fostering flow; 1) user value causing state of euphoria and 2) interaction causing repetitive behavior.



Picture 2.11. Conceptual model in research: Examining users' intention to continueusing social network games: A flow experience perspective (Chang, 2013)



Picture 2.12. Model summarizing flow experience and computer using behavior

2.1.5 Measurement of flow

Flow has been started by a group interview of people including artists, modelers, physicians, musician, athletes, etc. Based on the Experience Sampling Method, the development of a flow measurement was initiated. In this study method, participants were asked to recall and tell a certain story of flow experience (Engeser, 2012). In 1996, Jackson and Marsh developed the flow state scale to measure athletes investigating the tendency of flow. Later, the trait flow scale was invented in 1999 aiming at measuring the current state of flow through immediate memory. In 2002, the flow state scale 2 and Dispositional Flow scale were further developed to eliminate some limitations of the previous one (Engeser, 2012).

Flow State Scale was developed by Jackson and Marsh (1996) based on the conceptual framework of Csikszentmihalyi aiming to assess the level of flow. There were 36 items with 9 elements, 5Likert scale ranging from 1 (absolutely disagree) to absolutely agree (5). The flow state scale has been tested in 394 athletes from 41 different sports, aged of 14-50 years, mixed gender, race, and sport skill. The measurement tool showed high psychometric property with high reliability (r = .08-.86), besides, the confirmatory factor loading investigation penetrated good predictive ability of all elements (factor loading = .74). Especially, the sense of control, and challenge-skill balance were considerably high. However, flow element has been categorized into three groups; 1) challenge-skill balance and clear goal were in clearness of the state, 2) unambiguous feedback, concentration, and sense of control were in control of the situation, 3) action-awareness merging, loss of consciousness, time transformation, and autotelic experience were in absorption of the performance.

Dispositional flow scale was a parallel measurement of the Flow state scale aiming to measure the frequency of flow experience with the similar nine components. However, dispositional flow scale focused on current flow experience rather than past experience. Accordingly, the questionnaire items were considerably the same. The psychometric property was good (RMSEA < .05, RNI > .9, factor loading > .70). The study reported that global state flow had good relationship with state-base criterion factors, while global trait flow displayed good association with

dispositional criterion factors. This could be implied that flow state and flow trait were different reflecting in different validity (Marshv& Jackson, 1999).

Flow state scale 2 and Dispositional flow state have been developed after the first trial and some limitations were reported. To have the better version, some domains had to be revised especially the loss of consciousness and time transformation. Moreover, some items overlapped two elements, consequently, 13 items have been modified and tried out. The reliability has been improved (.80 - .90), the confirmatory factor analysis showed a good result (Flow state scale 2: NNFI > .90, CFI > .90, RMSE < .06, Dispositional flow state 2: R = .81-.90, CFI > .94, RMSE < .05 (Jackson &Eklund, 2002).

2.2 Computer game playing behavior

2.2.1 Definition of computer game

Computer game referred to electronics or digital game that players can access through personal computer or other game players (Microsoft Xbox, Sony PlayStation, Nintendo Wii), Tablet, and online game (Johnson & Scholes, 2013).

Computer game can be defined as both online and offline system game on personal computer. Mostly, people access to digital game on mobile phone or certain game player, such as; Game boy, Nintendo DS, PlayStation, Xbox Wii, and Smartphone (Van Rooij, 2011).

Computer game referred to a game which can be played through online system or computer software. There are interactions among players requiring skills and attempts to achieve tasks (Kertthong, 2009).

Computer game can be defined as computer software for entertainment applying digital games on it. People can enjoy playing on personal computer, computer notebook, or online network. To achieve a computer game, the player(s) must be required skills conforming to the content of each game, consequently, rules and goals might be set differently (Meeboontam, 2009).

As a result, computer game can be considered as any kinds of digital game played on any digital devices, portable devices, video game player, mobile phone,

tablet, personal computer, computer, and notebook which is on online and offline system.

2.2.2 Cause and effect of computer game addiction

Computer game playing behavior appears across several groups of people. There have been huge interests to study this phenomenon in many aspects, causes and effects and other factors positively/ negatively related. Some fascinating studies were demonstrated in this chapter.

This present study explained computer game playing behavior based on the theory of flow. In the closer look, flow experience mechanism was investigated in both positive and negative aspects. However, background characteristics were likely to affect the computer game playing behavior. The present examination focused on how different total spending time and what certain type of computer game was associated with computer game playing behavior.

For the time factor, as it was previously mentioned in the introduction, children were more likely to spend time on computer game playing. On one hand, spending too much time on computer game can affect; academic matters, routine life, interpersonal relationship, and health (such as eating problem, sleeping problem, etc.). On the other hand, wasted time on computer game can bring about negative consequences; physical deterioration, mental problem, social problem, conduct behavior, aggression, and drug related behavior (Liu, 2014; Gentile, 2011). These factors reflected the upcoming game addiction, the more time people spent on computer game, the more addictive they would become (Choo et al., 2010; Gentile, 2009; Pornnoppadol et al., 2009). Conforming to the study of Voiskounsky and colleagues (2004), it has been found that the more flow appeared, the more attractive computer game became. In other word, intense flow experience could lead to game addiction. Notwithstanding, spend long enough time playing game somehow developed many vital skills; problem solving, memory, etc. Hence, when people found it useful, they would spend greater time on computer game. According to Wu, Scott and Yang (2013), spending optimal time on computer gamecould develop cognitive ability, and other related skills. For gender influence, male has been found to spend more time playing game than female (Sublette &Mullan, 2012; Choo et al., 2010).

This might be because most computer game was online game competing with many players. These male players could fulfill their desires; a sense of belonging, peer acceptance, achievement, and reward. Online game players could not limit their time since they feel like accomplishing a mission with peers, they as a result seemed to spend longer and longer time playing game. On the contrary, female players were more likely playing offline game on mobile phone. They spent very little time to complete a small mission by themselves such as, dressing game, cooking game, singing game, etc (Sublette &Mullan, 2012; Choo et al., 2010).

Positive Consequences

Prot et al. (2012) indicated that computer game playing could improve visual ability, better learning skill, and greater empathy, but lower aggression. Likewise, Russoniello and colleagues (2009) noted that game playing created amusement, satisfaction, and relaxation. Paul and Willoughby (2012), furthermore, discovered that game could cause better intellectual development, critical thinking, planning, decision-making, and creativity. Johnson and Schole (2013) concluded that playing game helped an individual show greater constructive characteristics and positive consequences; relaxation, tension relief, frustration eradication, self-esteem, self-efficacy, independence, sense of belonging, positive advocacy, and interpersonal relationship.

Negative Consequences

According to Usman and Inam (2013), it has been reported that inappropriate computer game playing led to isolation, poor incest interaction, and interpersonal relationship. Anderson et al. (2010) claimed that game playing strongly linked to aggression, less empathy, and poor altruistic behavior in children and adolescents. Seemingly, there found the association between game playing and aggressive behavior and unkindness (Huesmann, 2010). Prot et al. (2012) computer game containing violent content could increase cognitive, emotional, and behavioral aggression, while, decrease altruism, empathy, learning performance, attention, concentration, and ended up with game addiction. According to Hongsanguanchaisri and Kateman (2013), it has been argued that although game could improve cognitive ability, players had still got several drawbacks; poor health (eyesight deterioration, stomachache, lack of sleep). This could cause any other psychological and

sociological problems, for example, poor educational outcome, poor emotional control, physical/ verbal aggression, depression, irresponsibility, theft, and conduct behavior. Moreover, family conflicts, fighting, and poor time management have been reported.

Computer game addiction

Computer has been popular since 2000 and it created constructive and destructive consequences, particularly, game addiction. It has been widely controversial regarding the difference between game and drug addiction in terms of, diagnostic criteria and severity. Here came myriad studies and research. According to the book, The Diagnostic and Statistical Manual of Mental Disorder 5th edition (American Psychiatric Association, 2013), there has been an attempt to reframe 'substance-related disorder' to substance related and addictive disorder. It was because the previous version of DSM has been revised since 1994 in about almost 20 years ago. Time past and many unknown mental diseases as well as non-substance related addictive behaviors have become familiar, the new edition has been amended. To illustrate this, there were a number of addictive disorders; gambling, game, Internet, shopping, exercising, working, etc. Even though, gambling has been already considered as an addictive disorder in DSM-IV called 'Pathological gambling' in impulse control disorder, the cause and the treatment mainly involved with substance-related disorder. Consequently, in DSM V, gambling was issued as substance related and addictive disorder. Computer game addiction has been named as 'Internet gaming disorder' in research appendix section 3 which meant that empirical studies should have been conducted since earlier research held different measures. Most of them have been conducted among Asian children and adolescents, thus, there were rooms for other sampling target group to improve better reliability and validity (Petry&O'brien, 2013). American Psychiatric Association (2013) addressed diagnostic criteria for game addiction; 1) obsess in thought 2) increase in desire to play game 3) feel upset when being obstructed to play game 4) loss of control 5) lack of interest in other things 6) change in mood 7) lie or deceive to play game 8) compensate inferior feeling/ life trauma/ crisis by playing game 9) incapability to manage relationship/ work/ study/ daily life. Griffiths (2005)found that how people defined, valued, motivated, and set goal in computer game could lead to addictive condition. It was crucial that some

people used computer game to avoid what happened in the real world or to compensate their unfinished business.

In Thailand, there are no standard diagnostic criteria for computer game addiction; however, scholars have found some common characteristics among game addictive, substance dependence, and pathological gambling people (Hongsanguansri&Kateman, 2003). They were; 1) feeling joyful when playing game, 2) being satisfied when winning and showing greater desire to win, 3) even the desire of winning has been met, they are still seeking for it, 4) consuming more and more time on game, 5) feeling upset/ agitated/ depressed/ tensed when being obstructed to play game, 6) using game as a mechanism of problem avoidance, 7) being obsessed and keeping concerned of playing game, 8) Craving for game affecting health and family relationship, 9) non-controlling oneself to stop even noticing negative consequences, 10) lacking of interest in other enjoyable activities, and 11) showing behavior problems being found; lying, theft, aggression, school absence, gambling, etc. In addition, Pornnopadol et al. (2014) suggested in the game addiction guideline for parents about the important signs of being addictive as follow; 1) Obsessing on playing game, spending most time on it with no interest in other activities, 2) consuming hours and hours on game, cannot limit time spent on it, 3) becoming resistant/ moody/ furious when being forced to stop playing game, 4) showing health problems; sleepless, poor nutrition, etc., 5) presenting irresponsibility; self-care, class absence, academic failure, isolation, poor interpersonal relationship,and 6) changing in behavior; stubborn, resistance, antisocial, lying and theft.

In a nutshell, computer game addiction showed several common criteria; 1) feeling obsessed on game and other related context, 2) becoming satisfied with a victory of the competition in game and showing greater desire to win other competitions, 3) spending more and more time on game, 4) feeling upset/ agitated/ depressed/ tensed when being prohibited to play game, 5) using game as tool to escape from problems and anxiety, 6) obsessing in previous failure and planning to win the next competition, 7) Craving for game without concerning of drawbacks; educational, professional, mental and physical, and social problems, 8) finding hard to quit or stop playing game, 9) lack of interest in other life activities, and 10) displaying behavior problems; lying, theft, aggression, school absence, gambling, and other related

problems. There were many behavior problems reported afterwards; liar, theft and burglary, aggression, school absence, running away from home, and gambling. However, the diagnostic criteria for game addictive behavior is similar to the criteria of substance related disorder and gambling focusing on neurophysiological notion (Petry&O'brien, 2013). Weinstein (2010) called this into question by noting that psychological and sociological factors should be taken into account as well.

2.2.3 The concept of game playing and computer game addictive behavior

Game playing and computer game addictive behavior has been studied in several perspectives, especially, concepts and theories. Aiming to explore a clear picture and its utility, several concepts were applied;

Medical Biology theory is a field of biology that has practical applications in physiology, in particular, brain and neurological function which is the center of behavior control. In the study of game playing, it focuses on the relationship between structural changes brain/ neurological system and computer game addictive behavior (Pornnoppadol, 2012; Higgins, 2006).

Behavioral theory is a systematic approach to the understanding of human and animal behavior. It assumes that the behavior of a human or animal is a consequence of that individual's history, including especially reinforcement and punishment, together with the individual's current motivational state and controlling stimuli (Passer & Smith 2007). Applied to computer game playing, game addictive behavior has been considered as the result of positive and negative reinforcements.

Humanistic theory is an area of psychology relating to an approach which studies the whole person, and the uniqueness of each individual emphasizes the study of the person's efficiency, value, ambition, independence, optimism, and hope (Maslow, 1970). Humanistic approach looks at game addictive behavior in sense of how game can fulfill individual's need as well as his view toward himself and the world (Wan &Chiou, 2006).

Cognitive theory is the study of mental processes such as attention, language use, memory, perception, problem solving, creativity, and thinking. It contains stimulation-response theory, thinking process (filtering, perceiving,

analyzing, processing, and responding). This means that all behavior, no matter how complex can be reduced to simple cognitive processes, like memory or perception. It is consequently applied to computer game playing to explore a player's thought, motivation, social learning, and self-control which leads to addictive behavior (Przybylski, Rigby &Ryna, 2010; Davis, 2001).

