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A GROUNDED THEORY FOR ACTIVE VIDEO GAME DESIGN TO PROMOTE GAMER ENGAGEMENT AND IMMERSION

by

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DECLARATION

I, Adele Braaf, declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

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Signed   **Date**

ABSTRACT

Active Video Games (AVGs) are a form of video games that rely on gamer motion as the main source of interaction between the AVG and the player. These AVGs serve a number of purposes, such as medical rehabilitation, education, social development, and motor skill development, among others. Prolonged play of AVGs is not sustainable as gamers lose interest in playing AVGs after the initial period of acquiring them. Therefore, the following research question was posed: "What design factors contribute to an engaged and immersed AVG experience?"

The aim was to explore the inhibiting and enhancing factors influencing engagement and immersion among AVG gamers, as well as to develop a theory of AVG design. Constructivist Grounded Theory (CGT) was used as the methodology to carry out this study, which adopted an inductive approach towards the research to construct a theory firmly grounded in the data. Play Active Theory (PAT) is the outcome of this process, which explores the engagement and immersion factors related to AVG design as well as the abandonment and replayability of AVGs. PAT was compared to existing engagement and motivation theories as part of the CGT process, and further refined. In closing, the research question was answered and the aims of the study were met. A reflection account of the research journey concludes the thesis.

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GLOSSARY

Acronyms	Definition
Abandonment	To give up completely. Synonymous with "discontinue", "stop", "give up"
ARCS theory	Attention, Relevance, Confidence, Satisfaction theory
AVGs	Active Video Games
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CGT	Constructivist Grounded Theory
CPUT	Cape Peninsula University of Technology
Engagement	Requires time, effort and attention (Soutter & Hitchens, 2016:2) The time spent on gaming (Neys, Jansz & Tan, 2014:5)
FT	Flow Theory
GT	Grounded Theory
GTM	Grounded Theory Methods
HU	Hermeneutic Unit
HUD	Heads Up Display
Immersion	Synonymous to "absorption" (Garell, 2015:32) Focuses a gamers attention ((Baranowski, Maddison, Maloney, Medina & Simons, 2014:5)
IT	Information Technology
Mini-game	Video games with simple and easy to understand video game mechanics that last between thirty seconds to five minutes (Macvean, 2013:73)
PAT	Play Active Theory
PC	Personal Computer
QRM	Qualitative Research Methods
Replayability	With reference to a video game. Noun, "being suitable for or with playing more than once"
RPG	Role Playing Games
SDT	Self-Determination Theory
SGT	Straussian Grounded Theory
SIT	Self-Identity Theory

1. CHAPTER ONE: INTRODUCTION

1.1 Introduction

Video games have come a long way from humble beginnings in 1961 to the massive industry it is today, with industry revenues bypassing 1.9 trillion US dollars and still being expected to increase by a compound annual growth rate of 5.1% by the year 2019 (Eliashberg, Hennig-Thurau, Weinberg, Wierenga, 2016:1; Egenfeldt-Nielsen, Smith & Tosca, 2009:10). Not only is the gaming industry a lucrative one, but it has also claimed hundreds of millions of gamers worldwide and is considered to still be growing at a rapid pace (Zhang, Moore, Gu, Chu & Gao, 2016:4; O'Donovan & Hussey, 2012:1; Wolf, 2007:22). These accomplishments show that it is no small matter and that this technological industry has a place to claim in the academic space.

This study focuses on the engagement and immersion of gamers in active video games (AVGs) and the factors influencing gamers' engagement and immersion. The aim is to explore the phenomenon and to address the research problem by answering the research question through the use of a suitable research methodology.

This study is grounded in a constructivist grounded theory (CGT) methodology. This means that the goal of the research is to produce a theory derived from its data. CGT is extensively explained in Chapter Three; however, there are a few key aspects to note. Each chapter is influenced by the rules of CGT and each section is influenced in the following ways:

- The research approach becomes an inductive study whereby the data determine the constructed theory
- The research question serves as a starting point, but can be susceptible to changes as the study progresses
- There are two literature reviews (Chapter Two and Chapter Six). The first serves as a preliminary literature review which does not go into detail and the second becomes more extensive as it serves as further data analysis, comparison, and discussion
- The methodology follows a specific qualitative data analysis process that consists of three phases (open coding, focused coding, and theoretical coding)
- Data collection and data analysis occur simultaneously

- Data collection only ends once data saturation has been reached; therefore, this affects the planning as no clear end date can be set
- The data collection tool evolves as more data are collected and the direction of collecting data shifts
- Chapter Six (the discussion) becomes more focused and does not include broad topics of the literature

This chapter sets the scene for the rest of the study and starts off by placing the research in context by providing the research background. The background touches on the research problem, which is preceded by the research question and aim of this study. Thereafter, a clear delineation is made of what the research will not cover, and then goes on to explain the researcher's philosophical stance. The chapter is further justified and the contribution to be made is noted. A strategic plan is presented to indicate how the researcher went about doing the research and the chapter closes off with the researcher taking into account the ethics and limitations of the study. A summary of each proceeding chapter ends off this chapter.

1.2   Contextualisation

This research focuses specifically on in-game design features of various active video games (AVGs) that influence immersion and engagement levels of AVG gamers. AVGs are video simulations that require physical body movement, unlike traditional video games whereby gamers remain sedentary (Bernstein, Gibbone, Rukavina, 2015:2). The aim is to explore the phenomenon and to address the research problem by answering the research question through the use of a suitable research methodology.

This research is based on Information Technology (IT) as well as design. Given the nature of the research, elements of human psychology are integrated into the research to understand the involvement of human factors. Grounded theory (GT) has been used as the research design because this methodology offers the opportunity to uncover new innovative ideas and theories.

One contextualisation challenge that has been encountered is the lack of knowledge over multiple disciplines.

1.3   Research background

Video games can be described in two parts: *video* meaning technology, and *games* meaning a recreational activity that consists of rules, conflict, challenge, skill ability, and an outcome or goal such as winning, losing or attaining a high score (Wolf,

2007:24). This means that video games utilise technology to bring about entertainment; however, as of 1998, video games shifted in style from being a purely sedentary activity to an active one when Konami (a video gaming company) released the first AVG, "Dance Dance Revolution" (Wolf, 2007:19). AVGs are also referred to as "exergames", "active games", "motion games", and "exertion games" (Hagen, Chorianopoulos, Wang, Jaccheri & Weie, 2016:1; Bernstein et al., 2015:2; Wu, Wu & Chu, 2015:1). Throughout this study, the active state of video gaming will be referred to as AVGs.

AVGs serve a multitude of purposes, *inter alia* for education, therapy, rehabilitation, health promotion, and advertising (Nguyen, Ishmatova, Tapanainen, Liukkonen, Katajapuu & Makila, 2017:1). The most common AVGs, having the function of promoting physical activity, host a number of benefits to the human condition (Simons, De Vet, Brug, Seidell & Chinapaw, 2014:2). Other research has shown how AVGs (which can be noted as a form of video gaming) hold a number of benefits for gamers (Altamimi & Skinner, 2012:3). These benefits include, but are not limited to:

- Medical rehabilitation
  - o Assists in treating dyslexia (Franceschini, Gori, Ruffino, Viola, Molteni & Facoetti, 2013:1)
  - o Improvement of balance for sufferers of muscular sclerosis (Zeng, Pope, Eun & Gao, 2017:8)
  - o Enhanced attention capacity (Eichenbaum, Bavelier & Green, 2014:11; Green & Bavelier, 2003:1)
  - o Treatment of depression and stress (Zeng et al., 2017:9)
  - o Improved motor and balance skills (Green & Bavelier, 2003:1)
- Education
  - o Developing skills (include leadership skills) (Nguyen et al., 2017:1)
  - o Learning lessons (history and human culture) (Nguyen et al., 2017:1)
  - o Ability to engage in multiple tasks simultaneously (Chiappe, Conger, Liao, Caldwell & Vu, 2013:1)
- Cognitive abilities
  - o Improved memory skills (McDermott, Bavelier & Green, 2014:1)
  - o Enhanced and faster decision making skills (Eichenbaum et al., 2014:14; Dye, Green & Bavelier, 2009:1)
  - o Encouraged creative thinking (West, Hoff & Carlsson, 2013:3)
  - o Improved problem solving skills (Adachi & Willoughby, 2017:2)
  - o Increased mental flexibility (Eichenbaum et al., 2014:12)

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- Social development
  - Forging deeper friendships with people sharing similar interests (Adachi & Willoughby, 2017:3)
  - Decrease in social isolation and building of friendship networks (Kiluk, 2016:14)
  - Ability to work in a team (Adachi & Willoughby, 2017:3)
- Motor skill development
  - Bowling (Wu et al., 2015:4)
  - Tennis (Zeng et al., 2017:4)
  - Boxing (Wu et al., 2015:4)
  - Dancing (Zeng et al., 2017:1)

Although AVGs have the potential to provide numerous benefits to gamers, many studies still indicate that AVGs fail to deliver these benefits (Simons, Brug, Chinapaw, De Boer, Seidell & De Vet, 2015:18; O'Donovan & Hussey, 2012:5). This can be attributed to gamers losing interest in playing AVGs after the initial period of acquiring them (Zhang et al., 2016:8; Dutta & Pereira, 2015:1; Peng, Crouse & Lin, cited by Garell, 2015:12). It is through the persistent usage of playing AVGs that the benefits are achieved and as Simons et al. (2015:18) note, "there's a need for the new development of AVGs that will stand better in terms of sustainability". As O'Donovan and Hussey (2012:5) note, for fitness levels to be maintained or improved, any type of physical activity the gamer participates in has to be performed on a regular or sustained basis. Altamimi and Skinner (2012:11) further support this argument by claiming that exergames should be designed with sustainability in mind to achieve the benefits associated with playing AVGs. This can be translated into reaping the other benefits of AVGs, in that it can only be fully attained through repeatable use. Simons et al. (2015:5) affirm this by stating that "additional efforts are required to increase the duration of active game play".

Another challenge hindering the amount of engagement a gamer experiences with AVGs concerns its design. According to a study conducted by Simons et al. (2015:17), participants reported that AVGs are boring and this discouraged them from persisting to play AVGs. This is also noted as Buday (2015) claims that health games may be boring and it displeases video gamers who seek fun in playing AVGs.

1.4   Problem statement

Prolonged play of AVGs is not sustainable as gamers lose interest in playing AVGs after the initial period of acquiring them (Zhang et al., 2016:8; Dutta & Pereira, 2015:1; Peng, Crouse, Lin, 2013). This causes the gamer to lose out on a multitude of benefits associated with playing these games (Simons et al., 2015:18; O'Donovan & Hussey, 2012:5). Along with the knowledge that current AVG design can be unattractive and boring (Buday, 2015; Simons et al., 2015:17), there are no specific theories regarding AVG design found that influence game engagement and immersion. Therefore, the problem is that prolonged play of AVGs is not sustainable as gamers lose interest in playing AVGs after the initial period of acquiring the games.

1.5   Research question

Given the nature of grounded theory, the research question is susceptible to being changed as the study progresses (Stol, Ralph & Fitzgerald, 2016:5). Keeping the foregoing in mind, the initial research question to guide this study is as follows: what design factors contribute to an engaged and immersed AVG experience?

1.6   Aim

This study has two aims. The first aim is to explore the inhibiting and enhancing factors that influence engagement and immersion among AVG gamers. The second aim is to develop a theory of AVG design.

1.7   Delineation

There are a few parameters in place to scope this study. This research does not develop a physical artefact, but a theory. It does not focus on health or weight issues and concerns, but focuses on identifying enhancing and inhibiting factors which influence the gamers' levels of engagement and immersion. This study does not include virtual reality gaming as the researcher is limited in obtaining certain equipment. And lastly, this study does not address every AVG available, but makes use of a varied and limited selection of games that cover as many genres and scenarios as possible.

1.8   Philosophy

Research paradigms provide researchers with a means of studying phenomena that occur in their field of study (Du Plooy-Cilliers, Davis & Benzuidenhout, 2014:19). By adopting a specific paradigm, the remainder of the research is guided by being aligned to the paradigm of choice (Du Plooy-Cilliers et al., 2014:19). A paradigm influences views, beliefs, and ways in which researchers conduct their study (Du

Plooy-Cilliers et al., 2014:34-35), as well as influences the lens through which the researcher perceives the data (Gray, 2004:16). Although a number of paradigms exist, there are three common paradigms used among researchers, namely positivism, interpretivism, and critical realism (Gray, 2004:17). Each paradigm consists of an epistemological, ontological, methodological, and axiological position (Du Plooy-Cilliers et al., 2014:23-24; Kumar, 2011:14). Depending on the adopted paradigm, each ontology, epistemology, methodology, and axiology will differ (Du Plooy-Cilliers et al., 2014:34-35).

1.8.1 Selected research paradigm

The research paradigm adopted for this study is interpretivism because it is most suited for the type of research conducted, following an inductive and subjective approach.

Epistemology

According to Du Plooy-Cilliers et al. (2014:23), "epistemology deals with the nature of knowledge and the different ways of knowing". This determines how the researcher sees and understands the phenomena and develops beliefs about it. It deals with the understanding of what knowledge is.

Ontology

Ontology concerns itself with reality, existence, and the study of being (Du Plooy-Cilliers et al., 2014:23; Gray, 2004:16). It asks the question, "How does one know what is real?" Different paradigms observe the same phenomena; however, if two researchers have differing paradigms, the way in which reality is perceived may differ (Du Plooy-Cilliers et al., 2014:34-35).

Methodological position

Du Plooy-Cilliers et al. (2014:24) note that methodology is a guiding system when it comes to solving problems. It contains the most appropriate research methods for collecting and analysing data. This position consists of qualitative, quantitative, and mixed-methods, among others (Gray, 2004:16), each of which is determined by the paradigm adopted by the researcher (Du Plooy-Cilliers et al., 2014:24).

Axiology

Axiology offers the researcher insight into a paradigm, in what the paradigm deems as valuable (Du Plooy-Cilliers et al., 2014:24). It allows the researcher to understand whether or not the values of the paradigm shape and mediate what is understood. According to Agnes and Guralnik (2001), axiology is "the branch of philosophy

dealing with the nature of value and the types of value, as in morals, aesthetics, religion, and metaphysics".

1.8.2 Interpretivism paradigm

Interpretivism is the chosen paradigm for this study. Interpretivism is usually used when dealing with social science (Du Plooy-Cilliers et al., 2014:27). It differs from positivism in that positivism relates to understanding objects and phenomena in the natural sciences. Interpretivism acknowledges that humans cannot be treated the same as objects, therefore a different approach or lens is needed when understanding social science phenomena (Du Plooy-Cilliers et al., 2014:27).

The reason why humans cannot be studied in the same manner as objects is attributed to their constantly changing behaviour, influenced by the environment in which they find themselves (Du Plooy-Cilliers et al., 2014:27). Therefore, interpretivist researchers compensate for areas in which positivists might be lacking by addressing social science issues differently (Gray, 2004:20). Interpretivist researchers mostly concern themselves with studying and describing meaningful social interactions in (mostly) social science (Du Plooy-Cilliers et al., 2014:34-35), whereas positivists concern themselves mainly with understanding the causal relationships of a phenomenon.

The ontology of an interpretivist is a belief that all people experience reality differently depending on factors such as current culture, past experiences, and current circumstances, among others (Du Plooy-Cilliers et al., 2014:29). This sense of reality and belief differs vastly from the positivists, who believe that reality and the experience thereof is governed and shaped by laws (Du Plooy-Cilliers et al., 2014:25). According to Du Plooy-Cilliers et al. (2014), interpretivist researchers maintain the opinion that social reality is always in a flux state, meaning that reality is always changing.

Interpretivists depend largely on qualitative research methods because the aim of most interpretivist researchers is to achieve in-depth understanding of multiple realities (Du Plooy-Cilliers et al., 2014:35). The interpretivist researcher usually approaches the study subjectively, attempting to understand the reality of people via the samples perspective (Du Plooy-Cilliers et al., 2014:35).

Axiologically, interpretivist researchers value complex interpretations and the understanding of different social realities (Du Plooy-Cilliers et al., 2014:35). This differs from the positivists' value of research, in that positivists value objectiveness

and the interpretivist researcher values uniqueness (Du Plooy-Cilliers et al., 2014:35). Therefore, interpretivist researchers include their own views and interpretations as well as the views of the participants in their studies (Du Plooy-Cillierset al., 2014:31).

1.8.3 Positivism paradigm

Positivists are mainly concerned with discovering and explaining causal relationships to predict and possibly control the relevant phenomena (Du Plooy-Cilliers et al., 2014:25). This paradigm is rooted in the physical or natural sciences (Kumar, 2011:14) and its ontology governs the paradigm within a set of scientific laws (Du Plooy-Cilliers et al., 2014:25; Gray, 2004:18).

Positivists rely mostly on experiments and the testing and isolation of variables to achieve precision in their research (Du Plooy-Cilliers et al., 2014:25). Due to their objectivist axiology, positivists highly value the honest representation and accuracy of facts (Du Plooy-Cilliers et al., 2014:27). Through the accumulation of facts, positivists produce generalisations concerning causal relationships between variables, which in turn become scientific law (Du Plooy-Cilliers et al., 2014:26; Gray, 2004:18). Because of this objective axiology, positivism has not been selected as the human experience cannot be accounted for from a non-subjective approach.

1.8.4 Critical realist paradigm

Critical realism is formed to fill the gap left from positivists' narrow focus and interpretivism's passive and subjective views (Gray, 2004:24) by taking aspects from both paradigms and taking the stance that, independent of human perspective, real structures exist (aligned with positivist views) and that knowledge is a social construct, which is similar to interpretivist views (Du Plooy-Cilliers et al., 2014:31).

Critical realism differs from positivism in that instead of discovering causal relationships and predicting results in order to control future events, critical realism is more concerned with understanding and explaining phenomenon (Du Plooy-Cilliers et al., 2014:31). This is because critical realism aims to empower people to take effective action and to question their existing reality (Du Plooy-Cilliers et al., 2014:32; Gray, 2004:23-24).

Similar to the interpretivist paradigm, critical realism views knowledge as being non-permanent because it is dependent on social contexts and underlying structures (Du Plooy-Cilliers et al., 2014:32-34). However, critical realists do not view this as

problematic, as they believe knowledge should be directed towards equipping people with tools to change their existing reality (Du Plooy-Cilliers et al., 2014:34).

Axiologically, due to being emancipation-orientated, critical realists value freedom and equality (Du Plooy-Cilliers et al., 2014:35). This differs from both positivism and interpretivism, as positivists value objective research and truth, and interpretivism values uniqueness (Du Plooy-Cilliers et al., 2014:35).

All these factors taken into consideration have led the researcher to adopt the interpretivist paradigm, as it is best suited for the study at hand.

1.9   Research strategy

This study adopts an interpretivist research philosophy and an inductive approach through the research process of constructivist grounded theory over a cross-sectional time horizon. Data are collected using all sources; however, focus is placed on observations and interviews as well as secondary data of online articles and blogs of gaming sites and product reviews. Figure 1.1 depicts the overall structure of the study.

Through the use of CGT, the researcher has the opportunity to closely link the cross-disciplinary work of IT and design to form a theory grounded in both disciplines that address the issue of engagement and immersion in AVGs. However, the perspective is represented from an IT point of view.
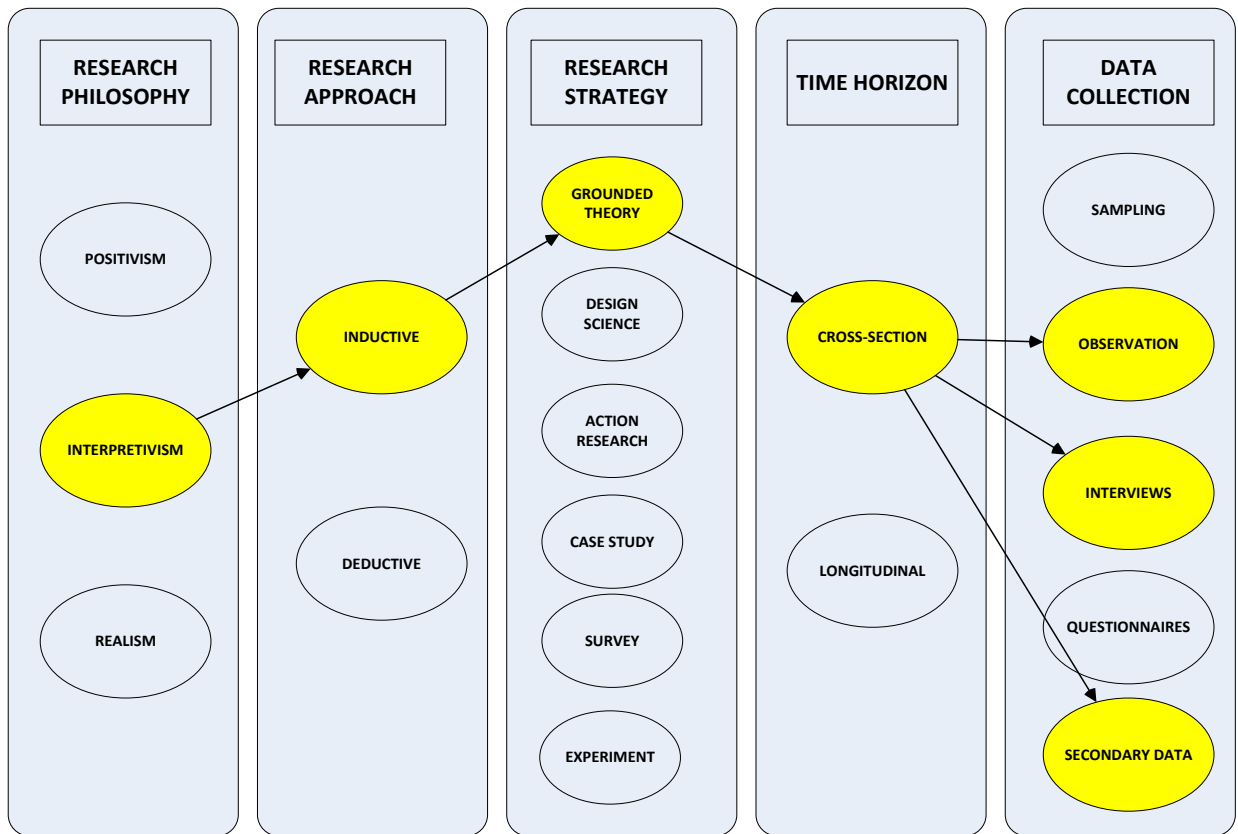
Figure 1.1: Research roadmap

1.10 Reason for undertaking the study

The reason for undertaking this study is to contribute towards improving the experience gamers have with AVGs, as well as to lower their levels of sedentary behaviours and to promote physical activity.

1.11 Contribution

The contribution is a theory of core categories established through the constructivist grounded theory methodology, which suggests ways in which AVG design can promote continuous engagement and immersion. Another contribution is a data collection tool, used to analyse human experiences. This research contributes towards the IT body of knowledge, as AVGs are an IT artefact and addresses issues concerning AVG design.

1.12 Ethics

The nature of this research requires physical activity through play for a number of participants; therefore, ethical considerations have been taken into account. With regard to participants' involvement, indemnity forms have been issued to ensure that a mutual agreement is reached and that it is purely volunteered participation.

All participants' personal information is kept private and confidential. The identities of participants remain anonymous as they are referred to using an alias name, which is self-assigned by each participant. All pictures of participants used in this research have been approved by the individuals respectively. Consent has been requested to allow the researcher to capture visual, video, and voice data and participants have had the option to decline while still participating in the study.

Before any activities took place, the researcher thoroughly informed the participants of what was about to occur, and the researcher allowed the participants to ask any questions and answered them openly and honestly to the best of her ability. Participants were also made aware that at any point they could stop being an active participant in the study.

No criticism was passed on the participants throughout the duration of the research. The researcher respected all participants throughout the study and agreed to delete all media forms of data captured to give them peace of mind.

1.13 Limitations

Limitations were apparent in this study, which the researcher acknowledged, and where possible the researcher worked around them. The following limitations applied to this study:

The researcher was limited geographically by only selecting participants from the CPUT Cape Town Campus as well as the suburban area of Rondebosch East, as those were areas in reach of the researcher.

The researcher was limited by the number of AVGs that could be used during the study. Although many video game platforms were used, to have a holistic view of the phenomenon, time restricted the ability to play every AVG at hand. Therefore, a selected variety of AVGs were chosen, which incorporated the education, cognitive skills, sport, and rehabilitation genres.

Lastly, the researcher was greatly limited by the research methodology selected - constructivist grounded theory - as the researcher is a novice and has not attempted this type of study before. The large amounts of data to work with proved to be a massive challenge and greatly added to the workload and stress involved in sorting and analysing the data. This research methodology also limited the researcher in that the roadmap to completing the study was unclear. There was no clear indication of how many participants to involve and how many workshops to carry out before

data saturation would be reached. This inhibited clear planning as the methodology comes with the "you'll see how it turns out" con. The researcher managed this limitation by keeping a close relationship with both supervisors to ensure the conducting of the study stayed aligned with its parameters.

1.14 Thesis chapter summary

1.14.1 Chapter Two: Literature Review

Chapter Two consists of a preliminary literature review, which is aligned with the norms of constructivist grounded theory. Therefore, the literature touches on the holistic topic of AVGs; however, it is not extensive as constructivist grounded theory research refrains the researcher from tainting his/her ideas from the literature.

1.14.2 Chapter Three: Research Methodology

Chapter Three links closely to the other chapters throughout the research. It unpacks the constructivist grounded theory in detail and highlights the research process followed throughout the entire study. It addresses the many methodologies available to the researcher and justifies why constructivist grounded theory has been selected. Also, this chapter indicates how and when the data collection and analysis process occurred, as well as how the final theory should be constructed. Lastly, it provides guidance, by means of a secondary literature review, on how the research should be concluded, which serves as the discussion for the research study.

1.14.3 Chapter Four: Data Collection

This chapter discusses the data collection process, as well as pre-, during-, and post-workshop. Workshops are planned and the strategies for each workshop are described. The data collection tool is listed and described. The chapter explains how the tool changes over time, why it changes, and how it addresses the research question. The chapter discusses how the sample group has been selected and describes how participants have been recruited. Supporting software for the data stored and analysed is listed, and the units of analysis and observation are identified. Lastly, the actual data collected are displayed in table format to show what was captured. The chapter ends by introducing the data analysis section.

1.14.4 Chapter Five: Data Analysis

This chapter commences with the focused coding phase in constructivist grounded theory. At this point data have been collected and refined to a certain point. Network views depict the phenomenon at hand and analyse the data further by abstracting the coding categories into higher level groups. At the end of this chapter theoretical

coding is explained, which is the last analytical phase of constructivist grounded theory. It concludes by connecting into the final chapter, where the constructed theory is placed.

1.14.5 Chapter Six: Discussion

This chapter starts off by depicting and explaining the constructed theory of the researcher. Thereafter, the chapter serves as a secondary literature review whereby the researcher compares her constructed theory to the current theories that exist in the current body of knowledge (BOK). The literature serves as additional data and further refines the theory. After adapting the final theory, the researcher places this theory back into the IT BOK by comparing it to a motivation theory. Recommendations are given and the researcher concludes the study.

1.14.6 Chapter Seven: Reflection

This chapter is a reflection of the researcher's journey and it addresses the challenges faced throughout the research process. It begins by explaining what the researcher would have done differently and what she learnt along the way. The chapter concludes with the methodological contribution and a summary of the researcher's experience.

1.15 Conclusion

In closing, this chapter stated the research problem and proposed a research question to address the problem. The strategy has been listed, as well as a brief summary of what to expect in the next chapters. The following chapter, the literature review, further contextualises the study and highlights major topics and themes to be discussed later on.

2. CHAPTER TWO: PRELIMINARY LITERATURE REVIEW

2.1 Introduction

Given the nature of the research at hand, a constructivist grounded theory approach has been selected as the underlying methodology of choice. Therefore, in keeping aligned with the grounded theory protocol, a preliminary literature review follows. However, the literature review lacks depth with regard to how much is understood by the researcher, because grounded theory does not encourage the researcher to become saturated by the literature before the data collection and data analysis phases have been completed (Evans & Moores, 2013:13; Giles, King & De Lacey, 2013:1). This is recommended for the researcher to maintain an unbiased opinion of the phenomenon at hand and to allow for any data collected and analysed to emerge, rather than to be preconceived (Dunne, 2011:4). The largest part of this preliminary literature review is sporadic and appears as "blindly selecting topics", because the researcher is constrained from delving too deep into the literature.

With this in mind, the literature review covers a high level view of AVGs, the history of AVGs, and aspects related to the engagement and immersion of AVG designs. The research problem states that prolonged play of AVGs is not sustainable as gamers lose interest after the initial period of acquiring them (Zhang et al., 2016:8; Dutta & Pereira, 2015:1; Peng et al., 2012, cited by Garell, 2015:12). Therefore, this leads the research aim to address the exploration of inhibiting and enhancing factors that influence engagement and immersion among AVG gamers. The literature review is guided by the research question: "What design factors contribute to an engaged and immersed AVG experience?" Key search words such as *active video games*, *design factors*, *engagement*, and *immersion* also guide the literature review. The searches are conducted through CPUT's online libraries whereby the researcher interrogated the academic databases of EBSCOhost, Scopus, IEEE Xplore Digital Library, Google Scholar, Emerald, ScienceDirect and SpringerLink.

This literature review commences with the meaning of video games and delves into what AVGs are. Thereafter the adoption of video games and how everyday life has become gamified, are discussed. The literature then addresses key topics of engagement and replayability which reflect the research problem. The artefact consoles and accessories as well as in-game design factors such as sound, the user interface, and avatars of AVGs, are discussed. The literature review closes off by presenting a number of benefits associated with AVGs and the matter of

persistence in playing these types of games. The chapter is concluded with a summary of the chapter.

2.2 Video games

Video games can be described in two parts: video, meaning technology, and games, meaning a recreational activity which consists of rules, conflict between player and computer opponent, challenge, skill ability of the player, and an outcome or goal such as winning, losing, or attaining a high score (Wolf, 2007). Video games serve multiple purposes: it can be used as a source of entertainment to induce fun, as an educational tool to challenge participants to develop new skills, or as a health tool to rehabilitate users or to promote physical exertion and bodily movement; however, physical movement video games are referred to as active video games (Garell, 2015).

2.2.1 AVGs

AVGs are also known as exergames, motion games, or active games and it differs from traditional video games in that it involves video simulations and incorporates movement, whereas traditional video games remain sedentary (Bernstein et al., 2015:2). The purpose of AVGs is to promote some form of physical activity, whether the design purpose is for exercise, education, or entertainment (Garell, 2015). AVGs are used in both commercial and health settings with off-the-shelf games such as Nintendo Wii-Fit, or in medical practices where AVGs are used for rehabilitation and physiotherapy (Garell, 2015; Gomes, Carvalho, Peixoto-Souza, Teixeira-Carvalho, Mendonça, Stirbulov, Sampaio et al., 2015).

A number of researchers have identified sedentary behaviours to be a concern and identified AVGs as a feasible solution as AVGs encourage a degree of physical activity (Zhang et al., 2016; Wu et al., 2015; O'Donovan & Hussey, 2012).

2.2.2 AVG consoles and accessories

Current video game consoles are designed to incorporate AVGs (Dutta & Pereira, 2015). Microsoft Xbox has the Kinect, Sony PlayStation4 has the PS Move, and Nintendo Wii or Wii-U makes use of handheld accessories and motion sensors (Zhang et al., 2016; O'Donovan & Hussey, 2012). However, some users have reported minor problems with physical accessories taking up too much physical space (Witherspoon & Manning, 2012) and accessories being accidentally dropped, resulting in physical damage of equipment (Baranowski et al., 2014). Other gaming consoles make use of full body sensors and cameras, such as the PS4 Move (Baranowski et al., 2014). This eliminates the problem of accidental damage by not

requiring the gamer to make use of handheld accessories. Overall, AVGs are accessible through motion sensor cameras as well as through handheld sensor accessories.

2.2.3 Benefits of playing AVGs

AVGs hold a number of benefits if used correctly, as they have been designed and used for entertainment, educational, and physiological purposes. Some studies investigated the possibility of replacing non-AVGs with AVGs to reduce the amount of sedentary time people participate in due to the negative health effects that have been associated with inactive behaviours (Dutta &Pereira, 2015; Simons et al., 2015; Simons et al, 2014).

Other studies have shown that AVGs are successful in improving body composition and lowering the levels of excessive fat on the individual's body (Gomes et al., 2015; Simons et al., 2014). However, at the end of a study conducted by Simons et al. (2015), where they looked at the effects of AVG use, it has shown contradicting results whereby a control group displayed less body mass index (BMI) than the intervention group. BMI is a person's weight in kilograms, divided by the person's height in meters squared (Nicholson, McKean, Lowe, Fawcett, Burkett, 2015:2) and is a more holistic indicator of an individual's health status. Therefore, not all use of AVGs are successfully beneficial to improving gamers' physical and mental conditions.

Simons et al. (2014) posit that for AVGs to be successful in reducing sedentary behaviours and in promoting physical activity, the time spent playing AVGs needs to be increased. Therefore, there is a need for AVGs to be repeatedly played.

2.2.4 Adoption of AVGs

Initially, access to video games was limited to public spaces. This is evident with the first coin-operated video game released for arcades in 1971 (Wolf, 2007). However, shortly after, in 1972, the first home video game system was released, showing signs of rapid growth in the video game industry.

The first AVG console was made available to the public in 2006 when Nintendo launched their Wii console, which came standard with a fitness game set to encourage physical activity (Wolf, 2007). This introduced AVGs to public households and since its release, this type of video game has continued to evolve. Its growth has led to a new way of designing AVGs and has incorporated newer trends such as gamification in its design.

2.3 Gamification

Gamification is "the use of game design elements in non-game contexts" (Deterding, Dixon, Khaled & Nacke, 2011:1). According to Cugelman (2013), gamification is not a game, but an everyday activity that has been transformed through the introduction of gaming elements such as scoring systems and goal setting. This is intended to add fun to ordinary daily experiences to encourage the execution of these experiences. Cugelman (2013) identifies gamification ingredients in a list that includes goal setting, fun and playfulness, ability to overcome challenges, social connectivity, performance feedback, progress comparison, and reinforcement. Many of these elements are required to transform an ordinary activity into a gamified one.

One of the purposes of gamification is to make use of innovative technology such as AVG consoles and games as persuasive tools to alter behaviour in people (Garell, 2015), thereby allowing AVGs on consoles like the Nintendo Wii, PlayStation and XBox to bring traditional outdoor activities, such as baseball and tennis, into the internal space and encouraging physically active behaviour to individuals who may not be willing to go outside to partake in such activities.

According to Garell (2015), gamification has become a trending topic. This is evident with the release of a mobile AVG, Pokémon Go, which transforms an ordinary activity of walking around your neighbourhood into an augmented reality gaming experience. Gamers can see augmented reality Pokémon characters on their mobile devices in relation to their surroundings and are encouraged to take a walk around to find more Pokémon characters to add to their collection. There are other game design motivators to get gamers walking and moving. Poké-eggs containing unknown Pokémon characters hatch after a defined distance has been covered by the gamer. This is an example of how an ordinary daily activity of walking from one place to another has been gamified.