Trait theory is an approach to the study of human personality. Trait theorists are primarily interested in how personality is associated with a certain situation or other social contexts (Walters, 1999). The measurement of this relationship, which can be defined as habitual patterns of behavior, thought, and emotion, is able to predict what personality is more likelyto have game addictive behavior.

Other related theory also can explain computer game addictive behavior such as, social and cultural approach--social role, social meaning, social opportunity and utility (Wan & Sun, 2011; Linderoth, 2013).

Theories related to computer game addictive behavior were briefly presented below;

Medical Biology Theory

Medical biology theory focused on the relationship between brain function and neurological system that is the same concept to substance related disorders (Eyler, Sherzai, &Kaup, 2011). Research regarding to computer game addictive behavior under the medical biology theory based on the structure and function of brain and related neurotransmitters. The result showed that on one hand, computer game playing could enhance cognitive skill; problem-solving, reasoning, memory, analyzing, and decision-making, by activating neuron system (Whitbourne, Ellenberg&Akimoto, 2013; Basak Voss & Erickson, 2011; Eyler, Sherzai&Kaup, 2011). It moreover helped develop hand-eye coordination and perception (Thompson O. & et al., 2012). On the other hand, playing game too much could lead to addictive behavior. Some changes in particular areas of the brain have been reported, especially, the self-control resulting in obsessive behavior and poor self-inhibition (Hoeft, Watson, Kesler, Bettinger& Reiss, 2008; Han, Lyoo&Renshaw, 2012; Weng et al., 2013). Furthermore, it has been found the decrease of blood circulation in anterior cingulate cortex similarly to the study of aggressive game players (Chou et al., 2013), as well as,

the abnormality of Dopamine in Ventral tegmentral and Nucleus accumben (Hoeft, Watson, Kesler, Bettinger& Reiss, 2008). Simply put, game addictive behavior could positively and negatively impacts the brain function and structure.

Behaviorism

Behavioral theory has been applied to explore factors causing computer game addictive behavior in children and adolescents (Khan, 2007). Studies penetrated that there were many factors leading to game addiction; availability/ accessibility to internet cafe, child rearing practice, family relationship, school problem, peer, etc (Sublette &Mullan, 2012; Griffiths, 2010). Types of computer game associated with rewarding have been considered as a chief incentive of game addictive behavior. Simply said, rewarding is a conditioned mechanism of positive experience resulting in repetitive action. Apparently, rewarding and praise is a positive reinforcement keeping a person away from sufferings/ unwanted situations but can get accepted from others (Usman&Inam, 2013; Beranuy, Carbonell& Griffiths, 2013). According to the behavioral theory, stimulating factors can increase game playing behavior, which leads to the study of protective factors against computer game addiction (Johnson & Scholes, 2013).

Humanism

According to the humanistic approach, Maslow's hierarchy of needs has been applied to computer game addictive behavior that game playing could serve a person's security and love need (Usman&Inam, 2013; Choi & Kim, 2004). The study showed that game playing was a tool to get praised, positive feedback, acceptance, a sense of belonging to society, and unrealistic achievement which could perfectly fill one's heart (Kuss, Louws&Wiers, 2012) and the need of security and love (Johnson, & Scholes, 2013; Hellstrom, 2012; Wan &Chiou, 2006). Additionally, the research revealed that when an individual felt unlovable, worthless, unachieved, bored, or hopeless, in real life, while everything could be possible in the world of game. Due to its positive consequences, an individual, consequently, ended up with consuming more and more time on computer game to compensate what a person cannot really accomplish in the real world (Karapetsas et al., 2014; Wan &Chiou, 2006).

Cognitive theory

Game addictive behavior has been studied through the perspective of cognitive approach as an irrational thinking (Davis, 2001) or cognition process affecting self-control and motivation to play computer game (Rebetez&Betrancourt, 2007). It has been reported that game addictive people had poor self-control and inappropriate cognitive ability causing negative patterns of thought; incapable and unlovable, while computer game could make them feel accomplished, proud, and loveable (Haagsma, 2013). Sticking in this sets of thought, an individual could become game addictive (Huanhuan, Li, & Su, 2013). It was crucial that low self-control could enhance the passion in computer game (Khang, Kim & Kim, 2013). Besides, cognitive theorist believed that intrinsic motivation relied on how individualexpected and valuedthings, whichcould be attained by playing game (Przybylski, Rigby &Ryna, 2010). A person had several needs to be achieved; 1) Competence need, some games required high competency and skill, a player must learn to develop himself to reach the next level of the game, 2) Autonomy need, a player could choose his role/ method/ control to proceed the mission, 3) Relatedness need, interpersonal relationship with peers, especially online game, players could interact with others by constructing their own dialogues.

Trait theory

Research displayed that game addictive people had extraversion, conscientiousness, and openness personality. These personal traits caused several characteristics; open to new experience, curiosity, enthusiastic to learn new things, challenge preference, and strive for achievement leading to game addiction with high satisfaction (Teng, 2008). Apart from conscientiousness and extraversion, agreeableness could cause game addiction due to poor self-regulation (Collins, Freeman &Premuzic, 2011). The characteristic of low self-esteem and poor self-efficacy were associated with game addictive behavior (Sariyska, 2014; Khang, Kim & Kim, 2013). Similar to a person with shyness and isolation, poor interpersonal relationship and lack of social support has been displayed among computer game addictive group. Computer game; consequently become a critical channel to indirectly contact the outside world without a straightforward exposure. Since a game person could create a fake identity resulting in the decrease of frustration and uncomfortable

feeling when talking with others, shy people, for this reason, were more likely to become game addictive (Ayas, 2012).

Social meaning theory

Being the winner or rewarded in game socially meant a lot to computer game players, it accordingly was a kind of social tool enhancing one's motivation (Wan & Sun, 2011). Enjoyment in particular, was an essential motivation increasing social role. Due to its competitive condition, computer game created ideal society stimulating people to play it Especially, an online game, a player can enjoy high social status--being a helper or commander (Reeves & Read, 2009; Sutton-Smith, 1997). Also, a single player could feel a sense of self-competition from reward and achievement in each level. This thus could positively reinforce the players themselves, attract others, and create any kinds of social networks (Yee, 2007). Likewise, Kowert and Oldmeadow (2013) demonstrated that online game can foster better social skills; emotional competence and social expression, enhancing a sense of belonging to society. Apart from that, computer game addictive people mostly valued the social meaning of game society since it helped enhance a sense of efficacy, imagination, confidence, and achievement. The ultimate goals of game playing were enjoyment, accomplishment, interaction, love and security, which an individual chose to fulfill himself (Lin & Lin, 2011).

Summary

The ultimate goal of a study regarding computer game addictive behavior was to have the comprehensive knowledge leading to prevention guideline and treatment program. Earlier research attempted to applied several approaches to explain game addictive behavior. Medical biology concept focused on a cell level, brain and neurological system generating neurotransmitters, which was associated with addictive behavior. Behaviorism, fundamentally, explained that external stimulation or reinforcement could increase computer game playing without the consideration of intrinsic motivation. Humanism emphasized on individual factors, believing in human's potential. Game addictive behavior, consequently, was a freedom of choice fulfilling basic needs; physical needs, love and belonging, acceptance, and identity. Cognitive concept explored human's thought, self-control, and expectation towards

computer game playing. However, it was believed that game playing was not because losing self-control-- an individual might intentionally ignore anything else but feeling integrated with game only. Trait theory research was examined via standard personality test and could be referred to a larger population. However, trait theory could not make it clear with regard to the relationship between personality and addictive behavior as well as the insufficient explanation of environmental factor and social context. Social meaning perspective noted that game addictive behavior might be conditioned by social influences; role, value, and identity. However, social meaning theory seemed to only describe game playing rather than clarify the causal scheme. Due to limitations of those approaches, flow theory has been introduced to investigate game addictive behavior both in positive and negative impacts. Accordingly, flow could explain computer game addiction in terms of causes; personal factors and external stimulation, and effects; constructive and destructive consequences.

According to the theory of flow, some elements could influence computer game playing developing to game addiction (Boyle, Connolly, Hainey& Boyle, 2012). The structure of flow components was flexible depending on certain context. Flow, moreover, was not limited to enjoyment but also self-efficacy, goal-directedness, integration, low self-relatedness, and creativity. Flow is state beyond enjoyment or passion but it covers cognitive ability, self-efficacy, emotion, and positive consequences (Obada, 2013; Engeser, 2012).

Theories	Fundamental concepts	Linkage to game addiction	Authors	Research design	Result	Strength/ Weakness
Medical Biology	Human's behavior is caused bybrain and neurological functions.	Structural transformation of brain and neurological function	Whitbourne, Ellenberg&Akimoto, 2013; Han et al., 2012; Weng et al., 2013; Chou et al., 2013; Hoeft, et al., 2008	To study the relationship between brain function and computer game playing behavior through brain imaging technique.	There found some changes in frontal lobe, cingulated cortex and dopamine.	It could be clearly explained through brain imaging technique but it could be seen only seen the cell level.
Behaviorism	Human's behavior is caused by stimulation which could be conditioned by positive and negative reinforcement.	Computer game playing could offer positive reinforcement and reward to the players.	Beranuy, 2013; Sublette &Mullan, 2012; Griffiths, 2010; Freeman, 2008**;** Prakraipetch, Sutham&Mantana, 2012	To study the relationship among causal variables, as well as, a qualitative approach to identify stimulators.	Computer game has been considered as a reward linking between computer game context and positive experiences.	It clearly projected external stimulators but lack of internal drives of an individual.
Humanism	Humans have a free will to think and make a decision relying on personal reasoning scheme, psychological need, and attitude towards world.	Computer game playing can fulfill the security and love need, acceptance, which increase good attitude towards self.	Kneer&Glock, 2013;Kusset al., 2012;Hellstrom et al., 2012;Karapetsaset al., 2014; Wan &Chiou, 2006	To survey the relationship with qualitative method by motivational interview.	Computer game playing can fulfill one's need on security and love, acceptance, and good self-image.	It is good to see that behavior is the outcome of intrinsic motivation but there are no proofs of causal relationship between motivation and game addictive behavior.

Picture 2.13. The table comparing concepts and theories behind computer game addictive behavior

Theories	Fundamental concepts	Linkage to game addiction	Authors	Research design	Result	Strength/ Weakness
Humanism	Humans have a free will to think and make a decision relying on personal reasoning scheme, psychological need, and attitude towards world.	Computer game playing can fulfill the security and love need, acceptance, which increase good attitude towards self.	Kneer&Glock, 2013;Kusset al., 2012;Hellstrom et al., 2012;Karapetsaset al., 2014; Wan &Chiou, 2006	To survey the relationship with qualitative method by motivational interview.	Computer game playing can fulfill one's need on security and love, acceptance, and good self-image.	It is good to see that behavior is the outcome of intrinsic motivation but there are no proofs of causal relationship between motivation and game addictive behavior.
Cognitive	Behavior is caused by the individual's perceptionin some certain situation through the process of thinking and reasoning which influences decision-making.	Game addiction is the result of irrational thinking process, insufficient self-control, and unrealistic expectation towards computer game.	Haagsmaet al., 2013; Huanhuan, Li & Su, 2013; Khang, Kim & Kim, 2013;Przybylski, Rigby &Ryna, 2010; Wan &Chiou, 2007	To study the relationship of thinking pattern, level of self-control, and level of expectation.	In game addictive people, there found several inappropriate patterns of thinking, for instance, low self-control, and unrealistic expectation which can be met by playing game.	It is obviously seen that some thinking patterns lead to game addiction but a person with high level of self-control can get addicted due to unrealistic expectation alone.

Picture 2.13. The table comparing concepts and theories behind computer game addictive behavior (cont.)

Theories	Fundamental concepts	Linkage to game addiction	Authors	Research design	Result	Strength/ Weakness
Trait & Personality	Behavior varies due to past experience in childhood, each individual has unique characteristic or trait.	Some traits can lead to computer game addiction.	Sariyska et al., 2014;Ayas, 2012; Khang, Kim, & Kim, Y., 2013; Collins, Freeman&Premuzic, 2011; Teng, 2008	A survey study aimed to explore the relationship of a certain personality and computer game addictive behavior.	Several personalities are more likely to cause computer addiction; Extraversion, Openness, Shy, Conscientiousness, Agreeableness, etc.	Several personality assessment tools have been standardized and widely distributed but the probability of getting influenced by intervene variables still has been found.
Social meaning	Social meaning is the result of social interaction.	Everyone is chasing their own roles, responsibility, and self, thus, playing game can make people feel valuable, and meaningful to the society.	Kowert&Oldmeadow, 2013; Lin & Lin, H.W., 2011; Wan & Sun, 2011; Reeves& Read, 2009	A survey research focused on clarifying the relationship and a qualitative scheme by the interview.	Computer game players can have better social status, role, and admiration.	It cannot be applied to those who are not in favor to the theory of social meaning.

Picture 2.13. The table comparing concepts and theories behind computer game addictive behavior (cont.)

2.3 Flow experience and computer game addictive behavior

2.3.1 Flow theory and computer playing

Video game and online game attracted people in several ways; amusement, concentration, time distortion, positive emotion, and problem-solving development, resulting a state of flow. However, flow could be seen as a two-edged sword due to its impacts on consciousness (Partington, Partington& Olivier, 2009). To illustrate this, computer game has created the competitive and challenging condition (challenge-skill balance), a player might lose self-control and strive for achievement without recognizing time transformation (Thatcher, Wretschko&Fridjhon, 2008). Flow happened only when an individual could manage and solve difficulties in the game (Kim & Davis, 2009). On this ground, flow experience is a psychological state of skill-challenge balance with high concentration, causing life satisfaction and intrinsic motivation to conduct repetitive behavior.

The state of flow talks about positive experience when a person shows his potentiality. Conforming to the study of Eisenberger and colleagues, flow is a good predictor of one's performance (Eisenberger, Jones, Stinglhamber, Shanock& Randall, 2005). Moreover, flow experience is associated with positive emotion and creativity in work/ sport (Csikszentmihalyi&LeFevre, 1989). Nevertheless, flow can display its drawbacks; time distortion, fatigue, low self-awareness, unconsciousness, and limited attention, all of which, can be harmful to life (Partington, S., Partington, E. & Olivier, 2009; Engeser, 2012).

Flow experience	***Negative Consequences***
Loss of self-relatedness, consciousness, and assessment	Other goals and values seem worthless
High concentration	No interest on other things in life
Sense of control	Unrealistic expectation towards self
Time distortion/ transformation	Negative impacts to daily living

The state of flow is one of vital factors directing a person to achieve goals and developing necessary skills to overcome burdens. This means that an individual has to obsess with the task at risk to lose something in exchange. Similar to substance addiction, game playing can bring positive consequences as a reward resulting in repetitive behavior (Seifert &Heddersen, 2010). On one side, repetitive action becomes skillful, on another side, doing something over and over again called obsession causing several dangers; poor health, and poor interpersonal relationship. Flow seems to lead people to where they want, happiness, proud, and skill, it somehow can bring about difficulties; chaos, upset, depression, and addictive behaviors (stronger desire and craving) (Partington, S., Partington, E. & Olivier, 2009; Wanner, Ladouceur, Auclair, &Vitaro, 2006).

In the world of computer game, some common results need to be met; enjoyment, challenging, a sense of control, reaction, as mentioned in the flow structure in the following table (Cowley, Charles, Black & Hickey, 2008).

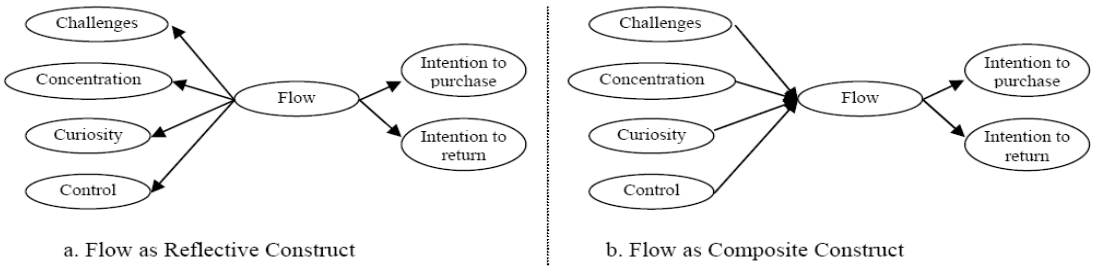
Flow experience	**Computer game experience**
challenge -skill balance	Skill to overcome the obstacle
involvement	feeling as if they were some characters in the game
ability to control and manage the task	keen and skillful on playing game
concentration	feeling as if things happened in the game were real
clear goal	many levels to get through in the game
immediate response/ feedback	continuing reward and punishment
time transformation	forget about time
low self-relatedness/ consciousness	all attention span directed to game

Nevertheless, both game playing and state of flow caused positive emotion, repetitive manners, curiosity, and addiction. The study of Thatcher, Wretschko and Fridjhon (2008) illustrated that computer game playing could cause many difficulties; psychological, social, professional, and educational. Likewise, Kim and Davis (2009) reported the similar association indicating that to recognize the importance of computer game was an essential intervenes variable. Computer game has been designed to attract people's fascination, with its challenging features and rewarding system; people could learn and play in the same time (Webster, Trevino, & Ryan, 1993). According to the technology acceptance model, too difficult game (low challenge-skill balance) could obstruct the initiation of flow. On the contrary, optimal level of challenge created a state of flow (Shin & Kim, 2008).

Previous studies regarding flow experience and game addiction displayed that the main component of flow were concentration, time distortion, involvement, enjoyment, and telepresence (Liu & Chang, 2012; Teng, 2012; Keller & Bless, 2008). Considering all the standard diagnosis for game addiction disorder guideline (American Psychiatric Association, 2013; Daria, 2013; Griffiths, 2005; 2010; Gentile, 2009; Hongsanguansri&Kateman, 2013; Pornnoppadol et al., 2009), game addictive behavior composed of; 1) obsess to computer game playing, 2) feel happy when goal has been met, 3) spend more time on computer game, 4) feel upset, agitated, depressed, psychosomatic when being obstructed to play game, 5) have stronger desire to play game when being tensed or facing difficulties, 6) keep thinking to win the competition, 7) crave for game at all times resulting in poor health/ relationship, 8) cannot stop playing game, 9) lack of interest in favorite activities, and 10) present several behavior problems (lying, stealing, school absence, home fleeing, and gambling). The elements of flow, 'self-relatedness' and 'time distortion' are literally associated with diagnostic criteria of game addiction. People with game addiction tended to obsess on playing game and could not quit it even though it has been starting to affect daily living; school, health, and relationship. They are more likely to omit their favorite activity but playing game instead, anything else seems unimportant, time disoriented (Partington, S., Partington, E. & Olivier, 2009; Weinstein, 2010; Wood, 2008; Wu, Scott, & Yang, 2013).

2.3.2 Conceptual Framework

Previously mentioned, a causal model of flow, particularly in the field of computer technology, some similarities and differences were investigated. Challenge-skill balance, for instance, has been considered as a fundamental factor of flow (Teng, 2012) while some studies focused on the conditions to flow (Liu, & Chang, 2012; Finneran, & Zhang, 2002; Hoffman & Novak, 1996). The most important factor creating state of flow was, the strong relationship between an individual's skill and the challenge of the task which must be higher than usual (Csikszentmihalyi&LeFevre, 1989; Engeser&Rheinberg, 2008). Conforming to the study of Novak (2000), Hoffman (2000) and Yung (2000), mentioning that curiosity, self-control, and challenge were effective predictors of flow. There were, as a result, attempts to examine these characteristics through the models of flow and Formative Conceptualization.



Picture 2.14. Models of Flow as Reflective and Formative Conceptualization, (Siekpe, 2005)

It is crucial to investigate some variables such as, challenge of the task, concentration, curiosity, and ability to control in order to categorize the causes of flow. The studied reported that only the challenge of the task, concentration, and curiosity were the best indicators of flow serving as components of flow structure, while the ability to control was exceptional (Siekpe, 2005).

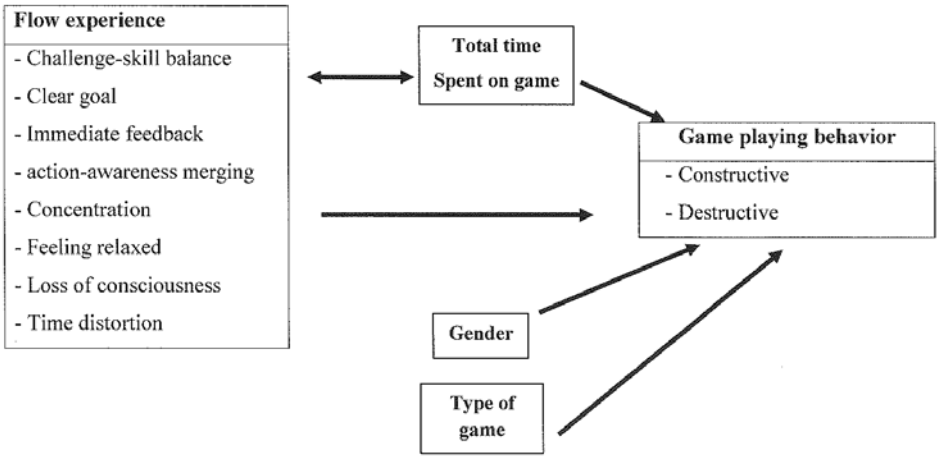
Above all, being studied in the context of computer game addiction, the state of flow, showed the influence to cause repetitive behaviors conditioned by positive consequences in the past. These positive reinforcements turned out to be the intrinsic motivation since it has been valued as a sign of happiness (Hoffman & Novak, 1996; Skadberg& Kimmel, 2004; Liu & Chang, 2012), telepresence (Liu &

Chang,2012; Skadberg& Kimmel, 2004; Hoffman & Novak, 1996), computer-human relationship (Chang, 2013; Liu & Chang, 2012; Ting et al., 2007), ease of use (Skadberg& Kimmel, 2004), independence, low self-evaluation, and involvement (Keller,& Bless, 2008; Keller &Blomann, 2008; Engeser, 2012). However, many studies have found several variables influencing computer game addictive behavior, in illustration; gender, type of game, and time spent on game (Pornnoppadol et al., 2009: Supakate, Nantamongkolchai&Damrongsak, 2012; Boonyasaen&Punnarong, 2009).

According to statement of the problem and literature review, research hypothesis have been addressed. In addition, structure equation model of flow experience influencing computer game addictive behavior has been demonstrated.

Research Hypothesis

1. The structure of flow experience in the context of computer game addictive behavior is different from MihalyCsikszentmihalyi's theory.
2. Flow experience positively affects to computer game playing behavior.
3. Different flow structures differently influence computer game playing behavior
4. Gender, average time, and type of game positively affect to computer game playing behavior.



Picture 2.15. Conceptual Framework and hypothesis model

CHAPTER III
METHODOLOGY

The study on flow experience in computer game playing among students in college was a quantitative study and cross sectional design. This study intended to examine flow components in computer game playing and to study the influence of flow experience on computer game addictive behavior. The research methodology was presented as follow.

3.1 Population and sample

Population

The population in this research was undergraduate students aged 18-24 years old who study in a university in Bangkok and play computer games via smartphones, computers, laptops and tablets, etc.

Sample

The samples for this study were drawn from undergraduate students aged 18 to 24 who study in a university in Bangkok.

A multi-stage sampling was conducted to select samples from a university. For the first sampling stage, undergraduate students in Srinakharinwirot University where the researcher worked and accessible computers were purposively selected. The number of students was 19,369 (educational service division Srinakharinwirot University, 2014).

A previous study found the proportion of adolescents playing computer game was taken to be 70% (Pornnoppadol et al., 2009), the sample size was calculated by using Cochran's sample size formula (Cochran, 1977).

$$n = \frac{NZ^2_{\alpha/2}pq}{NE^2 + Z^2pq}$$

$Z_{\alpha/2}$: Z-score (2 sided normal deviate; 95% CI, Z = 1.96)

p: the estimated proportion of an attribution that is presented in the population

q:1- p

E: precision level or margin of error (95% CI, E = 0.05)

$n = \frac{19{,}360(1.96)^2 (.7)(.3)}{19{,}360(.05)^2 + (1.96)^2 (.7)(.3)}$

$= 323$

The samples were 323 approximately. However, a study that uses a structural equation model has to take some factors (Wolf, Harrington, Clark, & Miller, 2013) such as latent variables, indicators, and missing data which affect the predictive power, measurement error, bias, and goodness of fit into account. Furthermore, it is necessary to exercise greater caution to be sure that the sample size does not lead to inferential error. According to a recommendation on statistical analysis of construct validity and independent-dependent relationship, the sample size in this study should be approximately 400-500 (Hair, Black, Babin& Anderson, 2010).

The second stage consisted of the selection of course. General education course was selected as it consisted of students from various faculties which tended to be a representative of population. Cluster sampling was applied to select students. The total sample was 500.

Of the sampled students, 478 students completed the questionnaire, which was equal to a 95.6% response rate.

3.2 Measure development and evaluation

Measures were developed as follow;

1) Reviewed theories and studied relating to the topic to identify operational definition and design scales and questions.

2) Assessed content validity of scales and questions by 3 specialists.

3) Calculated Item Objective Congruence (IOC) where a cutoff value of was ≥ 0.5

4) Edited questions, conducted a pilot study and assessed item analysis and correlation coefficient.

5) Conducted Confirmatory Factor Analysis (CFA) to analyze construct validity and conducted internal consistency to examine validity.

3.3 Research tools

There were 3 measures including 1) a questionnaire of demographic characteristics 2) computer game addictive behavior assessment, and 3) perception of game addiction impact assessment.

1) Demographic questionnaire. The demographic characteristics (gender, age, amount of time spent on playing game per week, types of computer game) were investigated by checklist and filled-out questionnaire.

2) Computer game addictive behavior assessment. A self-report scale assessing thought, feeling, emotion and experience while playing computer game. The measure was derived from conceptual framework and theory, tested internal validity by specialists. This measure consisted of 45 items in 9 domains including challenge-skill balance, clear goal, immediate feedback, action-awareness merging, concentration, feeling relaxed, and loss of consciousness, time-distortion and autotelic experience. The samples were asked to rate their levels of each domain on 5-point Likert scale ranging from strongly agree (5) to strongly disagree (1). The average score represents the level of flow experience on computer game playing.