2.4 Design factors

2.4.1 AVG avatars

An avatar is the main character of a game through which a player interacts with the game world (Soutter & Hitchens, 2016). Depending on the game genre, the prominence of the avatar can vary. In role-player games (RPGs), an avatar may occupy the centre of the screen, whereas in first-person shooter games, a portion of the avatar may be visible.

Avatars may be fixed or customisable depending on the game being played (Soutter & Hitchens, 2016). However, it has been found that if the gamer can alter the avatar

to their own preferences, then they will experience a greater sense of enjoyment and immersion into the game itself. This customisation allows the gamer to better identify with the avatar and relate to the game world (Soutter & Hitchens, 2016).

A gamer's identification to the avatar is stronger if the avatar resembles themselves (Soutter & Hitchens, 2016). Therefore, the more one can relate to the onscreen character, the more likely they are to fully immerse themselves in playing the video game. Contrary to this, Soutter and Hitchens (2016) found that their participants report lower levels of game enjoyment and engagement when the avatar is similar to the gamer's identity.

2.4.2   AVG audio

Sound design plays an important role in video games due to its multipurpose ability. Video game sounds can be a part of the background music or can originate from interaction with in-game objects (Domsch, 2016). Gameplay sound can also be a form of feedback from the game itself to the player to inform them of tasks, or criticism as to how they are playing.

Another purpose of sound in a game is to indicate that the game is not frozen when the visual screen is stationary and no gamer input can be given, such as a transition or loading screen (Domsch, 2016). This communication with the gamer is a necessity, as it keeps the gamer informed as to the state of play they are in.

According to Domsch (2016), sound enhances the gameplay experience and allows for a greater sense of immersion into the game world for the gamer. This can be conveyed through the sound of the avatar's footsteps during player movement, as well as ambience sounds in open world games. The design of sound in video games contributes towards the level of engagement that a gamer may experience while playing (Domsch, 2016).

2.4.3   AVGs user interface

A common way for contextual information to be displayed during gameplay is through heads-up displays (HUDs). HUDs provide contextual information related to the current gameplay situation through words, numbers, symbols, or word lists (Brooksby, 2008). Types of information that one is likely to find in a HUD are scores, health bars, and experience levels (Caroux & Isbister, 2016).

According to Caroux and Isbister (2016), it is commonly found that permanent information displayed in HUDs are usually placed around the edges of the screen,

whereas temporary information is usually found in the centre of the screen, usually in the form of warning messages.

Although HUDs are an assistive aid in helping the gamer navigate through the game, some researchers, including Wilson (2006), claim that when a HUD contains too much contextual information it can decrease the level of gamer immersion in the game itself. In accordance with the previous researchers, Soutter and Hitchens (2016) make reference to flow theory in the design of AVGs, which is an optimal state of engagement necessary for continuous use of video games. They concur that when immersion levels are low gamers are in a poor state of 'flow' and will lose their desire for continuous usage of video games. In essence, low immersion leads to gamers not wanting to persist in their use of AVGs.

The composition and spatial organisation of HUDs are regarded as critical according to Caroux and Isbister (2016). The authors conducted a study consisting of a first-person shooter game and a real-time strategy game. First-person shooter games have high anticipation from the gamer; therefore their HUDs composition and spatial organisation play a role in how the gamer interacts with the game. Similarly, this can be applied to AVGs as AVG players require information from the game to know how to respond and interact with the gameplay. Caroux and Isbister (2016) suggest that HUD elements should be displayed as close as possible to the area of main action in the game to enhance the gamer's experience.

More information in a HUD is preferred by the experienced gamer than by the non-experienced or casual gamer, because the more experienced a gamer is the more familiar he/she is with the information displayed on the HUD (Caroux & Isbister, 2016). For non-experienced gamers, heavily composed HUDs can be too much information to process (Wilson, 2006). HUD bars are preferred at the bottom of game screens (Caroux & Isbister, 2016).

2.5   Engagement and replayability

Various modes of gameplay affect the way gamers engage with the game itself (Neys, Jansz & Tan, 2014). The traditional means is single-player mode whereby an individual plays against the computer or attempts to overcome in-game challenges (Wolf, 2007). Other means of play consist of multi-player modes whereby competition is encouraged between opposing gamers and online gaming, which opens up the gamer to a global variety of opposition. The use of a multi-player mode encourages higher levels of gameplay among children and as some researchers

speculate, may be a better way to encourage continuous gameplay among gamers (Rowland, Malone, Fidopiastis, Padalabalanarayanan, Thirumalai & Rimmer, 2016).

AVGs are designed to address a variety of gamer needs. These needs are, but are not limited to (Neys et al., 2014):

i.   Diversion, whereby a gamer would want to engage in play to distract themselves from their current environment.

ii.   Arousal, which is the need for the gamer to experience a certain sense of excitement.

iii. Challenge, whereby the gamer would want to demonstrate a level of competence.

iv.   Immersion, which is similar to diversion, but the individual will be seeking a richer experience from the game.

v.   Competition, which is the need for the gamer to prove him/herself better than his/her opponent.

vi.   Social interaction, whereby the gamer fulfils a social need to connect with others.

This means that AVGs provide multiple ways for a gamer's needs to be met and in doing so, could possibly engage the player in the activity.

2.6   Persistence

According to Neys et al. (2014), persistence in games is defined as "the actual experience of wanting to continue playing a particular game in the face of insufficient reward". Neys et al. (2014) is of the belief that the level of experience that gamers project onto themselves will affect the manner in which gamers engage and play AVGs and NAVGs. This is evident through "Gamer Identity Strength", a term used by Neys et al. (2014) to explain how gamers are more likely to persist in playing video games regardless of the level of challenge they are faced with, because being a gamer is a part of that individual's identity. However, it is commonly found that there is not much persistence in playing AVGs despite the existing theories to encourage such behaviour (Zhang et al., 2016; Dutta & Pereira, 2015; Garell, 2015).

2.7   Conclusion

The literature review briefly addressed the difference between video games and AVGs, as well as how AVGs have been adopted into the everyday lives of people. The extent to which AVGs cause engagement and immersion was covered, as well as a key point of noting that there is a lack of persistence in playing AVGs. This is accompanied by the loss of attaining the value of benefits associated with AVG

gameplay. Some features in AVGs have been covered, such as the influence of audio and visual information in these types of games and how each relates to the state of engagement and immersion that gamers experience. The literature review brings to attention the potential research problem to be discussed throughout this study.

Considering that this is a preliminary literature review, it is important to keep in mind that the lack of depth of the literature review is needed for the researcher to successfully complete the study without tainting her understanding of the phenomenon at hand.

3. CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The following chapter discusses various research methodologies and highlights constructivist grounded theory (CGT) as the method of choice to carry out the study. This section reflects on the researcher's paradigm and shows how it relates to the chosen method. CGT is justified and its process explained in great detail. Where and how CGT influences the other areas of research, such as the research question, literature review, data collection, and data analysis sections, is indicated. It is important to note that for this study, the methodology drives the research. How data should be collected and analysed is extensively discussed and the workshop strategy plans are addressed.

3.2 Paradigm

As mentioned in Chapter One, the researcher adopted an interpretivist approach to the study, which influences the selection of an appropriate methodology. This means the methodology of choice has to be qualitative in nature.

The two choices of research methods are qualitative and quantitative (Myers, 1997:2). Quantitative methods are mostly related to a positivist approach while qualitative methods are usually concerned with understanding social phenomena, therefore the interpretivist approach is usually subjective and the quantitative methods are objective.

This research is concerned with the human experience and the interpretation of data gathered from participants. It is not quantitative and positivist, as it does not deal with statistics and calculative predictions for future events.

The reason why an interpretivist and qualitative approach is appropriate for this study is because the research problem and question concerns human experiences. This research approach is also best suited for achieving the aim of this study, which is to explore both the inhibiting and enhancing factors that influence engagement and immersion among AVG gamers. To accomplish this, the gamer's experience needs to be understood and interpreted through play. Therefore, play becomes the method.

3.3 Methodology

The choice of a research method influences the way in which the researcher gathers and collects data (Myers, 1997). It is important to consider which research

methodology is appropriate for this study. There are a number of qualitative research methods (QRMs) that can be used. These QRMs include ethnography, phenomenology, classic, and Straussian grounded theory, as well as narrative studies (Myers, 1997:2-3). Each methodology has its own theoretical development and distinct procedures for collecting and interpreting data (Goulding, 2003).

Grounded theory is flexible in terms of how data are interpreted and used but follows a systematic process of coding, theoretical sampling, and data saturation (Goulding, 2003), which is well suited to interactive situations. Ethnography is more concerned with culture and focuses mainly on participatory observation and interviews (Goulding, 2003). Ethnography is useful for longitudinal studies, as it requires becoming part of a target societal group and observing the culture. Phenomenology is similar to grounded theory; however, it differs in that the result of phenomenology is a description of the participants' experience and can be seen as a reflection on the conscious experience of the participants rather than the subconscious motivation behind why (Goulding, 2003). Grounded theory differs by explaining the cause and motivation behind the phenomenon at hand (Goulding, 2003). Phenomenology also differs in its research process and only makes use of one legitimate source of data (interviews), whereas grounded theory makes use of all sources of data.

3.3.1 Different grounded theories

There are three recognised and acceptable versions of grounded theory methods (GTMs): classic grounded theory (Classic GT), originated by Barney Glaser and Anselm Strauss; Straussian grounded theory (SGT), originated by Anselm Strauss and Juliet Corbin; and constructivist grounded theory, which is originated by Kathy Charmaz (Mills & Francis, 2006).

CGT is a variation and differentiation from the original classic grounded theory (Stol et al., 2016). Although it shares similar core principles with the other versions of GTM, there are differentiations in the way coding takes place as well as differing philosophical positions and use of literature (Kenny & Fourie, 2015).

3.3.2 Disadvantages of SGT and Classic GT

A number of researchers have criticised Straussian grounded theory by arguing that it is too complicated and detracts from the true nature of grounded theory (Kenny & Fourie, 2015; Urquhart, Lehmann & Myers, 2010). SGT is seen as highly systematic and rigorous in its coding procedures, which can be limiting to exploring research phenomenon's. Straussian grounded theory emphasises complex coding techniques

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and its' coding process consists of unique steps: open coding, axial coding and selective coding. Kenny and Fourie (2015) criticise that SGT's complicated coding process forces the collected data into preconceived ideas that coerce a theory, and Charmaz (2000) adds to the criticism of SGT by stating that Strauss and Corbin's version of GTM is "positivist, rigid, narrow and over complicated". For this study, SGT is not selected due to its rigid and complicated processes, as well as the further development of SGT moving in the direction of CGT. Corbin reformed SGT in the direction of CGT (Kenny & Fourie, 2015).

Classic GT is similar to CGT; however, it has been criticised as being ambivalent about its research paradigm, with a number of researchers claiming that it has a "soft positivism" approach (Kenny & Fourie, 2015). This is because Classic GT suggests that the final theory is based off a discovered pre-existing phenomenon (Kenny & Fourie, 2015). The process is also susceptible to personal biased interpretation of the data as Glaser (2002) admits by saying that "analysts are human" and can unintentionally sway interpretation according to their own personal biases. Kenny and Fourie (2015) complain that Classic GT is an inconsistent methodology as it incorporates interpretivist coding practices along with positivist research paradigms. It's coding steps consist of open coding, axial coding and selective coding. This goes against the interpretivist approach being adopted by the researcher and has influenced the researcher's decision to not select this form of grounded theory.

3.3.3   Selected methodology

Based on the comparison between various QRMs, and given the alternate grounded theories above, the selected methodology for this study is constructivist grounded theory (CGT).

3.3.4   Main claim

CGT produces a theory that is grounded in the experience of the participants as well as the experience and interpretation of the researcher (Mills, Bonner & Francis, 2006). Therefore, this research developed a theory that is 'grounded' in the experience of AVG gamers and subjective to the interpretation and experience of the researcher. The theory promotes a set of guidelines to advise the future design of AVGs to specifically encourage immersion and engagement.

For the methodology of CGT to be valid, it needs to adhere to the following core principles (Stol et al., 2016):
  i.   Collecting, coding and analysis of data should undergo constant comparison

ii.   Memo writing should be done to support the conceptualisation of data

iii. Theoretical sampling

iv.   Data saturation

v.   Developing a theory

vi.   Limited exposure to literature

vii. Treat everything as data

3.3.5   Reason for selection

CGT is based on an inductive research approach (Stol et al., 2016) which is well suited for this study as it enables the achievement of one part of the research aim, namely to propose a theory that advises the future design of AVGs to promote an immersed and engaged gamer experience.

CGT bases the final theory on the experiences of the participants (Mills & Francis, 2006), which is necessary in fulfilling the objective of answering the research aim to explore the inhibiting and enhancing factors that influence engagement and immersion for AVG gamers. In order to address the research question, the collection and analysis of participants' experiences are critical.

CGT is also selected as a methodology because it allows for a wide collection of qualitative data through many different forms (Urquhart & Fernandez, 2013). This allows for a fairly accurate overview of the phenomenon. It is also selected because the methodology follows a systematic and structured process for extracting value from the data (Evans & Moores, 2013; Urquhart & Fernandez, 2013). This structure is needed to make sense of seemingly unrelated data.

CGT provides a systematic method of collecting and analysing data and allows for an explanatory interpretation of the phenomenon (Evans & Moores, 2013). This aligns with the researcher's interpretivist paradigm approach to the study.

3.3.6   Advantages of CGT

CGT makes use of simplistic and highly adaptable coding guidelines (Kenny & Fourie, 2015). The coding steps consist of open coding, focused coding and theoretical sensitivity. The coding procedure is more interpretive and intuitive than Classic GT and SGT, and it makes use of in-depth interviews to yield a greater exploration of the meanings behind the participants' feedback (Kenny & Fourie, 2015). This aligns with the researcher's aim to explore, and it supports the interpretivist approach adopted by the researcher.

However, CGT has been criticised by Glaser (2002) as being susceptible to valuing the researcher's view as more important than that of the participants, given that it is deeply based in the interpretation of the researcher and the relationship between the researcher and participant. This has been defended by Charmaz (2006) who asserts that "we are part of the world we study and the data we collect". Therefore, it is not possible for the researcher to create an unobtrusive relationship with the social research (Kenny & Fourie, 2015).

3.3.7   CGT methodology process

CGT begins with a brief review of the literature to determine what has been done in the area of interest (Evans & Moores, 2013). This allows the researcher to identify a gap in the body of knowledge worth researching. Thereafter, during the preliminary phase, the researcher should only plan and determine how the initial data should be collected. Further planning for data collection throughout the study should not be done, as this is determined by the analysis of the data collected (Kenny & Fourie, 2015).

Data was collected during workshops, and analysed using Atlas.ti. Initial coding and memoing occurred immediately (Charmaz, 2012). The purpose of analysing data immediately is to get the researcher familiar with the data, and memoing from the start provides the researcher with an analytical momentum, which allows the researcher to consider, question, and clarify trends in the collected data (Charmaz, 2012).

Data analysis undergoes line-by-line coding, thus allowing the researcher to actively engage with the data as well as to form theoretical categories through comparative methods, memoing, and theoretical sampling (Charmaz, 2012). Comparative methods include comparing data against data, data against categories, and categories against categories (Stol et al., 2016). Theoretical sampling is the process of refining tentative theoretical categories by continuously collecting and analysing data to fill out the properties of the theoretical categories (Charmaz, 2012).

This process of collecting and analysing data was repeated until theoretical saturation occurred, which is the exhaustion of properties related to the emerged theoretical categories (Stol et al., 2016). Once data saturation has been achieved, the collection of data ceased (Charmaz, 2012). This repetitive process of collecting and analysing data in CGT is also known as "refocused coding" (Kenny & Fourie, 2015).

Once theoretical categories have been established, the researcher proceeded by refining the existing categories into the final theory (Kenny & Fourie, 2015). This theory is grounded in the data collected and analysed and serves as the research contribution. The following diagram (Figure 3.1) depicts the CGT process which has been explained above.
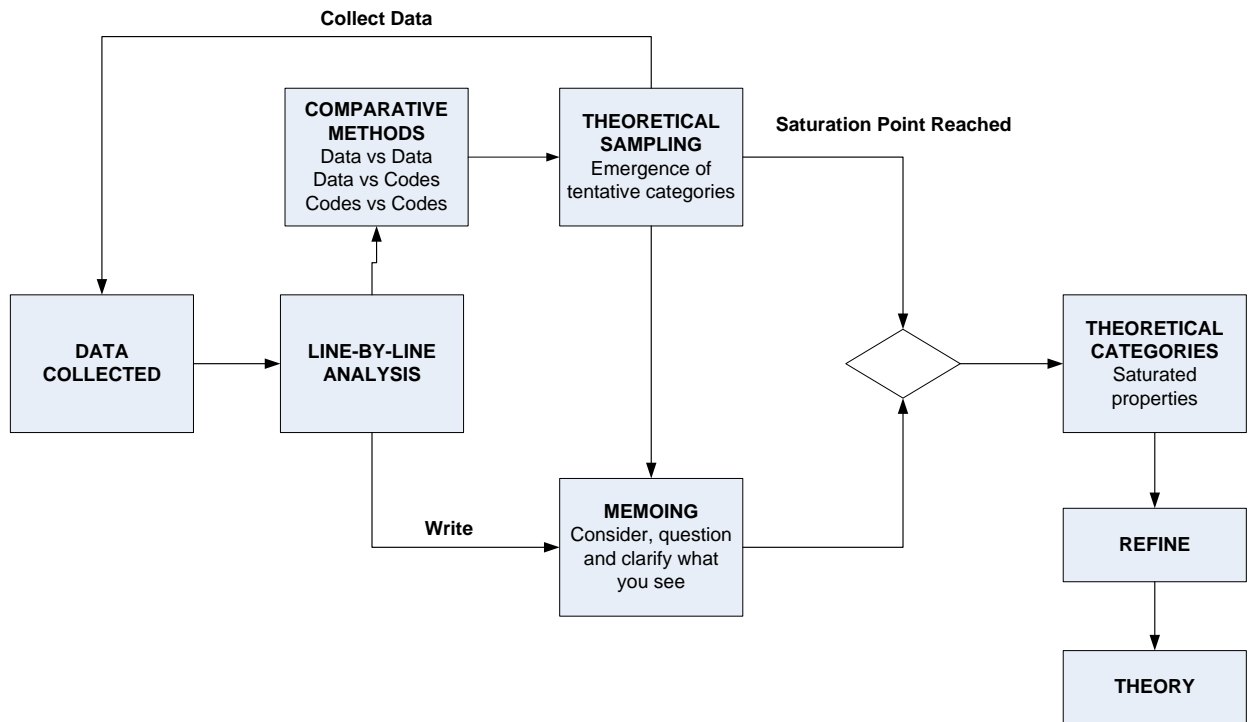
Figure 3.1: Process of CGT

3.3.8 CGT phases of data collection and analysis

Data analysis occurs parallel to the data collection process and consists of three main phases of constructivist grounded theory: open coding, focused coding, and theoretical coding (Evans & Moores, 2013:10; Dunne, 2011:1). Before conducting the actual data collection workshops, pilot data were collected and stored in a hermeneutic unit (HU) in Atlas.ti.

In CGT, open coding is the initial collection of data and line-by-line analysis, which results in a list of codes (Evans & Moores, 2013:10). Focused coding occurs simultaneously with open coding; however, during this phase new data are compared to existing codes and the researcher is more selective in what he/she is looking for (focused coding), as well as open coding, which results in new codes. Theoretical coding in terms of constructivist grounded theory is "the merging of concepts into groups" (Evans & Moores, 2013:10). This is the highest form of abstraction from the data and during this phase, core categories are constructed

and theoretical sensitivity is reached. This is accomplished by comparing code groups against other code groups and stand-alone codes to further abstract the substantive codes to form theoretical codes (Bryant & Charmaz, 2007:9). Substantive codes are an outcome of the open coding phase and theoretical codes are the outcome of high level abstraction when substantive codes are compared to one another and relationships are formed between them (Sbaraini, Carter & Evans, 2017:7-8; Bryant & Charmaz, 2007:9). Table 3:1 describes the three phases of data collection and analysis for a CGT study.

Table 3.1: Data analysis phases for constructivist grounded theory (CGT)

Phase	Method	Outcome
Open	Data vs. Data	Codes
Focused	Data vs. Codes	Code Groups / Tentative Categories
Theoretical	Data and Codes vs. Code Groups	Core Categories /Theoretical Sensitivity

After theoretical sensitivity has been reached, the researcher should compare their findings back to the literature (Giles et al., 2013:5). This is where the secondary literature review takes place and is more focused on what has been constructed. Literature serves as further data for comparison purposes and refining the final theory (Glaser, 1998).

3.4   Role of the researcher

The researcher plays a close role throughout the entire methodology process. Due to the nature of CGT, the researcher is required to interact with the participant and form a relationship to communicate and gather data. The researcher plays a pivotal role in analysing the data through the bias of his/her perception and understanding, as well as his/her ontological stance throughout the study (Urquhart et al., 2010; Mills & Francis, 2006).

This may be seen as unscientific and biased, however, due to the interpretivist ontological stance taken by the researcher and that of the originator of CGT, "we are part of the world we study and the data we collect". Therefore, it is not possible for the researcher to create an unobtrusive relationship with the social research (Kenny & Fourie, 2015).

It is necessary for the researcher to be aware of potential bias towards conducting the study (Evans & Moores, 2013). The researcher ensured an objective analysis

and interpretation of the participants' 'story' at all times. Measures have been taken to ensure that as little as possible interference occurs between the researcher and the participant during the workshop.

3.5   Limitations

This study is limited to participants of a specific geographic location, as these are areas in reach of the researcher. Also, because of the nature of the selected methodology, the study is limited to micro-focusing on data and analysis; therefore, larger concepts are overlooked as the minute details shape the output theory. Another limitation is set on the selected AVGs that were tested, as these have been selected based on previously owned AVGs. Lastly, a major limitation is placed on the researcher who has foundational knowledge in the IT sphere, but lacks design knowledge. Therefore, the researcher is not as observant to design trends that might have been relevant to this research study. To mitigate this challenge, the researcher worked closely with the co-supervisor who is qualified in the design discipline.

3.6   Ethics

Participatory interviews involve physical activity, which takes into consideration the current state of health of the participant. Indemnity forms have been drafted and given to potential participants for them to take part in the data collection process and to hold them liable and accountable for any unforeseen accidents and injuries which could occur during or after participation. AVGs require physical exertion and expenditure of energy.

Careful consideration has been given to the fact that this research entails a human testing approach. Participants' identities are and will remain anonymous, as will their weight classification and medical information. Participants have not been made to feel judged or criticised for their level of physical fitness.

3.7   Research design

This study adopted an interpretivist research philosophy and an inductive approach through the research process of CGT over a cross-sectional time horizon. Data were collected using all sources; however, focus was placed on observations and interviews by means of workshops as well as secondary data of online articles and blogs of gaming sites and product reviews (Figure 1.1).

3.7.1 Sampling

A non-random sampling process was used as it targeted a specific group of people, not gender specific. The age group targeted was between eighteen and thirty so that adult consent could be given from the approached individuals. This specific demographic was selected because gamers of different age groups prefer different video game design features. Children are more likely to have different game preferences than young adults.

The researcher selected the participants from the Cape Peninsula University of Technology and the Crawford and Rondebosch East community because participants were more accessible to the researcher in these areas. Participants have been selected based on their willingness to voluntarily partake in this study.

When deciding how many participants should be used, the initial number of participants was two. This formed the first data collection and analysis process. Thereafter, the total number of participants was determined by reaching a data saturation point (data collection ceased once the data indicated the same coding groups for data analysis). According to Khambete and Athavankar (2010), "Grounded Theory prescribes use of theoretical sampling, with no prescribed minimum number of interviews".

3.7.2 Unit of observation and unit of analysis

Both the unit of observation and the unit of analysis were people who play AVGs.

3.7.3 Tool

The data collection tool consisted of a number of components that worked together to document and manage the data collection process. These components were aimed at capturing the human experience and serve as contributing data to developing the theory. A number of video games and consoles formed part of the data collection tool so that participants could interact with these consoles to provide information to the researcher.

List of components (Appendix A):
  i.   Form 1: Research consent form
  ii.   Form 2: Participant coding and personal information
  iii.   Form 3A: Interview questions
  iv.   Form 3B: Observation
  v.   Form 4: Memo
  vi.   Form 5: Gameplay instructions

| vii. | Form 6: Pre-test evaluation |
| viii. | Form 7: Participant briefing letter |

List of games:

i.	Mobile: Pokémon Go
ii.	Nintendo Wii: Mario and Sonic 2012 London Olympic Games
iii.	Nintendo Wii: Trauma Centre - New Blood
iv.	Nintendo Wii Fit: Shaun White Snowboarding
v.	Nintendo Wii Fit: Plus
vi.	XBox Kinect: Dance Central 3
vii.	XBox Kinect: Dragon Ball Z
viii.	XBox Kinect: Adventures
ix.	PS4: Rabbids

3.8   The CGT data collection process

Given the selected research methodology of constructivist grounded theory, data were collected from many sources, including blogs, newspapers, online articles, and journal entries (memoing). However, a large portion of data was collected primarily from people through organised workshops. Information was gathered from multiple sources to ensure that the research consisted of a qualitative understanding of the phenomenon.

Data were collected from participants by means of semi-structured interviews and the use of a smartphone to capture visual and audio data. The interview consisted of open-ended questions to extract information from the participant, as well as sub-questions to probe further into the participants' responses. Interviews were voice recorded using Smart Voice Recorder software to ensure the capturing of verbal data.

3.8.1   The workshop procedure

Figure 3.2 depicts the procedures followed that guided the research workshops.
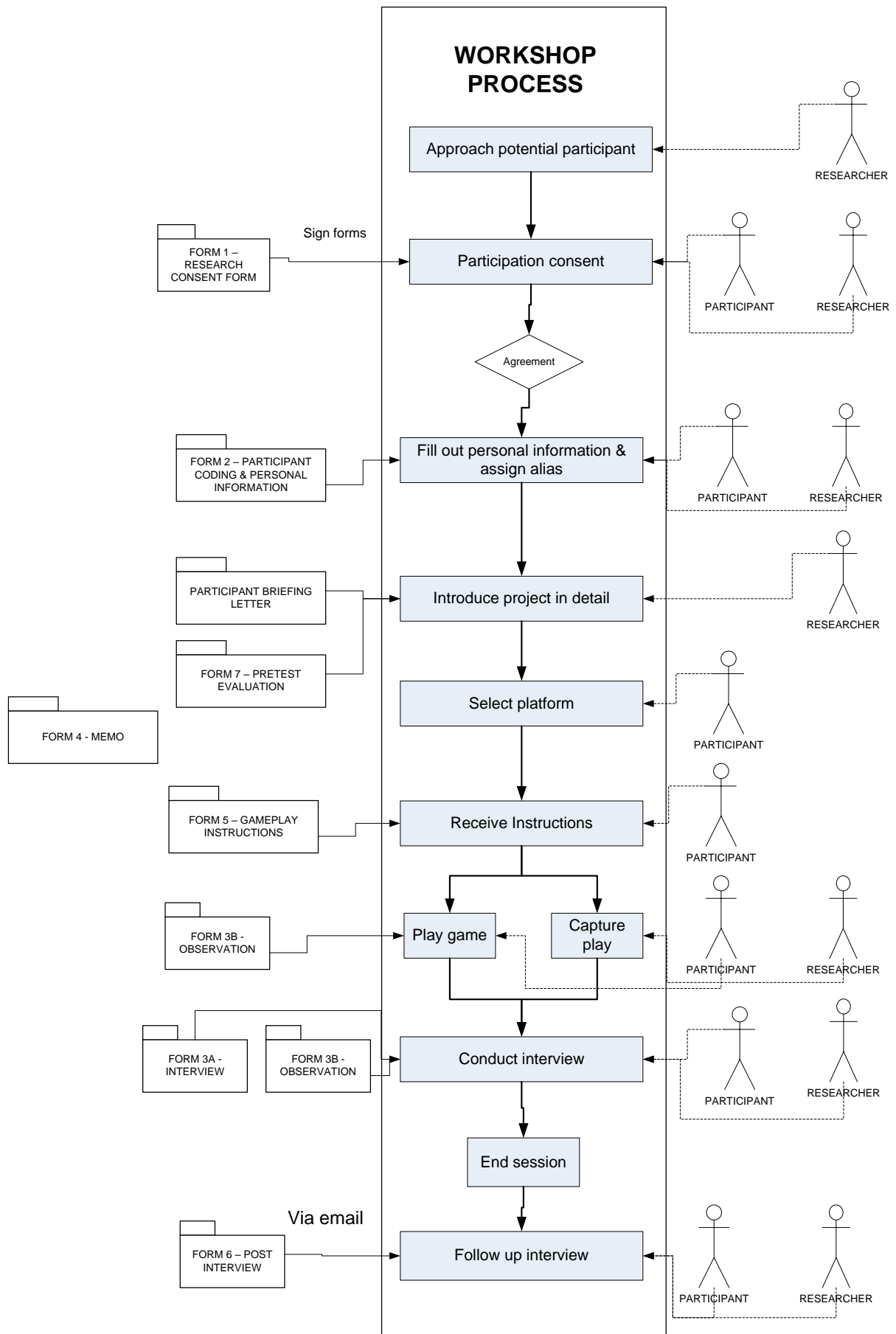
Figure 3.2: Activity diagram of the data collection workshop procedure

3.8.2 How data were collected in this study

The researcher began by allowing the participants to engage with the AVG artefact and made use of the data collection tools at hand to capture the experience (Figure 3.2). If consent has been granted, the researcher proceeded to take pictures and video footage of the participants while they played the AVG.

Thereafter, the researcher conducted a personal interview with each participant while using a voice recorder to capture the responses and taking written notes as the participants answered the interview questions.

Directly after completion of the workshop, the researcher wrote a reflective memo to capture the highlights of the experience and proceeded to digitally capture all information and store it in the Atlas.ti tool. Thereafter, the researcher read through each memo, observation form, and interview script, and conducted a line-by-line analysis and coding. Voice recordings as well as pictures were stored and coded in Atlas.ti.

After each workshop the researcher planned the next workshop strategy for future data collection.
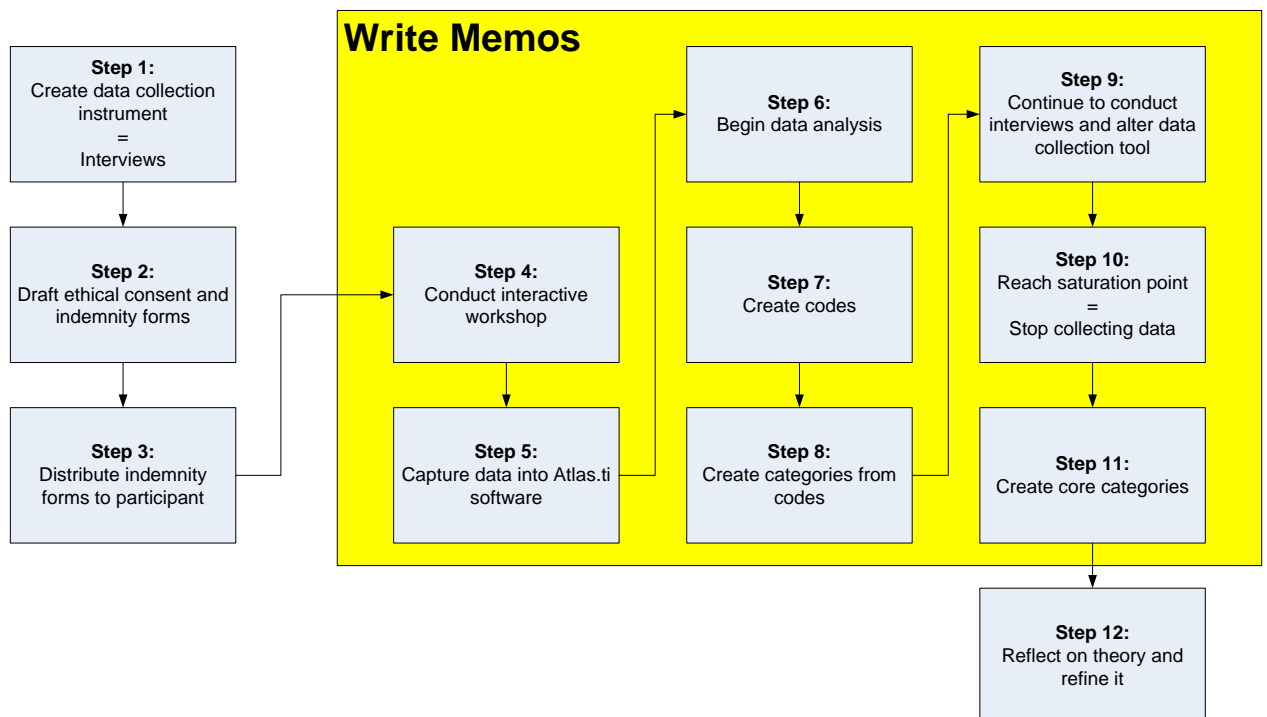
Figure 3.3: Researcher's process of following CGT

3.9   Validity and reliability of data collected

The validity and reliability of data collected was ensured by managing and storing the collected data in Atlas.ti software. Atlas.ti is a computer-aided qualitative data analysis software (CAQDAS) tool that supports the process of qualitative data analysis (Friese, 2012). It does not analyse the data for the researcher; however, it does assist by providing automated processes to manage the task of organising the data.

The Atlas.ti tool assisted the qualitative data analysis by increasing the validity of the research results, especially during the conceptual stage of analysis (Friese, 2012). This is because the use of manual methods can lead the researcher to forget the data behind the concepts established through grounded theory. However, a software supported analysis makes it easier for the researcher to remember the trail of thought initially held when conceptualising theoretical categories (Friese, 2012).

Data reliability and validity was ensured by making use of memoing, which is a grounded theory technique of documenting the research process and interpreting the data as it is collected. This provided a sense of an audit trail to the data collected and a log of how the focus and nature of the research evolved as data were collected and analysed.

Pilot tests were conducted to test the process of analysis and to refine the manner in which the data were utilised during the data collection.

All forms that were part of the data collection tool were scanned and stored in Atlas.ti to ensure that no data were captured incorrectly. Coding took place on the scanned forms during data analysis.

3.10   Data analysis strategy

Our history and culture influence and shape our view of the world, and it moulds our ideas concerning the meaning of truth (Mills & Francis, 2006). This ties in to how the data have been interpreted by the researcher. The researcher therefore acknowledges that the way in which information is viewed and interpreted, is subjective to the perception of the interpreter.

For this study, Atlas.ti software was used to store and analyse the data collected. According to Friese (2012), using Atlas.ti makes it easier to analyse data systematically and to ask analytical questions. The software automates many manual processes, thus giving the researcher more time to focus on analysis. This

computer-aided software assisted with the data analysis process by providing systematic structure to the analysis process, which ensured a reliable interpretation of the data collected.

This specific software is especially well-suited to assist in conducting a grounded theory methodology, as its features include coding and grouping of concepts as well as displaying data in various network views to assist in seeing the data from different angles.

Data were analysed through the CGT process. This means that as data were collected, it was analysed and re-used to create new questions to pose to the participants. Data have been coded and grouped into theoretical categories until a data saturation point was reached. Thereafter, the data formed part of a core category that was further analysed and refined to create a new theory.

3.11 Conclusion

The research methodology highlights the importance of carefully selecting the appropriate methodology that aligns with the perspective of the researcher and the nature of the research problem. CGT has been justified as the most appropriate methodology to carry out this research. How CGT influences each section of the study has been noted as the research process describes the manner in which a study should be executed. Data collection workshops and data analysis have been addressed. The analytical process for executing a CGT methodology maps the way forward for the next two chapters, data collection (Chapter Four) and data analysis (Chapter Five).

4. CHAPTER FOUR: DATA COLLECTION

4.1 Introduction

The data collection process is structured around the parameters in line with CGT. Although CGT accepts all sources of information as data, the main source of data used comes from conducting semi-structured interviews with participants through interactive workshops. CGT has a unique way of conducting its data collection process as it occurs simultaneously with data analysis. It is important to keep in mind that CGT makes use of three phases, which controls the process of collecting and analysing data to forming a theory. Figure 4.1 visually presents the process of simultaneous and repetitive data collection and analyses throughout the CGT study.
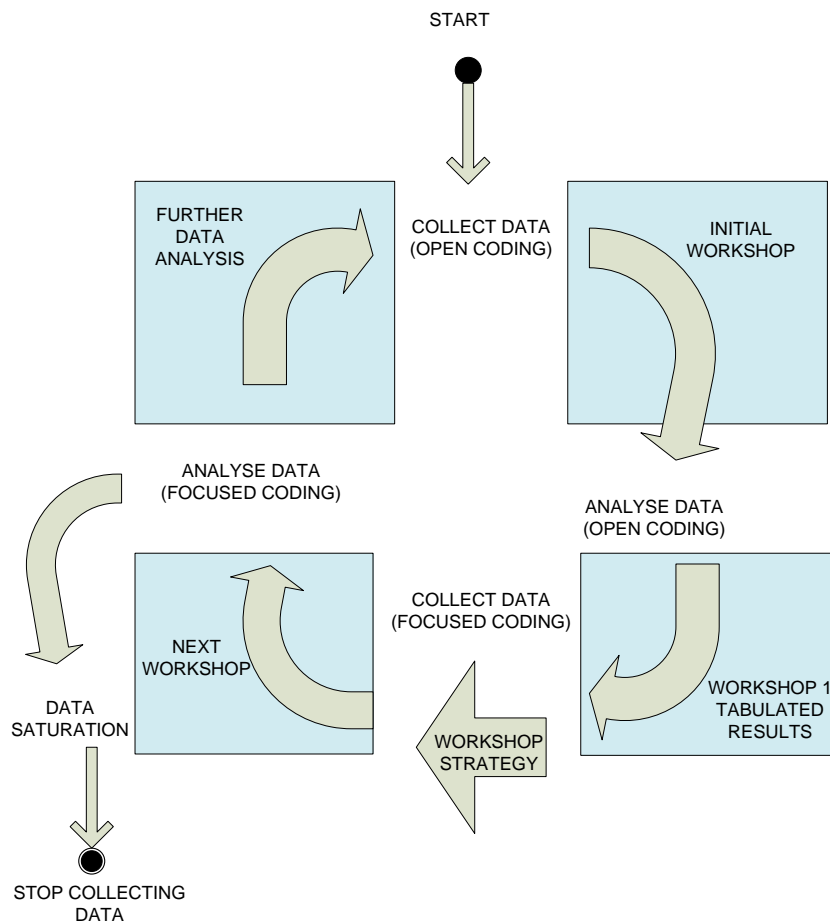
Figure 4.1: CGT open and focused coding cycle

The chapter focuses on phase one of CGT. The focus is on open coding and crossing over into phase two of the focused coding. However, only the data collected is presented; the analysis of the data collected is indicated in Chapter Five.

This chapter also covers the three versions of the data collection tool. The data collection is discussed and the data are described. Workshop structures and strategies as well as the software used to store and analyse the collected data are discussed.

4.2 Tool description

The interview questions component (Appendix A, Form 3A) of the data collection tool consists of three versions: i) the initial interview questions, ii) version 2, and iii) version 3. The first questionnaire consists of four questions. Each variation contains new questions required to elicit information in answer to previous questions asked while analysing the data.

Table 4.1: Comparison of questionnaire versions

	Version 1	Version 2	Version 3
Question 1	**Were you engaged and/or immersed?**	**Were you engaged and/or immersed? How did you feel?**	**Were you engaged and/or immersed? How did you feel?**
Sub-question 1	At which points did you feel engaged / immersed?	At which points did you feel engaged / immersed?	At which points did you feel engaged / immersed?
Sub-question 2	What aspects about this activity engaged/ immersed you most?	What aspects about this activity engaged / immersed you most?	What aspects about this activity engaged / immersed you most?
Sub-question 3	What aspects about this activity frustrated / put you off the most?	What aspects about this activity frustrated / put you off the most?	What aspects about this activity frustrated / put you off the most?
Question 2	**What will make you want to play this game again?**	**What will make you want to play this game again?**	**What will make you want to play this game again?**
Sub-question 1	What features would you like to see added / removed?	What features would you like to see added / removed?	What features would you like to see added / removed?
Sub-question 2	What would you like to see more of / less of?	What was your opinion about the challenges in the game?	What was your opinion about the challenges in the game?
Sub-question 3	How did you feel about the challenges in the game?		
Question 3	**Do you feel as though you exercised after playing this AVG?**	**How did you feel playing alongside somebody?**	**How did you feel playing alongside somebody?**
Sub-question 1	How much?	Would you prefer playing alone or with someone?	Would you prefer playing alone or with someone?
Sub-question 2	How little?	How would you describe your relationship to the other participant?	How would you describe your relationship to the other participant?

	Version 1	Version 2	Version 3
Question 4	**Do you feel as though your needs as a gamer were met?**	**Did you at any point feel silly or uncomfortable playing?**	**Did you at any point feel silly or uncomfortable playing?**
Sub-question 1		Does how you look when playing bother you around another gamer?	Does how you look when playing bother you around another gamer?
Sub-question 2		Why, or why not?	Why, or why not?
Question 5		**Do you feel as though your needs as a gamer were met?**	**Do you feel as though your needs as a gamer were met?**
Question 6			**What opinion do you hold concerning the avatars?**

The tool itself consists of eight components:

   i. Participant briefing letter
   ii. Research consent form
   iii. Participant coding and information form
   iv. Pre-test evaluation form
   v. Observation form
   vi. Memo form
   vii. Interview questions form
   viii. AVG instructions

4.3 Purpose of each component

The data collection tool consists of eight components and each one serves a specific purpose in this research. The following section briefly describes the purpose of each component. It was necessary to make use of multiple tools for the researcher to capture the phenomenon from as many perspectives as possible.

4.3.1 Research consent

The research consent document serves as a formal letterhead from CPUT providing information to the participants regarding the researcher's supervisors as well as the faculty research ethics committee secretary and his/her contact details (Appendix A, Form 1). This document provides the participants with the necessary information to make inquiries concerning the authenticity of the research workshops being carried out by the researcher. The consent document also asks for permission to collect data from the participants. The document needs to be signed for the participants to

take part in the research activity. However, they are permitted to not participate, if at any stage they feel to withdraw from participating.

4.3.2   Participant coding and information

The participant coding and information form (Appendix A, Form 2) contains fields requesting the personal information of the participants, such as name, age, and medical condition. One of the main purposes of this form is to allow the participants to create their own aliases, which they are identified by in the study. This is to protect their identities throughout the research. Another purpose of the form is to serve as a checklist to introduce the study in more detail. At the end of the form permission requests are made to ask the participants' consent to being recorded visually and audibly for further analysis of the data captured.

4.3.3   Interview questions

The interview questions component (Appendix A, Form 3A) serves a major role in identifying the information needed to understand the phenomenon. It serves a great purpose for the researcher and allows interaction between the participants and researcher. This form has undergone the most alterations, as it is the main form used to extract data and information from the workshop. This form allows for the extraction of specific information regarding questions derived from previous analysis from the participants and gives meaning to the data analysed.

4.3.4   Observation

The observation form (Appendix A, Form 3B) is intended to assist in identifying the factors that should be taken into account when observing the research activity. This is meant to make it easier to observe the surroundings without missing any obvious factors. Observations include the actual environment, the state of the participants themselves, the gaming console, and how the participants interact with it. The researcher conducted a self-evaluation to establish any possible personal influences on the process of observation and data collected.

4.3.5   Memo

The memo form (Appendix A, Form 4) is important in documenting multiple sections of the workshop. Memos are used to document observations, conducting reflection reports, and analysing data.

4.3.6   Gameplay instructions

The AVG instructions component (Appendix A, Form 5) is designed solely for the participants to allow the researcher to have as little interaction with the research

activity as possible. This is to ensure the non-interference of the researcher. The instructions give the participants a great deal of leeway to move around in the AVG, to simply be themselves, and to discover where there are uncertainties in playing the AVG.

4.3.7   Pre-test evaluation

The pre-test evaluation form (Appendix A, Form 6) is intended to identify the pre-state of the participants before conducting the activity in case any state might justify why they behave in the way they proceed to do. The pre-test evaluation determines the participants' level of fitness, the type of gamer the participants are, their needs and preferences when playing AVGs, and their current emotional and physiological state at the time of playing the game.

4.3.8   Participant brief

The purpose of the participant briefing letter (Appendix A, Form 7) is to provide a summary of the nature of the research being conducted so that the participants are well informed. The letter is given to participants for safe keeping so that they have an informed understanding of the activities they partake in.

4.4   Workshop strategy

The initial workshop has no particular goal in mind other than observing the participants and capturing and analysing the data. From the first workshop's analysis, the research tool is adapted as more questions emerge relating to the engagement and immersion experience.

The second workshop has a strategy in mind to identify the behaviours between unknown people. For the second workshop, a male and female are used and the difference in behaviour is notable. The aim is to identify whether or not the sequence of activities influence the participants' performance by scheduling the most energy intense activities first and then alter this for a separate workshop where the least energy intensive activity is done first. Workshop 2 and Workshop 4 both make use of the XBox 360 between strangers of the same gender and opposite genders.

Workshop 3 consists of one participant who plays with a mobile AVG. This is to observe how a player reacts when playing alone.

After Workshop 4, the strategy incorporates the use of three participants instead of two to determine if the number of simultaneous players influences engagement and immersion levels. For this study, awkward activities were specifically aimed for

because the trend of uncomfortable bodily movements and stances stood out as a significant factor influencing engagement and immersion levels.

Workshop 5's interview questions incorporate questions (Appendix A, Form 3A) pertaining to the avatar specifically, because the involvement of avatars seems to be a trending factor in AVGs, and because participants spent a great deal of time elaborating on their views of the avatars during previous workshop interviews in this study.

Figure 4.2 displays the workshop strategy for Workshop 2A and 2B, which compares the order of AVGs and the number of participants playing at one time.
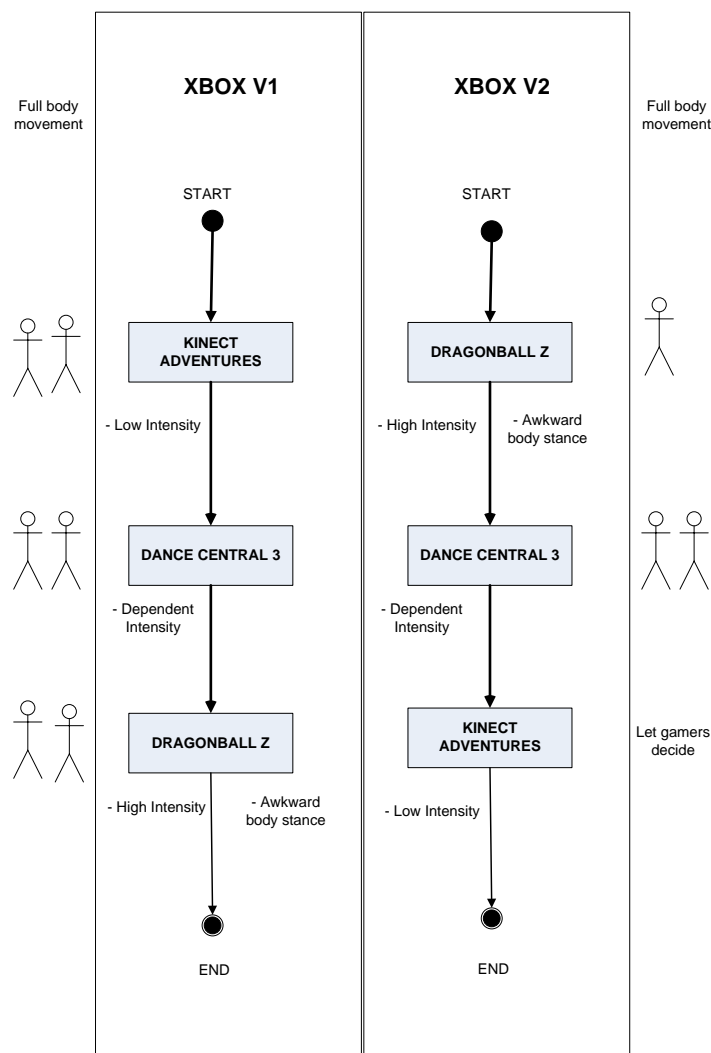
Figure 4.2: Workshop 2A and 2B strategy plan

4.5   Workshop flow

4.5.1   Before the workshop

The data collection process began by approaching an individual from the sample group and asking if they would like to participate. With their willingness expressed, the researcher asked for their contact details to schedule their time slot. Thereafter, the researcher booked a venue in the Engineering building at CPUT, Cape Town Campus. The rooms made available were 2.25, 2.26 and the IT BTech laboratory. Workshops were usually planned for one per week, for the researcher to have enough time to plan the workshop strategy, book the venue, to meet with the co-supervisor to analyse the data after the workshop, and to reconstruct the data tool where needed. Once a date had been established, the participants were contacted and asked to come in. The gaming console was selected for the participants prior to the workshop instead of allowing the participants to decide. This was done to have better control over the workshop strategy.

4.5.2   During the workshop

The workshop began with the researcher introducing the research project and by introducing the participants to each other. The introduction included a description of the research activity that the participants would be performing, as well as ensuring them they could stop the activity at any time. All ethical considerations were taken into account and an indemnity form was given to each participant to sign so that they would take full responsibility for their involvement in the research project. The introductions were done in a safe and friendly manner, respecting each participant in the process.

After completing their indemnity forms, the researcher proceeded by handing over a list of instructions for each AVG to the participants (refer to Form A for instructions). At this point the researcher took up a seating position away from the participants, and allowed them to execute their instructions while they played the AVGs. The researcher observed the participants playing and took down notes where necessary (see observation and memo forms). The researcher took videos and pictures only during workshops where participants gave their consent. The only time the researcher stepped in was when the participants did not know what to do and asked for assistance. Figure 4.3 is an image of the space used to host the initial workshop.

Figure 4.3: Workshop setup

Each workshop had an average duration of two hours. On completion of the research activity, both the participants and the researcher reported for an interview (Appendix D). Voice recordings were done during each interview in order to capture all information for further analysis by the researcher at a later time; written notes were also taken throughout the interview as a method of documenting the answers given by each participant. Participants were thanked upon completion of the workshop.

4.5.3   After the workshop

After the workshop the researcher collected all the pre-interview and interview forms and completed these forms. Thereafter, a memo was written for each workshop to record the observations made by the researcher. All the forms were digitally scanned and captured into Atlas.ti.

Data analysis commenced after the initial workshop. As each form was transcribed line by line, the initial set of codes emerged. Four hundred and ten (410) codes were originally formed after the initial workshop as coding was done *in vivo*, meaning each code, although the same as another, was captured verbatim.

After transcribing the data, the researcher met with the co-supervisor to discuss the workshop execution and the codes that were identified. Both supervisor and co-supervisor attended the first two workshops to facilitate the session and to provide constructive feedback to the researcher. Feedback was given by the co-supervisor and the researcher proceeded by altering the data collection tool where needed,

planning a new workshop strategy, and repeating the data collection process. This process of collecting data was repeated until data saturation was reached.

4.6   Ethics

The workshops were audibly recorded and visually captured with the consent of the participants. The CPUT Cape Town Campus security manager was approached to ask for consent to host non-CPUT students on site, and consent was granted. Letters of consent are attached in Appendix B.

Data collection has a degree of validity due to it being digitally captured while simultaneously being documented primarily by means of observations. Images and voice recordings depict events accurately and video recordings capture the full experience of the workshops.

The manner in which data are stored and preserved ensures the reliability of the data collection. Atlas.ti hosts the data, which include scanned copies of all forms, memos, and interview questions. Due to multiple forms of the same data (documents, images, voice, and video) the data collected maintain its relevance, accuracy, and reliability.

The Atlas.ti tool and its purpose have been mentioned in Chapter Three, section 3.9.

4.7   Open coding phase

This section focuses on the specific data collected for each workshop and the codes that emerged from it. Data collected were grouped per workshop and tabulated. This section also serves as a narrative account of the events that took place.

Before the researcher hosted any data collection workshops, a pilot test was conducted on test data to ensure the correct use of the Atlas.ti tool and the familiarisation of the process of storing and managing data. Atlas.ti is the computer assisted qualitative data analysis software (CAQDAS) supported by the Cape Peninsula University of Technology. The use of Atlas.ti offers the opportunity to store, code, and analyse large volumes of qualitative data. The software also provides a mechanism that clearly shows relationships between data and emerging categories. These qualities relate directly to the required process of a grounded theory study.

4.8.1   Pilot analysis: exploring the process and building CAQDAS proficiency

Initially the researcher collected articles and reviews of AVGs online, which consisted of blogs, product reviews, images, and ratings. The AVG articles were

specific to the PlayStation 4, XBox Kinect, and Nintendo Wii consoles, as well as mobile AVGs.

The articles were stored in separate folders for each AVG and the documents were stored in Atlas.ti HU. This initial test data were coded and assisted the researcher in becoming familiar with working with the analytical tool, as well as experimenting with new methods that would be best to code the data. Multiple attempts were made before understanding the difference between normal coding and *in vivo* coding. *In vivo* coding proved to be more beneficial in that it took the analysis deeper by using the actual words the reviewers used.

Each article was read line by line to submerge the researcher in the data. While reading and coding each line, the reviews shaped the researcher's idea of what critics and users look for in AVGs and what differentiates favourable conditions from non-favourable ones. Conducting a pilot analysis also gave the researcher an estimate of what to expect in dealing with the amount of data when conducting the workshops for data collection.

The first draft of the pilot HU was labelled "Pilot Hermeneutic Unit" and consisted of two hundred and eighty four (284) codes (Figure 4.4). The researcher became more familiar with the tool and began creating code groups. However, at this point the researcher encountered the first major problem. The codes had no way of differentiating themselves from others. Because the focus and scope of collecting and analysis data used immersion and engagement and guide posts, codes such as "social experience" have not provided sufficient knowledge on whether or not it contributed towards engaging and immersive experiences or if it took away from it. Therefore, coding was done again with the difference of incorporating a key into the codes to differentiate between inhibiting and enhancing factors.

Figure 4.4: Pilot hermeneutic unit without code key

This second test HU was labelled "2017" and consisted of four hundred and thirty (430) codes (Figure 4.5). Through the second batch of coding and analysis data, the researcher became more comfortable using the analytical tool and was able to use more meaningful naming conventions when labelling codes. This was useful in deriving greater meaning and value from the data.

Figure 4.5: Second hermeneutic unit using code keys

The same process of reading, coding, and line-by-line analysis was used for the second HU and this was a continuous analytical method to deeply immerse the researcher in the data. However, a problem encountered during the second pilot HU was the duplication of codes. This was as a result of the use of *in vivo* codes as many of the same concepts were captured separately due to the different naming of the codes. This was dealt with by merging codes of the same meaning, which in turn added to the groundedness of that particular code.

Thereafter, the actual data collection workshops were planned and conducted.

4.8.2 Beginning the workshops: exploring the initial data

The beginning of the workshops and the open coding phase occurred in January 2017. Each participant was asked to assign an alias name to him/herself to be identified by throughout the study. Participant one decided to go by the name Peach and participant two selected Pear.

The first workshop took place on 25 January 2017 in the Engineering building at the Cape Town Campus of CPUT. Peach and Pear played Just Dance 4, Mario and Sonic 2012 London Olympics, Wii Fit Plus, and Shaun White on the Nintendo Wii console. However, they have not granted permission to be recorded or to be photographed (Appendix D).

The workshop started off by introducing the participants to the researcher and giving Peach and Pear their briefing on what to expect during the workshop. They were very excited to take part and were eager to fill out the paper work, in which they provided more personal information about themselves.

The activity sequence was plotted out; however, Peach and Pear, being so comfortable and eager to play dictated the flow of the workshop activities. This was pleasant for the researcher in that it allowed for the researcher to step out of the interactive space and observe from a distance the manner in which the participants interacted with the AVG.

Peach and Pear specifically preferred alternating between rounds rather than waiting for the one player to complete all activities before the next player commenced. This provided information on the flow in which AVG gamers would normally want to play.

During the first workshop, the way in which the participants viewed and prioritised the avatars stood out, especially the way in which the avatars reflected the gamer. If

the avatar was a fictional non-human character, the gamer would start taking on the persona of the avatar by mimicking the avatar's movements, sounds, and gestures. Peach began flapping her arms as wings when playing with a chicken character. At this point it was observed that the way in which the gamers identified with avatars was an important factor in AVGs.

Winning stood out as another major factor in engaging and immersing the participants as there were many verbal and physical reactions to scoring, unlocking in-game rewards and viewing the final scores and passing comments on how well the other performed. Peach and Pear both preferred playing a different mini-game instead of progressing with the one or repeating a round. The level of competition and social interaction were other factors that stood out during the first workshop. A joint interview was conducted with both Peach and Pear to gather detailed feedback from their experience. Table 4.2 shows the codes gathered for both Peach and Pear after Workshop 1.

Table 4.2: Codes gathered for both Peach and Pear after Workshop 1

Enhancing engagement and immersion	Inhibiting engagement and immersion	Observations	Wants or requests	Replayability
Variety of AVGs	Limited functionality	More focused on the second round of play	Clear tutorials and instructions	Clear tutorials and instructions
Clear instructions and tutorials	Confusion with sensor accessories	More motivated to play again after losing first round	Subtitles to accommodate voice prompts	Competing against another
Music	Too many rounds of a mini-game	Non-human avatars spark interest in gamer	Full body sensor	Having fun
Avatars	Limited body movement	Prefer to play again if alternating with another player	Novelty AVG genres	Realism
Realism	Losing	Prefer progression over repeating a round		
Competition	Unrealistic			
In-game rewards	Do not understand AVG controls			
Winning	Uncertainty			
Cinematic clips	Getting moves wrong			
Novelty	Accidental physical contact			
AVG feedback	Fatigue			
Having fun	Sensor responsiveness			

Enhancing engagement and immersion	Inhibiting engagement and immersion	Observations	Wants or requests	Replayability
Fair challenge	Complicated main menu			
Customisation options				
Good graphics				
Viewing final scores				
Easy menu navigation				

The frequency for each factor differed. After the first workshop was conducted, the data collection tool (the interview document, observation document, memo document, photos, and voice recordings) were scanned and stored in Atlas.ti. Line-by-line analysis and *in vivo* coding took place. From the codes that were captured and the experience gained from the first workshop, the researcher adapted the data collection tool to capture more detailed information about specific trends. More data were needed, therefore a workshop strategy was planned and the second set of participants was contacted and their workshop was scheduled (refer to section 4.4).

Phase two of the analysis is focused coding, whereby specific observations were looked for. However, simultaneously, initial coding still took place with focused coding as new data were captured.

4.8.3 Continuing the collection of data: Workshop 2A

With the continuation of data collection during Workshop 2, the open coding process continued and contributed to the initial stages of focused coding. Before the second workshop was conducted, a workshop strategy was planned to observe specific trends concerning information observed from the first workshop. The strategy was designed to identify new data and trends, and to clarify assumptions about previous data captured. Workshop 2 was split into Workshop 2A and Workshop 2B as the same console was used in both workshops.

The following section serves as an account of the events that took place during Workshop 2A.

Workshop 2A took place on 3 February 2017 in the Engineering building, BTech laboratory and made use of the XBox Kinect console which used Dragon ball Z,

Dance Central 3, and Kinect Adventures AVGs. Figure 4.6 shows the setup of the space used for Workshop 2A.

Figure 4.6: CPUT Engineering building, BTech laboratory

ICARUS, male, and Pineapple55, female, were complete strangers who participated in the second workshop (2A). This combination was selected specifically to observe whether or not the personal relationship between two participants influenced the way in which gamers would play an AVG. It does influence the manner in which one plays.

The level of discomfort from Pineapple55 was most notable while not playing the AVG (Figure 4.7). Instead of engaging in the AVG verbally while ICARUS was playing, Pineapple55 remained quiet and to herself. There was a high level of disinterest when not playing the AVG if the other person was a stranger. This differed from the two sisters Peach and Pear who took interest in the other's gameplay and remained engaged and immersed, unlike Pineapple55 who lost engagement and immersion while ICARUS was playing. However, Pineapple55 retained eye contact on the AVG while not playing, but refrained from any further participation.

Figure 4.7: Pineapple55 uncomfortable and withdrawn

ICARUS was extremely excited to participate in the workshop and had high energy levels. He showed more full body movement throughout the workshop and was more vocal than Pineapple55.

Throughout the second workshop, a new factor that presented itself was the level of comfort and how that influenced the gamers' engagement and immersion. This was related to the awkward activities required to play the AVG for a dancing game, as well as the most noted fact that there were two participants of different gender who had no affiliation to one another.

Following up from the previous workshop, the high intensity behind Dragon Ball Z further clarified how fatigue levels influence engagement and immersion. It was observed that when the players experienced fatigue, they were less likely to fully engage and be immersed in the activity at hand. It was also noted that they started to slow down as fatigue stepped in.

A significant moment noted was how competing in a social activity simultaneously influenced the relationship between the two participants. During Dance Central 3, both Pineapple55 and ICARUS began talking to one another when facing off against each other in a dance battle. This improved Pinapple55's level of comfort tremendously as she became much more vocal and interactive with the AVG as well as with her fellow participant. The improvement of their relationship assisted in the engagement to the AVG as they were both more focused and motivated to play against one another from that point onwards (Figure 4.8). It was also observed that

there was a greater sense of team work between each participant from that point onwards.

Figure 4.8: Level of immersion and engagement greatly increases during competition

On completion of this workshop, Pineapple55 and ICARUS had their interviews and their contributions were added to the existing HU in Atlas.ti.

The codes captured for the second workshop can be seen in Table 4.3, Workshop 2A codes for ICARUS and Pineapple55. Again, the frequency of each code differed, which influenced the level of groundedness behind each one. At this point, the data were merely coded before analysing it, until Workshop 2B was conducted. This way, the strategy plan could be given time to discern any major trends and differences between the data captured. However, while coding the existing data, some codes became more grounded and groups of patterns were already beginning to emerge. Hints of groups began to emerge by codes that duplicated each other when the same experience appeared more than once. Table 4.3 represents the codes for both ICARUS and Pineapple55 for the data that have been collected for Workshop 2A.

Table 4.3: Workshop 2A codes for both ICARUS and Pineapple55

Enhancing engagement and immersion	Inhibiting engagement and immersion	Observations	Wants or requests	Replayability
Viewing final score	Sensor failure	Prefer progression over repeating a round	Clear instructions and tutorials	Clear instructions and tutorials
Scoring bonus	Missing a target	Watching someone else play makes the other want to play	Variety of song choice	Competing against another
Clear instructions and tutorials	Viewing pictures of self-playing after every round	Nostalgia	Translucent avatars	Having fun and exercising

Enhancing engagement and immersion	Inhibiting engagement and immersion	Observations	Wants or requests	Replayability
Watching someone else play	Playing one at a time	Would play around a stranger acting silly	Moving picture tiles for upcoming dance moves	Realism
Avatars resemble the gamer	Difficult menu navigation	Initial interaction with a stranger makes the gamer really uncomfortable	More instructions	Challenge
Music	Challenge too difficult			
Freestyle dance mode	Unexpected cinematic			
Variety	Small range of sensor			
Competition	Avatars blocking view			
Childhood nostalgia	Looking silly			
Popular TV series	Lack of competition and challenge			
Cinematic clips	Playing around a stranger			
Beating your own old score	Watching someone else play			
Having fun	Initial uncertainty			
Exercise	Being nervous			
Accurate sensor	Fatigue			
Playing together				
Social activity				
Playing				
Feedback				
Novelty				
Encouragement from others				

4.8.4   Mobile AVG workshop: Pokémon Go

Workshop 3 took place on 8 February 2017 at CPUT Cape Town Campus and consisted of only one participant, John. The purpose behind this was to observe any trends when an AVG is played completely alone and on a mobile device platform. This single participant workshop formed part of a series of workshops with varying numbers of participants to contribute to a variety of play scenarios. The AVG played was Pokémon Go, whereby John took a twenty minute walk around the campus depending on where the AVG suggested he walk. John did not grant permission to be photographed during the workshop, but agreed to an interview on completion of the activity.

During the activity, John's engagement was minimal and peaked when a Pokémon or Pokéstop appeared in his vicinity. It was observed that the lack of social activity did not give him much motivation to continue playing nor did it increase his level of activity when walking around. John wandered mostly back and forth with no set direction, unless a Pokémon appeared. This gave greater insight into the influence of social interaction on the engagement and immersion of AVGs, as well as how the lack of instructions can take away from the experience.

It was not the intention of the study to capture every possible play scenario, as the emerging theory is a substantive grounded theory (exploring a specific context). To inform formal theory, more testing scenarios are needed (refer to Chapter Six, section 6.7 or Chapter One, section 1.7).

Another notable trend that emerged was the number of times the AVG crashed and the network gave issues. Sometimes it would result in losing the Pokémon and other times the AVG would freeze and John would have to restart the game. The frustration was minimal but notable and inhibited his immersion into the AVG.

The codes from this workshop were added to existing codes, but gave more insight to new aspects of the AVG, especially the social aspect and how errors majorly affected the gamer's state of engagement. Table 4.4 tabulates the data collected from Workshop 3.

Table 4.4: Mobile workshop data collected - Pokémon Go

Enhancing engagement and immersion	Inhibiting engagement and immersion	Observations	Wants or requests	Replayability
Collecting Pokémon and items	Lack of social grouping	Intrinsically motivated to play the AVG; not much to do with the AVG itself	Realistic map	Realism
Realism	Bugs and glitches			
Augmented reality	AVG crashes			
Childhood nostalgia				
Meeting people				
Popular TV show				

From this point onwards, existing codes in Atlas.ti were beginning to show depth as some codes' level of groundedness increased. However, data saturation was not possible as new trends kept emerging and more areas of AVG play needed to be explored.

4.8.5 Continuing to collect data: Workshop 2B

Workshop 2B took place on 13 February 2017 in the Engineering building, CPUT Cape Town Campus. It made use of the XBox Kinect and the same AVGs as Workshop 2A to carry out the strategy plan and make specific observations.

The participants for this workshop were Fiki and Lenboxs, who were complete strangers, and males. Trends between strangers of different and same genders were observed to note whether it influenced the way in which participants engaged and immersed themselves in AVGs. Not much difference was noted compared to findings from previously conducted workshops, as Lenboxs showed signs of being very uncomfortable and not as engaged throughout the entire workshop. Being uncomfortable mostly affected the type of body movements the player used when playing (Figure 4.9). If you are uncomfortable, you are more reluctant to move fully, which in turn affects the ability to perform and win, which in itself was a rewarding and engaging experience. Analysis showed that the bigger the movements or the more body parts incorporated in the movement and execution of the moves had a direct relation to how engaged and immersed an individual became in the AVG experience.

Figure 4.9: Lenboxs only using upper body movement

Being uncomfortable also made the gamers more self-conscious about how they appeared when executing the moves. Lenboxs was very hesitant and against playing the dancing game. During this workshop it was observed that when the

gamers becomes self-conscious they are not fully immersed, because they are more concerned with what is going on around them than on the AVG itself.

This workshop also aimed to determine whether or not the order of activities played a role in how much fatigue influences engagement and immersion. Although fatigue directly determined whether or not a participant continued to play, it did not affect the way in which participants engaged with the AVG. After Fiki left the room, Lenboxs became more engaged and immersed in the AVG and began using fuller body movements (Figure 4.10).

Figure 4.10: Lenboxs making use of his entire body

The factor of not knowing each other affected the competitiveness between the two players. They both became disinterested in competing against one another and became more interested in their own individual progress and performance. The lack of competition presented itself in many moments of both participants being disengaged in the activity, by walking away from the console every time they completed a round.

When observing the other player, the participant sitting out would watch the other's performance, unless they were asked by the other to leave the room. Although eye contact was made now and then for the gamer sitting out, there was a clear lack of interest in the AVG (Figure 4.11).

Figure 4.11: Disinterest when not playing

The sensor malfunctioned many times during the workshop and it disrupted the immersion that Fiki and Lenboxs experienced. Lenboxs mentioned not being able to select the avatar he wanted due to the Kinect sensor being too sensitive and he kept missing the option he would have preferred. During the interview, Lenboxs mentioned how much the inaccuracy of the sensor put him off and disrupted his experience. Fiki also complained that the sensor failed to detect his movements accurately, which caused a degree of frustration. At the end of this workshop, the relationship between both participants did not improve and they each gave their account of their experience.

The codes which emerged from this workshop were aligned with previous data collected, but some new information featured. The existing data became extremely grounded and clear groups were emerging. After the workshop, the data were coded and analysed and clear categories started to crystallise (Table 4.5). It was decided that a final workshop should be conducted to confirm the patterns and trends that emerged and to further saturate the existing data.

Table 4.5: Data collection codes for Workshop 2B

Enhancing engagement and immersion	Inhibiting engagement and immersion	Observations	Wants or requests	Replayability
Successfully executing moves	Watching the cinematics	More comfortable playing alone instead of around a stranger	Clear instructions	Clear instructions
Watching someone else play to learn from	Watching the tutorial while someone else is playing	Prefer progressing a round instead of repeating it	New genres	Challenge
Clear instructions	Getting moves wrong	Disinterest in final score	Translucent avatars	Tutorials
Full body movement	Awkward activities		Full body sensor	Competing against another person
Avatar resembles gamer	Difficulty navigating menu		Tutorials	
Music	Long cinematics		Direct competition	
Gathering, collecting, earning items	End of play		Options to choose angle and view of play	
Viewing pictures of self-playing	Poor sensor responsiveness		More characters to play with	
Novelty	Not much competition or challenge			
Challenge	Difficult movements			
Viewing final scores	Confusing gameplay - uncertainty of what to do			
Simple movements	Trying out something new			
Avatar appearance	Avatar does not resemble gamer			
Social activity	Missing target			
Easy menu navigation	Fatigue			
Leniency with points	Screen too overloaded with information			
Variety	Tiring activities			
Unlock in-game content	Bugs and glitches			
Browsing through song menu				
Freestyle dance mode				
Selecting an avatar				

Enhancing engagement and immersion	Inhibiting engagement and immersion	Observations	Wants or requests	Replayability
Winning				
Hitting targets				
Feedback of performance				
Good graphics				
Easy adaptability				
Interesting storyline				
Competing against another person				
Customisation option				
Visual and written feedback				

4.8.6 The initial code book

After conducting the fourth workshop and analysing the data, a code book of each code and its level of groundedness was printed and physically placed into groups. Twenty eight (28) groups were formed, which covered all aspects of the AVG that was experienced (Figure 4.12). Because no codes were without a group, it suggested that no new data were emerging and that data should be near the saturation point. Table 4.6 lists the initial group of codes that emerged from the data collected and analysed through the open and focused coding phase of CGT. However, focused coding as a phase had not yet come to an end.