The questionnaire was tried out and conducted a measure of internal consistency. The overall reliability was .882 (the reliability in domains was .311-.829) and the correlation coefficient was .311-.829. Confirmatory factor analysis (CFA) was also exploited to evaluate the construct validity (mentioned in chapter 4).

Example of questions in flow experience assessment

Question	Strongly agree ------ >>> Strongly Disagree				
	5	**4**	**3**	**2**	**1**
oA computer game with challenging task makes me more enjoyable.					
ooWhile playing computer game, nothing seems to be important.					

3) Perception of game addiction impact assessment. A self-report scale assessing the perception on several dimensions of human behavior, thought, feeling, and perception of impacts due to game addiction. The measure was developed based on relevant studies and diagnostic criteria on addictive behavior. This measure consisted of 30 items on 2 domains; 15 items on perception of the utility and 15 items on perception of impacts due to game addiction. The samples were asked to rate their levels of each domain on 5-point Likert scales ranging from strongly agree (5) to strongly disagree (1).

The measure was tried out and examined the internal consistency. The overall validity was .919. When assessing each domain, perception of the utility showed that the reliability was .886 and correlation coefficient was .495-.787. Perception of impacts due to game addiction displayed that the reliability was .888 and the correlation coefficient was .281-.278.

After examining by specialists, the questionnaire consisted of 22 items (12 constructive behaviors and 10 destructive behaviors). The researcher then conducted a pilot study in the sample and found that the reliability was .919 (perception of the utility: reliability=.923, correlation coefficient = .655-.828, perception of the impact: reliability=.890, correlation coefficient = .629-.804).

After collecting the data, confirmatory factor analysis was applied to investigate 22 construct validity of 22 items. Prior to that, exploratory factor analysis was conducted to examine indicator relationship by considering KMO (Kaiser-Meyer-Olkin) and Bartlett's test of sphericity (identity matrix). It has been displayed that

KMO was 0.92 and Barlett's test has statistical significance at 0.00, both perfectly presenting good quality of data for confirmatory factor analysis.

Confirmatory factor analysis was applied to examine the factor loading of 28 items and found that items 1, 2, 8, 10, 13, 14, 15, 17, 19, 20, 28, and 30 were correlated with positive behaviors while items 5, 6, 7, 11, 18, 21, 22, 24, 25, and 26 were correlated with negative behaviors. The factor loading ranged from 0.55 to 0.80 with statistical significance level at 0.05. In the closer inspection, Index of Item-Objective Congruence (IOC) after adjusting were; Chi-square (X^2) = 517.17, (df) = 189, X^2/df = 2.73, GFI 0.91, NFI =0.91, CFI =0.94, and RMSEA=0.06. It displayed that the construct validity was congruent to the empirical evidence.

Examples of items in computer game addictive behavior assessment (positive behaviors)

Question	Strongly agree ------ >>> Strongly Disagree				
	5	**4**	**3**	**2**	**1**
oMy creativity is a result of playing computer game.					
ooPlaying game can improve my problem-solving skill.					

* Higher score represents better positive consequences.

Examples of items in computer game addictive behavior assessment (negative behaviors)

Question	Strongly agree ------ >>> Strongly Disagree				
	5	**4**	**3**	**2**	**1**
oPlaying game deteriorates my attention on other things in life.					
ooI admitted that playing game keeps me away from meal causing a digestion problem.					

* Higher score represents better positive consequences and addiction.

3.4 Data collection

The following steps were taken to conduct the study:

1. The researcher gained certificate of approval from the faculty of Social Sciences and humanities, Mahidol University in order to ask for an official permission from the selected university.

2. The research asked the coordinator of university in order to seek an approval to collect data from students. Students were also informed research methodology and received informed consent form approved by the ethics committee of the faculty of social sciences and humanities, Mahidol University in order to grant permission to study.

3. Once the informed consent form was granted, the researcher arranged an appointment with the coordinator.

4. Samples received an explanation of the study and were informed that the completion of questionnaire and interview took approximately 25-30 minutes. Moreover, participation in any measurements was entirely voluntary activity.

5. After completion of the interview, completed questionnaires were placed and sealed in an envelope. The samples were able to review their questionnaire for additional queries.

6. The researcher rechecked the completion of all completed questionnaires before analyzing data.

3.5 Data management and analyze

3.5.1 Data management

1) Data cleaning

2) Scoring of questionnaires

3) Data analyze

3.5.2 Data analyze

1) Descriptive analysis to examine the demographic variables; frequency, mean, S.D, correlation coefficient, skewness, kurtosis calculated by SPSS for Windows version 22

2) Confirmatory factor analysis (CFA) to examine construct validity of instruments calculated by AMOS

3) Structural equation models for latent variable analysis to examine goodness of fit test between variables (Hair, Black, Babin& Anderson, 2010).

- Chi-Square: to compare an observed frequency distribution to a theoretical frequency distribution. All else equal, the greater the chi-square statistic, the stronger the relationship

- Root Mean Square Error of Approximation (RMSEA): to invariance RMSEA between .005 and .08 indicated very good fit

- Goodness of Fit Index (GFI): to assess how closely the model comes to replicating the observed covariance matrix. GFI between .90 and .95 was considered satisfactory.

Squared Multiple Correlation (R), an element of (0, 1) and represented the proportion of the variance of the independent variable explained by explanatory variable

Cutoff point for Structural equation models for latent variable analysis (Meyer, Gamst&Guarino, 2006; Hair, Black, Babin& Anderson, 2010)

	χ^2	**df**	**p-value**	**CMIN/df**	**GFI**	**AGFI**	**RMSEA**
Cutoff point			>.05	≤5	≥ 0.95	≥ 0.90	.05 ≤ .08

4) Adjusted model: if goodness of fit was considered unsatisfactory, consideration should be taken to the extent to which parameters should be added or removed.

CHAPTER IV
RESULTS

The present study aimed to explore computer game playing behavior in college students aged 18-24 registering Bachelor degree in Srinakarinwirot university, Bangkok, in particular, flow experience in different types of game playing affecting positive and negative consequences. The researcher investigated flow structure and its elements in order to clarify the relationship with computer game addiction. Three sections of analysis were demonstrated below;

1. Basic statistical analysis of the sample and observable variables
2. The result of Confirmatory Factor Analysis investigating flow structure in the context of computer game addiction
3. The result of Structural Equation Modeling identifying the psychological and sociological effects of computer game playing

Section 1: Basic statistical analysis of the sample and observable variables

1.1 Basic analysis

Sample of the current study were college students aged 18-24 in Srinakharinwirot University, Bangkok. Of 500 undergraduates who had computer game playing problem, only the complete data from 478 respondents were counted in this study. Background characteristics of samples have been demonstrated in the table 1.

Table 4.1.Background characteristics presented by percentage (N = 478)

Background Characteristic	*N*	*%*	*M(SD)*
1. Gender			
Male	240	50.2	----
Female	238	49.8	----
Total	478	100.0	
2. Time spent on game (hours/ week)			14.2(10.89) (Median= 13.00)
1hour/ week	1	.2	----
70 hours/ week	2	.4	----
14 hours/ week	44	9.2	----
3. Type of computer game			
Offline	190	39.8	----
Online	288	60.2	----
Simulation game and puzzle game	204	56.2	----
Music, sport, and fighting game	60	16.5	----

Table 4.1 displayed that male and female players were very close in total numbers; male = 50.2% and female = 49.8% While average time spent on game was 14.2 hrs/ week, a person spent time on game at least less than an hour a week and at most up to 70 hours a week. Online game was the most popular with 60.2% of game players, 39.8% was offline game players. 56.2% was simulation and puzzle game, while, 16.5% was planning, music, sport, and fighting game, the rest was planning and adventure game.

1.2 Basic statistical analysis of observable variables

The basic statistical analysis of observable variables has been categorized by the elements of flow. The result was demonstrated in the table 4.2.

Table 4.2. Statistical analysis of experience of flow and the perception of computer game

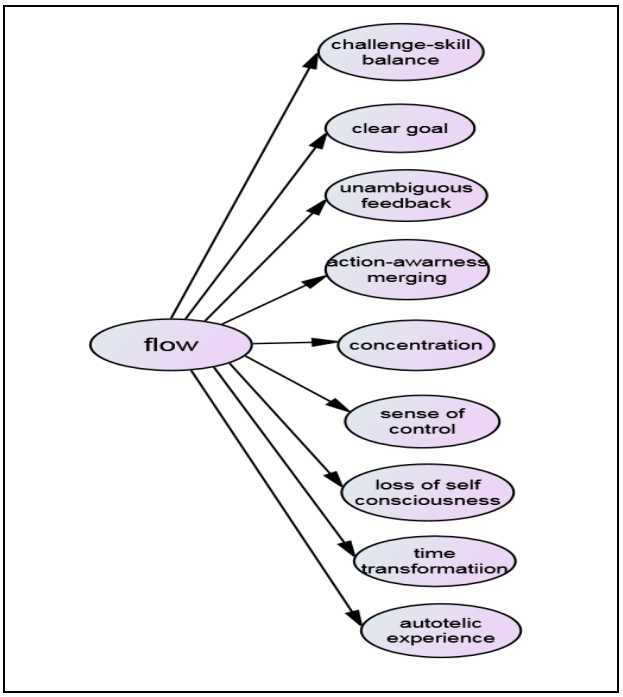
Variable	Min	Max	Mean	S.D.
Flow experience	86	213	143.13	20.7
- Challenge-skill balance	8	29	19.40	3.18
- Clear goal	7	25	16.91	3.24
- Unambiguous feedback	9	25	19.06	3.32
- Action-awareness merging	5	25	14.75	5.51
- Concentration	5	30	13.47	4.47
- Sense of control	7	23	15.23	2.93
- Loss of conciousness	5	23	14.20	3.83
- Time transformation	6	23	15.48	2.98
- Autotelic expereince	7	23	14.62	3.44
Perception of utility	20	87	50.67	12.03
Perception of mental and physical impacts	14	69	36.50	10.54

Table 4.2 showed that the samples had high flow experience (M = 143.13, SD = 20.7). In the closer consideration, the challenge-skill balance was at the highest (M = 19.40, SD = 3.18), while; concentration was at the lowest (M = 13.47, SD = 4.47). Moreover, perception of the utility was higher than the perception of negative consequences; M = 50.67, SD = 12.03 and M = 36.50, SD = 10.54 respectively.

In sum, this study penetrated that all samples possessed flow experience while playing computer game especially a game with challenge-skill balance and clear goal directedness. The samples perceived that playing game could have positive impacts rather than negative ones. To illustrate this, playing game in those with proper conditions could develop thinking ability, planning, decision-making, imagination, creativity, as well as, enjoyment and relaxation better than causing any troubles; school problem, conflict, sleepless, eating disorder, and addictive behaviors.

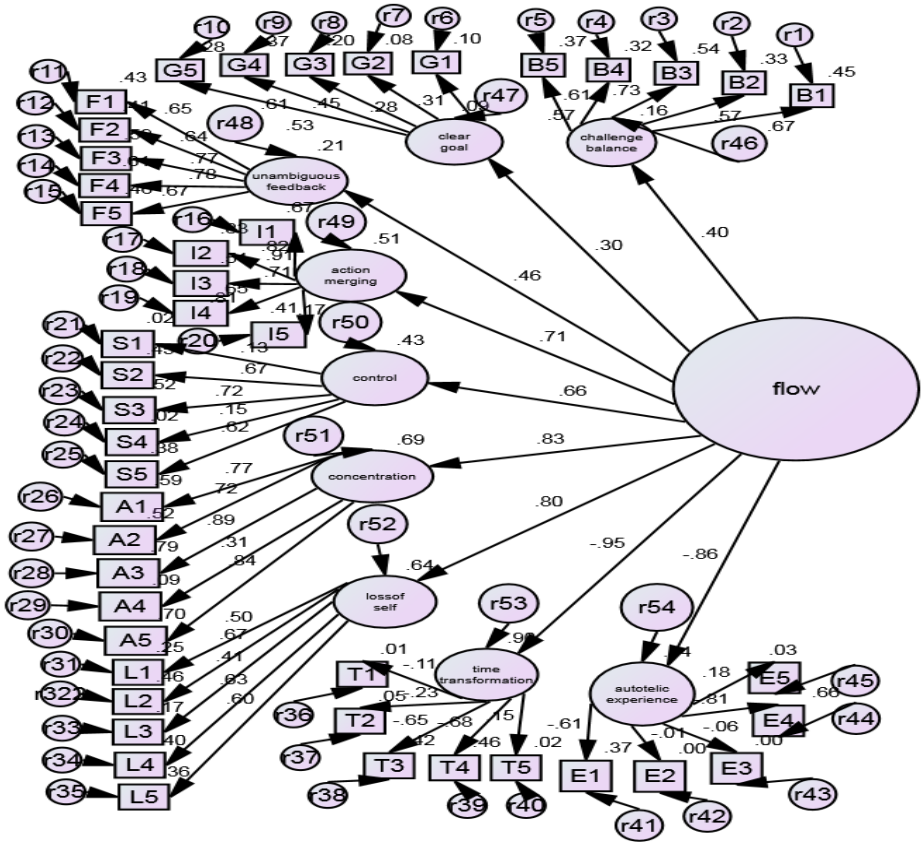
Section 2 Confirmatory Factor Analysis

Confirmatory factor analysis: CFA was applied to examine the structure of flow in the context of computer game addiction clarifying the difference from MihalyCsikszentmihalyi's structure of flow. There were nine elements in Csikszentmihalyi's theory (Csikszentmihalyi, M., 1990); 1) challenge-skill balance, 2) clear goal, 3) unambiguous feedback, 4) action-awareness merging, 5) concentration, 6) sense of control, 7) loss of consciousness), 8) time transformation, and 9) autotelic experience. The structure has been displayed in the picture 16.