Table 4.6: Initial code groups after open coding and during focused coding

Code groups			
Appearance/Graphics	Competition	Menu	Realism
Avatar	Customisation	Movement	Self-develop
Being informed	Enjoyment	Narrative	Sensor
Bugs and glitches	Exercise	Nostalgia	Social
Cinematics	Feedback	Act of playing	TV show
Comfort	Lack of control	Novelty	Variety
Challenge	Self-expression	Preference	Winning and success
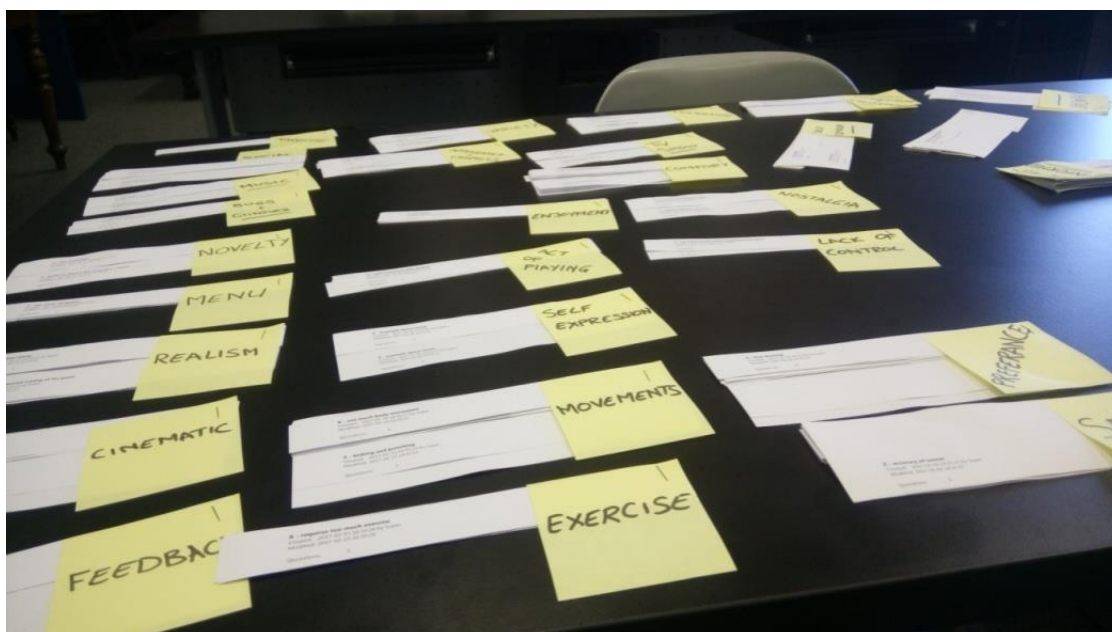
Figure 4.12: Image of printed code groups

To check for data saturation, a final workshop was done. The achievement of data saturation would be indicated when all the new codes could fit into the existing groups.

4.8.7 Checking for data saturation: an account of the final workshop

On Saturday, 18 February 2017, Workshop 4 was held at a private residence to observe the difference in environment and whether or not that influenced the manner in which participants engaged themselves with the AVG. Another observation planned was the use of three participants, instead of two, to monitor the difference between more or less players. The participants who took part in this workshop were JuniorKidd, 2Awesome, and Toefm.

They made use of the PlayStation 4 console and the AVG used was Rabbids Invasion, which is an interactive TV series. This particular AVG allowed the researcher to observe the differences in immersion experienced by the gamer during play of an AVG which entirely consisted of interactive cinematics. This would be in contrast to other AVGs that utilise cinematics sporadically between gameplay.

Factors that stood out predominantly during this workshop were the level of competitiveness surrounding a socially interactive game. Participants were very much engaged and immersed throughout the experience, showing great enthusiasm in winning, beating their opponent, and in wanting to play again after losing to someone who is considered a friend/acquaintance.

The game required high levels of physical activity and full body movement as well as audio input from the participants. It engaged them visually and through audio means. A major component of the AVG that captured the participants' full attention was the reliance on continuously watching the screen to play, because quick interaction was required to gain points and to beat the opponent.

Trends that also emerged during this workshop were the frustration and disruption caused by the sensor failing to accurately detect body movements, and pausing the gameplay (Figure 4.13). The frequency of this particular error popping up caused the participants to switch off the AVG and restart after a while. This lowered their desire to want to engage themselves in the AVG (2Awesome, Toefm, JuniorKidd interview - voice recording).

Figure 4.13: Toefm and JuniorKidd frustrated at the sensor malfunction

Being situated in a private resident environment, the researcher observed whether or not outside people who are not involved in playing the AVG would disrupt the immersion and engagement of the participants. When non-participants were in the nearby vicinity, engagement and immersion were not lost.

The participants played two at a time and the level of engagement of the participant sitting out was observed (Figure 4.14). At times the participant not playing would be engaged and at other times there would be zero engagement or eye contact with the screen, nor would they participate verbally. Therefore, it is not clear whether or not being actively involved in playing the AVG would ensure engagement and immersion.

Figure 4.14: JuniorKidd not engaged while sitting out

When errors occurred, the participants took action in how to resolve it. At the end of the workshop, a joint interview between all three was held and each answered the questions in turn. The interview was voice recorded and all three participants gave the researcher permission to photograph, video, and audibly record them.

The data collection tool was digitally captured and stored in Atlas.ti. Line-by-line coding followed, matching trends to existing codes. Nothing new particularly emerged through this workshop, and after coding the data collected it was decided to cease data collection. The codes collected reaffirmed previous data and codes (Table 4.7).

On completion of Workshop 4, after the data were captured and analysed, a backup of the current state of Atlas.ti HU was made. This was to prevent any data loss or damage going forward when analysing the codes against one another and merging same concepts together. The video and voice data recorded were reviewed repeatedly to ensure nothing was left out when conducting the analysis and coding.

Table 4.7: Data collected for the final workshop

Enhancing engagement and immersion	Inhibiting engagement and immersion	Observations	Wants or requests	Replayability
Easy menu navigation	Watching the cinematic clips	Prefer progressing a round than to repeat it	Full body sensor	Having fun
Watching someone else play	Getting moves wrong	TV series genre requires constant attention to play		Competing against each other
Viewing final scores	Sensor errors	Comfortable being silly around friends		Having fun and exercise
Playing together	Fatigue			
Having fun	Losing			
Sensor accidentally letting you win	Watching ending cinematic			
Competing against each other	Stepping out of sensors range			
Popular TV show	Sensor causing you to lose			
TV series genre	Dressed uncomfortably			
Winning	Awkward activities			
Avatar appearance				
Interesting storyline				
Novelty				
Full body movement				
Successfully executing moves				
Social competition				
Awkward body poses				
Social activity				
Viewing achievement boards				
Half body movement				

4.8 Abstraction of the code groups

The following section delves into the abstraction of the emerged code groups. This still falls under the focused coding phase of CGT; however, the outcome of this section leads the data analysis phase of the next chapter. This section is an important stepping stone to reaching the full data analysis phase. It focuses on merging codes together to increase the level of groundedness found in the code groups and sets the foundation for comparing code groups together.

4.9.1 An account of the first level of abstraction

After a backup of the HU was made, the codes were ordered by their level of groundedness. Then, from the codes that held the highest level of groundedness, they were merged with other codes of the same meaning. This further added to the level of groundedness of that particular code (Figure 4.15).
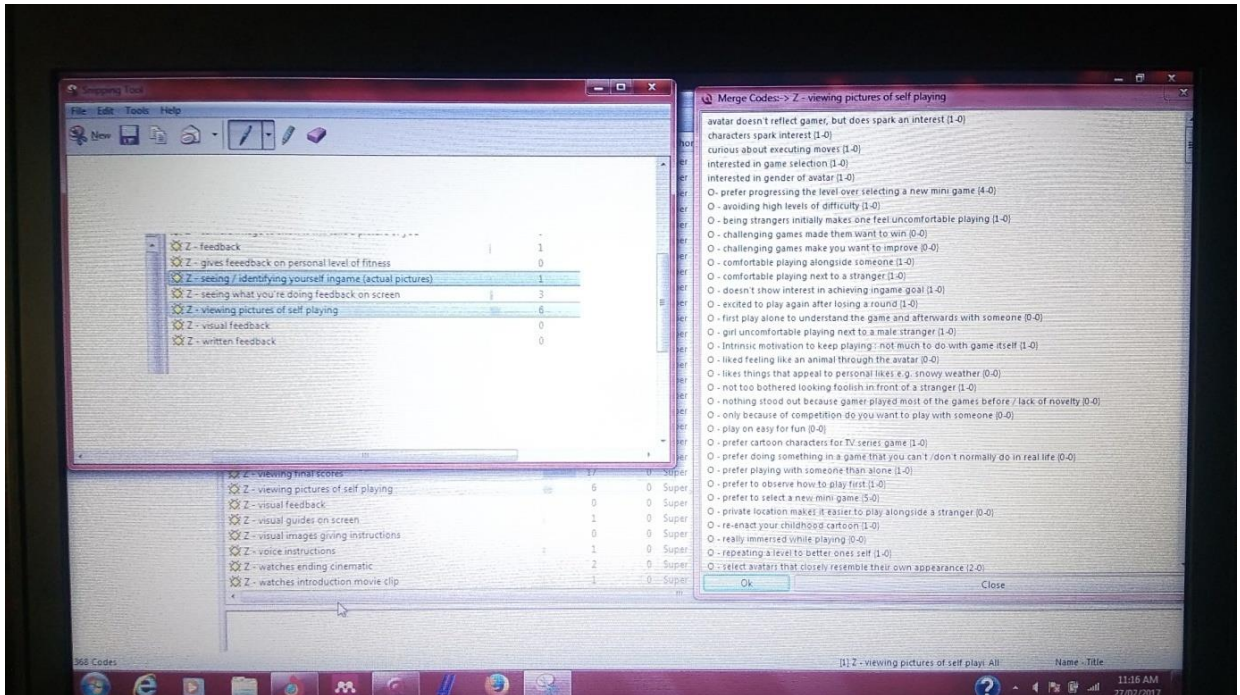
Figure 4.15: Merging codes together of "watching yourself playing"

Thereafter, with the manual code groups kept in mind, codes were digitally grouped together into the relevant categories. By merging codes together of the same naming conventions, it simplified the grouping of codes. Some codes, however, fell into more than one group, which was the beginning step in forming relationships between the codes (Figure 4.16).

Figure 4.16: A code falling into more than one code group

Twenty eight (28) code groups emerged after the initial analysis. Some code groups reflected more than one sub-category (e.g. the "being informed" and "avatar" code groups consisted of multiple sub-categories). In total, the twenty eight (28) code

groups and sub-categories were digitally recorded as thirty six (36) digital groups in the Atlas.ti HU.
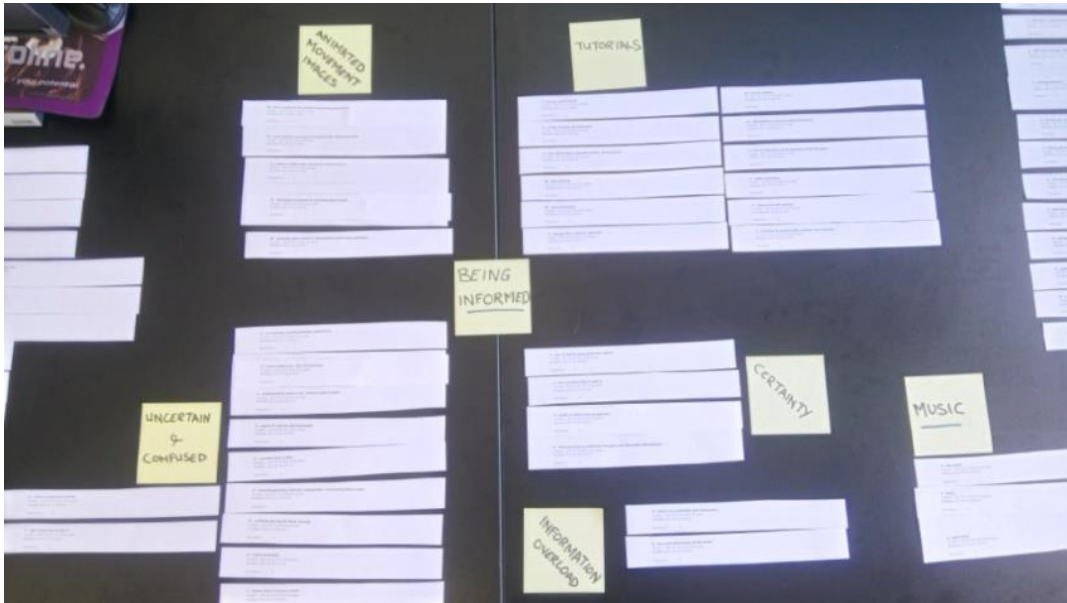
Figure 4.17: Code group with sub-categories
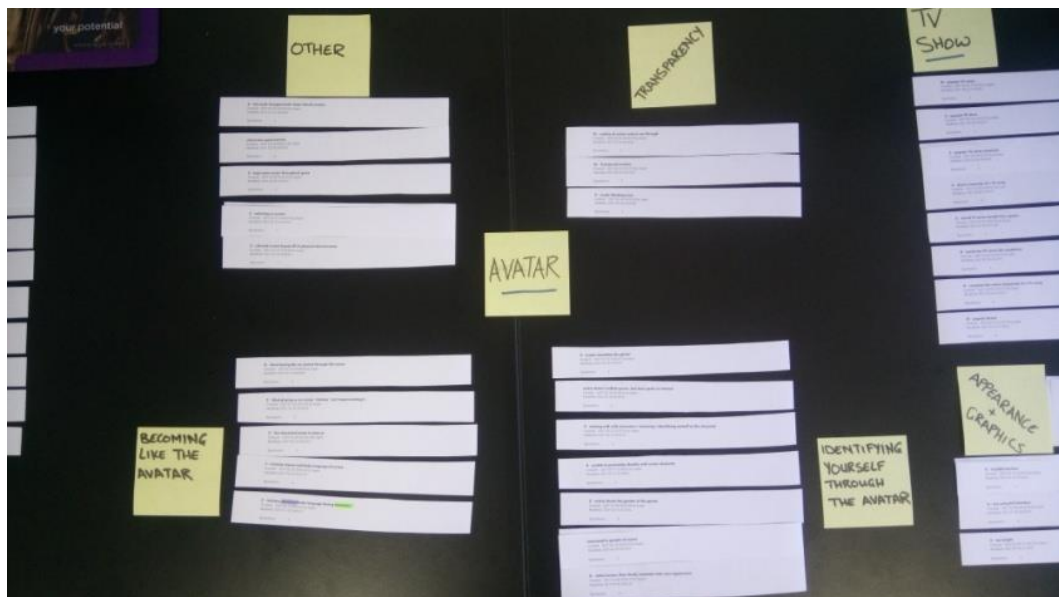
Figure 4.18: Code group avatar with its sub-categories

Once the groups were formed, the code names reflected the attributes of the groups (Figure 4.19). After the groups were formed, possible relations between the groups were examined. The first step in identifying possible relationships was looking at the codes that fell into more than one category. These relationships, tighter with the memos of the workshops held, were used to mix and match groups together on

specific nodes and form network views. Multiple networks were discarded because the relation between codes was not clear.
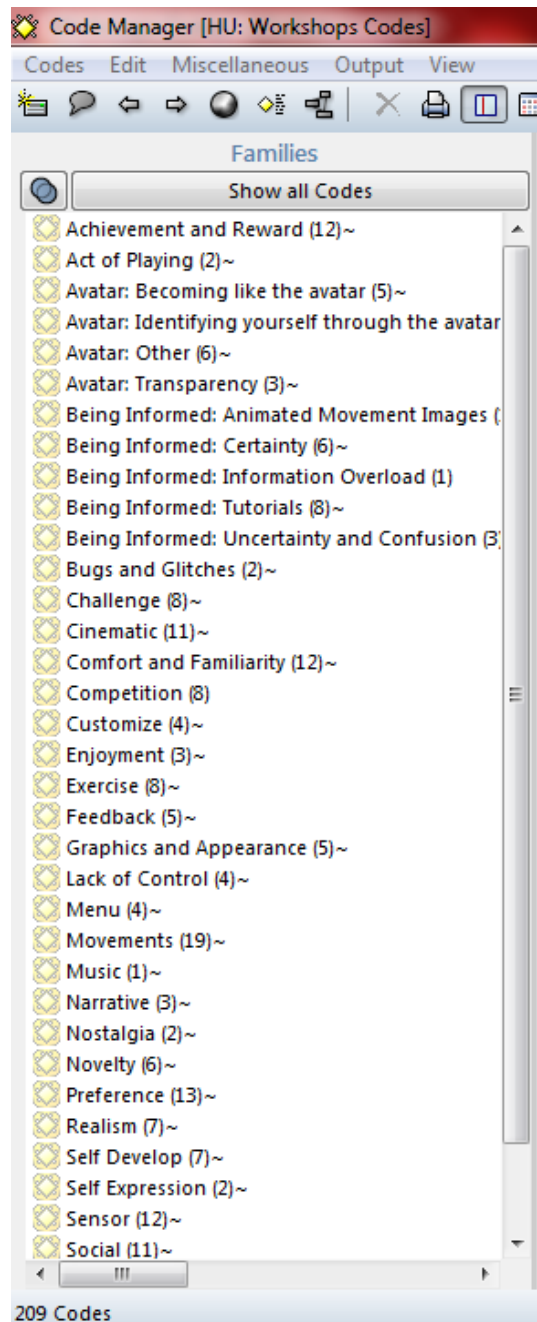
Figure 4.19: List of code groups in Atlas.ti

A number of combinations of groups were manually written out, the codes were analysed, and relations were formed between them (Figure 4.20). The total list of groups was written and combinations were made incorporating each one along the line. Some groups held close relationships to one another, whereas other stood on their own and explained themselves.
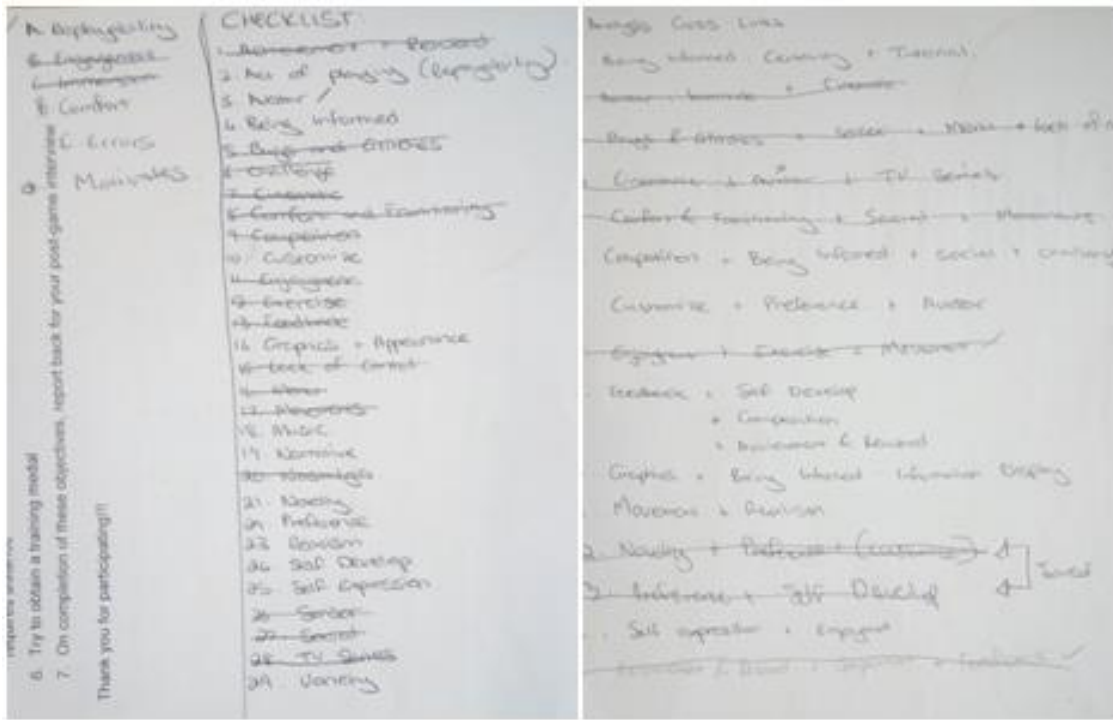
Figure 4.20: Manual checklist and combinations of code groups

After a number of attempts at forming possible network views, a total of ten networks were depicted that encapsulated the trends noticed throughout the analysis and data collection. The networks were each given descriptions and described the relationships between code groups based off specific codes/nodes (Figure 4.21).

Figure 4.21: Network view manager of all ten networks

4.9   Conclusion

This data collection chapter introduced the tools that were developed and used to capture the research phenomenon. The tool and process flow was explained for

each workshop conducted. Strategies guided by the data collected were presented for the workshops. Each workshop was given a recollection account of events which took place along with the data captured for each workshop session. After each workshop the data determined the future direction of where the next phase of research would go. Along with this, the data collection tool was altered after most workshops to adapt to the purpose of the study. After coding and grouping the codes, abstraction activity followed, forming the foundation for the next chapter, the data analysis.

5. CHAPTER FIVE: DATA ANALYSIS

5.1 Introduction

The analysis of the data begins in the focused coding phase of CGT and ends with the theoretical phase, where theoretical sensitivity is reached and the final theory is proposed. Network views encapsulating the code groups formed through the open and focused coding phase are depicted throughout this section and serve as the analysis for the research. Atlas.ti provides the necessary views to form these networks and assists in understanding and interpreting the relationship between the data. However, this section begins by presenting the findings, mostly pertaining to the evolvement of the data collection tool over time and then transitions into the in-depth analysis of the network views. The chapter closes by introducing the theoretical phase of CGT and proposes the constructed theory. This theory links to Chapter Six, the discussion.

5.2 The evolution of the data collection tool

The following section discusses how the tools and forms used to collect data changed throughout the data collection phase of the research. Conducting the data collection has been a trial and error exercise, however, as time passed the process became clearer to the researcher. Minor changes have been made to the tool in order to be aligned with the research question, namely "What design factors contribute to an engaged and immersed AVG experience?"

5.2.1 The initial changes

After the initial workshop with Peach and Pear, the co-supervisor suggested making alterations to the participant coding and information form regarding the request for consent. The initial form had not requested consent to publish images taken during the workshop or informing the participant of what will happen with their data upon completion of the analysis. The alterations give more access to the usage of information acquired and the participants more control over how the media is used and discarded.

Alterations have been made to the interview questions document (Appendix A) due to observations that have been made while conducting the initial workshop. It did not occur to question the relationship between the participants playing. It was observed that Peach and Pear have a close relationship, being sisters, and their interactions influenced the AVG playing experience. This manifested as greater confidence during interaction and a more playful attitude to the experience as a whole. The

resulting gameplay and interaction was observed as more engaged and immersed. The social interaction between two strangers was then questioned by adding the question, "What would the reaction be between two strangers?" A further alteration to the interview questions form included asking whether the participants prefer to play with someone (known or stranger) or rather play alone. The outcome from this observation was that gamers prefer to play together rather than alone. During his post-workshop interview, ICARUS said that he likes playing alongside somebody (Appendix D, Question 3, as well as 2Awesome, JuniorKidd, and Toefm during their voice recorded interview).

5.2.2   The second set of changes

The second and third workshop both consisted of version two of the research tool. However, after conducting the second workshop, it was noted that some of the required activities for the XBox made participants feel extremely uncomfortable and foolish. Therefore, the interview questions form was altered again to include questions pertaining to this observation.

5.2.3   The final changes to the tools

Finally, the interview question forms were altered again to account for a trend that emerged, namely the influence of the avatars on the gamers. The final workshop incorporated version three of the interview questions form (Table 4.1). Throughout the process, the workshop strategy constantly changed to align with observations and trends to be explored.

Figure 5.1 represents a visual display of the dates when the data collection tools were altered after workshop sessions. Many of the changes were based on the workshop strategies surrounding the collection of data, as well as from previous data collected.

	ⓘ	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		**Default Tool V1**	21 days?	Wed 14/12/16	Wed 11/01/17		
2		Workshop 1 Nintendo Wii	1 day	Wed 25/01/17	Wed 25/01/17	1	Pear,Peach
3		**Tool Alterations V2**	1 day?	Tue 31/01/17	Tue 31/01/17	2	
4		Workshop 2 Xbox 360	1 day	Wed 01/02/17	Wed 01/02/17	3	Icarus,Pineapple55
5		Workshop 3 Pokemon Go	1 day?	Wed 08/02/17	Wed 08/02/17	4	John
6		Workshop 4 Xbox 360	1 day?	Mon 13/02/17	Mon 13/02/17	5	Fiki,Lenboxs
7		**Tool Alterations V3**	1 day?	Fri 17/02/17	Fri 17/02/17	6	
8		Workshop 5 PlayStation 4	1 day?	Sat 18/02/17	Sat 18/02/17	7	2Awesome,JuniorKidd,Toefm

Figure 5.1: The growth and change of the data collection tool over time

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5.3   Analysis of network views

In this section and phase of CGT for the analysis of the data, focused coding guided the analysis by means of comparing codes against code groups. The expected outcome was tentative categories forming the basis for the theoretical phase and for constructing the proposed theory. The following is a set of ten network diagrams incorporating all twenty eight (28) code groups that initially emerged through abstraction in Chapter Four (Table 4.6), and depicts the relationship between them, which is a strong motivator for GT. The relationships between codes indicate code density and the frequency of codes depict the level of groundedness and relevance. The process of abstracting data into codes and codes into code groups was preceded by further abstraction of the code groups into relational network views:

    i.   Network 1 - Significance behind gamers being comfortable

    ii.   Network 2 - Significance of being informed and knowing what to do

    iii.   Network 3 - Choices granted by the AVG for gamers

    iv.   Network 4 - Cinematics in AVGs

    v.   Network 5 - Preferences for AVG gamers

    vi.   Network 6 - Errors and glitches in AVGs and consoles

    vii. Network 7 - Feedback from the AVG to gamers and the sense of achievement experienced

    viii. Network 8 - Motivation to play the AVG

    ix.   Network 9 - Realistic experiences in AVGs and the roles of avatars

    x.   Network 10 - Replayability of AVGs

These networks are the result of the focused coding process (explored in Chapter Four), grounded in the data from the various research activities. The raw observations and findings that informed both the open coding and focused coding processes were represented as tables in Chapter Four:

    i.   Table 4.2: Codes gathered for both Peach and Pear after Workshop 1

    ii.   Table 4.3: Workshop 2A codes for both ICARUS and Pineapple55

    iii.   Table 4.4: Mobile workshop data collected - Pokémon Go

    iv.   Table 4.5: Data collection codes for Workshop 2B

    v.   Table 4.7: Data collected for the final workshop

Continuing from Chapter Four's abstracted code groups, the following network views have been drafted to show the relationship between code groups and to further abstract the data to a higher level.

5.3.1 Network 1 - Significance behind gamers being comfortable
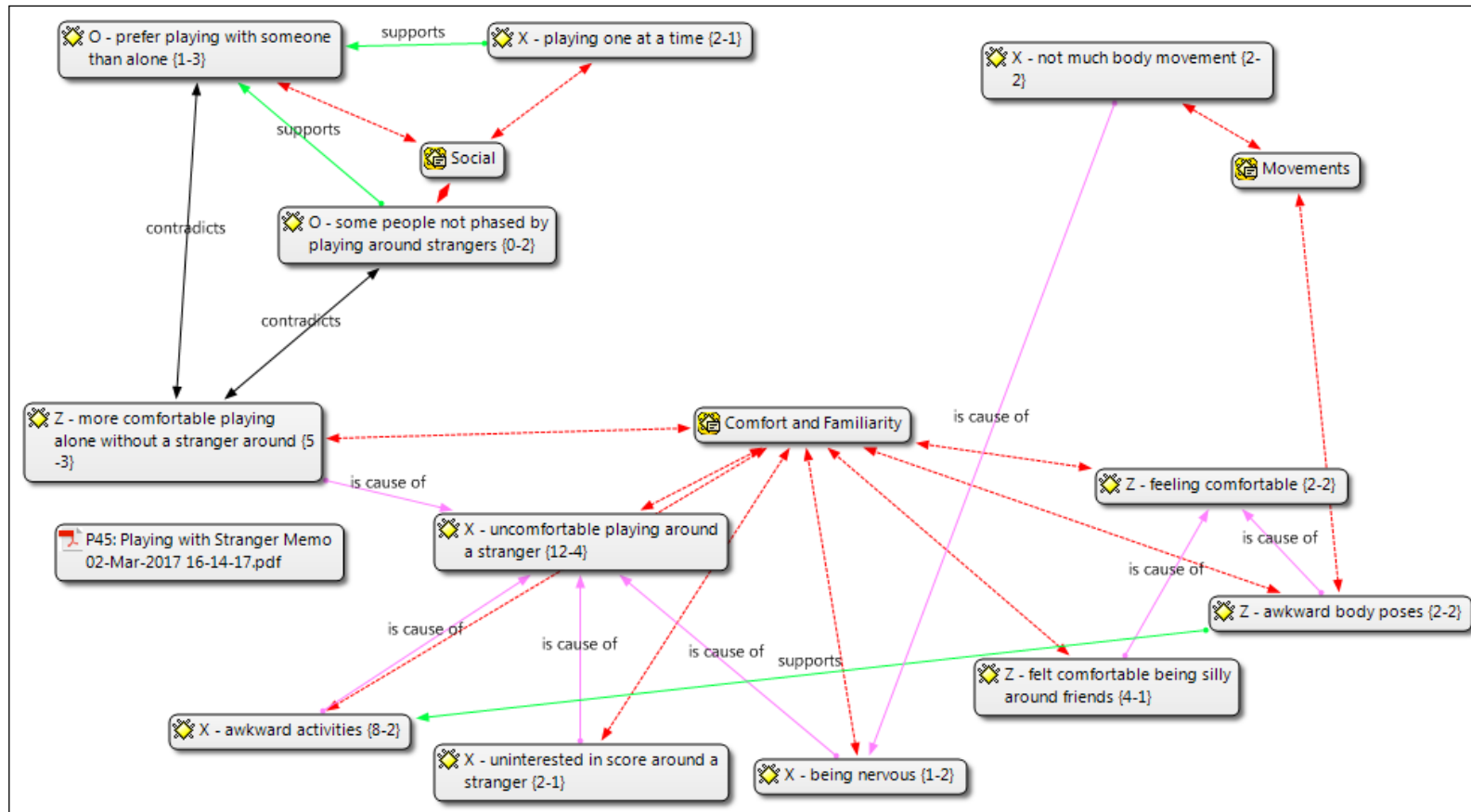
[1]**Figure 5.2: Network view of the significance behind gamers being comfortable**

[1]Figure 5.2: Red lines should be overlooked as they indicate the nodes belonging to the code group (red lines cannot be removed using the software). Black lines indicate contradictions. Green lines indicate support. Pink lines indicate causal reasons.

The type of relationship a gamer has with another is directly related to his/her level of comfort while playing. If they are unknown to each other and have no relationship, they may be likely to feel uncomfortable. This might be more when a female is playing alongside a male. It was not the intention of the study to capture every possible play scenario, as the emerging theory is a substantive grounded theory (exploring a specific context). To inform formal theory, more testing scenarios are needed (refer to Chapter Six, section 6.7 or to Chapter One, section 1.7). This has been evident between Pineapple55 and ICARUS (Figure 5.3). Pineapple55 felt very uncomfortable, and it has been noticeable throughout her experience as well as during her interview. However, if the competitors have an existing relationship with each other, they experience a greater level of engagement and immersion while playing AVGs. This has been the case between Peach and Pear, who are sisters, and between JuniorKidd, Toefm, and 2Awesome, who are friends.

Figure 5.3: Pineapple55 not too comfortable around ICARUS

Being uncomfortable while playing usually manifests as nervousness in a gamer, disinterest in being competitive (noticed through lack of interest in viewing personal final scores), and finding awkward activities to be disengaging and non-immersive. This can be observed in the lack of body movement and the hesitance to play the AVG. All of these inhibit engagement and immersive states and lowers a gamer's motivation to continue playing the AVG.

Interestingly, when a gamer is comfortable and playing alongside an acquaintance, awkward activities become engaging and immersive, and appearing foolish in front of the other person hardly hinders engagement or performance. The same awkward activities that initially will put off strangers evoke a light-hearted nature to friends who display laughter and a sense of camaraderie towards one another (Figure5.4).

Figure 5.4: Toefm and 2Awesome during awkward activity

Feeling uncomfortable is so inhibiting towards engagement and immersion that the participants reported they would rather prefer to play alone than with a stranger. This contradicts the observation that despite being strangers, gamers are not too concerned by playing around someone they do not know. This was noted by ICARUS during his interview (Appendix D, Interview Question 3). This could be because gamers prefer playing with someone more than playing alone. This is supported by the observation that playing one at a time is disliked among players, who would prefer to play together. However, it is important then that the activity encourages relationship building, because the lack of friendship inhibits the gamer's state of engagement and immersion.

5.3.2 Network 2 - Significance of being informed and knowing what to do
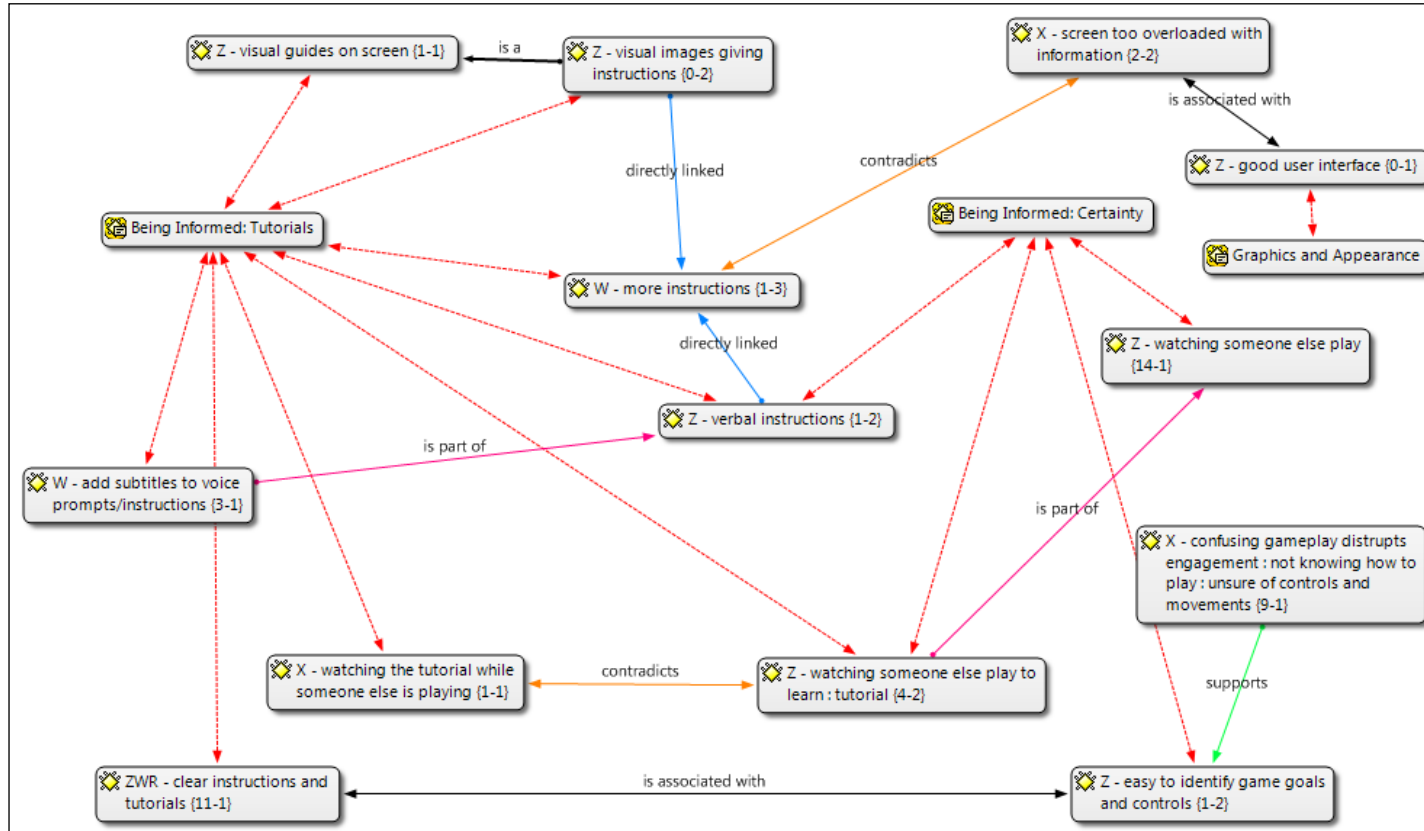
Figure 5.5: Significance of being informed and knowing what to do

[2]Figurer 5.5: Red lines indicate nodes stemming from its code groups. Pink lines indicate it is part of the node. Blue lines indicate it is directly linked to the node. Green lines indicate support relationships. Orange lines indicate contradictions. Black lines indicate the node is associated with the other.

The "Being informed" category is highly valued by AVG gamers. Knowing what to do directly affects the way a gamer plays and performs. Certainty in knowing what to do while playing is a highly engaging and immersive factor and is achieved through the means of clear and informative tutorials and instructions from the AVG throughout playing the game. Participants were given a list of general instructions to follow, however, the main instructions came from the AVGs they played.

When the gamers can easily identify the goals of the AVG as well as the physical movements needed to achieve these goals, they become more certain in their ability to perform, which in essence results in a successful round of play (by either winning or by achieving the in-game goal). To understand the controls and mechanics of the gameplay, the AVG needs to provide clear instructions and tutorials for how to play. This enables the AVG to be engaging and immersive for the gamer.

When the goals of the AVG are unclear or the instructions for how to play are unclear, it disrupts the engagement of the gamer. Not knowing how to play can inhibit a gamer from playing at all. This breaks immersion and engagement completely and was noticeable when Peach and Pear played on the Nintendo Wii. Not knowing how to play volley ball for Mario and Sonic Olympics and not knowing how to position the Wii board for Shaun White greatly disrupted their engagement and broke their immersion into the AVG completely, because they became more focused on how to play than actually playing the game.

Therefore, tutorials are highly valued, especially when the gamer has never played the AVG before. Most participants listed the need for clearer instructions while playing. For the XBox Kinect, the players generally struggled with the initial start movement to begin the mini-game in Kinect Adventures and requested that it be taken out as it is confusing and distract the gamers from being engaged and immersed. For Dance Central 3, participants playing the XBox all mentioned the issue of the upcoming dance moves being very uninformative, because the images are static (non-moving) and depict animated movements which the players need to perform. Fiki and Lenboxs did not know how the moves should be executed to play that AVG.

For all the complicated body movements needed to play AVGs, the user interfaces are usually loaded with instructions and information, such as in the case of Dragon Ball Z and Dance Central 3 (Figure 5.6 and Figure 5.7) in contrast to simple movements that have clear instructions. This information overload and clutter of the screen is distracting for the gamers as they do not know which tile of instruction is

applicable at that moment. Fiki mentioned that he did not know whether he should mirror the dance moves or do it with his right hand when the avatar moves their right hand, or face to his right when the avatar faces to their right hand side.

Figure 5.6:Dragon Ball Z information overload

Figure 5.7: Dance Central 3 information overload

The confusion of information overload or lack of instructions usually results in gamers losing points by getting moves wrong and failing the round or the competition. Losing in itself lowers the motivation for gamers to keep playing, especially if they lose more often than winning. Therefore, AVGs should try to incorporate as many forms of tutorial and instructive guides as possible be it written, verbal or through animated pictures; however, it should not be too much information which clutters the user's interface and bombards the gamer with too much information. This will have a negative influence on the gamer's engagement and immersive states. When instructions are simple, clear and concise, it will be highly engaging and immersive for the players.

5.3.3 Network 3 - Choices granted by the AVG for gamers
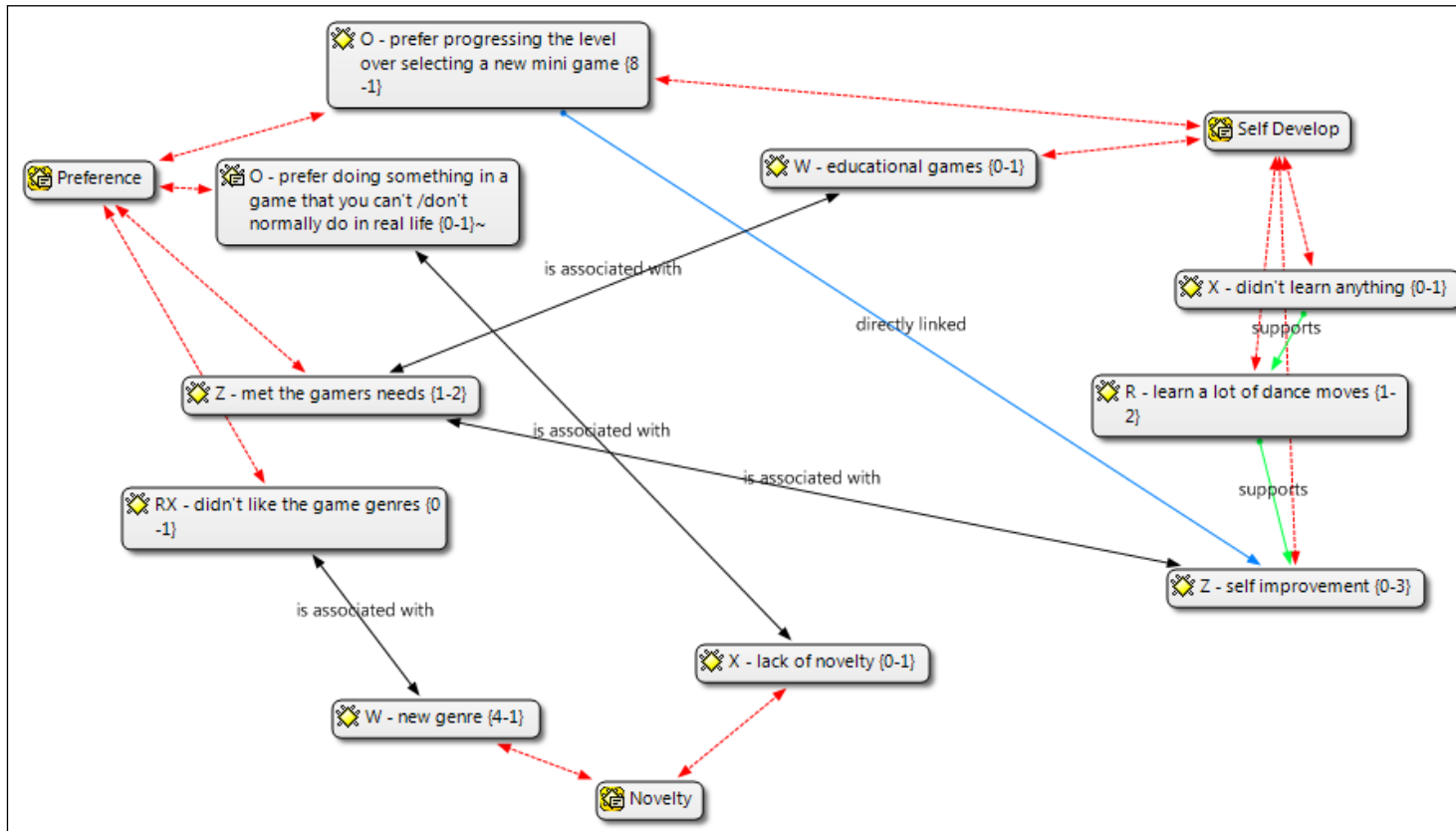
[3]**Figure 5.8: Choices granted by the AVG for gamers**

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[3]Figure 5.8: Red lines indicate relation to the code group. Blue lines indicate a direct link relationship. Green lines indicate support relationships. Black lines indicate an association between nodes.

Preferences speak about the specific gamer and what he/she likes. Depending on the wants and needs of a particular gamer, some AVGs may not appeal at all, despite having engaging and immersive factors incorporated into the AVG itself. A gamer has specific game genre preferences as well as personal objectives and motives for wanting to play. What may make one person want to play can vastly differ from another individual, and this is independent of the AVG (Appendix A, Form 6: Pre-Test Evaluation).

When the gamer has specific needs and the AVG is able to fulfil those needs, the gamer is more likely to engage. In the instance of Fiki, who listed learning as a need, he specifically looked at whether or not the AVG provided learning material and skills. When the AVG manages to fulfil the needs of the gamer, the individual is more likely to experience satisfaction from playing.

Self-development speaks closely to the needs of a gamer, as many gamers listed exercise and learning as part of their needs, both of which contribute towards personal development of physical and mental ability. AVG gamers perceive value in these games if they can benefit from learning and developing after playing these games. This is reason to encourage AVG gamers to continue playing these types of games.

5.3.4 Network 4 - Cinematics in AVGs
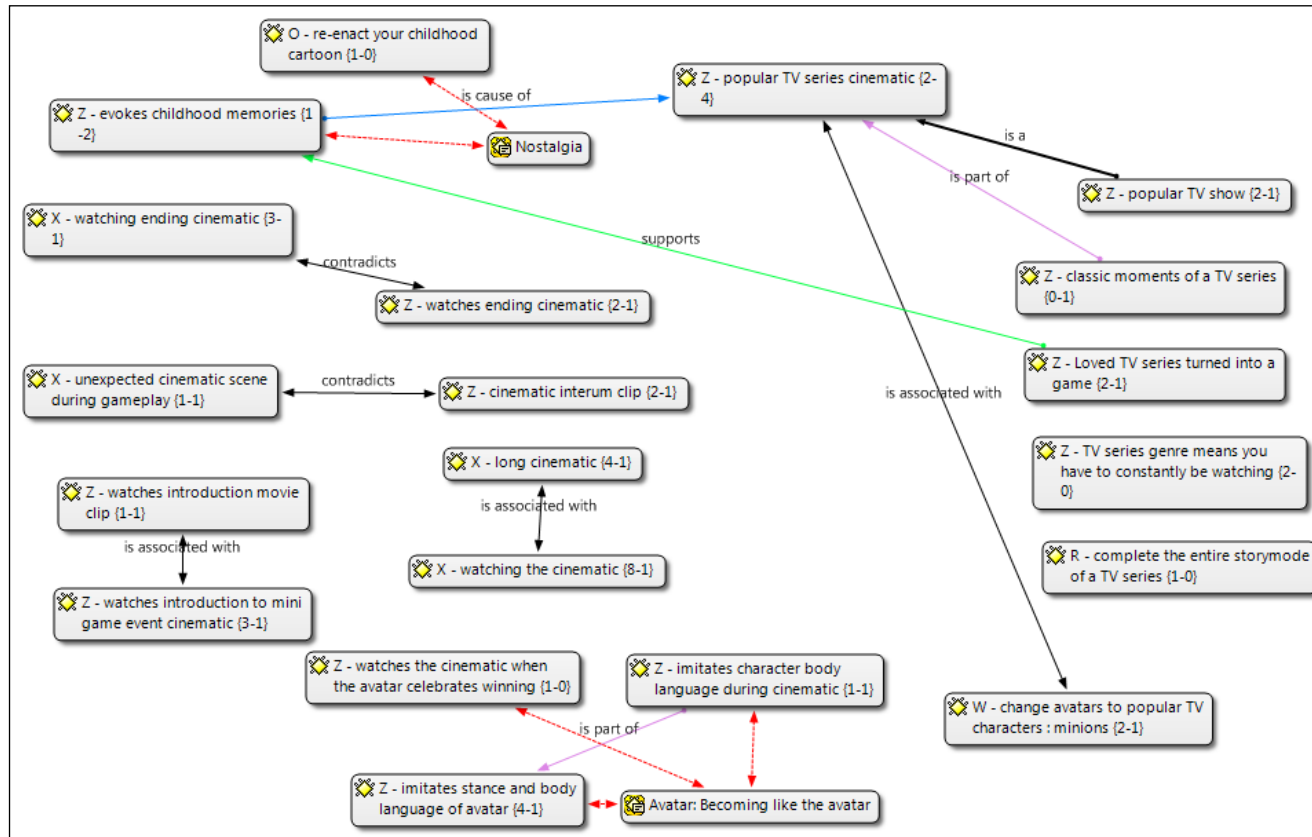
[4]Figure 5.9: Cinematics in AVGs

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[4]Figure 5.9: Red lines indicate relation to code group. Black lines indicate association with the nodes as well as "is a" relationships. Green lines indicate support relationships. Purple lines indicate "is part of" relationships. Blue indicates "is cause of" relationships.

TV series genre games are extremely effective in engaging players, especially when it brings about a sense of nostalgia from childhood favourites. When this genre of TV series gameplay is combined with cinematics from the actual show, it greatly enhanced immersion into the AVG. This was noticed when Lenboxs, during his post-workshop interview, commented that he liked the Dragon Ball Z game storyline and he mentioned that watching the TV series in a game would make him want to play again and finish the game. However, it should be noted that having extensively long cinematics become disruptive for the AVG gamer as they begin to lose immersion as the cinematic draws out. Lenboxs explicitly skipped the cinematic for each AVG he played after a while.

Introduction cinematics were very engaging and immersive for the participants as they showed a curiosity towards understanding what the AVG entails. Very rarely did anyone skip the introduction clips to a game or a mini-event in the game. However, with the ending cinematic clip there was a conflict of interest between some participants who preferred to watch it and remain engaged and immersed, whereas for others, they lost interest as soon as the activity itself was over.

During the ending of a mini-game there would usually be an ending cinematic which would include the avatar either celebrating a victory or having lost the round. For the Nintendo Wii, Mario and Sonic London Olympics, the avatars were usually shown on a podium celebrating their victory. It was observed that Peach and Pear always watched the ending cinematic of a mini-event and even went as far as imitating the entire persona of the avatar they were playing as. If the avatar was shaking their hands together to indicate victory on the podium, the participants themselves would imitate the gestures performed by the avatars themselves. This victory cinematic was highly engaging and immersive for each of them respectively. What could be the cause of this ending cinematic being so engaging and immersive is the fact that it incorporates winning, which in itself is a highly engaging and immersive state for players. The cinematic then adds as an enhancing factor to extend the moment of victory and enjoyment.

Having many short interim cinematic clips randomly throughout gameplay is extremely distracting and hinders engagement and immersion among gamers. This was most noticeable when Pineapple55, ICARUS, Fiki, and Lenboxs played Dragon Ball Z on the XBox Kinect. In contrast, Rabbids Invasion, an interactive TV show game, which utilises one long cinematic throughout the gameplay, was very engaging and immersive for JuniorKidd, 2Awesome, and Toefm, because the nature

of playing the AVG was dependent on constant observation and interaction. Figure 5.10 shows the comparison of the two different types of styles.
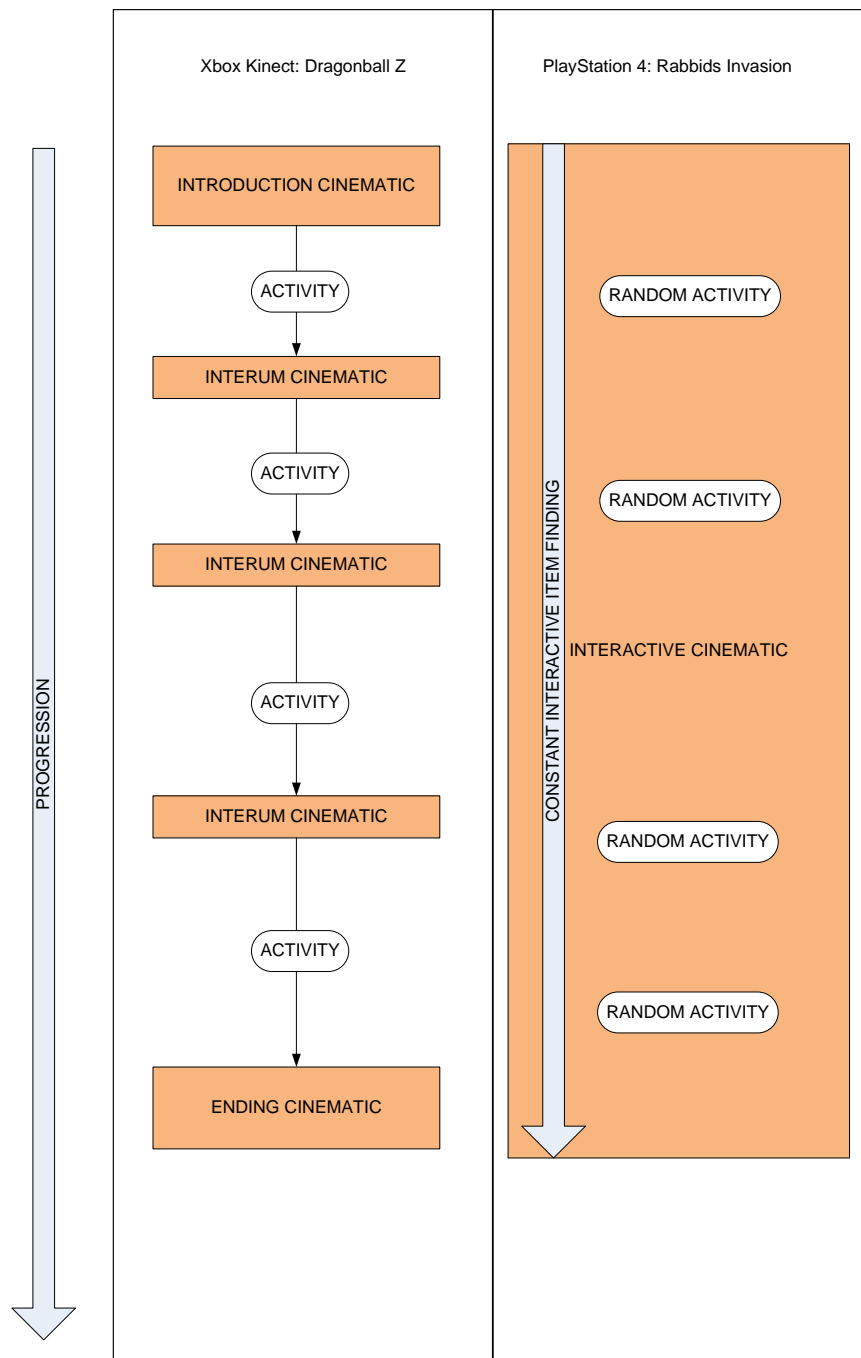
Figure 5.10: Comparison of cinematic styles

This contradicts the observation that AVG gamers dislike long cinematic clips; however, in the instance of playing Rabbids Invasion, the cinematic was interactive, therefore, the gamer was not standing stationary throughout the procedure. It was noted that having an interactive cinematic game genre for AVGs was highly engaging and immersive for the participants.

5.3.5   Network 5 - Preferences for AVG gamers
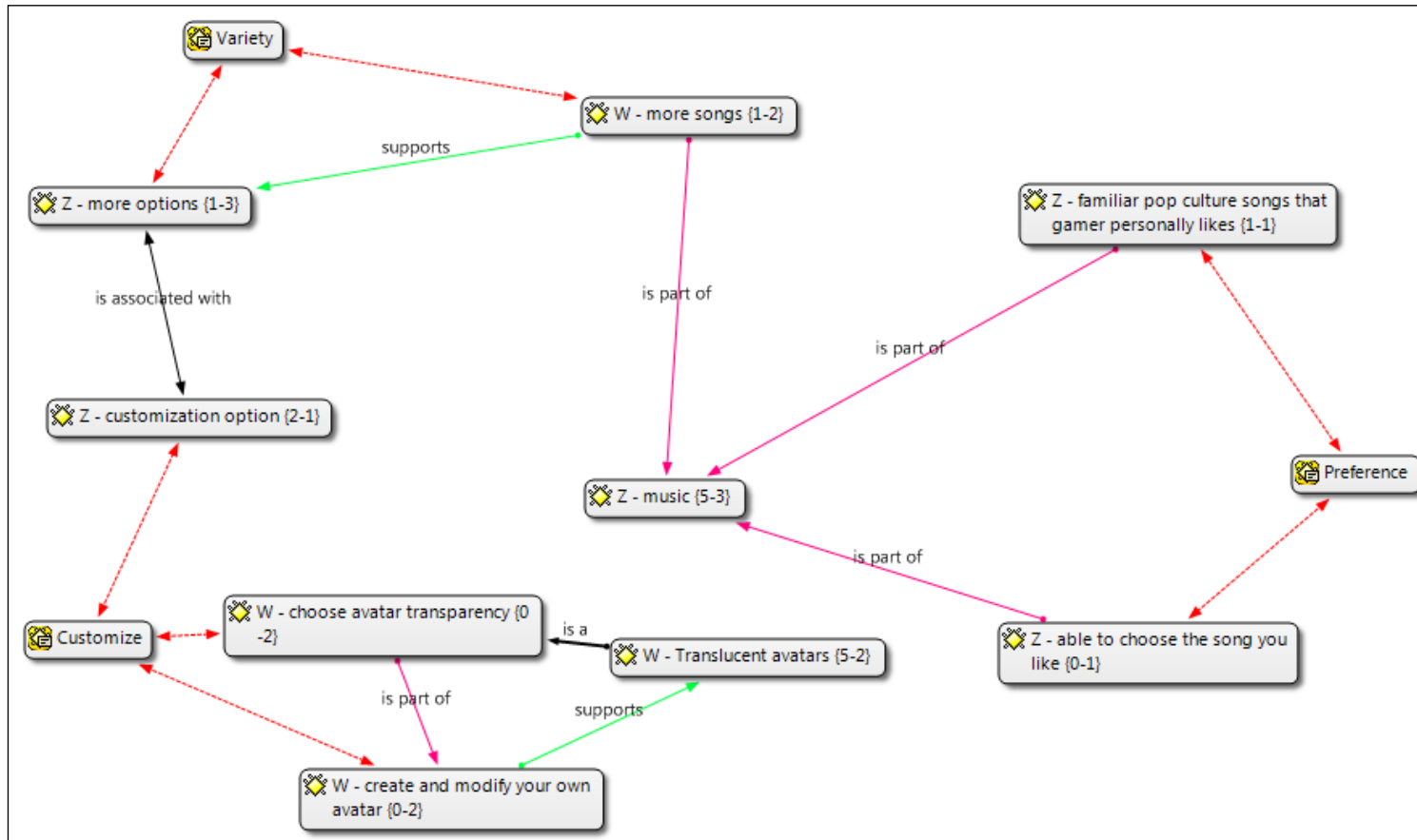
[5]Figure 5.11: Preferences for AVG gamers

Music in AVGs sets the tone for the activity at hand and the mood of the game. Fast paced action games have fast paced music. When music fills the environment of the AVG, the gamer becomes more immersed in the activity.

Many gamers prefer a variety of options and the ability to choose their preferences. With regard to music, gamers like the ability to choose songs they prefer in order to play the event of the AVG. It is extremely engaging when songs made available by the AVG fit the preference of the gamer as this boosts the level of satisfaction and fun while playing, which in turn links to replayability.

Customisation allows for the gamer's preferences to be met by providing the gamer with more options. With regard to avatars, which are very engaging features for the gamer, the customisation option adds variety to the AVG, which in turn touches on the preferences of the gamer who could prefer many options. For example, Peach and Pear stated that they want more variety in what they can do in the mini-games and avatars made available to them.

AVGs cannot meet every single gamer's needs and wants; however, by providing a customisation spectrum, the AVG can bridge the gap of fulfilling the gamer's needs by a significant amount. When ICARUS and Lenboxs complained about the visibility and obstruction of the avatar figure itself in the AVG, they requested to have the option to choose the transparency of the character. If a spectrum of transparency was made available to the gamer, it would more likely increase their level of immersion in the game directly in line with their own specific preferences. Giving the gamer a choice in the settings of an AVG is highly immersive as it lowers the chance that they would find little features distractive if they could alter it to their preference.

5.3.6   Network 6 - Errors and glitches in AVGs and consoles
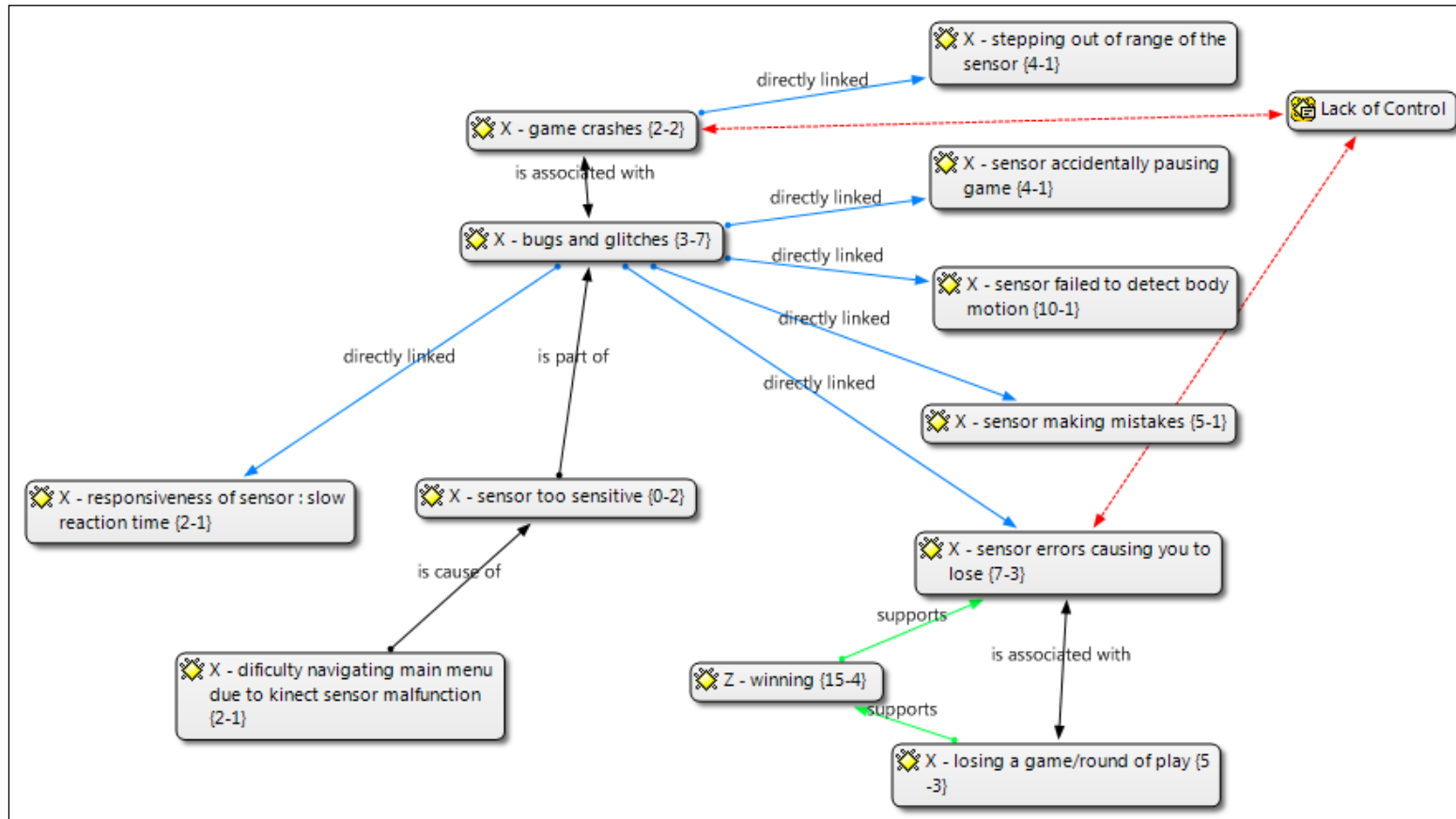
**[6]Figure 5.12: Errors and glitches in AVGs and consoles**

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[6]Figure 5.12: Red lines indicate association to the origin code group. Blue lines indicate direct link relationships. Green lines indicate support relationships. Black lines indicate association, "cause of" and "part of" relationships.

Errors are a hindrance to experiencing an optimum level of engagement and immersion. Bugs and glitches are minor errors which distract the gamer from the activity at hand. However, not all glitches are critical, in that they do not make the gamer turn the AVG off at that moment. Having an AVG crash or not responding would be a major error and this will cause the gamer to have to switch the AVG off to reboot/restart it. However, these technical faults do cause an increase in frustration experienced by the gamer. Most bugs and glitches occur through the motion sensor or camera, which detects the body movement of the gamer. If the player steps out of range of the camera, the sensor will likely cause the game to pause, causing an immediate disruption in the gameplay. The sensor may also fail to detect the movements of the body, which in turn results in the gamer losing points or even the game. When the gamer loses because of the sensor causing errors, the frustration is enough for the players to turn off the AVG and not want to be engaged any longer. This was evident when Toefm and JuniorKidd were playing Rabbids Invasion on the PS4 and the sensor continuously failed to detect their movements, or falsely gave points for incorrect movements, giving the opponent an unfair advantage. The continuous pausing caused 2Awesome to turn off the entire game and restart it, because of errors experienced (Figure 5.13). This hindered immersion and engagement completely for those participants.

Figure 5.13: 2Awesome switching off AVG due to sensor malfunction

It makes sense why losing a game, regardless of the cause, breaks immersion and engagement, because AVG gamers value winning. Also, the lack of control experienced when the sensor malfunctions goes beyond the gamer and increases frustration.

Menu navigation is an engaging experience in itself, as gamers take their time to browse through all the options available to them. With regard to a motion detection sensor controlling the navigation experience, it is noted that an over sensitive response to the camera can make menu navigation extremely difficult. This was seen in Dance Central 3 and Dragon Ball Z, where ICARUS, Pineapple55 and Lenboxs struggled to navigate through the respective menus. Other than notable frustration, Lenboxs and Fiki ended up selecting avatars which did not resemble them, as it was too difficult to pinpoint the sensor on the options that they wanted (Figure 5.14). This failure to select an avatar (which adds to the gamer's engaged and immersive experience) influenced the gamers, in that they were hardly immersed in the AVG at hand and showed signs of being very distracted (apart from being uncomfortable around a stranger).

Figure 5.14: ICARUS navigating through AVG menu

Game crashes are extreme cases whereby the game freezes or turns itself off. This was evident in the case of John who was playing Pokémon Go, and reflected back on past experiences when playing the mobile AVG. Servers constantly being down or the game freezing was noted as massively disengaging and off-putting for him. Technical errors hamper the engaging and immersive experience that AVG gamers have. It is necessary for mechanics to be functioning seamlessly.

5.3.7 Network 7 - Feedback from the AVG to gamers and the sense of achievement experienced
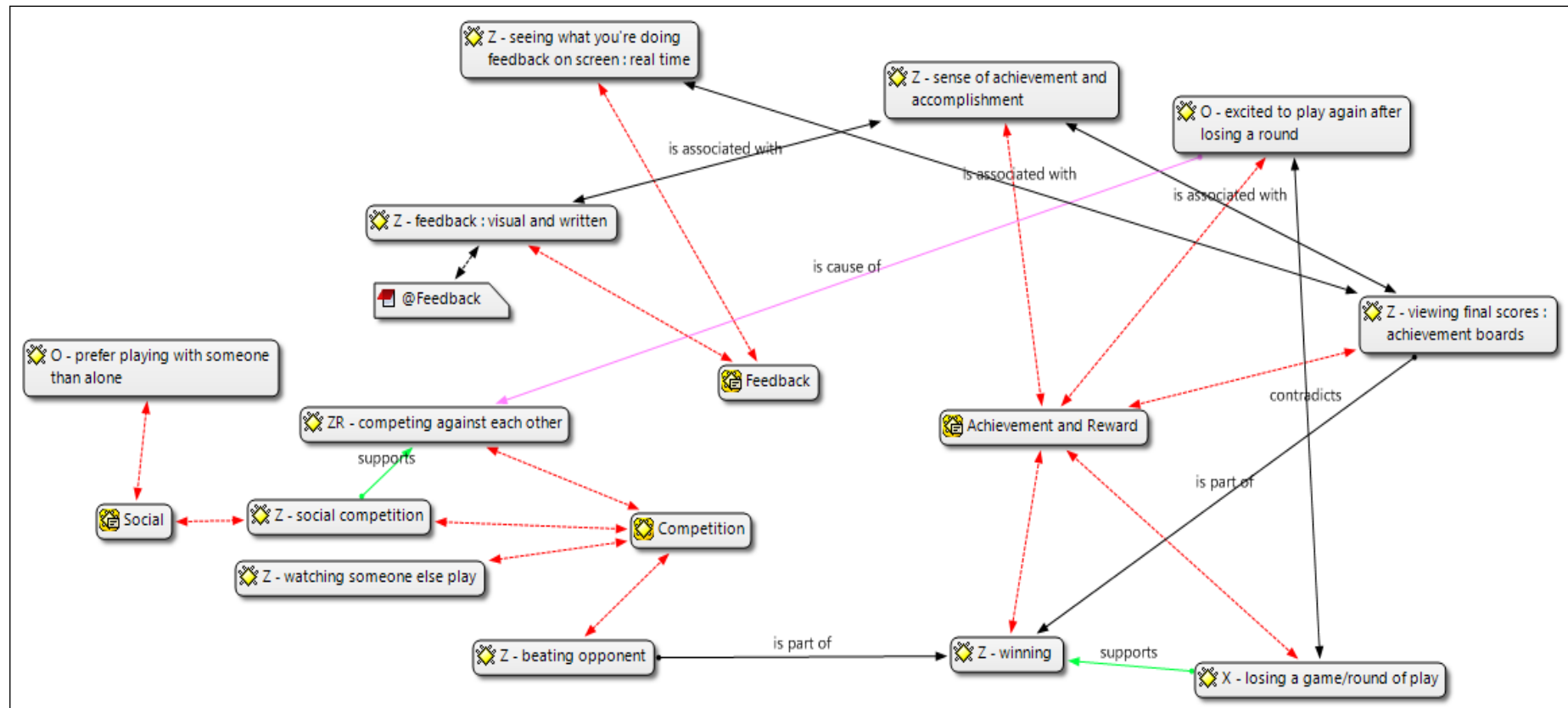
[7]**Figure 5.15: Feedback from AVG to gamers and sense of achievement experienced**

[7]Figure 5.15: Red lines indicate relation to origin code group. Green lines indicate support relationships. Pink lines indicate "is cause of" relationships. Black lines indicate "is part of", "contradicts", and "is associated with" relationships between nodes.