Picture 4.1. MihalyCsikszentmihalyi's First-order (9- factor structure) measurement model of flow

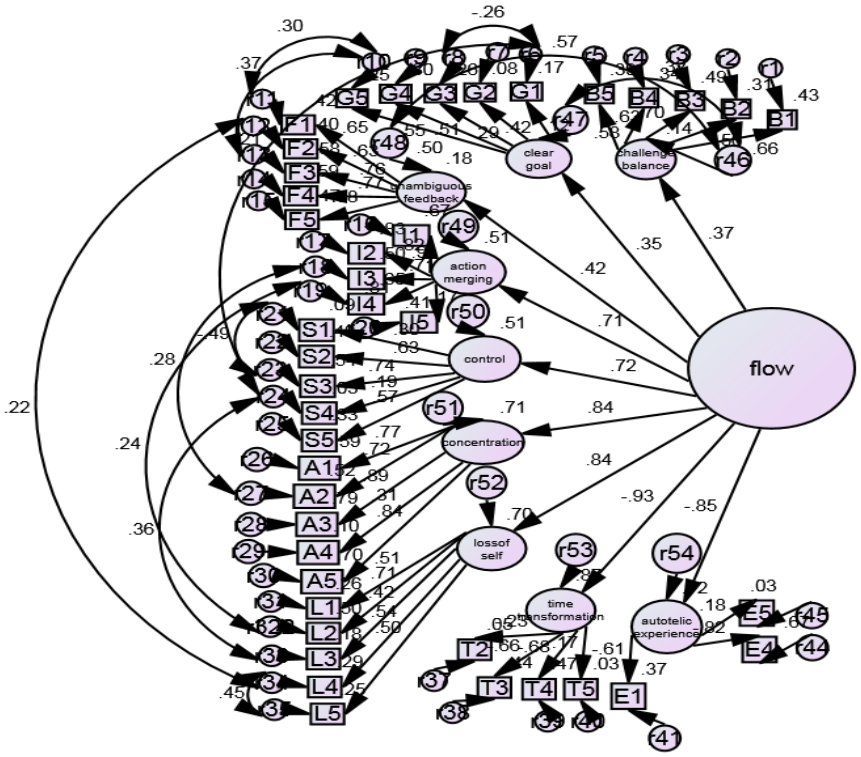
The researcher developed the questionnaire relying on the theory of flow, thus there were nine elements with 45 items in this assessment tool. Afterwards, the Confirmatory Factor Analysis: CFA was examined to identify the validity. The result with Chi-square = 3213.085, df = 936, CMIN/df = 3.433, GFI = .759, AGFI = .74, CFI = .716, RMSEA = .071 based on Meyer, Gamst, and Guarino (2006), and Hair, Black, Babinand Anderson (2010) displayed that the constructed model was not congruent with the empirical evidence as shown in picture 17.



Picture 4.2. Generic model

First-order (9- factor structure) measurement model of flow

Picture 17 showed that those indicators with no statistical significance level at .05 have been removed, and the Confirmatory Factor Analysis was revised. The result demonstrated Chi-square = 2105.349, df = 798, CMIN/df = 2.638, RMR = .091, GFI = .827, AGFI = .804, CFI = .828, RMSEA = .059. Given by Hair, Black, Babinand Anderson (2010), the constructed model was not congruent with the empirical evidence as shown in picture 18.



Picture 4.3.Revised model

First-order (9 - factor structure) measurement model of flow

According to table 18, even though there found a better result, all the nine elements still were not congruent with empirical evidence reflecting that it was not significantly applicable at all. From that, the researcher exploited the Exploratory Factor Analysis: EFA to examine the relationship among observable variables. It was begun with the test of KMO (Kaiser-Meyer-Olkin) and Bartlett's test of sphericity. Then, the principle components analysis and Varimax were exploited to identify the tendency of nine elements without setting numbers of the component.

Table 4.3. KMO (Kaiser-Meyer-Olkin) and Bartlett's test of sphericity

Kaiser-Meyer-Olkin Measure of Sampling adequacy	**Bartlett's Test of Sphericity**		
	Chi-Square (χ^2)	**df**	**p-value**
.839	1741.116	36	.000

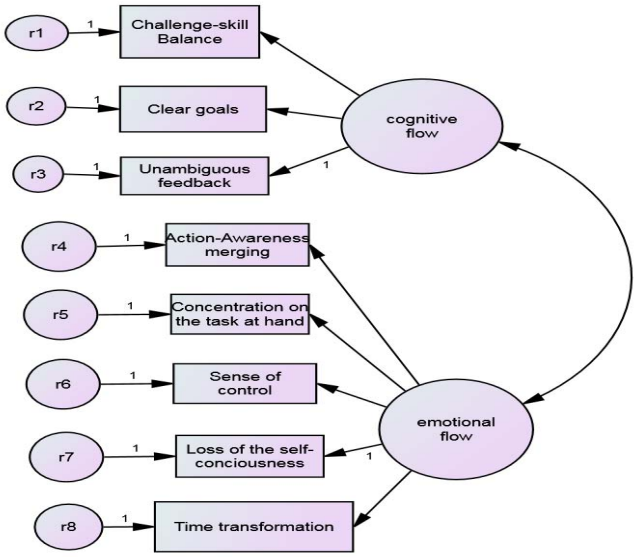
Table 4.4. Flow Components with Eigen values >1.00**,**percentage of variance and cumulative variance

Component	**Eigen values**	**% of variance**	**% of cumulative**
1	3.927	43.635	43.635
2	1.307	14.519	58.155

Table 4.5. Elements of flow structure by Varimax Method

Factors	**Component**	
	1	**2**
Challenge-skill balance	.130	.813
Clear goal	.070	.615
Unambiguous feedback	.229	.761
Action-awareness merging	.849	.180
Concentration	.909	.131
Sense of control	.575	.124
Loss of consciousness	.862	.155
Time transformation	.666	.268
Autotelic experience	.366	.424

According to table 4.3-4.5, it seemed that the data could fit the factor analysis because KMO (Kaiser-Meyer-Olkin) = .839, close to 1, was acceptable and Bartlett's test of sphericity had statistical significance level of .00. After the data cleaning, Principle components analysis and Varimaxwere operated to identify the tendency of how to group nine elements without setting number of the components, it revealed that two elements displayed good Eigen values which was higher than 1 (Component 1 = 3.927, Component 2 = 1.307). It can be implied that according to Virmax method, flow experience can be divided into two domains. The first one composed of challenge-skill balance, clear goal and unambiguous feedback, the other domain composed of action-awareness merging, concentration, sense of control, loss of self-consciousness, and time transformation. However, autotelic experience did not fit to those two domains (Briggs & Cheek, 1986). After testing the structural validity of flow experience, flow elements have been shown in Picture 19.



Picture 4.4.The 2 first order factor (correlated) measurement model of Flow Experience

Table 4.6.Standard factor loading of flow experience structure

Flow experience	Estimate	S.E.	C.R.
Unambiguous feedback→cognitive flow	.737	.128	9.208*
Challenge-skill balance →cognitive flow	.716	.092	9.208*
Clear goal →cognitive flow	.405	.052	7.024*
Loss of consciousness→emotional flow	.881	.264	10.895*
Sense of control →emotional flow	.478	.032	10.895*
Concentration →emotional flow	.911	.053	27.228*
Action-awareness merging→emotional flow	.844	.066	24.181*
Time transformation →emotional flow	.620	.028	14.000*

The structural validity examination of the 2 first order factor (correlated) measurement model of flow experience showed Chi-square= 49.947, df = 19, CMIN/df = 2.629, GFI = .975, AGFI = .952, CFI = .980, RMSEA = .058. After adjusting the model, it displayed better result, Chi-square= 39.283, df = 18, CMIN/df = 2.182, GFI = .980, AGFI = .960, CFI = .987, NFI = .976, RMSEA = .050. This could be implied that the constructed model of hypothesis was congruent with the empircal evidence.

The standard factor loading of cognitive flow elements was .737 - .405, Clear goal was the lowest, Unambiguous feedback was the highest, while; the emotional flow was.911 - .478withSense of control as the lowest, Concentration as the highest. In the closer look, in cognitive flow, there were Unambiguous feedback,Challenge-skill balance, and Clear goal, respectively. In the emotional flow, there were Concentration,Loss of consciousness,Action-awareness merging,Time transformation, and Sense of control, respectively. Moreover, it has been found that cognitive flow and emotional flow had a positive association (r = .48) representing the 2 First order factor (correlated) measurement model of flow experience.

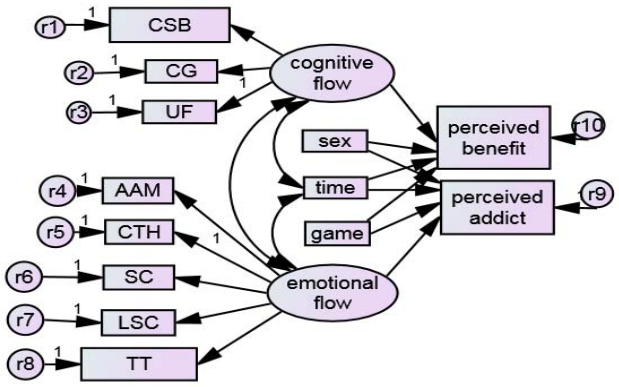
In sum, the constructed model was congruent with the empirical evidence, Chi-square= 39.283, df = 18, CMIN/df = 2.182, GFI = .980, AGFI = .960, CFI = .987, NFI = .976, RMSEA = .050. However, Chi-Square had some limitations due to the sample size as the bigger sample size, the greater statistical significance. Confirmatory

Factor Analysis: CFA showed that the elements of flow experience was different from the original ones. To illustrate this, the previous model composed of nine elements (first-ordermeasurement model), while; the present study suggested the 2 first order factor (correlated) measurement model; 1) Cognitive flow (3elements); Challenge-skill balance,Clear goal and Unambiguous feedback,2) Emotional flow (5 elements); Action-awareness merging, Concentration, Sense of control,Loss of consciousness, and Time transformation.

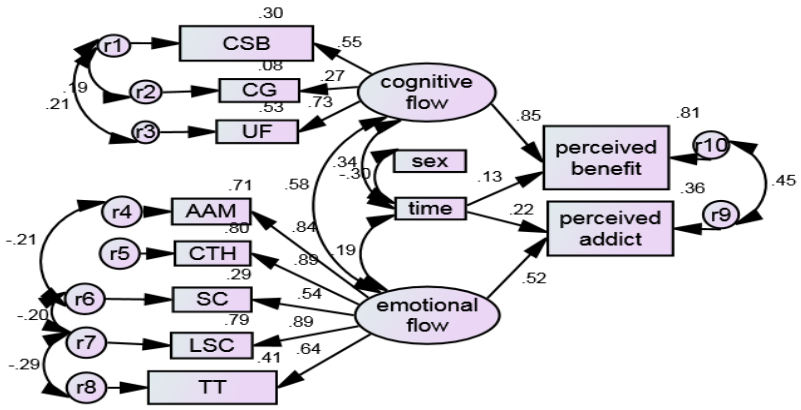
Section 3.Structural Equation Modeling

The present study, the data was examined through the conceptual framework and research hypothesis, then the model has been adjusted due to the modification indices to investigate the research hypothesis: (1) positive association between flow experience and computer game playing behavior, (2) different components of flow experience influencing different computer game playing behavior, and (3) positive association among gender, time spent on game, and types of game influencing computer game playing behavior.

Hypothesis 1. Positive association between flow experience and computer game playing



Picture 4.4. Structural Relationship between flow experience and computer game playing



Picture 4.5. Structural Relationship betweenflow experience and computer game playing (adjusted model)

The result penetrated Chi-square= 176.122, df = 53, CMIN/ df = 3.32, GFI = .948, AGFI = .911, CFI = .950, NFI = .931, RMSEA = .070presenting that the constructed model after adjusting was congruent to the empirical evidence. This meant that flow experience had a positive correlation with computer game playing behavior, the flow element could explain both congitive and emotional flow in term of direct infulence on perception of game palying utility(β=.85) with the statistical significance level at.05 and on perception of mental and physical impacts (β=.52)with the statistical significance level at.05.

Hypothesis 2. Different components of flow experience influencing different computer game playing behavior

Table 4.7. Factor loading of elements and parameters of Structural equation modeling of relationship between flow experience and perception of playing game consequences

Flow experience	**Estimate**	**S.E.**	**C.R.**
Unambiguous feedback →cognitive flow	.726	.128	5.566*
Challenge-skill balance →cognitive flow	.551	.053	12.451*
Clear goal →cognitive flow	.274	.043	7.024*
Loss of consciousness →emotional flow	.890	.264	10.895*
Sense of control →emotional flow	.539	.032	10.895*
Concentration →emotional flow	.892	.053	27.228*
Action-awareness merging →emotional flow	.840	.066	24.181*
Time transformation →emotional flow	.643	.028	14.000*
Addiction →emotional flow	.518	.075	12.769
Benefit →cognitive flow	.849	.289	11.569

This table showed that in the dimension of cognitive flow composing of Unambiguous Feedback (factor loading=.73), Challenge-skill balance (factor loading = .55) and Clear goals(factor loading =.27) had direct influence on perception of game utility (β=.85)with the statistical significance level at.05 but it had no influence on perception of mental and physical impacts. This could be implied that cognitive flow influenced perception of computer game playing utility.