Viewing final scores and leader boards had the highest level of groundedness in achievement and reward. The act of observing one's final score was the most prominent point of engagement and immersion with the AVG for most gamers. Viewing one's final score is a part of winning or measuring how well the gamer performed, and is associated with a sense of achievement and accomplishment.

"Winning" as an engaging and immersive experience is supported by noting that losing a game contributes towards lowered levels of engagement. Gamers lost interest in playing an AVG if they lost more often than they won. However, this is a contradiction to the observation made, whereby gamers are more excited to play after losing a round. In the instance of this observation of losing, it was usually related to a competitive loss whereby someone would be eager to play again in order to beat their opponent. This was noted between 2Awesome and Toefm, when the one lost, the other wanted to play again to do better.

Winning, feeling accomplished, and observing how well an AVG gamer performed each contributes towards being engaged and immersed in the AVG; however, it occurs through the feedback mechanisms of the AVG. When a player's actions reflect in real time on the screen, it evokes immersion into the AVG. Written and visual feedback are indicators of how well the gamers are doing, which is important because it allows the gamers to make changes where necessary to improve their performance and their chance of winning.

Competitiveness has a major influence on the engagement and immersive states of the gamer and ties into the replayability of the AVG (Figure5.16). Competition contributes towards the immersive and engaged state a gamer experiences, through the experience of "beating your opponent". Beating your opponent is a part of winning, which is an enhancing factor to being engaged and immersed. Also, many participants, including ICARUS (during his post-workshop interview), 2Awesome, JuniorKidd, and Toefm (during their voice recorded interview) reported that they prefer playing with someone rather than playing alone, and the act of playing with someone improves their desire to want to play. The reason for preferring to play against someone was the sense of competition that came out of it.

Figure 5.16: ICARUS and Pineapple55 competing against each other

5.3.8   Network 8 - Motivation to play the AVG
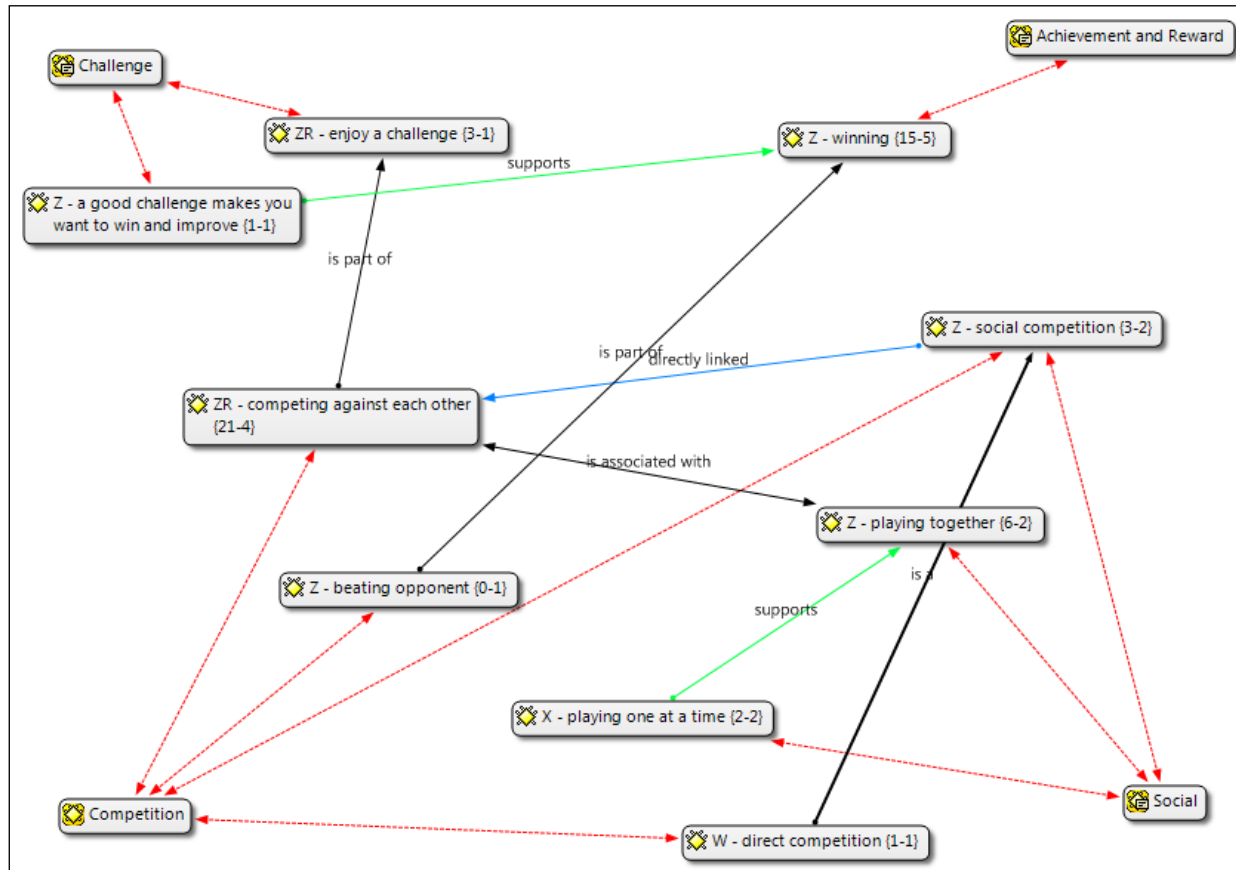
Figure 5.17: Motivation to play the AVG

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[8]Figure 5.17: Red lines indicate origin code group. Blue lines indicate directly linked relationships. Green lines indicate support relationships. Black lines indicate "is part of" and "is associated with" relationships.

Having a reasonable challenge is extremely engaging and immersive for players. If gamers do not have a manageable challenge they are able to overcome, they are likely to either become bored or frustrated. Having a good challenge encourages engagement and immersion. Overcoming a fair challenge gives the gamer a sense of accomplishment and reward, which is noted through the act of winning. However, another way of receiving a challenge is through direct competition with another gamer. Competing against another gamer is highly engaging and immersive and encourages replayability. This is supported by the social factor in gaming, whereby playing together socially is a highly enjoyable experience. Most AVG players displayed a preference of playing with another over playing individually. The social aspect when coupled with direct competition drives the motivation for gamers to play AVGs (Figure 5.18).

Figure 5.18: Lenboxs and Fiki competing against each other

5.3.9 Network 9 - Realistic experiences in AVGs and the role of avatars
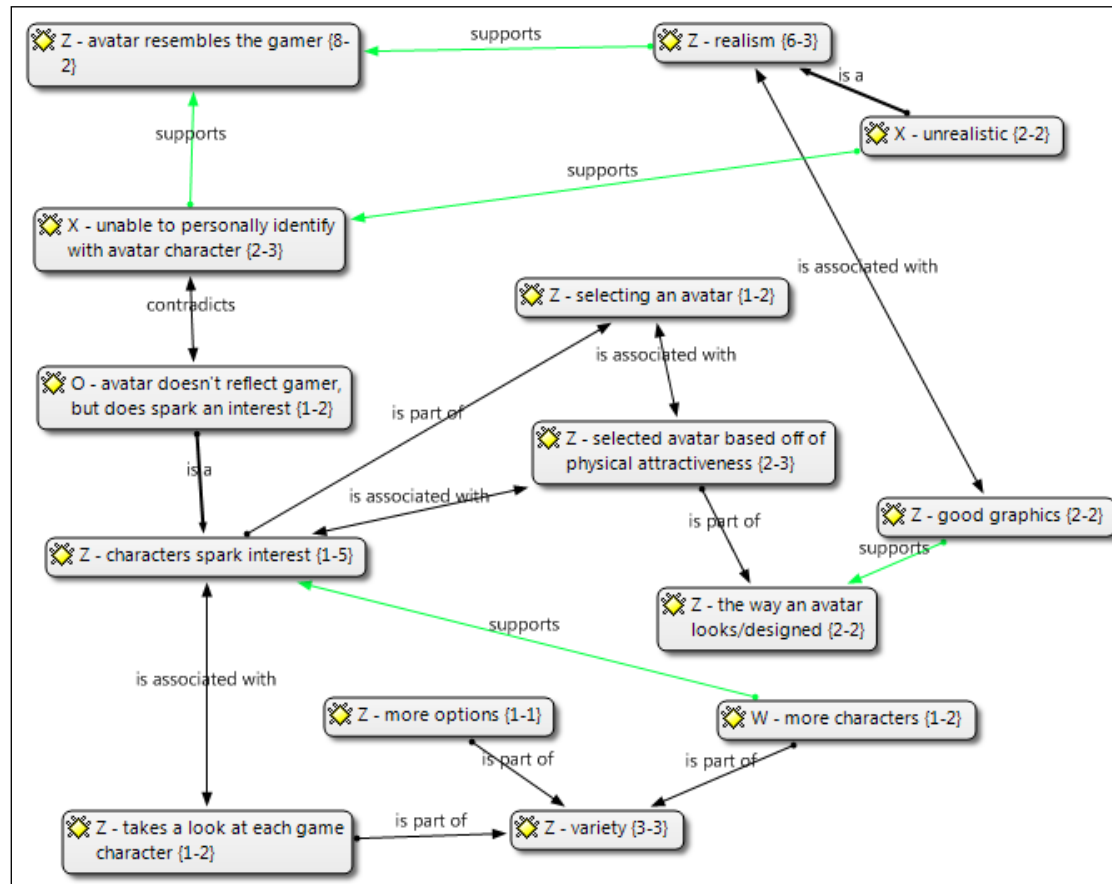
[9]**Figure 5.19: Realistic experiences in AVGs and the role of avatars**

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[9]Figure 5.19: Green lines indicate support relationships. Black lines indicate associative relationships, as well as contradiction and "is part of" relationships.

The more realistic features appear to be in an AVG, the more immersive it is for the gamer. This is supported by the observation that gamers dislike unrealistic attributes in an AVG. This is closely related to the design and appearance of the avatars available in an AVG.

Gamers become more immersed and engaged in the AVG when they can identify themselves in the avatar with which they play. This was apparent when ICARUS explicitly stated he was selecting his particular avatar because it is dressed the same way as himself (Figure 5.20). He further went on to keep that same avatar throughout his time playing Dance Central 3, despite there being a number of other avatars to choose from.

Figure 5.20: ICARUS matching attire to avatar

This contradicts the observation that gamers like to have variety, because when presented with a number of characters to play with, they were likely to choose and keep the one that mostly resembles them self, even if the only attribute they share is the same gender.

This was also noted throughout Peach and Pear's experience when playing Shaun White, in that they did not want to play as the male character, and this caused a drop in their engagement of play. They were not focusing, because they did not like the non-relating avatar they were playing with.

However, in contradiction to relating to the avatar, it was observed that despite the avatar being different from the gamer, the avatars in themselves sparked much interest in the gamers and encouraged engagement and immersion. When there was a large variety of characters to choose from, gamers took their time to browse through each option (Figure 5.21). And when the avatar did not resemble the gamer, players were more likely to select them based off their design and appearance (Fiki and Lenboxs selected avatars based off their physical attractiveness).

Figure 5.21: Variety of avatars to select from

Although good graphics and realistic features encouraged and enhanced engagement and immersion, it has not negatively influenced AVGs with poorer graphics, as the participants who played on the Nintendo Wii and who played XBox Kinect Adventures reported experiencing high levels of fun and engagement throughout their workshops, despite the other games having a less realistic appearance and non-human avatars (Figure 5.22 and Figure 5.23).

Figure 5.22: XBox Kinect Adventures less realistic appearance

Figure 5.23: Mario and Sonic 2012 Olympics non-human avatars

Therefore, relatively poor graphics and appearance were not enough to put gamers off from playing AVGs.

5.3.10 Network 10 - Replayability of AVGs
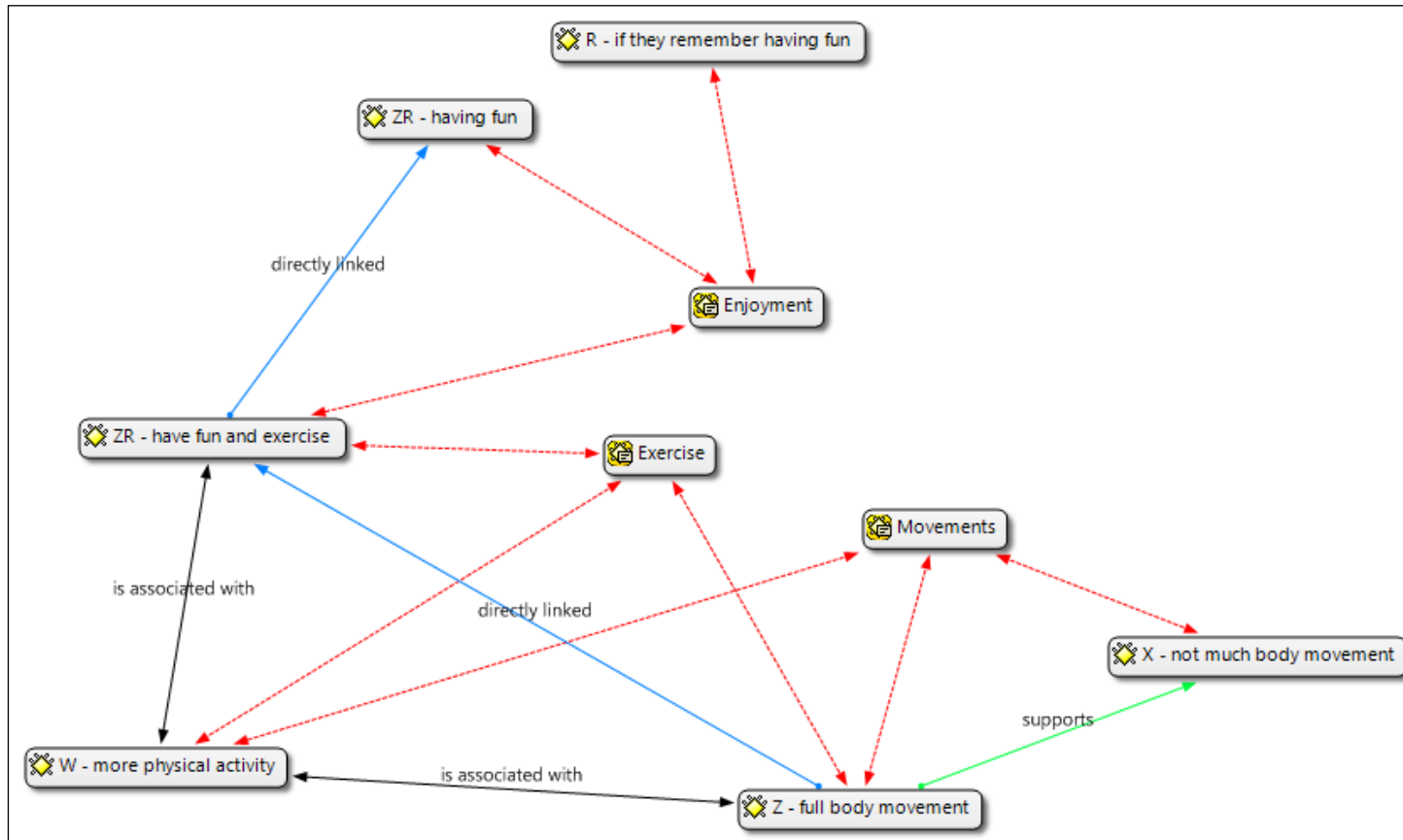
This category speaks directly to the research problem as it addresses the issue of playing an AVG again after its initial use.

When asked, "What would make you want to play again?" participants' answers mostly included having fun, or remembering that they had fun when playing the AVG. When mentioning having fun, it was often coupled with "having fun while exercising". AVG gamers placed an almost direct relationship between exercising and having fun.

When asked about what the AVG gamer would like to see more of being incorporated into the AVGs they were experimenting on, Toefm, JuniorKidd, and 2Awesome each wanted more physical activity added to the gameplay activities. This could be influenced by their level of fitness (each of whom is fit). However, full body movement was noted to be an enhancing factor towards high levels of engagement and immersion. This is supported by the observation that "not much body movement" was related to low levels of engagement and immersion.

Figure 5.25: Toefm and 2Awesome running on the spot

Full body movement is exercise or physical exertion. It was noted that the more the body moves, or the more one exercises, the more that individual is experiencing engagement and immersion, which directly correlates to having fun and exercise. This directly influences an AVG gamer's enjoyment and desire to want to persist in playing an AVG after its initial use (Figure 5.25).

5.4   Beginning a new phase of CGT data analysis - theoretical coding

The theoretical coding phase marked the final step in the data analysis process for CGT with the expected outcome being a proposed theoretical model consisting of

saturated core categories (Sbaraini et al., 2017). To achieve theoretical sensitivity, another trial and error approach was needed to find which method would best fit the abstraction task.

Theoretical sensitivity is one's ability to understand an empirical phenomenon in theoretical terms (Glaser, 1992). By doing so, relevant concepts may be identified in the phenomena to indicate some type of coexistence between the emergence of the data (Kelle, 2017). This is a necessary step needed in the final phase of CGT in the final formation of a theoretical contribution.

After conceptualising the code groups by network views, there was still a large volume of data to work with and further abstraction was needed to reach theoretical sensitivity. This caused a problem in deciding how to manage and conceptualise the network views to make theoretical sense of it.

Because of the large volume of data being used, an assistive method to further abstract the data was needed. Literature was consulted on how to achieve theoretical sensitivity in a GT study. It was during this search that the researcher found Glaser's coding families. The coding families seemed to be an appropriate method to use because it provided a systematic approach to filtering data and making sense of it, and it potentially allowed the researcher to have a better sense of control over working with a large volume of data.

5.4.1 Glaser's coding families approach

Theoretical coding families stem from different sociological and philosophical contexts and are grouped together into families to allow the researcher to better identify relations between their codes (Kelle, 2017:4). The purpose of Glaser's coding families is to bridge the gap that exists between the emergence of data in a researchers work, with the achievement of theoretical sensitivity (Kelle, 2017:3), which is the process of abstraction and moving from phase two of focused coding to phase three of theoretical coding. However, there are many limitations and disadvantages when using Glaser's constructs that may possibly stifle the data and making the task too laborious for novice researchers (Kelle, 2017:4; Böhm, 1994:5).

5.4.2 Attempting Glaser's coding families method

After attempting to utilise some of Glaser's coding families to classify the substantive codes already found, it was found that the method was, as the literature indicated, too restrictive and it appeared to force the data into predefined moulds (see AAPPENDIX E: GLASER'S CODING FAMILIES for enlarged image).
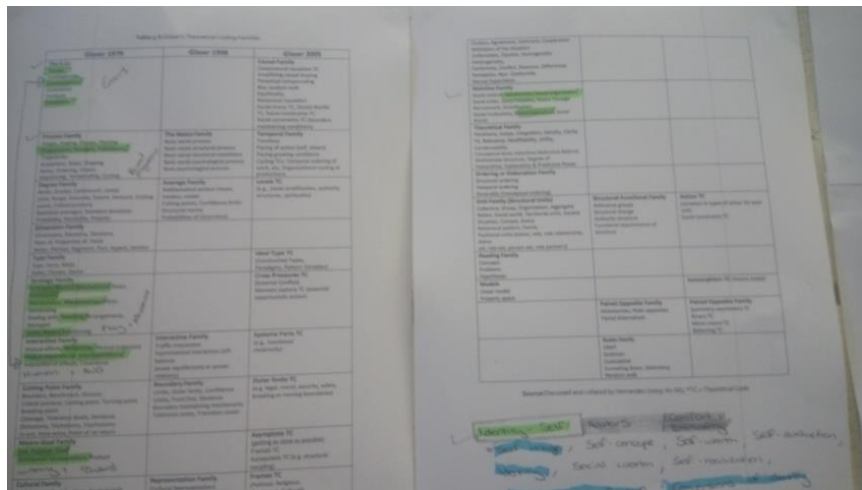
Figure 5.26: Attempt to fit existing categories into Glaser's coding families

Along with the resistance to force the data into predefined moulds, the researcher being a novice was not in the best position to be using Glaser's coding families, as it required extensive knowledge of how to apply it correctly to one's research (Kelle, 2017:6; Böhm, 1994:5). A thorough understanding of Glaser's coding families was needed and the researcher greatly lacked in that knowledge. With these two reasons in mind, it was decided to abandon the use of Glaser's coding families to further abstract the core categories and to reach theoretical sensitivity.

5.4.3 Asking the analytical question

It was difficult to find an appropriate means to further conceptualise the tentative categories. After careful consideration, the ten network views were taken into account and a specific analytical question was asked: "What common pattern/trend occurs through all or most of the sets of networks?"

Taking into consideration the events that took place throughout the workshops and interviews, as well as the relationships formed between the code groups, the following concept emerged: that at some point the gamer experienced a state of being engaged or immersed; however, that alone was not sufficient to guarantee the continual use of an AVG. Two steps are needed to ensure replayability.

5.4.3.1 Developing the theory

The first draft is shown in Figure 5.27.
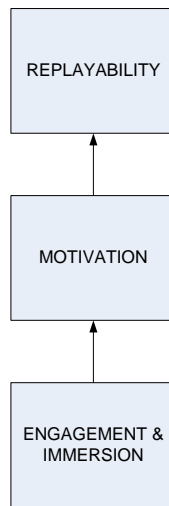
Figure 5.27: First draft of the final theory

When analysing each of the networks there is acknowledgement of some flow between being engaged and being motivated which will in essence lead to replayability. However, this fails to address many of the minor details, such as what if someone is engaged but still does not play? As a result, a further adaption of the conceptual model was designed, as shown in Figure 5.28.
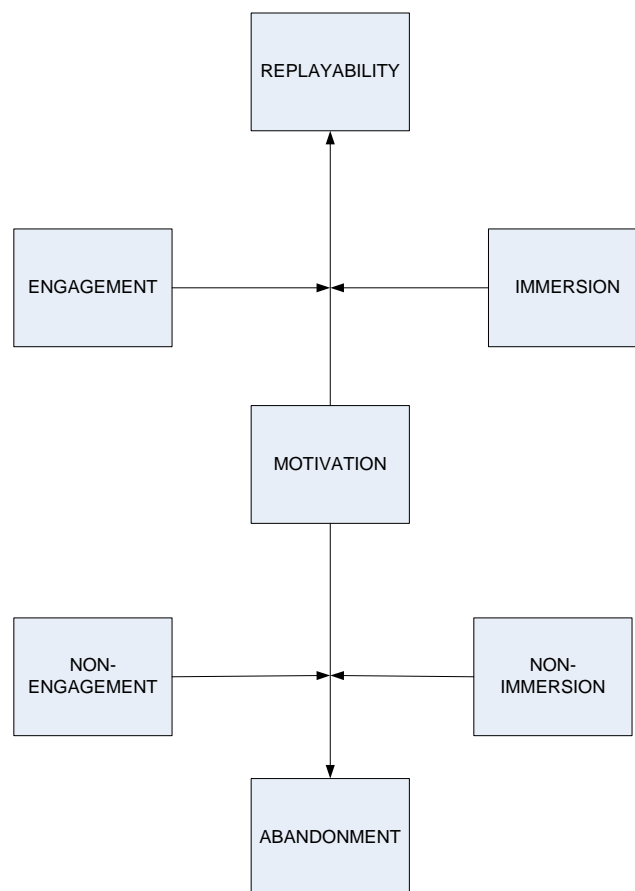
Figure 5.28: Second variation of the constructed theory

The second diagram better illustrates the idea that being engaged and immersed leads to replayability, and it acknowledges that the lack of engagement and immersion or factors leading directly to distraction contribute towards abandonment. Motivation plays a pivotal role in the mix as well. The problem with this diagram is the assumption that motivation drives the inhibiting and enhancing factors of engagement and immersion, is not necessarily true, i.e. being motivated results in engagement and immersion, and not being motivated results in disengagement and non-immersion. Motivation is argued as an independent factor that should stand on its own in conjunction with the inhibiting and enhancing factors.

Ultimately, these two theoretical model drafts led to the final diagram, which more accurately illustrates the factors contributing to replayability and abandonment. Figure 5.29 is explained in Chapter Six (Play Active Theory explained). The theoretical construct as shown in Figure 5.29 best describes the inhibiting and enhancing factors contributing towards the engagement and immersion of AV gamers, specifically what leads to the abandonment and replayability of an AVG.

For easier readability purposes, Figure 5.29 is redesigned to better illustrate the flow of the continuum discussed in Chapter Six, section 6.2. The redesigned diagram holds the same meaning and utilises colour and a horizontal line to depict the movement of the continuum, as it is easier to read from left to right.
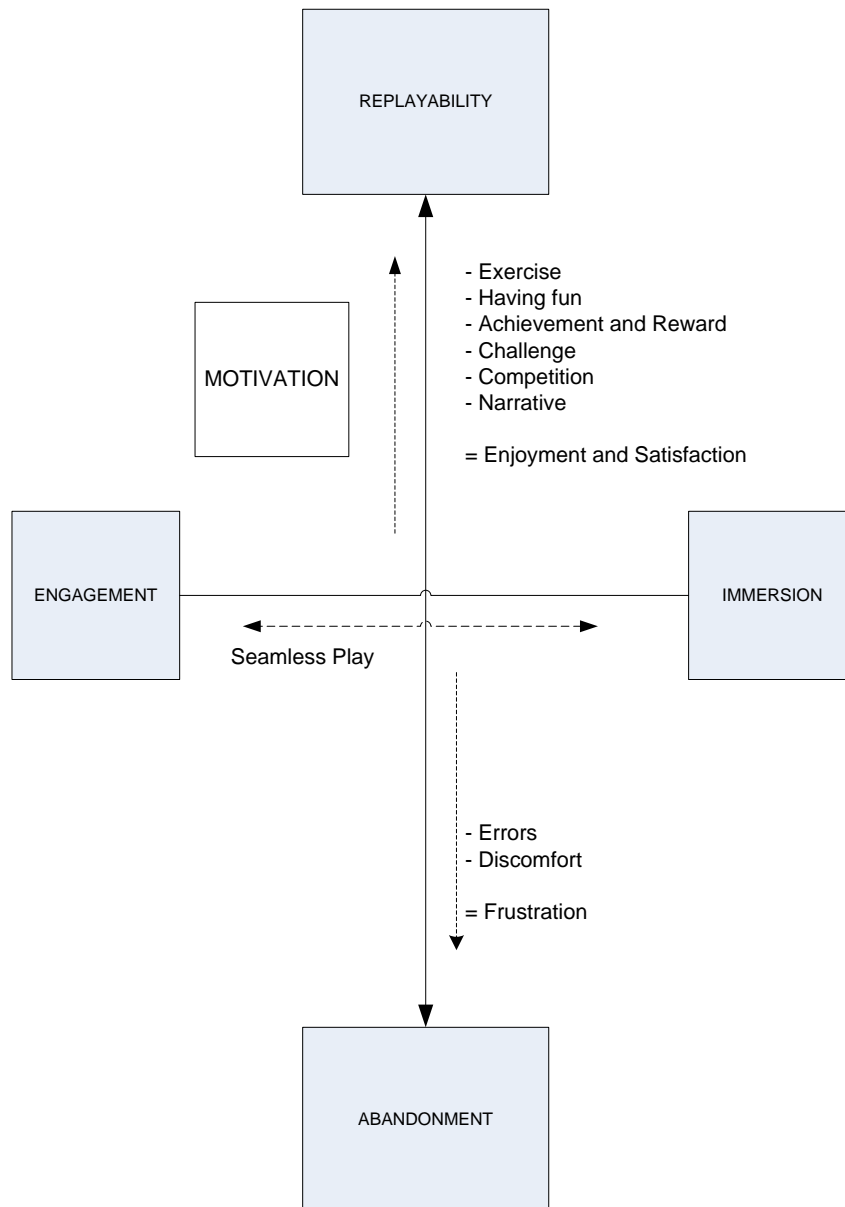
Figure 5.29: Completed constructed theory

5.5 Summary

The focused and theoretical coding phase of CGT in data analysis was conducted and the outcome is a proposed theoretical model depicting the design factors in AVGs that influence a gamer's engagement and immersion levels. The proposed theoretical model was formed through the abstraction of ten network views (section 5.3), which consist of substantive codes and relationships. This chapter also addressed the evolution of the data collection tool, and closed with the final theoretical construct, which is explained in detail in Chapter Six.

6. CHAPTER SIX: DISCUSSION

6.1 Introduction

Chapter Six serves as a secondary literature review (see section 2.1), however, in keeping aligned with CGT, the nature of the secondary literature review differs from traditional literature reviews in that it also serves as a discussion of the theory constructed. According to Giles et al. (2013:5), the purpose of conducting a secondary literature review for a CGT study is "to allow the researcher to engage with ideas relevant to the research and to assist the researcher in positioning their study in the existing body of knowledge, as well as to clarify the theoretical contribution being made". The chapter starts by explaining the constructed theory developed in Chapter Five, which is grounded in the data, compares it to the current literature and then adapts the final theory once it incorporates the relevant ideas noted. The literature review serves as additional data in a constant comparison against the constructed theory, which determines how the theory is edited and refined (Glaser, 1998:67). To end the chapter, the final proposed theory is positioned in the existing body of knowledge to ensure a valid contribution has been made.

Literature was reviewed in comparison to the emerged theory. The searches were conducted through CPUT's online libraries whereby the researcher interrogated the academic databases of EBSCOhost, Scopus, IEEE Xplore Digital Library, Google Scholar, Emerald, ScienceDirect, and SpringerLink. Keywords were derived from the constructed theory: "engagement and immersion", "motivation", "abandonment and replayability", "challenge and competition", "achievement and reward", "exercise and having fun", and "active video games". These key words guided the secondary literature review. However, searches were limited to articles in relation to motivation theories, mostly because the search had to be more focused. Not all literature was consulted.

Chapter Five closes off by depicting a diagram of the final constructed theory, which is labelled Play Active Theory (PAT). This is a substantive theory derived from the data collected and formed through the process of CGT. Section 13.2 discusses PAT in detail and compares it to Flow Theory (FT), Self-Determination Theory (SDT) and Social Identity Theory (SIT). Each theory either serves as a motivational theory or a theory that relates to engagement and immersion.

6.2   Play Active Theory explained

Figure 6.1 depicts the constructed theory formed through the CGT process and explains the nature of engagement and immersion that gamers experience when playing AVGs as well as their enhancing and inhibiting design factors contributing towards participants' experience. The theory is labelled the Play Active Theory (PAT) and should be viewed as being two halves of the same continuum.
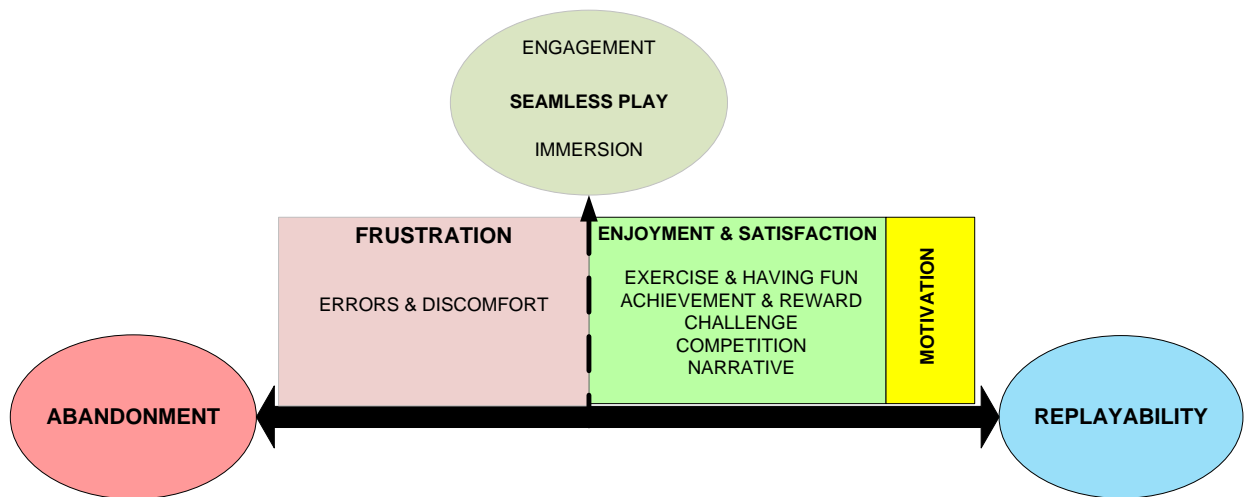
Figure 6.1: Play Active Theory (PAT) diagram

PAT starts at the left side of the diagram. There are a number of design factors leading to abandonment in AVGs for a gamer. Influential inhibiting design factors to engagement and immersion in AVGs are mechanical errors, such as bugs and glitches resulting in for example games crashing or freezing. The second inhibiting factor to engagement and immersion would be a feeling of discomfort by the gamer. This could occur because of a number of reasons, such as the AVG requiring the gamer to contort their body into uncomfortable and awkward positions. The uncomfortable feeling can increase when surrounded by other people that would be considered 'strangers' or 'non-friends'. When a culmination of inhibiting factors occurs, frustration increases in the gamer. Either a build-up of frustration or a once off bug/glitch could be sufficient to result in abandonment of the AVG.

On the other hand, if the gamer does not experience any errors and discomfort, they are likely to become seamlessly engaged and immersed in the AVG. This is the vertical dotted line connecting the two halves of the continuum. Once the gamers find that they are experiencing a seamless state of engagement and immersion, they may still abandon the AVG once they cease to play.

For replayability to be achieved, the gamer needs to at least be experiencing seamless engagement and immersion. For the AVG to be replayable, the engagement needs to be seamless in that there are no distractions to their engagement and immersion. With the presence of enhancing factors and motivation factors, the gamer will more likely experience replayability. The more the gamer experiences enhancing factors, such as competition, challenge and reward, the more immersed the gamer may become and this betters the chance for replayability. However, these enhancing engagement factors may still not be sufficient to ensure replayability. It only moves the gamer higher on the PAT continuum towards replayability. Once intrinsic motivation is introduced to the continuum alongside enhancing factors, the more likely the gamer will experience replayability.

One of the most influential enhancing factors of engagement and immersion that may lead directly to replayability is having fun while exercising. This was noted by the majority of participants (2Awesome, Toefm, ICARUS, JuniorKidd, Pineapple55, and Lenboxs) whose responses indicated having fun and exercising together in the same answer when asked the question, "What would make you want to play again?" during their interviews. Along with this, to ensure replayability the gamer needs enhancing engaging and immersive factors as well as a motivational factor to encourage intrinsic motivation to want to persist in playing AVGs. Therefore, a formula for achieving AVG replayability could be:

Replayability = Seamless engagement and immersion + enhancing factors + motivational factor

6.3   Comparing PAT to the literature

Throughout reviewing the literature pertaining to the design of video games and AVGs, researchers mention a number of supporting theories that influence these artefacts. Of these theories four stand out in particular, as they are mentioned across articles. The theories currently influencing the design of AVGs and video games are: Flow Theory (Csikszentmihalyi, 1975), Self-Determination Theory (Deci & Ryan, 1985), Social Identity Theory and ARCS theory. Each theory is briefly explained and compared against PAT to identify supporting and differing claims.

6.3.1   Flow Theory

Flow Theory (FT) is mentioned across a number of AVG design articles and represents the psychological side of how a gamer would interact with the game (Bunnell & Pruna, 2016; Csikszentmihalyi, 2007). Originally founded by Csikszentmihalyi (1975), FT is known as "complete absorption in what one does" or

as "optimal experience and optimal development" (Nakamura & Csikszentmihalyi, 2002:1).

In the design of AVGs, FT is utilised with the hope that it may increase the habitual use of playing these type of video games (Straker, Fenner, Howie, Feltz, Gray, Lu, Mueller et al., 2015:5). With regard to the habitual use of AVGs, FT makes mention of an "autotelic experience", which is an intrinsic motivation to participate in any given activity (Nakamura & Csikszentmihalyi, 2002:1). Therefore, the main purpose of implementing FT in the design of AVGs is to get gamers to persist in the usage of these products. Altamimi and Skinner (2012:10) further support this notion as they list FT as being necessary for ensuring the sustainability of playing exergames, and therein achieving the health benefits associated with these games.

A number of characteristics constitute being in a "state of flow" or being optimally engaged and immersed in an experience. With regard to the design of AVGs, specific conditions are needed to be in a state of flow. According to Garell (2015:34-35) and Straker et al. (2015:5-6) the conditions required are:
  i.   A balance between the activity's level of difficulty and the gamer's level of skill to overcome the challenge
  ii.   Presentation of clear goals and objectives in the AVG
  iii.   Immediate and continuous feedback during and after gameplay
  iv.   Full concentration of the gamer
  v.   The gamer must feel a sense of control
  vi.   Intrinsic motivation
  vii.   Sense of losing track of time
  viii. Social immersion and interaction

These characteristics represent the features of FT in the design of AVGs and they are somewhat coherent with PAT proposed in this research. PAT supports FT in that it lists a set of requirements favourable for the gamer to be in an optimal state of engagement and immersion. Some of these requirements are: full concentration of the gamer, presentation of clear goals and objectives in the AVG, the feeling of a sense of control by the gamer and intrinsic motivation. However, FT differs in that it does not mention a sense of a continuum whereby the amount of engagement experienced or not experienced leads to replayability or abandonment of AVGs. If FT is adhered to, the gamers may find themselves on the vertical line of the PAT whereby they will be in a state of seamless play, which is the first step required before they can achieve replayability.

6.3.2 Self-Determination Theory

Self-Determination Theory (SDT) is used in the design of video games as a means to ensure the persistence of its usage as well as a motivational theory to encourage intrinsic motivation to encourage gamers to continue their habitual use of AVGs (Zhang et al., 2016:4; Neys et al., 2014:2). Persistence can refer to a behavioural pattern which is concerned with continuing to play video games, despite setbacks, insufficient rewards, and frustration of achieving goals (Neys et al., 2014:2).

According to Zhang et al. (2016:4), SDT is based off a continuum structure whereby there are two opposite extremes: one being amotivation and the other being motivation. This theory looks at the types of rewards associated with different levels of motivation. It also claims that the more time one spends engaged in a habit, the more likely they are to be intrinsically motivated, which is considered the most self-determined form of motivation (Neys et al., 2014:3).

This continuum structure relates to the structure of PAT as it indicates a movement between the states experienced by the gamer. In PAT, the more one moves to an end of the spectrum, the more likely they will experience replayability (or abandonment of the AVG), which is similar to the notion of SDT, whereby intrinsic motivation results in an individual participating in an activity out of their own free will, regularly.

According to SDT, when an individual is considered amotivated, that individual requires external rewards to further motivate them to persist in an activity, but the more intrinsically motivated individuals are, the more likely they will partake in an activity out of free will (Zhang et al., 2016:4). PAT relates to SDT in that when the individuals find themselves at the lower half of the diagram (and are not in a seamless state of play), they require that distracting factors be removed and engaging factors be present. These are external factors. When a seamless state is achieved, motivation is required to encourage gamers to experience replayability. The rewarding factors mentioned in PAT, such as "achievement and reward", serve as motivational factors to encourage replayability in AVGs.

SDT relates to FT, as Csikszentmihalyi (1991) claims that one of the principles to achieve flow is intrinsic motivation, otherwise referred to as an "autotelic experience", whereby doing the task becomes a reward on its own.

The four extrinsic motivations that make up the continuum are external regulation whereby: i) behaviour is controlled by external rewards, ii) introjected regulation,

iii) where an individual seeks social approval to motivate their behaviour, iv) identified regulation, v) where someone does an activity because of their own interests and abilities, and vi) integrated regulation whereby an individual partakes in an activity because it has become a part of their lifestyle (Zhang et al., 2016:4). Figure 6.2 depicts a visual overview of SDT.
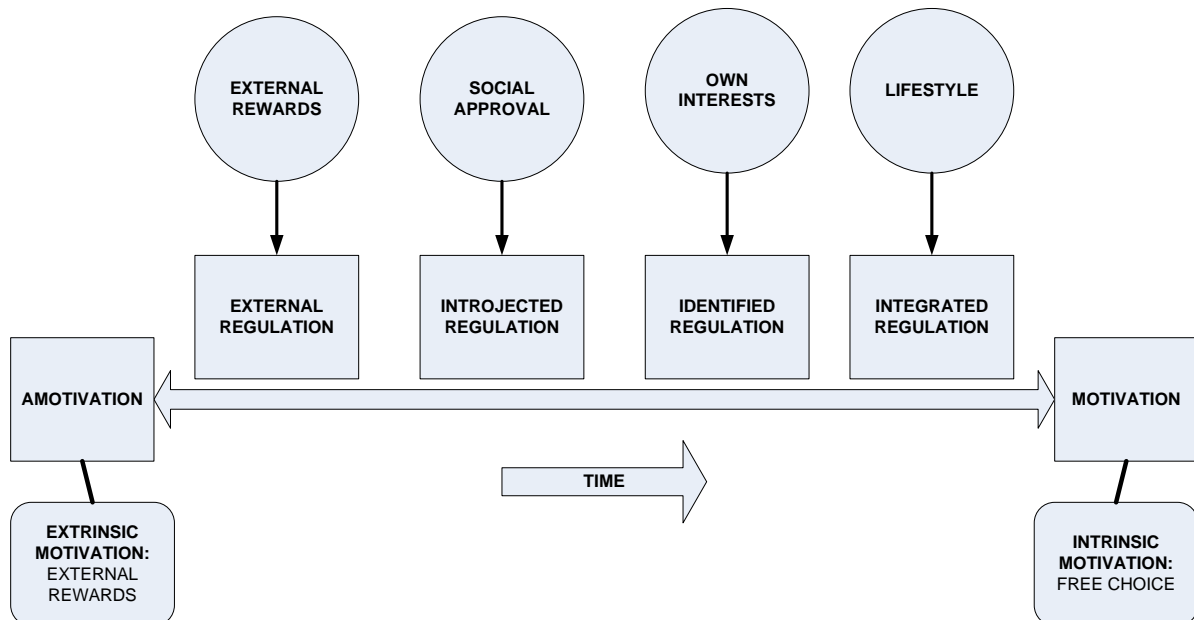
Figure 6.2: A visual representation of SDT

PAT differs from SDT in that SDT does not address specific factors that inhibit or enhance the gamers experience when playing AVGs. It addresses the motivational factors which encourage gamers to participate in an activity. However, aspects of SDT and FT, such as the continuum structure and movement of motivation in SDT and specific conditions needed to be met in FT, align with the principles of PAT.

6.3.3 Social Identity Theory

Social Identity Theory (SIT) is not as prominent as FT and SDT. However, it contributes towards what could possibly influence persistence in playing AVGs. By explaining the social dynamics of video games, SIT assists in understanding what could possibly motivate an individual to play AVGs (Neys et al., 2014:1).

SIT suggests that the way in which individuals classify themselves along with their social group, has an association with levels of motivation (Neys et al., 2014:3). Therefore, if classified as being a gamer, the gamers would conform to the norms of that type of group, be it that they play digital games. This idea is supported by Johnston and Whitehead (2011:2) who note that a sense of community among gamers can be formed in an online gameplay environment or in a physical reality of

a social group of friends. According to Neys et al. (2014), the more an individual identifies themselves through gaming, the more likely they are to persist in playing despite in-game setbacks and challenges.

The different types of gaming groups can be classified as: i) heavy-gamers, ii) hardcore-gamers, and iii) casual gamers (Neys et al., 2014). There is no hierarchical structure to the type of gamer one might classify themselves as. Each group, depending on their own perceived level of identity to games, would persist in playing video games differently to the other groups.

PAT supports SIT with regard to the social dynamics. PAT recognises that social influence, especially with regard to a "healthy social challenge", greatly influences the motivation one has to continue playing an AVG. However, it differs by claiming that the way gamers identify themselves influences the persistence of playing. Throughout this study, it is found that gamers are likely to persist in playing when a friendship is present between competitors. The friendship level of participants and the level of healthy competition determined whether or not the gamers felt a need to play again. The way in which the players identified themselves in the study did not influence their desire to want to play again.

6.3.4 Attention, Relevance, Confidence and Satisfaction (ARCS) theory

While researching SDT, the researcher came across its origin, which lies in the education field (Chen & Jang, 2010:1). Chen and Jang (2010:1) introduce the ARCS motivational model, which was originally created for being used in the discipline of education. The authors highlight the value of the ARCS model and they also show that educational motivation theories can be applied across disciplines, such as using SDT in the areas of politics, healthcare, and religion (Chen & Jang, 2010:1). Furthermore, Jokelova (2013:1) agrees with Chen and Jang (2010) by stating that the ARCS model can also be used within a variety of fields and for a variety of audiences. It is with this reasoning that the researcher decided to further investigate the ARCS motivational theory to determine whether or not the principles would apply to the AVG discipline, as well as to compare the findings of this research with the ARCS motivational theory.

The ARCS (Attention, Relevance, Confidence and Satisfaction) motivational model was developed to address issues regarding learning motivation (Jokelova, 2013:1). The model deals with the concept of becoming and remaining motivated to persist with the task at hand, which originally is to motivate students to learn academic content (Visser & Keller, 1990:4). ARCS comprises four main components, each of

which should be met in order for someone to become and remain motivated to persist in performing a task such as learning (Yau, 2015:2). The four components of the ARCS model are: i) attention, ii) relevance, iii) confidence, and iv) satisfaction (Yau, 2015:2; Jokelova, 2013:1; Visser & Keller, 1990:4).

6.3.4.1 Attention

The purpose of the A in ARCS is to acquire and maintain the attention of students throughout the instructional content (Yau, 2015:2; Jokelova, 2013:1). In alternate disciplines this translates into acquiring and maintaining the attention of the audience throughout the activity. The category of attention holds two subgroups, which is curiosity and sensation seeking (Keller, 2008:2-3).

Curiosity addresses the students' attitude towards unresolved problems and how they would become engaged through techniques that stimulate the learners' sense of inquiry (Keller & Suzuki, 2004:3). Jokelova (2013:1) also notes that if the process of discovering the unknown does not occur fast enough, the students' motivation to continue will diminish. This identified need for exploring the unknown translates into what is observed in AVGs, as firstly the gamers' attention would need to be acquired (becoming engaged) and then maintained. Curiosity in AVGs could manifest itself in the gamer exploring the artificial world and discovering unknown areas, being motivated through in-game objectives.

A principle from curiosity which translates into the experience a gamer has with AVGs is the amount of time an activity can take. As is found with the dragged-out cinematics and time consuming game rounds, the gamers lost interest in playing (refer to Chapter Five, section 5.3.4).

With sensation seeking, one should vary the approaches taken to invoke stimulation, as people are bound to lose interest in any given activity after time has passed (Keller, 2008:3). This presents itself as the need for novelty. With the origin of ARCS in a classroom environment, students show a need for novelty in order to motivate their learning experiences. This can be directly seen with regard to gamers engaging with AVGs. There is a prominent desire for novelty as gamers found it kept them interested in playing the AVG.

The ARCS model goes on to suggest strategies for combating each obstacle to one of its four categories (Jokelova, 2013:1-2). With regard to attention, the model suggests using variation as a tool against monotony, which learners found brought about a sense of boredom (Keller, 2008:3). This is found as an appealing

characteristic in AVGs as gamers showed a great interest in variation, having many options at their disposal and found that it made the AVG more interesting. Another strategy suggested by the ARCS model to capture and maintain attention is to change the modes of delivery of instruction to the learners (Keller & Suzuki, 2004:3). This can be seen by the participants in this study, when AVG gamers show a great deal of importance regarding "being informed" and many list that they prefer audio, written, and visual (pictures) modes of instruction.

In addition to the previous suggestions, another is for educators to include humour into their lessons to gain the attention of the learners (Jokelova, 2013:2). This is also noted in AVGs with regard to the narrative storylines the games follow. Gamers indicate a preference for funny storylines, with particular regard to the PS4 AVG, Rabbids Invasion. Another strategy recommended to gain the learners' attention is to provide them with a choice to pick topics that suite them (Keller, 1987:4). This is clearly seen with the participants in this study who indicate their liking of having options available for them to make choices, relating to which avatars they can play with, the sound tracks to play to, customisation options for features in the game such as camera angles and the choice of which mini-games to participate in.

The category of attention ties in closely with PAT, as it agrees that the first step to maintaining motivation of the audience is to capture the individuals attention and then to apply strategies to maintain it. This relates to the horizontal line of PAT, which says gamers first need to be engaged seamlessly before they can achieve replayability, which would be sustained motivation to play.

6.3.4.2 Relevance

Relevance refers to perceptions and feelings towards desired outcomes or ideas based upon one's own goals, values, and motives (Keller, 2010). This means that an individual becomes motivated to engage in a learning activity (or any activity, including the use of AVGs) when the activity presented serves to fill the needs or goals of the individual. As long as the activity itself is seen as relevant to the person (in terms of meeting their goals, matching their values, or being in alignment with their motives), the individual will likely be motivated to participate in that task.

Relevance in ARCS concerns itself with meeting or satisfying the needs of the students, as well as saying that when the students' goals are being achieved through the activity, learners are more likely to stay motivated (Keller, 2008:3; Keller & Suzuki, 2004:3; Keller, 1987:3).

Looking at the category of relevance in further detail, it can be broken down into the need for achievement, power and affiliation, as well as being associated with a level of competence (Keller, 2008:3). PAT aligns with this notion because achievement and reward is a key factor in ensuring replayability. The gamers became more motivated when scoring highly, completing the main goals of the AVGs, and when beating their opponents.

The need for power manifests itself through team work, whereby the group all works towards accomplishing a common goal (Jokelova, 2013:2; Keller, 2008:3). This is clearly noted in AVGs whereby group work is greatly valued in accomplishing a common goal, for example, when players were asked about the mobile AVG Pokémon Go, participant John reported that he enjoyed the social factor of the AVG where one could meet potentially new friends who all shared a common goal of catching Pokémon together in public.

According to Jokelova (2013:2), the need for affiliation is "the extent to which an individual seeks out social interactions and friendships with other individuals". This is in alignment with Social Identity Theory, as well as a sub-category of SDT, whereby the influence of social factors contribute towards an individual's intrinsic motivation to participate in an activity. It is also in direct alignment with PAT, as the social factor when included with healthy competition and friendship (in being comfortable playing around others), greatly improves one's desire to continue playing the AVG.

Lastly, with regard to relevance, the need to feel competent in what an individual is doing is highly valued and contributes towards learners staying motivated to complete their learning instruction (Keller & Suzuki, 2004:3). Being competent aligns with PAT in that being informed is highly valued by the participants. When the gamers felt competent and well-informed in what they were doing, they highly valued it and enjoyed their experience of playing AVGs much more. It is when there is a lack of clear instruction and not knowing what to do that they found themselves unable to play and lost their motivation to continue.

Therefore, the sub-category of relevance in the ARCS model aligns and reiterates what PAT portrays.

6.3.4.3 Confidence

According to Keller (2010:135), confidence is a sub-category of the ARCS model and refers to "people's expectancies for success in the various parts of their lives". However, it focuses more on the level of control that individuals have over their

behaviour (Yau, 2015:3). Jokelova's (2013:3) opinion gives more insight into confidence and describes it as when an individual believes they have a chance to succeed, knowing that the outcome of success was derived from the person's own ability to execute the task and not by an external influence. Therefore, the need to exercise control is highly valued and relates to the individual's motivation to persevere in the task at hand (Yau, 2015:3). Yau (2015:3) further affirms that perseverance is an effect of confidence.

Confidence deals with variables regarding students' perception and feelings of personal control and expectations for success (Keller, 2008:3). Jokelova (2013:3) states that with regard to confidence and the exercise of control, the amount of effort put in should reflect the amount of success achieved. Also, Jokelova further identifies a potential hazard, which is when an external influence or an uncontrollable factor leads to the learners' failure. Jokelova (2013:4) labels this as "learned helplessness" and directly links it to being disengaged and unresponsive. PAT relates closely with observation as bugs, glitches and errors, all of which are out of the gamers control and could potentially lead to the gamers' failure, adds to the level of frustration experienced, and often times results in the abandonment of the AVG (through being unresponsive to the game or disengaged).

Also, throughout the study it isnoted that gamers needed to feel to a high degree in control of their actions and felt more immersed in the AVG when they saw their movements being reflected accurately in the AVG. Being in control formed one of the tentative categories through which PAT is built.

6.3.4.4 Satisfaction
The final sub-category of the ARCS model is satisfaction and it refers to how individuals feel about their achievements, specifically feeling good (Keller & Suzuki, 2004:3). Satisfaction is different from the other three categories in that it concerns itself specifically with the post-activity (Jokelova, 2013:5). What is important to note about the satisfaction sub-category is that "it is a prerequisite for any future task" (Jokelova, 2013:5), meaning, satisfaction is the factor that motivates people to continue doing an activity after the present task has been completed (Proske, Roscoe, McNamara, 2014:3).

PAT is in agreement with this stance that the number one factor which directly relates to replayability is enjoyment and satisfaction. When gamers experience a culmination of the following factorsthey are likely to replay the AVG: i) having fun

while exercising, ii) achievement and reward, iii) challenge, iv) competition, and v) a good narrative (all of which lead to enjoyment and satisfaction).

Another factor of satisfaction refers to positive feedback immediately after the activity (Woo, 2014:6). After a task has been completed, educators are encouraged to give feedback to the students by commenting on the students' successful completion of the work (Jokelova, 2013:5). This reinforcement after the task increases the likelihood of the same behaviour occurring again in the near future (Keller, 2008:3). This is noted during the observation of gamers playing AVGs, whereby the gamers show a great interest in viewing their personal scores after each round of play. Scoreboards and in-game achievement feedback mechanisms are highly valued and encourage the gamers to improve on their current abilities.

6.4   Adapted PAT

After reviewing the literature and acknowledging that motivational theories are needed to be analysed and reviewed, comparisons have been made between PAT and current theories being utilised in the design of AVGs.PAT supported each theory to a certain extent.

PAT needs to stand on its own and represent the phenomenon at hand. Each theory currently in literature partially addresses the problem, but each theory lacks components of the other to successfully address the issue of persistence in playing AVGs. Therefore PAT, which identifies factors leading to replayability and abandonment of AVGs, is proposed as a new theory on gaming design.

6.5   Recommendations and future research

The ARCS modelis well structured and covers most of the existing motivational theories such as FT, SDT and SIT in one or more of its sub-categories. It is also discovered that the findings and principles of PATalign with each of the sub-categories of the ARCS model. Therefore, it is concluded that PAT fills the gap of knowledge for AVG motivation and engagement and immersion when being applied with the knowledge borrowed by the ARCS motivational theory.

The ARCS model should be used in the IT discipline when designing AVGs, as it incorporates all the findings of the factors leading to engaging and motivating gamers to persist in the use of these types of video games. PAT includes most of the points mentioned in the ARCS model, and it is recommended to utilise the ARCS model in conjunction with PAT, as the ARCS model gives specific structured

steps to motivate the people participating in the relevant activities and PAT is a more specific theory grounded in the experience of playing AVGs.

Future research should consider the testing pool for data collected and people sampled in order to get a greater perspective and analysis of the phenomenon. Future research should also consider testing other factors in AVGs and different scenarios and environments, which could yield different results. A different demographic of people should be sampled and tested as this might also bring forth new and different information. Further studies should be done internationally on AVG experiences, especially first world countries, as their cultures and economic climates may change the opinions and beliefs of participants in other parts of the world.

6.6 Summary

This chapter discussed PAT with regard to existing theories, including FT, SDT, SIT, and ARCS. Similarities and differences of the four theories were highlighted, and it was found that each theory alone is not sufficient to affirm PAT. After using the theories as a lens, these theories have been compared to the proposed PAT. After considering all the theories and their similarities and differences to PAT, it has been concluded that PAT can be proposed as a theory on its own.

6.7 Contribution

PAT contributes specifically to AVG designers and developers who wish to produce artefacts that will be replayable among AVG gamers and for people who wish to benefit from these types of games in the long term with regard to their overall skill development, medical rehabilitation, education, maintenance and improvement of cognitive abilities, and social development. The theoretical contribution is specific to the IT body of knowledge (BOK) as it is designed specifically for the AVG experience and it is a very detailed and fixed theory. The usage of PAT is for understanding engagement and immersion along with design factors in AVGs. The most important aspects to take into consideration are the contribution of design factors that ensure replayability. Lastly, PAT differs from the ARCS theory model in that it incorporates the principles of ARCS motivation as one aspect of its components. Therefore, PAT should be used in conjunction with the ARCS theory model to ensure optimal design of AVGs.

7. CHAPTER SEVEN: REFLECTION

7.1 Introduction

The following section serves as a reflection of the study conducted and addresses the challenges encountered by me and what I have learnt throughout the research process. I discuss how the challenges were mitigated and what I would have done differently. The chapter concludes with the methodological contribution of the study.

7.2 What I learnt along the way

Throughout the research process many lessons were learnt, some of which required me to go back and make amendments to the writing of the study. However, there were some significant learning points along the way.

The first major learning point was identifying a suitable methodology to answer the research questions and address the research problem. It was important to know every step of the GT process and to decide which form of GT would work best for the nature of the study and my level of experience. Although CGT allowed for a greatdeal of flexibility, it still posed a massive challenge for a novice researcher who was not initially prepared for the large volume of data and the amount of uncertainty that accompanies taking on a methodology such as this. A major challenge was the distortion of the predefined research process, which is usually a deductive approach, followed by a full literature review and then data collection. For CGT, the process was reversed, being inductive by nature. This difference in research approach caused a great deal of discomfort for me as I did not know what to expect or do because there was little information to work with without an initial literature review that goes in depth about the subject topic.

Being a novice, there was great pressure from having to work with such a large volume of data and a great deal of uncertainty. In order to work through the challenge of structuring data, an Atlas.ti qualitative data analysis tool was used. Ironically, the tool itself posed a new challenge. Atlas.ti is a complex tool which requires training to learn not only how to conduct qualitative data analysis, but also how to do it in the tool itself. This added to my workload as multiple attempts of testing data had to be used in new HUs to learn how to use the software. When it came time to collect and analyse the actual data which was to be used from the workshops, I made multiple backups of the HUs to allow for possible mistakes and backtracking if I needed to go back to a previous state. Code books were also printed out to keep track of every step of coding I went through. It is a good idea

todo this, even though initially it will be extremely overwhelming, but once one becomes used to the process it becomes extremely reliable and useful when manipulating your collected data.

The way I addressed the posed challenges was to work closely and meet regularly with both my supervisors in order to manage the uncertainty and to make sure that the study was still going in the right direction. My supervisors also were great at motivating me to pursue the study until the end and provided great insights into what to try and where to go. With regard to managing the large volumes of data, it was helpful to store everything in well-organised local files on my personal computer (PC). It was also helpful to learn how to use the CAQDAS tool very early on and to make some test HUs to practically learn how to use the tool and to understand the CGT research process. I also consulted YouTube videos to help with learning the Atlas.ti tool.

A minor challenge encountered along the research process was the limitation of a geographical area where I could find potential participants for the study. This along with the uncertainty of not knowing how many participants would be needed added pressure to plan accordingly when making laboratory room reservations for data collection testing. To manage this challenge, I decided to print flyers advertising the research workshops around the CPUT Cape Town Campus. Many interested participants responded to these advertisements and I easily found enough people to participate in the study. As for the uncertainty of not knowing how many workshops would have to be planned for, I decided to make a block booking over a period of three months with the CPUT Campus security manager to allow for conducting workshops over weekends with people who might not be CPUT students. This worked out because three months was much longer than what was needed to conduct the data collection process. Therefore, I recommend planning for extreme case scenarios but making the most out of the time allocated per workshop. Although I was limited to finding participants, the advertisement posters assisted in attracting potential participants.

A final challenge and limitation experienced was the selection and availability of AVGs to use as testing games in the study. Here, it was necessary to accept the limitation and to make the most of what was available. Including most genres and platforms of AVG consoles helped greatly providing the most holistic view of the phenomenon at hand.

7.3   What I would have done differently

If I had a chance to go back and redo the study, there would only be a few things which I would have done differently. It would be possible that I would not choose to do another CGT study, as the amount of work and data becomes quickly overwhelming. This also made data analysis extremely difficult as I had to make a judgement call on which areas to focus on and which areas to stop pursuing. These judgement calls were solely based on the level of groundedness of the codes emerging. I acknowledged that there were many avenues of research pertaining to AVGs that could still have been explored, but it was not feasible for the scope of this study. Therefore, I would opt for a more sizeable and manageable research methodology to address the posed research questions and problem. However, I do not regret conducting a CGT study, as there were many skills to learn from going through this process, along with learning how to deal with limited time constraints.

With regard to the research done, I would not do much differently other than to just follow the steps of CGT very closely and to document each and everything done along the way. Every piece of information is useful in a CGT study and contributes to the final product. Reading becomes a normal part of research regardless of which methodology any researcher decides to follow.

7.4   Methodological contribution

When conducting a CGT research study, the most important aspect to realise from the beginning is how much the methodology influences every other part of the research. It is important to understand these influences as they will dictate how and what you can and should do as a researcher. Knowing these factors early on really assisted me in planning accordingly and understanding the nature of my work.

The bulk of the work happens during data collection and data analysis for a CGT study. It worked out well for me to have multiple data collection components such as observation forms, interview forms, and memos to capture different aspects of the phenomenon at the same time. Having this in place before any data collection workshop is conducted is even better as the event takes place so quickly that it is easy to miss out on important information. Therefore, it is recommended to use multiple data collection and capturing tools.

After each data collection workshop, I adapted the data collection tool to keep it constant with the line of analysis that needed to be followed. This constant changing and updating of the data collection tool is similar to the agile development methods used in the IT discipline, whereby developers make constant prototypes and

updates to existing software to keep up with customer and market demands. This same principle was applied to altering the DC tool throughout the CGT process and workshops and it worked well for me.

7.5   Summary

The study addressed the problem of prolonged play of AVGs as not being sustainable as gamers lose interest in playing AVGs after the initial period of acquiring the games. The main research question asked was what design factors contributed to an engaged and immersed AVG experience? The aim of the study was to explore the inhibiting and enhancing factors that influenced engagement and immersion among AVG gamers. The second aim was to develop a theory of AVG design. The research problem was addressed as the research question was answered by achieving the goals of the two aims: to explore the inhibiting and enhancing design factors in AVG that influenced engagement and immersion and to develop a sustentative theory. CGT was used as the underlying methodology to collect and analyse data, which was coded and abstracted to form PAT. PAT was compared to literature in Chapter Six, and recommendations for future research were made. PAT addressed the issue of replayability and abandonment of AVGs and suggested specific engaging and immersive factors to take into consideration when designing future AVGs.

7.6   Conclusion

Therefore, the next researcher who decides to take on a CGT study should be well organised, extremely analytical, and be able to manage pressure and uncertainty well. They should also be mentally flexible as that is needed to get through the many unexpected twists and turns of a CGT study.

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APPENDIX A: DATA COLLECTION TOOLS

Form 1: Research Consent Form

Cape Peninsula
University of Technology

Introductory letter for the collection of research data

Adele Braaf is registered for the M Tech (IT) degree at CPUT 211241369 The thesis is titled Design factors in active video games to promote their continuous engagement and immersion and aims to produce a theory for in-game design factors that will enhance engagement and immersion in active video games. The supervisor(s) for this research is/are:

Mr Jay Barnes   barnesj@cput.ac.za

Mrs Vikki Du Preez   dupreezv@cput.ac.za

In order to meet the requirements of the university's Higher Degrees Committee (HDC) the student must get consent to collect data from individuals which they have identified as potential sources of data. In this case the student will use interviews and participatory workshops to gather data.

If you agree to this, you are requested to complete the attached form (an electronic version will be made available to you if you so desire).

For further clarification on this matter please contact either the supervisor(s) identified above, or the Faculty Research Ethics Committee secretary (Ms V Naidoo) at 021 469 1012 or naidoove@cput.ac.za.

Yours sincerely

Mr Jay Barnes

19 August 2016

I _____ in my capacity as an individual give consent in principle to allow Adele Braaf a student at the Cape Peninsula University of Technology, to collect data as part of his/her M Tech (IT) research. The student has explained to me the nature of his/her research and the nature of the data to be collected.

This consent in no way commits any individual to participate in the research, and it is expected that the student will get explicit consent from any participants. I reserve the right to withdraw this permission at some future time.

In addition, the individuals name may or may not be used as indicated below. (Tick as appropriate.)

	Thesis	Conference paper	Journal article	Research poster
Yes	X			
No		X	X	X

_____

_____

Signature

Name & Surname _____   Date _____

Form 2: Participant Coding and Personal Information

PARTICIPANT CODING AND INFORMATION

Full Name	
Gender	Male	Female	(Tick box where applicable)
Cell Number	
Email Address	
Age	

Alias	
Research Activity	
Date	

Medical Conditions	Yes	No
If yes, specify		

STEPS	
CHECK	INSTRUCTIONS
	Talk about the project
	Introduce the project, yourself and the goals of the study
	Talk about why you are doing this and what excites you about the project
	Explain what the participant can expect and what research activities you hope they will participate in
	Give the participant a description of the study to keep (document)
	Talk about the person
	Ask the participant if they have any questions or concerns
	Note down any that they have and answer their questions
	Talk about the process

	Introduce the research activity
	Explain any tools that you will be using
	Inform the participant of the approximate duration of the activity
	Restate that all activities are voluntary and that they are able to stop participating at any point during the session
	Talk about the protocol
	Introduce the ethics process and consent form
	Walk the participant through the form
	Note down any concerns and how you addressed them

Would you agree to the following:	Yes	No
Being voice recorded during interviews?		
Being visually photographed before and during gameplay?		
Allow pictures taken in workshop to be published in thesis?		

Please note, all voice and video recordings, as well as pictures taken are solely for the

purpose of reflection and analysis from the researcher. None of these materials will be published or made available to the public and will be deleted on completion of analysis. If the researcher would like to use an image, you will be personally contacted to ask for permission to make use of said material. Should you not wish to have your picture used you may decline permission and the researcher will not make use of it.

Participant Signature

Form 3A: Interview Questions

<u>**Version 1**</u>

INTERVIEW QUESTIONS	

Alias	
Date of interview	
Research Activity	

Question 1	Were you engaged and/or immersed?
	At which points did you feel engaged / immersed?

	What aspects about this activity engaged / immersed you most?
	What aspects about this activity frustrated / put you off the most?

135

Question 2	What will make you want to play this game again?
	What features would you like to see added/removed?
	What would you like to see more of/ less of?

Add	Remove

	How did you feel about the challenges in the game?	
Question 3	Do you feel as though you exercised after playing this AVG?	
	How much?	

	How little?
Question 4	Do you feel as though your needs as a gamer were met?

Thank you for your time!!!

Version 2

<table>
<tr><td colspan="2" align="center">**INTERVIEW QUESTIONS**</td></tr>
</table>

Alias	
Date of interview	
Research Activity	

Question 1	Were you engaged and/or immersed? How did you feel?
	At which points did you feel engaged / immersed?

		What **aspects** about this activity engaged / immersed you most?
		What **aspects** about this activity frustrated / put you off the most?

Question 2	What will make you want to play this game again?
	What features would you like to see added/ removed?

	What was your opinion about the challenges in the game?
Question 3	How did you feel playing alongside somebody?
	Would you prefer playing alone or with someone?
	How would you describe your relationship to the other participant?
Question 4	Did you at any point feel silly or uncomfortable playing

	Does how you look when playing bother you around another gamer?
	Why, or why not?
Question 5	Do you feel as though your needs as a gamer were met?

Thank you for your time!!!

INTERVIEW QUESTIONS

Alias	
Date of interview	
Research Activity	

Question 1	Were you engaged and/or immersed? How did you feel?
	At which points did you feel engaged / immersed?

		What **aspects** about this activity engaged / immersed you most?
		What **aspects** about this activity frustrated / put you off the most?

Question 2	What will make you want to play this game again?
	What features would you like to see added/removed?
	What was your opinion about the challenges in the game?

Question 3	How did you feel playing alongside somebody?
	Would you prefer playing alone or with someone?
	How would you describe your relationship to the other participant?
Question 4	Did you at any point feel silly or uncomfortable playing

	Does how you look when playing bother you around another gamer?
	Why, or why not?
Question 5	Do you feel as though your needs as a gamer were met?
Question 6	What opinion do you hold concerning the avatars?

Thank you for your time!!!

Form 3B: Observation

<table>
<tr><td colspan="2" align="center">**OBSERVATION FORM**</td><td></td></tr>
</table>

Alias		
Date of observation		
Research Activity		

This form is to be used in conjunction with the interview form. Take note of key aspects that you observe before and/or during the research activity. Indicate if you have asked the participant about something you have noted.