In the emotional flow dimension composing of Loss of consciousness (factor loading = .89), Concentration (factor loading = .89), Action-awareness merging (factor loading = .84), Time transformation (factor loading = .64), and Sense of control (factor loading = .54) had direct influence on perception of mental and physical impacts(β=.52)at the statistical significant level of .05 but it had no influence on perception of game utility at all. It could be clearly seen that emotional flow influenced the perception of mental and physical impacts from computer game playing.

Furthermore, the analysis demonstrated the postive association between cognitive flow and emotional flow(r = .58).

Hypothesis 3. Positive association among gender, time spent on game, and types of game influencing computer game playing behavior

Table 4.8. Relationship amonggender, time spent on game, and type of game influencing computer game playing behavior

Variable	**Estimate**	**S.E.**	**C.R.**
Addiction ←Time	.224	.021	5.919*
Benefit ←Time	.127	.027	2.874*
Emotional flow ←→ Time	.190	.484	4.025*
Cognitive flow ←→Time	.342	.358	4.173*
Time ←→sex	-.298	.245	-6.521*

The analysis of Structure Equation Modeling projected that time spent on computer game playing had direct influence on the perception of mental and physical impacts(β=.22) and had direct influence on the perception of game playing utility (β=.13). Moreover, time spent on game has been found a positive relationship with cognitive flow and emotional flow, r = .34 and .19 respectively. However, gender had a negative relationship with time spent on game playing (r = -.29), in the deeper inspection, male was more like to spend more time than female. Notwithstanding, gender and type of game displayed no influence on neither patterns of game perceptions nor flow experience. While type of game did not seem to associate with other variables, it could be seen by the closer inspection that online game consumed much more time than offline game.

In conclusion, cognitive flow directly influenced perception of game playing utility(β=.85), while; emotional flow directly influenced perception of mental and physical impacts (β=.52). Besides, time spent on computer game directly influenced the perception of negative consequences of game playingboth mentally and physically(β=.22) as well as directly influenced perception of game utility (β=.13).

Gender factor has been found its relationship with time spent on game; male players seemed to spend more time than females. People were more likely to spend more time playing online game rather than offline game. The current study demonstrated that players who had flow experience while playing computer game with skills praticing; evalation, decision-making, analysing, planning, goal-setting were more likely to recognize game playing utility. On the contrary, those who experienced contentment, concentration, group conformity, and loss of conciousness were more likely to percieve metal and physical impacts. Essentially, cognitive flow and time spent on game co-explianed positive consequences from computer game playing at 81%, while; emotional flow together with time spent on game were able to explain negative consequences from game playing at 36%. Considering time spent on game factor, it was associated with both cognitive flow and emotional flow. Male players seemed to spend more time than females with the fact that the dimensions of flow experience (cognitive or emtional) had the predictive ability on consequences from computer game playing.

CHAPTER V
CONCLUSIONS AND DISCUSSION

This research studied computer game playing behavior in undergraduate students via the theory of flow experience. The research questions were which states of game playing behavior would result in beneficial behavior and which states would cause game preoccupation or addiction. The research examined Structural Equation Models between flow experience while playing game that caused several consequences from computer game playing and empirical evidence. The specific objectives were:

1) To examine structure of flow experience in the context of computer game playing behavior.

2) To study components of flow experience that caused positive effects from computer game playing behavior.

3) To study components of flow experience that caused negative effects from computer game playing behavior.

5.1 Samples

The population and the sample were undergraduate students aged 18-24 years old currently studying in Srinakharinwirot University, Bangkok. They had computer game playing behavior on a daily basis either online or offline mode on any devices such as smartphones, personal computer, laptop computer, and tablet. The sample size was calculated by a formula and the criteria for a research that used Structural Equation Model technique to analyze statistical data. As a result, the proper sample size was 400-500 people. Although the data was collected from 500 people, only 478 were employable.

Instrument

The instruments used in this research were: 1) a questionnaire about personal information in a checklist and fill-in-the-blank format. The questions included gender, age, an average number of hours playing game per week, and types or characteristics of game. 2) An assessment of computer game playing behavior. There were 45 items asking in 9 domains, 5 items each. The domains were challenge-skill balance, Action-awareness merging, clear goal, unambiguous feedback, concentration on the task at hand, sense of control, loss of consciousness, time transformation, and autotelic experience. It was 5-rating scale of accordance from strongly agree (5) to strongly disagree (1). The overall validity was .882 (The validities of each aspect were between .311-.829). And 3) an assessment of the recognition of consequences from computer game playing was included. It evaluated a player's cognition, emotion, and perception of the computer game playing behavior's outcome in both advantageous outcome and the outcome that affected emotions and behaviors. There were 22 items: 12 items were about awareness of the beneficial outcome while 10 items were about awareness of the consequence that influenced emotions and behaviors. The overall validity was .919. The validity of the first part was .923 and the latter part was .896.

5.2 Data Collection and Analysis

After granting the permission from Research Ethics Committee of Mahidol University and Srinakharinwirot University, the researcher explained objectives and processes of the study, and elucidated the rights in answering a questionnaire to samples. After being collected and checked about their completion, the questionnaires were recorded and analyzed the basic data by fundamental statistical formulas on SPSS for Windows Version 22 program. Also, Confirmatory Factor Analysis was exploited to examine structural validity of an assessment of components of flow experience, positive computer game playing behavior, and computer game addition and Structural Equation Models Analysis were analyzed by AMOS program.

5.3 Conclusion

The research began with a question regarding conditions of various kinds of game playing behavior that could lead to different consequences through theoretical knowledge and research about flow and game playing. This question led to the research of flow experience while playing game that affected a result from computer game playing. Specifically, which states of game playing influenced beneficial behaviors and which states led to a mental and physical impact or game addiction? Also, the research examined structural models of flow experience in the context of computer game playing behavior study. The results from the study included:

5.3.1 Structure of flow experience in the context of computer game playing behavior was different from the original theory's structure. To examine the Structural Equation Models of flow experience components and structural validity of flow experience components, the researcher used Exploratory Factor Analysis (EFA). The statistical outcomes were acceptable. This implied that modified structural models of flow experience components were correlated with empirical evidence. (Chi-Square = 39.283, df = 18, p-value = .003, CMIN/DF = 2.182, GFI = .980, AFGI = .960, RMSEA = .050).

The structure of flow experience could be divided into 2 flows: cognitive flow and emotional flow. The cognitive flow consisted of 1) challenge-skill balance, 2) clear goal, and 3) unambiguous feedback. The emotional flow included: 1) action-awareness merging, 2) concentration on the task at hand, 3) sense of control, 4) loss of consciousness, and 5) time transformation. Both flows have a positive relationship as the two first order factor correlated with the measurement model of flow experience.

5.3.2 The modified structural equation of flow experience that affected computer game playing behavior was correlated with empirical evidence (Chi-Square = 176.122, df = 53, p-value = .00, CMIN/DF = 3.32, GFI = .948, AGFI = .911, RMSEA = .070). This implied that flow experience during game playing influenced computer game playing behavior.

In particular, cognitive flow had a direct effect on the recognition of advantages of game playing (β = .96). On the other hand, emotional flow in directly affected the recognition of mental and physical consequences induced by game playing (β = .54).

5.3.3 Other components such as the duration of game playing, gender of a player, and type of game also had a role in the research. The duration of game playing directly impacted on the recognition of mental and physical consequences caused by game playing (β = .21). Men were more likely to spend more time playing game than women. And online game consumed more time than offline game.

5.3.4. Cognitive flow (challenge-skill balance, clear goal, and unambiguous feedback) directly influenced the recognition of advantages of game playing (β = .96). However, emotional flow (action-awareness merging, concentration on the task at hand, sense of control, loss of consciousness, and time transformation) directly led to the recognition of mental and physical impacts resulted from game playing (β = .54). The duration of game playing also directly affected the recognition of emotional and physical impacts (β = .21). The emotional flow together with duration of time playing game could explain the awareness of mental and physical impacts from game playing at 37%.

There was a relationship between flow experience while playing game and its behavioral consequences. Particularly, if a player had a cognitive flow experience to evaluate, make a decision, analyze, plan, set a goal, and become aware of self-improvement, he/ she would be more likely to have a positive outcome or to perceive the benefits of game playing. On the contrary, if a player had emotional flow experience causing contentment, intense concentration, game sympathy, and low of consciousness or worries, it could cause psychological and physical impacts. The duration of game playing could affect the recognition of mental and physical consequences. Gender and type of game were relevant to the duration. Men and offline game tended to consume more time on game. Nonetheless, the key factor of positive and negative behavioral outcomes was flow experience of a game player.

5.4 Discussions

The objective of this research was to study factors of flow experience during computer game playing causing positive and negative impacts by applying an examination of Structural Equation Models. The investigation has been conducted between flow experience while playing game resulting from playing computer game

and empirical evidence. The discussions of this research have been presented respectively to research hypotheses.

5.4.1 Research hypothesis 1: Structure of flow experience in the context of computer game playing behavior was different from the original theory's structure.

By using Exploratory Factor Analysis (EFA) to examine flow experience structure in the context of game playing behavior, it was different from the structure of Mihaly Csikszentmihalyi's original theory (Csikszentmihalyi, M., 1990). There were nine components in his flow experience theory composing of challenge-skill balance, clear goal, unambiguous feedback, action-awareness merging, concentration, sense of control, loss of consciousness, time transformation, and autotelic experience. However, there were 2 major differences in this study: 1) there were eight components in this study, and 2) the structure of flow experience was able to classify into two flows: cognitive flow and emotional flow.

Firstly, there were eight components of flow experience in this study. It differed from the original theory probably because the theory was based on personal occupations or demanding responsibilities while this research study in specific context of computer game playing, which was a leisure activity or a hobby.

The playing game experience with a continuous concentration encouraged a player to develop gaming skills in order to achieve a goal. A player might immerse himself/ herself in a game resulting in losing consciousness or attention in other people or surroundings as well as having a distorted sense of time. A player might also have self-improvement awareness in ability and emotional aspects. However, Csikszentmihalyi's flow theory was based on knowledge in motivation, cognition, potential, and happiness experience. He aimed to understand the question 'Why people could spend a great deal of time in working or engaging in an activity without extrinsic rewards?' (Csikszentmihalyi, M., & Csikszentmihalyi, I., 1988) in people who worked in arts, music, and sports fields, and later expanded to other career fields. He found that flow was a personal experience that reflected the oneness of a person and an activity. A person could constantly concentrate and spend long time doing an activity. A person would evaluate an activity if it were interesting enough,

appropriately challenging, and provided a set of experiences that recognized positive outcomes. These would urge a person to do it repeatedly. According to general flow experience in his theory, an activity had no power to create flow experience by itself. This was different from computer game playing that could cause enjoyment by itself. It could motivate a game player to keep playing and also built up new skills. Therefore, a game player could recognize a joyful emotion and an increasing ability. This experience was relevant to a definition of flow as a state of mind when a person deeply engaged in an activity and recognized an enhancing cognitive ability (Csikszentmihalyi, M., 1990). In particular, computer game playing could cause flow experience in the sense of skills utilization to accomplish a task, the recognition of self-improvement, the sympathy with game, and the distorted perception of time. These experiences occurred when players thought and felt as if they were those characters in a game. They might consequently have a sense of freedom and control, which did not exist, in the real world. Hence, it was a new emotional experience. More importantly, it could enhance a player's self-esteem when missions were completed. The detailed conclusion has been discussed below.

a) Flow theory in challenge-skill balance: this was a key component in flow theory. It meant the perception and evaluation of one's ability to do a demanding task or challenge and a task's difficulty. The balancing point that would cause flow experience was when a task was slightly more difficult than daily routine. For example, if a task were too easy for one's ability, it would result in boredom. If a task were too difficult, on the other hand, it would cause anxiety, stress, and the sense of incapability to handle a task. When task's difficulty and one's skills were both low, it led to disregard and lack of motivation. A person could maintain enjoyment and felt relaxed by working on a not-too-difficult task corresponding to his/ her skills. In other words, a person could work on a task that he/ she felt capable to do while was still somewhat challenging enough to motivate a person to develop skills in order to meet the balancing point.

b) Flow experience in challenge-skill balance is recognition of one's ability while playing game. If a player with high skills played an easy game, he/ she would be bored while a low-skill player playing complicated game could cause him/ her anxiety, stress, irritation, and frustration. If a player could play a challenging

game, he/ she would feel like to play more and improve skills. Therefore, a player would evaluate the balance between his/ her ability and game's difficulty.

c) Flow theory in unambiguous feedback: a state that a person could recognize the change of physical feedback such as the change of internal organ, sensation, joint movement, and the accuracy of sight, hearing, smelling, and tasting. These changes indicated an increasing potential of a person by flow experience.

d) Flow experience in unambiguous feedback: a state which a person became aware of the physical changes during or after playing game. They could be the movement of joints or fingers, the accuracy of sight, a sharp observation, a function of eye-hand coordination, a cognitive ability in analysis, planning, decision-making, and reasoning. These changes would cause a player contentment and enjoyment. A player could recognize the positive changes resulting from computer game playing. The more an individual played computer game, the more skills have been improved.

e) Flow theory in clear goal: a person would feel flow when he/ she had a goal in an activity or know what he/ she was doing and why doing it. Csikszentmihalyi believed that flow experience could not take place without a goal and a process to achieve that goal. Having a clear goal, a person could constantly focus on what he/ she was doing and the flow experience would be continuously maintaining.

f) Flow experience in clear goal: a player could determine a clear goal by the length of time playing game or by the game's level or mission. This would make a player fully focused on and enjoyed playing game. A player was responsible for controlling himself/ herself to achieve the goal of a game.

g) Flow theory in action-awareness merging was a state that a person felt completely at one with an activity resulting from having focused intention on what he/ she was doing. Without any efforts, a person could physically and psychologically immerse in an activity. This was an indicator that a person was having flow experience.

h) Flow experience in action-awareness merging: a state that a player became immersed into a game as if he/ she were in game's world. This caused unconsciously physical and emotional involvement. A player would have sympathy due to angry, irritation, frustration, glad, or excitement in game.

i) Flow theory in concentration on the task at hand referred to concentration in what one was doing. It was a common attribution of flow experience. This allowed a person to feel integrated with an activity. Nevertheless, it could also cause the lack of restraint or attention in surroundings since a person only focused on what he/ she was undertaking.

j) Flow experience in concentration on the task at hand was a complete attention or intention on a game continuously played without any distractions from surroundings. This caused flow experience. However, a player might not pay attention in responsibility, daily routine, social interaction, or anything excepting game. If a player paid too much attention on game, it could bring about the obsession in computer game.

k) Flow theory in sense of control did not mean to control the situation since it would cause anxiety or boredom rather than flow experience. It meant to undertake an activity with positive feelings such as joyfulness, safe, relax without worries, fears of failure, or wariness of its consequence. A person could handle obstacles with positive state of mind. This feeling of sense of control was primarily based on the balance between skills and challenge.

l) Flow experience in sense of control was the state of game playing with relaxation and happiness so that a player could play game at ease. He/ she could play game effortlessly with confidence in his/ her own ability to win a game.

m) Flow theory in loss of consciousness was the state that an individual felt free from self-analysis and self-evaluation. It did not mean that a person lost his/ her mind, but became unaware of one's self due to flow experience. However, people in general usually reflected, evaluated, analyzed, or enquired themselves. And this common attribution might be an obstacle of working with flow experience.

n) Flow experience in loss of consciousness: a game player decreased in self-criticism, self-evaluation, and self-enquiry in a real world situation, for instance; his/ her ability, limitation, role, and responsibility. While playing game, a player would only think about one's task, obstacle, or identity in a game. An individual who played a role as a game character would display sympathy with game. This experience would result in flow.

o) Flow theory in time transformation was a distorted perception of time while having flow experience. Time could be faster or slower than it was in the reality. It only occurred when a person had intense state of flow. Mild flow experience could not create this sense of time distortion.

p) Flow experience in time transformation was a distorted perception of time while playing game. A player might feel that he/ she just started playing game while hours had actually passed or felt that the time has stopped or slowly passed. This indicated flow experience while playing game.

An explanation above showed that each component of flow experience while playing game was contextually specific leading to greater appropriate and relevant definition of the study context. Several studies of flow experience introduced new components and dimensions that caused flow depending on its study contexts. This indicated the uniqueness of an individual and each activity that could lead to different antecedents of flow. The antecedents varied due to activity and a person's ability to complete a task. It was also about the connection between an activity under certain contexts, which might represent a symbolic meaning, and internal experiences of a person. In other words, flow experience was a consequence of complex antecedents from external context as well as personal internal feelings towards a specific activity, which could create flow. There were new structures and definitions of flow that were different from the original theory with better application to the studying contexts (Seifert & Hedderson, 2010; Thatcher, Wretschko & Fridjhon, 2008; Chen, Wigand & Nilan, 2000). To illustrate this, the study of Novak and Hoffman (2000) found that structures of flow varied and their components or internal dimensions diverted such as challenge, skill, intention, self-control, positive experience, involvement, interactivity, time-distortion, stimulation, telepresence, curiosity, clear goal, loss of consciousness, and action-awareness merging. Moreover, results from studies varied because flow experience was different in various circumstances according to characteristics of an activity, age of a person, and social/ cultural contexts (Seifert & Hedderson, 2010).

This study also found the different structures of flow experience in computer game playing behavior. A component in autotelic experience from the original theory did not present in this study. The possible reason was that this

component overlapped with other components such as challenge-skill balance, unambiguous feedback, and sense of control. Also, autotelic experience was defined as a state that a person had an internal motivation to do an activity causing flow again. In order to be in that state, a person needed to have flow experience, which consisted of other components. In addition, this study's definition of autotelic experience was an internal desire to play game again because of having positive internal experience or contentment and remembrance. This definition overlapped with definition of challenge-skill balance, an improvement of skill to accomplish challenge of game; unambiguous feedback, recognition of game playing utility; and sense of control, positive feelings such as fun and enjoyment from game playing. The result of this study complied with Procci and colleagues (2012). It has been found that nine components of flow structure were overlapping and interacting with each other. Therefore, it should be examined whether structure of flow was relevant to the contexts of studies. Additionally, autotelic experience was usually studied as a single factor as autotelic personality, which was a personality indicating flow experience in activity (Asakawa, 2004).

In addition to a different result in flow's antecedents, this study also found that a structure of flow experience could be arranged into two dimensions: cognitive flow and emotional flow. The result from Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) indicated that the first flow consisted of challenge-skill balance, clear goals, and unambiguous feedback, while, the second flow included action-awareness merging, concentration on the task at hand, sense of control, loss of consciousness, and time transformation. This finding was similar to Magyarodi and colleagues (2013) developing a flow assessment based on Mihal Csikszentmihalyi's theory. It has been found that there were two components of flow: the balance between challenge and skill and the absorption in the activity. In Stavrou and Zervas (2004) divided flow structure into three components: 1) clearness of the state consisted of challenge-skill balance and clear goal, 2) control of the situation consisted of unambiguous feedback, concentration on the task at hand, and sense of control, and 3) absorption of the performance consisted of action-awareness merging, loss of consciousness, time transformation, and autotelic experience. In the first dimension, cognitive flow, its components shared similar characteristics that suggested

cognitive quality such as evaluation, expectation, control, and decision-making. Cognition referred to the mental process involving storing and remembering information about stimulus in attention. When the stimulus was presented, the mental process would interpret, analyze, reflect, evaluate, expect, and make a decision to express a behavior (Pastorino & Doyle-Portillo, 2012; Hunt & Ellis, 2004). Therefore, the three components of this dimension (challenge-skill balance, clear goal, and unambiguous feedback) presented these cognitive qualities; the dimension could be called cognitive flow. Likewise, the second dimension including action-awareness merging, concentration on the task at hand, sense of control, loss of consciousness, and time transformation indicated the feelings of pleasure, relaxation, contentment, fun, and intention. These feelings pointed out the sympathy of game that could decrease a player's consciousness and attention of surroundings and immerse himself/ herself into a game. This was a reflection of emotional experience that was an instant primary response to external stimulus associating to physical reaction. This concept was in a framework of definition of emotion (Ravee, 2015; Pastorino & Doyle-Portillo, 2012). As a result, the second dimension of flow experience was defined as an emotional flow. These two dimensions were accordant to definition of flow; the mental state that a person could recognize the developing cognitive function, had positive experiences, intensely involved with the activity (Csikszentmihalyi, M., 1990). It could be implied that this definition covered both cognitive and emotional aspects.

In summary, the flow experience structure in the context of computer game playing behavior was different from original theory's structure. The researcher used Exploratory Factor Analysis (EFA) to examine the Structural Equation Models of flow experience components and structural validity of flow experience components. The result showed that the structure of flow experience could be divided into two dimensions: cognitive flow and emotional flow. The cognitive flow reflected cognitive quality such as evaluation, expectation, control, and decision-making. It consisted of 1) challenge-skill balance, 2) clear goal, and 3) unambiguous feedback. The emotional flow included 1) action-awareness merging, 2) concentration on the task at hand, 3) sense of control, 4) loss of consciousness, and 5) time transformation. This dimension indicated an expression of emotional experience responding to external stimulus after

a person perceived it. The cognitive flow and emotional flow were correlated. When playing game with positive emotional experience, a person would recognize and remember it. Also, the positive emotional experience could enhance cognitive abilities such as problem-solving skills, recollection, analysis, and creativity. On the contrary, when playing game with negative feelings like frustration or anger, it could interrupt cognitive functions like decision-making, evaluation, and memory process (Hunt & Ellis, 2004). However, emotional experience could not occur without cognition. When something happened, a person would use his/ her cognition to evaluate and interpret it. A person would decide how to appropriately respond to a given situation. For instance, when encountering the mission or obstacle in game, a player would use cognitive ability to analyze and evaluate it. If he/ she interpreted or considered it as a challenging, the emotional experience would be positive. However, if a player saw it as a difficulty, he/ she would feel anxious or stressed out. Therefore, this indicated that although cognitive process and emotional process came from different dimensions, they were correlated and influenced each other (Fulcher, 2003; Schulkin, 1993).

5.4.2 Research Hypothesis 2: flow experience had a positive correlation with computer game playing behavior.

The present result stated that flow experience had an impact on computer game playing behavior. Flow experience could be grouped into two dimensions: cognitive flow and emotional flow. The cognitive flow reflected cognitive functions such as evaluation, decision-making, analysis, planning, and goal setting. It consisted of challenge-skill balance, clear goal, and unambiguous feedback. The emotional flow included action-awareness merging, concentration on the task at hand, sense of control, loss of consciousness, and time transformation. This dimension indicated emotional characteristics like positive emotional experience, intention, sympathy, immerse into game, and less awareness of worries. Flow experience from computer game playing had 2 aspects: cognition and emotion. A player would use cognitive function such as planning, self-evaluation, and memorization while playing game. At the same time, he/she would have sympathy with game. The sympathy could be positive or negative depending on ability to overcome an obstacle. With adequate ability, a player would have a positive emotional experience giving back positivity to

cognitive process such as creativity, problem-solving, and decision-making. Otherwise, a player with inadequate skill would feel frustrated. This led to lesser cognitive effectiveness, boredom, and irritation (Lewis & Haviland-Jones, 2000). Hence, while playing game, there would be cognitive and emotional process taking place and interacting. If a player perceived a game that it was too difficult to handle, he/ she would have negative emotional experience. Nonetheless, if a game were considered as a challenging, it would lead to positive emotional experience. The structure of flow in this study's context divided into two aspects was relevant to a study of Magyarodi and colleagues (2013). This study grouped flow into two dimensions: balance between challenge and skill and absorption in the activity. It was also similar to Chang (2013). This study developed a model in order to understand social network game playing based on flow theory. There were two key antecedents that caused flow experience and contentment leading to repeat online game playing behavior: hedonic value and utilitarian value. Indeed, structures of flow had both emotional dimension like enjoyment, preoccupation and cognitive dimension like self-efficacy (Obada, 2013; Engeser, 2012).

A player needed to have ability to handle with obstacle in game or game format. He/ she had to be focused and used ability to achieve each game level. Game also attracted a player's attention resulting in loss of consciousness and time distortion (Thatcher, Wretschko & Fridjhon, 2008; Kim & Davis, 2009). Flow experience while playing game could yield both positive and negative consequences. In a bright side, it enhanced a player's cognitive skills, learning ability, visual-motor coordination, self-efficacy, as well as positive emotion such as enjoyment, contentment, relaxation and sense of social belonging. In a negative side, it caused adverse effects to a player and surrounding people, for example; physical unhealthiness, decrease of learning performance, moody, irritating or depressive emotion, lack of discipline, lack of responsibilities, and lack of social interaction with family or surrounding people (Partington, S., Partington, E. & Olivier, 2009). Thus, game playing in adolescent had both benefits and adversities. It could improve a player's English, cognitive skills, planning, working with hands, relaxation while caused a physical weakness, eyesight problem, sleeping problem, improper routine, unfinished emotion, imitation of undesirable behavior, and conflicted relationship with other people. Flow experience

could explain game playing behavior and its positive and negative outcomes after experiencing flow. Flow component could be an indicator of utilitarian consequence or game additive behavior (Boyle al., 2012; Obada, 2013; Engeser, 2012).

5.4.3 Research Hypothesis 3: different antecedents of flow experience caused different computer game playing behaviors.

A result from the study found that cognitive flow, challenge-skill balance, clear goal, and unambiguous feedback, directly affected the recognition of advantages of game. If a player experienced cognitive flow while playing game like evaluating, analyzing, planning, making a decision, setting a goal, or becoming aware of positive change or improvement in skills, it was more likely to create a positive game playing behavior or realization of game's benefits. A player could control his/ her behavior in a proper way by the function of cognitive process. This process was interpreting, evaluating, and expecting towards stimulus. It was created by an opportunity to use cognitive abilities such as analysis, planning, and goal setting while a game player could recognize game's advantages as well as evaluate his/her potential to deal with game's difficulty. In terms of emotional flow, it consisted of action-awareness merging, concentration on the task at hand, sense of control, loss of consciousness, and time transformation. It also directly had an effect on the recognition of mental and physical impact from game playing or game addition behavior. If a player had flow experience in positive emotional experience, involvement, sympathy with game, decrease of self-consciousness, and incorrect sense of time, it would be more likely to have the perception of mental and physical impact. The game playing's drawbacks resulted from lack of emotional control. In particular, a player deeply immersed one's self into a game, had sympathy with game that led to loss of consciousness and low attention in surroundings and one's responsibilities. Especially, when a player had a positive emotional experience while playing game and remember it, he/ she would keep playing game repeatedly. Nonetheless, cognition and emotion were correlated. When stimulus presented, a person was urged to perform cognitive function like analyzing, evaluating, and expecting the consequences before interpreting and expressing response. Emotion was a part of expressive response. When a player had a positive emotional experience while playing game, he/ she was more likely to be

constantly focused on game without worries of its consequences. This would improve a player's ability in order to carry out the task or solve the problems. On the other hand, if a player had negative feelings while facing difficulties in a game, it would interrupt his/ her cognitive functions. Thence, as cognitive function was related to emotional experience while playing game, a player had to weight if he/ she wanted to focus on cognition or emotion.

Flow theory addressed motivation being induced by positive experience that caused creativity and positive behavior on daily basis. (Csikszentmihalyi, M., & LeFevre, 1989) Notwithstanding, flow from game playing could cause involvement or preoccupation with game leading to an unawareness of time, a conflict with personal value, and meaning of surroundings. When focusing on something intensely, a person tended to ignore his/ her surroundings as well as had distorted sense of time. This could interfere a person's routine. (Seifert & Heddersen, 2010) Yet, it could help a person to develop his/her skills according to a greater amount of time spending on game playing. This was relevant to Wan and Chiou (2006) mentioning that flow experience was not a key factor that caused game addiction behavior. Especially, when a player experienced a cognitive flow, he/she could develop cognitive abilities concerning the game. However, flow would not cause only a positive experience, but also emotionally difficulties, if a player were greatly involving in emotional flow. Particularly, when a player experienced flow in cognitive dimension such as evaluation the balance between challenge and skills, goal setting and recognition of game's positive consequences that promoted his/ her cognitive abilities such as planning and eye-hand coordination, a game playing behavior would lead to positive results. Nevertheless, emotional flow experience such as intense intention, feeling at one with a game, lack of worries, and sense of time's distortion would lead to negative outcomes mentally and physically and game addition behavior. A player might unexpectedly spend long period of time playing game with all attention that he/ she did not do other activities resulting in the disturbance of daily routine or responsibilities. Similarly, Sublette and Mullan (2012) found that negative consequences from playing online game happened when a player used game to escape from reality and excessively soaked himself/ herself in the game's world. Nonetheless, this research found that flow experience in cognitive aspect could straightly cause the

recognition of game playing's benefit. If a player were having a cognitive experience while playing game like assessing, decision-making, analyzing, planning and goal-setting, it would lead to positive outcomes or the perception of game-playing advantages. Choi and Kim (2004) also found the similar findings, indicating that glow experience from playing game and positive consequences were resulted from positive feedback from the game and appropriate game's goal-setting. However, flow experience in emotional aspect would directly cause mental and physical effects. If a player experienced emotional flow like positive emotional experience, intense concentration, game sympathy, and lack of concerns, it would lead to game playing's drawbacks or recognition of emotional and physical effects. Consistent to Chou and Ting (2003), it has been reported that if a player experienced mainly enjoyment from playing game, perceived surrounding distortedly, and excessively focused on the game, it would be more likely to cause game additive behavior. Also, Stavropoulos, Alexandraki and Motti-Stefanidi (2013) presented the positive correlation between Internet addiction and the feelings of immersion, oneness, and sympathy with the activity. Besides, game additive behavior criteria included intention, loss of consciousness and surroundings, positive or oneness feelings, and distortion of time perception. The components of the criteria reflected that a person spent most of time with game that he/ she forgot or ignored responsibilities leading to disturbance of activities that a player should do and avoidance of reality's hardship. These characteristics were relevant to studies in game addiction noting key indicator of game additive behavior; the lack of attention or interest in surroundings (Partington, S., Partington, E., & Olivier, 2009; Weinstein, 2010; Wood, 2008; Wu, Scott & Yang, 2013).

5.4.4 Research Hypothesis 4: gender, an average number of hours playing game and mode of game had an effect on the correlation between flow experience and computer game playing behavior.

The current findings indicated that the length of time spent on game directly affected computer game playing behavior, both positively and negatively. If a player spent most of time on game, it meant less time with other aspects in life such as study, routine responsibilities, relationship, and healthcare. A player might have a

problem with eating and sleeping schedule. It could cause preoccupation with game and ignorance of other activities, even ones that a person was supposed to do. Moreover, it could make a player irritated if he/ she could not play game or be prohibited from playing game. This could cause game addictive behavior, risk behaviors, aggressive behaviors, and stealing behaviors. Evidences from other studies stating that the more excessive time a person spent on game, the more likely it caused negative effects supported this finding. To illustrate this, physical outcomes were sleeping problems and obesity; emotional consequences were depression and stress; learning aspect like the drop of studying performance; social problems were aggression and the risk of substance abuse (Liu, 2014; Gentile, 2011). These negative results reflected the antecedents of game addictive behavior or pathology of game addiction. The more time spent on game, the higher tendency of these negative behaviors would be shown (Choo, et al., 2010; Gentile, 2009; Pornnoppadol et al., 2009). Even though the more time playing game tended to cause the higher risk of game addictive behavior or negative consequences, the duration spent on game could also increase an opportunity to enhance a player's abilities as well as enjoyment. The important factor was the characteristics of the game. This study found that the time factor could cause both cognitive and emotional outcomes. Therefore, it depended on behaviors or dimension of flow experience that happened during the game whether it emphasized on cognition or emotion. Cognitive flow that promoted a player's skills such as language, memory, and visual-motor coordination would make the time playing game profitable. On the other hand, if a player spent time playing game because he/ she wanted to evade loneliness and boredom or to gain positive emotional experience, time spent on game would be worthless or negatively affected a player physically and mentally. Thus, the time spent on game playing was associated with flow experience. The more time spent, the more flow experience happened. However, time was not a key indicator of negative consequences and game addictive behaviors. To indicate this, it also needed to consider impacts of game playing. Because some people might have more time to play game and could still maintain studying or working performance as well as social interaction while some people might be incapable of studying and finishing the given tasks, then they presented social isolation, moody state, aggression, and conflicts with others.

The present study mentioning that duration a person spent on game playing caused both useful behaviors and physical and mental impact was relevant to Voiskounsky, Mitina and Avetisova (2004). In the closer inspection, this research finding showed that the more a person experienced flow while playing game, the more time he/ she would spend on it. If a player had an intense flow experience, it was more likely to cause game addictive behavior. On one hand, flow experience from game playing that consumed more time could promote cognitive functions. When a person acquired positive outcomes, a player would spend more time on game for self-improvement. Hence, duration of game playing was not the most significant indicator of game playing consequences. This study found that time had both negative and positive effects on a player. The greater critical indicator was dimension of flow experience while playing game. Chiang, Lin, Cheng and Liu (2011) cited that the longer duration of game playing could cause the greater flow experience. And the consequences of flow experience could be advantageous or adverse. Similarly, Wu, Scott and Yang (2013) found that when a player spent more time on game, he/ she could develop cognitive skills because a player had flow experience. While playing game, a player had to improve his/ her abilities to match game's challenge. Pornnoppdol et al. (2009) demonstrated that an amount of time playing game was correlated with self-control, time-management, and responsibilities in studying or other activities. Game players who were not game addicted had a sense of self-control that they could stop playing game when it was time for other activities or it reached the time limit. However, most of players who addicted to game did not like to do other activities and did not want to be responsible for any tasks. They had a weak sense of self-control and time-management that they would play game as long as they wish.

Gender also had an indirect effect on positive and negative game playing behavior via the time consumption. To be precise, men spent more time playing game than women. The possible reason was the type of game men preferred. They usually played online game that needed to play together with other players. This kind of games required time and cooperation from other players in order to accomplish missions in game. Therefore, men were more likely to spend more time on game. On the other hand, women preferred offline game on smartphones, which demanded lesser time to finish the tasks. Moreover, women did not aim to socialize or compete with

other players when they were playing game. They generally played by themselves or just for passing the time. This was related to Sublette et al. (2010) reporting that men spent more time on game playing than women because they wanted to fulfill their mental yearning. They also had more negative effects from game playing behavior than women in several aspects; social behavior, learning behavior, and game addictive behavior.

Despite this study did not report the significance of game's mode influence on game playing behavior, there were some facts regarding this factor. Online game could attract a player to spend comparatively long time. Because it commonly required many players to coordinate in order to carry out the tasks. There was also an opportunity to chat with other players that they could decide whom they wanted to interact with as well as a space to show off their abilities. A player could make trial and error and had freedom in a game. The game's story lines were usually attractive. Its characters had interesting backgrounds and attributions. Most importantly, there were rewards or items in game that caused longer time spending on it. This rewarding mechanism was created by positive experiences while playing game that motivated a person to repeat playing game. The rewards might refer to negative reinforcement such as avoiding undesired feelings or circumstances apart from the positive reinforcement like a compliment and acceptance among players.

In summary, men were more likely to spend more time on game than women because they probably played game in order to fulfill their social yearning and gained acceptance and succession, while; women did not use game for these purposes. In addition, men often played online game that required a great amount of time to finish the missions or pass the stages. Therefore, they were more likely to spend more time playing game. Yet, this study found that time duration was not a key indicator of game playing consequences. The state of flow in computer game playing was indeed a key factor that could penetrate its positive or negative outcomes.

5.5 Suggestion

5.5.1 Suggestion for application

a) The study found that flow experience during game playing could cause benefits as well as emotional and behavioral consequences. Hence, government organizations, Ministry of Public Health and Ministry of Culture should consider not to present only negative images of children who played game as a problem or ones with game addiction. There were also profitable aspects. In order to change children's game playing behavior, it should not forcefully prohibit them from playing game by people who had bias point of view towards game players. Therefore, the organizations in charge of game playing regulation should adjust their attitude to be more understanding about the children who played game and benefits of game playing behavior. They should encourage children to play game in positive way. As the stated result, flow experience during game playing in cognitive sense such as evaluation the difficulties of game, setting goal in each level, and recognizing their self-improvement from playing game would lead to advantageous consequences. On the other hand, if a player had gaming experience in terms of emotional effects such as intensely focusing, immersing into game's world, having positive emotional experience, and ignoring surroundings could lead to negative outcomes or psychologically, physically, and behaviorally affected a player. As a result, the organizations should raise public awareness or develop handbook to understand multidimensional consequences of game playing for officers and game player. The findings showed that game playing behavior could provide creative or useful outcomes with appropriate game playing pattern. Thus, organizations in science and technology, especially software industry promotion agencies should support in developing game that can yield advantages to computer game playing. For example, game that a player has to improve his/ her skills to overcome obstacles with time limit in each stage or goal should be considered. In some games, there is a quota in each time a player played. If he/ she uses up the entire quota, a player has to wait for certain duration for being able to play again. Furthermore, game can be developed in terms of content that explained advantages of different kinds of popular game or new-entry game about how it can improve a player when playing due to recommended ways. This can exhibit an image of game playing

as a useful activity rather than a problematic one. After developing appropriate game that can cause advantages, educational or social-development related agencies should implement the proper game in daily life in both education and leisure contexts. In reality, it is undeniable that nowadays game is a part of children and adolescents' daily routine.

b) From this study, the duration of game playing could cause undesirable behavior similarly to former studies. Nonetheless, the duration had correlation with cognitive flow experience that led to benefits from playing game. Hence, relevant agencies should create an atmosphere that stimulated a player's flow experience in cognitive dimension through developing game or promote a game with the positive attributions. For instance, organizations related to children and adolescents' affairs, science and technology, software industry promotion, education, and public health should organize a game competition in a game that was beneficial or game-development competition. This can attract a game player to play game with profitable characteristics.

Parents and educational institute are essential factors to take care of game-playing behavior in children and adolescents. They have to change their negative attitudes towards game and focus more on game's content and how it can provide advantages. They can also appreciate and give a compliment about the development of children's skills from playing game. They can point out to their children that game can cause positive consequences without any negative effects to the player and other people when it is appropriately played. Lastly, young game players can prove the positive sides of game playing to public. They can show that a cognition-improvement game can develop their abilities and does not negatively affect their time or responsibilities.

5.6 Future Research recommendations

5.6.1 The present finding devised a new structure of flow experience which was different from the original theory. But it was still based on Mihal Csikszentmihalyi's theory. Thence, future research should identify a new definition of

flow experience depending on the context of studied activities and develop into a new structure of flow experience of that certain context.

5.6.2 There should be a comparison between samples who were diagnostically addicted to game and game players who played on a daily basis about how similar or different their antecedents of flow experience were.

5.6.3 There should be a study on causal factors that create flow experience in playing game context or other contexts.

5.6.4 Factors in flow experience can be applied in other contexts for the social beneficial use such as flow experience in work, flow experience in playing sports, or flow experience in playing music.

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