Pictures may be used to facilitate observations

		Total time played	
The Person	Take note of the level of engagement, emotions, reactions to questions and body language		CHECK
The Environment	Take note of the context and setting		

The Research Tool	Take note of how the tool is interacted with	
The Researcher	Behaviour and reflective practice	
Other		

Form 4: Memo

MEMO				

TITLE/NAME		Memo Date		

		Participants/Aliases referred to:	
Research Activity			
Research Activity Date			

PURPOSE OF MEMO					
Observation		Event		Theory Implication	
Data Comparison		Idea		Other	

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Form 5: Gameplay Instructions

WII FIT PLUS

Welcome to Wii Fit Plus. Please complete the following list of instructions and report for an interview on completion. Kindly note that you may withdraw from participation at any point during this exercise.

Note: No jumping on the Wii-Fit Board! Please remove your socks.

1. Select an avatar
2. Follow onscreen prompts
3. Select "**Training**" option
4. Select your Trainer
5. Select your workout
6. Repeat your workout or select one other workout
7. On completion, report for your post-game interview

Thank you for participating!!!

Figure F5.1: Wii Fit Plus instructions

POKEMON GO

Welcome to Pokemon Go. Please complete the following list of instructions and report for an interview on completion. Kindly note that you may withdraw from participation at any point during this exercise.

If you already have Pokemon Go installed on your device, you may continue with the instructions. If you do not have Pokemon Go installed, please proceed to do so.

This will be a 20 minute exercise. Utilise this time to do most of your exploring.

1. Create your avatar
2. Take a walk around the building (1 - 2km preferable)
3. If a Pokemon pops up on your radar, attempt to capture it
4. Note how many Pokemon you were able to catch during this time
5. If you are in the position of a Poke-egg, attempt to hatch it by walking the required distance
6. Try to obtain a training medal
7. On completion of these objectives, report back for your post-game interview

Thank you for participating!!!

Figure F5.2:Pokémon Go instructions

WII TRAUMA CENTRE

Welcome to Wii Trauma Centre. Please complete the following list of instructions and report for an interview on completion. Kindly note that you may withdraw from participation at any point during this exercise.

Please make use of the Wii-remote and nunchucks.

1. Select "**New Game**"
2. Select your preferred level of difficulty
3. Select the "**Guest**" account
4. Watch the cinematic
5. Select "**T1**" for the tutorial
6. Select "**T2**"
7. Complete level **1-1 "In a Remote Town**"
8. Choose the surgeon you would like to play with
9. On completion of the game, report back for your interview

Thank you for participating!!!

FigureF5.3: Wii Trauma Centre instructions

WII-FIT: SHAUN WHITE

Welcome to Wii-Fit Shaun White. Please complete the following list of instructions and report for an interview on completion. Kindly note that you may withdraw from participation at any point during this exercise.

Note: No jumping on the Wii-Fit Board! Please remove your socks.

1. Select your Wii avatar
2. Select Single-Player mode
3. **Riding Controls:** Select the balance board and controller
4. Stay off the board and Press "**A**" button
5. Step on board once it is initialized (You may change your board sensitivity)
6. Follow onscreen prompts
7. Go to Map
8. Play Race
9. Repeat race if you like x 2
10. Attempt next challenge x 2
11. On completion, please report for your post-game interview

Thank you for participating!!!

FigureF5.4: Wii Fit Shaun White instructions

WII MARIO AND SONIC 2012 LONDON OLYMPICS

Welcome to Wii Mario and Sonic 2012 London Olympics. Please complete the following list of instructions and report for an interview on completion. Kindly note that you may withdraw from participation at any point during this exercise.

Please make use of the Wii-remote and nun-chucks for this exercise.

1. Select the "**Guest**" profile
2. Select the "**Single Match**" option
3. Choose an event you would like to play
4. Select "**One Player**"
5. Choose a character or Mii avatar to play with
   Please note: Depending on the event selected, you may have to select multiple characters for your team.
6. Follow the onscreen instructions and rules
7. Go to controls and familiarise yourself with the settings
8. Start the event activity
9. Repeat the event if you like or select a new event
   You may partake in a maximum of 3 rounds, either repeated or new events
10. Upon completion, report for your interview

Thank you for participating!!!

FigureF5.5: Wii Mario and Sonic instructions

PLAYSTATION 4 RABBIDS

Welcome to PlayStation4 Rabbids. Please complete the following list of instructions and report for an interview on completion. Kindly note that you may withdraw from participation at any point during this exercise.

Please note, this game should be played in pairs.

1. Position your body to fit the camera
2. Select the start button
3. Press Enter "**X**"
4. Select "**Sticky Rabbit**" gameplay block
5. Follow the onscreen instructions until the chapter is complete
6. On completion, report back for your interview

Thank you for participating!!!

FigureF5.6: PlayStation 4 Rabbids instructions

XBOX KINECT DANCE CENTRAL 3

Welcome to XBox Kinect Dance Central 3. Please complete the following list of instructions and report for an interview on completion. Kindly note that you may withdraw from participation at any point during this exercise.

1. Select "**Main Menu**"
2. Select the "**Dance**" option
3. Select "**Perform**"
4. Pick a song from the list
   The further down the song list you go, the more complicated the dance moves are
5. Select your preferred level of difficulty
6. Change your dancer
   a. Select a character
   b. Choose their style
7. Change the venue
8. Select "**Start**"
9. Follow the onscreen prompts on the right hand side of the screen
10. You may repeat the song or you may select a new song
    You may complete a maximum of 3 rounds in total
11. Upon completion, report back for your interview

Thank you for participating!!!

FigureF5.7: XBox Kinect Dance Central 3 instructions

XBOX KINECT DRAGONBALL Z

Welcome to XBox Kinect Dragonball Z. Please complete the following list of instructions and report for an interview on completion. Kindly note that you may withdraw from participation at any point during this exercise.

1. Raise your hand to the sensor block on the Main Menu
2. Select the Guest account
3. Select the Memory Unit (not cloud storage)
4. Do NOT select the "**Save Data**"
5. Select "**Story Mode**"
6. Select the tutorial
7. Complete the first tutorial
   You may complete all tutorials, however this is not necessary. At any time feel free to opt out of the tutorial to continue
8. Select the "**Saiyan Saga Story**"
9. Select the "**Raditz Saga**"
10. Follow the onscreen instructions
    You may skip the cinematic if you wish. To do this, raise your right hand until the dial ring completes
11. Defeat your opponent
    Follow the onscreen prompt where appropriate
12. Upon completion, please report for your interview

Thank you for participating!!!

FigureF5.8: XBox Kinect Dragon Ball Z instructions

XBOX KINECT ADVENTURES

Welcome to Xbox Kinect Adventures. Please complete the following list of instructions and report for an interview on completion. Kindly note that you may withdraw from participation at any point during this exercise.

1. Select the "**Start**" button
2. Follow and read the onscreen instructions
3. Select "**Free Play**"
4. Select any activity of your choice
5. Select the stage you would like to play in
6. Follow onscreen instructions and play the round

   Collect as many coins as possible throughout the activity
7. Once complete, you may repeat this level or you may continue to the next stage

   You may either repeat or continue for a maximum of 3 rounds in total
8. You may also choose to do a new activity instead of repeating the same event
9. On completion, report back for your interview

Thank you for participating!!! |

FigureF5.9: XBox Kinect Adventures instructions

Form 6: Pre-Test Evaluation

<table>
<tr><td colspan="2">**PRE-TEST EVALUATION**</td><td>AVGS</td></tr>
</table>

Participant's Alias	

Date	

Question 1	How would you rate your current level of physical fitness?	
	Unfit / Inactive	
	Moderately Fit	
	Fit	
	Super Active	

Question 2	How would you classify yourself as a gamer?	
	Non-Gamer	
	Casual Gamer	
	Gamer (Regular)	
	Hardcore Gamer	

Question 3	What do you particularly look for when choosing to play an AVG?	
	Fun	
	Learning	
	Exercise	
	Competition	
	Distraction	
	Pleasure	
	Other	

Question 4	How are you feeling?

Form 7: Participant Briefing Letter

Cape Peninsula
University of Technology

AVGS

A GROUNDED THEORY FOR ACTIVE VIDEO GAME DESIGN TO PROMOTE GAMER ENGAGEMENT AND IMMERSION

Participant Briefing

The purpose of this study is to develop a theory concerning future design for active video games (AVGs). Through the use of existing gameplay consoles and AVGs, you will be participating by playing a number of selected games and noting certain aspects of the game that appeals to your immersive and engaged state.

The workshop will involve physical activity from your part as well as interviews and observations from the researcher. You will need to consent to the requested permissions of the researcher; however, you may decline and not participate in this study. All your information will be treated confidentially and you will be given an alias name as a reference for your inputs. You will need to complete an indemnity form stating that you will take responsibility for yourself throughout the workshop.

Whilst participating in the research activities, please take note of what you are experiencing, in order to be aligned to the purpose of this study.

Thank you for your time and efforts. I hope you enjoy yourself.

CPUT IT Masters Student: Adele Braaf, 211241369

APPENDIX B: DATA COLLECTION PERMISSION AND APPROVAL

Permission to collect data on CPUT Cape Town Campus

MTech (IT) Research Process for Conducting Data Collection Workshop

Adele Braaf 211241369

Supervisors:

Mr Jay Barnes   barnesj@cput.ac.za

Mrs Vikki Du Preez   dupreezv@cput.ac.za

To whom it may concern: please find attached a detailed process explaining how the workshops will take place and an estimate of how much time will be required.

Purpose:

The purpose of this workshop is to collect data for my research project through the use of active video game consoles.

Session time estimate:

Each session will have an estimated duration of 60 minutes. Two participants will take part at a single time. In this time, each individual will get a chance to play 3 games respectively. And then have one multiplayer game, where they will play against or alongside each other. After their session, they will proceed to their individual interview and then a joint interview between both participants.

Duration of entire workshop:

Due to the nature of the study (grounded theory) there cannot be an estimated duration. Therefore, a block booking request for usage of the Engineering rooms (2.25, 2.26 & 2.24) have been made from 16th January - 30th April 2017.

Please note, the actual room bookings will be made in advance before hosting a workshop. Therefore, these rooms will not be fully booked for the entire duration, but only during times needed (advanced noticed will be given).Participants will be given a date and a 1-hour timeslot to conduct their workshop; however, not every day between the time range will be

used.It has been requested for Saturdays to be made available to accommodate participants who work during the week.

Granted Permission by CPUT Cape Town Security Manager

M Gmail   Adele Braaf <adelebraaf@gmail.com>

MTech (IT) Research Data Collection Workshop Process

Johan Jooste <JoosteJ@cput.ac.za>   Fri, Jan 13, 2017 at 1:14 PM
To: Adele Braaf <adelebraaf@gmail.com>

Morning Adele

Thanks and good luck

Johan

From: Adele Braaf [mailto:adelebraaf@gmail.com]
Sent: 13 January 2017 12:54 PM
To: Jay Barnes; Vikki Du Preez
Cc: Waldon Hendricks
Subject: MTech (IT) Research Data Collection Workshop Process

[Quoted text hidden]

Disclaimer

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APPENDIX C: PARTICIPANT PROFILES

Table C1: Participant profile description

Alias	Gender	Age	Medical Condition	Fitness Level	Type of Gamer	Needs	Activity
Peach	Female	18	None	Moderately Fit	Casual Gamer	Fun Competition Pleasure	Nintendo Wii
Pear	Female	18	None	Moderately Fit	Casual Gamer	Fun Distraction Pleasure	Nintendo Wii
Pineapple55	Female	24	None	Unfit/Inactive	Casual Gamer	Learning	Xbox Kinect
ICARUS	Male	24	None	Super Active	Gamer (Regular)	Fun Competition Distraction	Xbox Kinect
Fiki	Male	26	None	Moderately Fit	Gamer (Regular)	Fun Learning Pleasure	Xbox Kinect
Lenboxs	Male	30	None	Unfit/Inactive	Hardcore Gamer	Fun Pleasure	Xbox Kinect
John	Male	22	None	Fit	Casual Gamer	Fun Competition Distraction Pleasure Excitement Fast Paced	Mobile

Alias	Gender	Age	Medical Condition	Fitness Level	Type of Gamer	Needs	Activity
2Awesome	Male	25	None	Fit	Hardcore Gamer	Fun Competition	PlayStation 4
Toefm	Male	26	None	Fit	Hardcore Gamer	Competition	PlayStation 4
JuniorKidd	Male	25	None	Fit	Gamer (Regular)	Competition Pleasure	PlayStation 4

APPENDIX D: CENSORED PARTICIPANT PROFILES

PEACH

PARTICIPANT CODING AND INFORMATION

AVGS

Full Name	
Gender	Male ___ Female ✓ (Tick box where applicable)
Cell Number	
Email Address	
Age	17

Alias	Peach
Research Activity	(console) Wii
Date	25 / 01 / 2017

Medical Conditions	Yes	No ✓
If yes, specify		

STEPS

CHECK	INSTRUCTIONS
✓	Talk about the project
✓	Introduce the project, yourself and the goals of the study
✓	Talk about why you are doing this and what excites you about the project
✓	Explain what the participant can expect and what research activities you hope they will perticipate in
✓	Give the participant a description of the study to keep (document)
	Talk about the person
	Ask the participnt if they have any questions or concerns
	Note down any that they have and answer their questions
	None. Only interested in what games you will be playing.

	Talk about the process
	Introduce the research activity
	Explain any tools that you will be using
	Inform the participant of the aproximate duration of the activity
	Restate that all activities are voluntary and that they are able to stop participating at any point during the session
	Talk about the protocol
	Introduce the ethics process and consent form.
	Walk the participant through the form
	Note down any concerns and how you addressed them
	No problems with briefing. Understand the process.

Would you agree to the following:	Yes	No
Being voice recorded during interviews?	✓	
Being visually photographed before and during gameplay?		✓

Participant Signature

[signature]

**Cape Peninsula
University of Technology**

Introductory letter for the collection of research data

Adele Braaf is registered for the M Tech (IT) degree at CPUT 211241369. The thesis is titled "A grounded theory for active video game design to promote gamer engagement and immersion" and aims to produce a theory for in-game design factors that will enhance engagement and immersion in active video games. The supervisor(s) for this research is/are:

Mr Jay Barnes   barnesj@cput.ac.za

Ms Vikki Du Preez   dupreezv@cput.ac.za

In order to meet the requirements of the university's Higher Degrees Committee (HDC) the student must get consent to collect data from individuals which they have identified as potential sources of data. In this case the student will use interviews and participatory workshops to gather data.

If you agree to this, you are requested to complete the attached form (an electronic version will be made available to you if you so desire).

For further clarification on this matter please contact either the supervisor(s) identified above, or the Faculty Research Ethics Committee secretary (Ms V Naidoo) at 021 469 1012 or naidoove@cput.ac.za.

Yours sincerely

Mr Jay Barnes

13 January 2017

I _____ in my capacity as an individual, give consent in principle to allow Adele Braaf a student at the Cape Peninsula University of Technology, to collect data as part of his/her M Tech (IT) research. The student has explained to me the nature of his/her research and the nature of the data to be collected.

This consent in no way commits any individual to participate in the research, and it is expected that the student will get explicit consent from any participants. I reserve the right to withdraw this permission at some future time.

In addition, the individuals name may or may not be used as indicated below. (Tick as appropriate.)

	Thesis	Conference Paper	Journal article	Research poster
YES	X		X	
NO		X		X

Signature _____

Name & Surname _____   Date _25_/_01_/_17_

PRE-TEST EVALUATION

Participants Alias	Peach

Date	25 / 01 / 2017

Question 1	How would you rate your current level of physical fitness?	
	Unfit / Inactive	
	Moderately Fit	✓
	Fit	
	Super Active	

Question 2	How would you classify yourself as a gamer?	
	Non-Gamer	
	Casual Gamer	✓
	Gamer (Regular)	
	Hardcore Gamer	

Question 3	What do you particularly look for when choosing to play an AVG?	
	Fun	✓
	Learning	
	Exercise	
	Competition	✓
	Distraction	
	Pleasure	✓
	Other	

Question 4	How are you feeling right now?
	Normal

INTERVIEW QUESTIONS

Alias	Peach
Date of interview	25 - 01 - 2017
Research Activity	Wii Fit / Sonic, Mario / Shaun White / **AVGS** Just Dance 4.

Question 1	Were you engaged and/or immersed? / How did you feel?

At which points did you feel engaged/immersed?

Very excited + energetic from games
Lack of instructions at beginning of
each game

What aspects about this activity engaged/immersed you most?

Music - sets the feels of the game
+ gives motivation to play

very focused.

What aspects about this activity frustrated/put you off the most?

Sonic: Didn't have an option to go back during
the round.
S.W: Didn't like verbal instructions = waits ✓.

Question 2	What will make you want to play this game again?

Wii fit plus more fun options to play
Liked being the chicken
Realistic - moved with you   Liked feeling like one
Because you can have fun character.
+ exercise.

What features would you like to see added/removed?

Bracelets for sensors wearables to detect full body movement (aud).

Nothing no remove.

How did you feel about the challenges in the game?

It wasn't too difficult : like it. You can have fun most of the time instead of trying to figure out what you're supposed to do.

Question 3 | What would you like to see more of?

Greater variety of games. Introduce new games from other cultures (that we don't know of yet. New real life activities.

Question 4 | What would you like to see less of?

SHAUN WHITE. Give less instructions. Give subtitles. So everyone can play (deaf person).

Question 5 | Do you feel as though your needs as a gamer were met?

7/10 for needs being met. Because they did have fun + lots of

healthy competition.

Like competing in games.

Thank you for your time!!!

Teach

OBSERVATION FORM

Alias	Peach.
Date of observation	25 / 01 / 2017.
Research Activity	Wii.

AVGS

This form is to be used in conjunction with the interview form. Take note of key aspects that you observe before and/or during the research activity. Indicate if you have asked the participant about something you have noted.

Pictures may be used to facillitate observations

The Person	Take note of the level of engagement, emotions, reactions to questions and body language	CHECK
	Selected beginner.	
The Environment	Take note of the context and setting	
Wii - Fit: Mario + Sonic	Selected a "balance" game	

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The Research Tool	Take note of how the tool is interacted with	
The Researcher	Behaviour and reflective practice	
wii fit :	Looks excited / engaged flapping arms as a bird.	
Mono + Sonic	- Re-enacts the avatars winning stance. - Doesn't conform to selecting an event someone else suggests. - down on knees for [Shooting] game before she begins. - Missed the shooting target. - Very focused and round.	
Other		

MEMO

TITLE/NAME		Memo Date	25	01	2017

	Participants referred to:	Person

Research Activity	Wii
Research Activity Date	25 - 01 - 2017

PURPOSE OF MEMO

Observation	✓	Event		Theory Implication	
Data Comparison		Idea		Other	

> Wii - Fit:

Having confusion placing Wii board correctly
- Looks excited by achieving in game goals.
- Wii-Fit: didn't differentiate between ball colours rell.
- Lots of verbal communication done regarding game.
- Looks happy when receiving final score.
- Liked once they unlocked something in game.
- Selects beginner difficulty.

Wii Fit: arm flapping.
- Communicates well with other participant.
- Remarks about score + feedback (positive).

> Mario & Sonic:
- Stance in place. [FENCING]
- Very into the movement.
- Moving feet + whole body.
- Very animated + enthused about winning.
- Very verbal
- Communicating game strategy with peer
- Even more excited to play again after losing a round.
- Takes a while to enjoy winning moment in game to proceed.
- [SHOOTING]: Very laid back. Around 4/6
  Doesn't want to complete mini game. (lose)
- Dancing when victory.
- Selected a new event.
  - Prefered olympic events over dream events.

KEY POINTS

[DANCING]:
- Watches the into to the event.
- Doesn't follow onscreen prompt feedbacks.

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SHAUN WHITE:

> Excited about snowboarding / ~~starting~~. Starting

- No facial expression at start of game / round.
- Little body movement.
- Very quiet.
- Adjusts well to board.
- No change in facial expression for achieving mini in-game goal.
- Very animated / happy expression / verbal at succeeding round.
- Chose to progress to new round.
- Navigates menu well.
- Imitates character body language during cinematic.
- Verbal comments about falling in-game.
- Very focused. (2nd round)
- Has good control of both handheld remote + board.
- Mini - impressed at winning.

MEMO

| TITLE/NAME | Just Dance | Memo Date | 2 5 | 0 1 | 2 0 1 7 |

| Participants referred to: | Peach |
| | Vera |

| Research Activity | Wii |
| Research Activity Date | |

PURPOSE OF MEMO

| Observation | | Event | | Theory Implication | |
| Data Comparison | | Idea | | Other | |

- Browsing through Song menu
- Competing against each other
- Lots of facial expressions [FINAL COUNT DOWN]
- Accidental contact between participants
- Laughing
- Peach > Smiling constantly
- Very enthused > breakdown > playing dance game
- Not executing all the moves properly
- Laughing
- Verbal comments (lots)
- Browsing rapidly through song list (Peach)
- Peach wants to sit + play
- 2nd Song
- Not doing full body movements : tired
- Getting more full body movements
- Just waving wii > remote around without moving full body
- Peach still attempting full body movements
- Peach facial expressions (smiling)
- Both quiet while playing
- Low energy
- Feet aren't moving
- Extra star gained gives motivation to play

| KEY POINTS |
| |
| |
| |

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PEAR

PARTICIPANT CODING AND INFORMATION

AVGS

Full Name	
Gender	Male ☐ Female ✓ (Tick box where applicable)
Cell Number	
Email Address	
Age	17

Alias	Pear
Research Activity	(console) Wii
Date	25 / 01 / 2017

Medical Conditions	Yes ☐ No ✓
If yes, specify	

STEPS

CHECK	INSTRUCTIONS
✓	Talk about the project
✓	Introduce the project, yourself and the goals of the study
✓	Talk about why you are doing this and what excites you about the project
✓	Explain what the participant can expect and what research activities you hope they will perticipate in
✓	Give the participant a description of the study to keep (document)
	Talk about the person
	Ask the participnt if they have any questions or concerns
	Note down any that they have and answer their questions
	Might not know how to play Pokemon Go.

	Talk about the process
	Introduce the research activity
	Explain any tools that you will be using
	Inform the participant of the aproximate duration of the activity
	Restate that all activities are voluntary and that they are able to stop participating at any point during the session
	Talk about the protocol
	Introduce the ethics process and consent form.
	Walk the participant through the form
	Note down any concerns and how you addressed them

Would you agree to the following:	Yes	No
Being voice recorded during interviews?	✓	
Being visually photographed before and during gameplay?		✓

Participant Signature

Cape Peninsula
University of Technology

Introductory letter for the collection of research data

Adele Braaf is registered for the M Tech (IT) degree at CPUT 211241369. The thesis is titled "A grounded theory for active video game design to promote gamer engagement and immersion" and aims to produce a theory for in-game design factors that will enhance engagement and immersion in active video games. The supervisor(s) for this research is/are:

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Yours sincerely

Mr Jay Barnes

13 January 2017

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In addition, the individuals name may or may not be used as indicated below. (Tick as appropriate.)

	Thesis	Conference Paper	Journal article	Research poster
YES	X		X	
NO		X		X

Signature _____

Name & Surname _____   Date _25 /01/17_____

PRE-TEST EVALUATION

Participants Alias	0gar

Date	25 Jun 2017

Question 1	How would you rate your current level of physical fitness?	
	Unfit / Inactive	
	Moderately Fit	✓
	Fit	
	Super Active	

Question 2	How would you classify yourself as a gamer?	
	Non-Gamer	
	Casual Gamer	✓
	Gamer (Regular)	
	Hardcore Gamer	

Question 3	What do you particularly look for when choosing to play an AVG?	
	Fun	✓
	Learning	
	Exercise	
	Competition	
	Distraction	✓
	Pleasure	✓
	Other	

Question 4	How are you feeling right now?
	I feel nothing

INTERVIEW QUESTIONS

Alias	Paul
Date of interview	25 - 01 - 2017
Research Activity	Wii

AVGS

Question 1	Were you engaged and/or immersed? / How did you feel?

At which points did you feel engaged/immersed?

10 seconds in

Lost immersion after losing

Realism in games

What aspects about this activity engaged/immersed you most?

S.W. Liked the Snow setting.
Liked the voice instructions
Liked the visual guides on screen
feedback for 10 sec. Integrated on
the board. The feels realistic cause
as you move on the board, you see
it on the screen

What aspects about this activity frustrated/put you off the most?

Losing more than winning in Mario
Doesn't like the non-realistic part
of the volleyball

Question 2	What will make you want to play this game again?

You will play a game again because
you be had fun and liked the
environmental setting of the snow

What features would you like to see added/removed?

Take the fakeness out.
Get basic rules and instructions
accurate would make you want to
play

How did you feel about the challenges in the game?

It was very challenging and made
you want to win
Still want to feel the challenge, but
enough to go to the next level

Question 3	What would you like to see more of?

more options
customize options
more variety to game events +
what you can do in an event.

Question 4	What would you like to see less of?

Nothing

Question 5	Do you feel as though your needs as a gamer were met?

Found it fun, and a good
distraction. Not pleased.

Didn't feel praised.
Influenced by how it appears.

Thank you for your time!!!

TITLE/NAME	Wii F...		Memo Date	25	01	2017.

Participants referred to:	Recorda.
	Peer

Research Activity	Wii
Research Activity Date	25 - 01 - 2017

PURPOSE OF MEMO

Observation	✓	Event		Theory Implication	
Data Comparison		Idea		Other	

Wii fit : selected Training Plus
was very curious going enough the event
Selection.
Follows onscreen instructions well.
- Interacts well with other participant in the
  room.
- Not much body movement on the wii board.
- Expressionless face.
- Makes a few verbal comments about in
  game characters.
- Smiled and verbal response when viewing their
  score.
- Chose to select a different workout event.
- Tries out wii board movement before
  playing.
- Seems very engaged   - Shows expression
- Reads prompts well.   when performing Squat
- Interested in gender of avatar.
Mario + Sonic:
- Takes a look at each avatar character. "Tails"
- Read rules well.
- Looks excited about his game.
- Don't understand controls.
- Confused about what to do on 1st round.
- Really happy when winning.
- Verbal dissatisfaction about in game fouls.
           - Very focused. Doesn't take eye off scree

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Mario + Sonic:
- Shows frustration when moves go wrong.
- Makes comments about opponents "taunt stances" when they win.
- Shaking head in frustration. (very mild frustration)
- Steps forward + back in a rocking motion.
  ↳ very engaged.
- Quite happy regardless of final score. (loss).

> SHAUN WHITE:
- Pretty good at balancing board.
- Doesn't show much expression
- Not sure about verbal ingame instructions.
- Very focused
- Doesn't show much enthusiasm after round completion.
- Not much movement.
- Very focused
- Adjusted well to wii board.
- No facial expression
- Very happy + verbal @ winning round
- Follows instructions ingame well; navigates menu well.
- Selected new match round instead of repeat old.
- Body moves well with board.

OBSERVATION FORM

Alias	Peur
Date of observation	25 - 01 - 2017
Research Activity	u..

AVGS

This form is to be used in conjunction with the interview form. Take note of key aspects that you observe before and/or during the research activity. Indicate if you have asked the participant about something you have noted.

Pictures may be used to facillitate observations

The Person	Take note of the level of engagement, emotions, reactions to questions and body language	CHECK
	Very willing to sport - Tries out new moves well.	
The Environment	Take note of the context and setting	
	Wii fit : Snowboarding + Skating.	
Mario + Sonic	worked the introduction move.	
SHAUN WHITE.	• Quiet + enply clear environment. Spacious. > Adjusts well to the game.	

The Research Tool	Take note of how the tool is interacted with	
	Selected "chocolate". archer.	

The Researcher	Behaviour and reflective practice	
wii fit	- shows excitement. - shows some shock / disbelief of score achieved.	
Mario t Sonic	- Confused about which buttons to use. - Very focused + concentrated. - shows expression during special /power attacks. - Not much physical movement required for the game.	

Other
- prefered to play same game alternating each round with other participant.

MEMO

AVGS

TITLE/NAME	Just Dance.	Memo Date	25	01	2017

Participants referred to:	Peach
	Pear

Research Activity	Wii
Research Activity Date	

PURPOSE OF MEMO

Observation		Event		Theory Implication	
Data Comparison		Idea		Other	

- Browsing through Song menu.
- Competing against each other.
- Lots of facial expressions [FINAL COUNT DOWN].
- Accidental contact between participants
- Laughing
- Peach smiling constantly.
- Very enthused throughout playing. dance game.
- Not executing all the moves properly.
- Laughing
- verbal comments (lots).
- Browsing rapidly through song list (Peach).
- Peach wants to sit + play.
- 2nd Song
- Not doing full body movements : tired.
- Getting more full body movements.
- Just waving wii remote around without moving full body.
- Peach still attempting full body movements.
- Peach facial expressions (smiling).
- Both quiet while playing.
- Low energy.
- Feet arent moving.
- Extra star gained gives motivation to play.

KEY POINTS	

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PARTICIPANT CODING AND INFORMATION

AVGS

Full Name	

Gender	Male ✓ Female	(Tick box where applicable)
Cell Number		
Email Address		
Age	25	

Alias	JuniorKidd
Research Activity	PlayStation 4
Date	18 February 2017

Medical Conditions	Yes No ✓	
If yes, specify		

STEPS

CHECK	INSTRUCTIONS
	Talk about the project
	Introduce the project, yourself and the goals of the study
	Talk about why you are doing this and what excites you about the project
	Explain what the participant can expect and what research activities you hope they will perticipate in
	Give the participant a description of the study to keep (document)
	Talk about the person
	Ask the participnt if they have any questions or concerns
	Note down any that they have and answer their questions

	Talk about the process
	Introduce the research activity
	Explain any tools that you will be using
	Inform the participant of the aproximate duration of the activity
	Restate that all activities are voluntary and that they are able to stop participating at any point during the session
	Talk about the protocol
	Introduce the ethics process and consent form.
	Walk the participant through the form
	Note down any concerns and how you addressed them

Would you agree to the following:	Yes	No
Being voice recorded during interviews?	✓	
Being visually photographed before and during gameplay?	✓	
Allow pictures taken in workshop to be published in thesis	✓	

Please note, all voice and video recordings, as well as pictures taken are solely for the purpose of reflection and analysis from the researcher. None of these materials will be published or made available to the public and will be deleted on completion of analysis. If the researcher would like to use an image, you will be personally contacted to ask for permission to make use of said material. Should you not wish to have your picture used you may decline permission and the researcher will not make use of it.

Participant Signature

Valentine

PRE-TEST EVALUATION

AVGS

Participants Alias	Jimmy's MM

Date	18 February 2017

Question 1	How would you rate your current level of physical fitness?

Unfit / Inactive	
Moderately Fit	
Fit	✓
Super Active	

Question 2	How would you classify yourself as a gamer?

Non-Gamer	
Casual Gamer	
Gamer (Regular)	✓
Hardcore Gamer	

Question 3	What do you particularly look for when choosing to play an AVG?

Fun	
Learning	
Exercise	
Competition	✓
Distraction	
Pleasure	✓
Other	

Question 4	How are you feeling right now?

HUNGRY

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Yours sincerely

Mr Jay Barnes

13 January 2017

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In addition, the individuals name may or may not be used as indicated below. (Tick as appropriate.)

	Thesis	Conference Paper	Journal article	Research poster
YES	X		X	
NO		X		X

Signature _____

Name & Surname _____ Date __13 02 2017__

2AWESOME

PARTICIPANT CODING AND INFORMATION

AVGS

Full Name	
Gender	Male ✓ Female (Tick box where applicable)
Cell Number	
Email Address	
Age	25

Alias	2AWESOME
Research Activity	PlayStation 4
Date	18 February 2017

Medical Conditions	Yes	No X
If yes, specify		

STEPS

CHECK	INSTRUCTIONS
	Talk about the project
	Introduce the project, yourself and the goals of the study
	Talk about why you are doing this and what excites you about the project
	Explain what the participant can expect and what research activities you hope they will perticipate in
	Give the participant a description of the study to keep (document)
	Talk about the person
	Ask the participnt if they have any questions or concerns
	Note down any that they have and answer their questions

PRE-TEST EVALUATION

AVGS

Participants Alias	2Awesome

Date	18 February 2017

Question 1	How would you rate your current level of physical fitness?	
	Unfit / Inactive	
	Moderately Fit	
	Fit	✓
	Super Active	

Question 2	How would you classify yourself as a gamer?	
	Non-Gamer	
	Casual Gamer	
	Gamer (Regular)	
	Hardcore Gamer	✓

Question 3	What do you particularly look for when choosing to play an AVG?	
	Fun	✓
	Learning	
	Exercise	
	Competition	✓
	Distraction	
	Pleasure	
	Other	

Question 4	How are you feeling right now?
	HAPPY, WELL RESTED

Cape Peninsula
University of Technology

Introductory letter for the collection of research data

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Ms Vikki Du Preez   dupreezv@cput.ac.za

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Yours sincerely

Mr Jay Barnes

13 January 2017

I _____ in my capacity as an individual, give consent in principle to allow Adele Braaf a student at the Cape Peninsula University of Technology, to collect data as part of his/her M Tech (IT) research. The student has explained to me the nature of his/her research and the nature of the data to be collected.

This consent in no way commits any individual to participate in the research, and it is expected that the student will get explicit consent from any participants. I reserve the right to withdraw this permission at some future time.

In addition, the individuals name may or may not be used as indicated below. (Tick as appropriate.)

	Thesis	Conference Paper	Journal article	Research poster
YES	X		X	
NO		X		X

Signature

Name & Surname _____ Date _18/02/2017_

TOEFM

PARTICIPANT CODING AND INFORMATION

AVGS

Full Name	
Gender	Male ✓ Female (Tick box where applicable)
Cell Number	
Email Address	
Age	26

Alias	TCEFM
Research Activity	PlayStation 4
Date	18 February 2017

Medical Conditions	Yes	No ✓
If yes, specify		

STEPS

CHECK	INSTRUCTIONS
	Talk about the project
	Introduce the project, yourself and the goals of the study
	Talk about why you are doing this and what excites you about the project
	Explain what the participant can expect and what research activities you hope they will perticipate in
	Give the participant a description of the study to keep (document)
	Talk about the person
	Ask the participnt if they have any questions or concerns
	Note down any that they have and answer their questions

	Talk about the process
	Introduce the research activity
	Explain any tools that you will be using
	Inform the participant of the aproximate duration of the activity
	Restate that all activities are voluntary and that they are able to stop participating at any point during the session
	Talk about the protocol
	Introduce the ethics process and consent form.
	Walk the participant through the form
	Note down any concerns and how you addressed them

Would you agree to the following:	Yes	No
Being voice recorded during interviews?	✓	
Being visually photographed before and during gameplay?	✓	
Allow pictures taken in workshop to be published in thesis	✓	

Please note, all voice and video recordings, as well as pictures taken are solely for the purpose of reflection and analysis from the researcher. None of these materials will be published or made available to the public and will be deleted on completion of analysis. If the researcher would like to use an image, you will be personally contacted to ask for permission to make use of said material. Should you not wish to have your picture used you may decline permission and the researcher will not make use of it.

Participant Signature

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PRE-TEST EVALUATION

AVGS

Participants Alias	TOUM

Date	18 February 2011

Question 1	How would you rate your current level of physical fitness?	
	Unfit / Inactive	
	Moderately Fit	
	Fit	✓
	Super Active	

Question 2	How would you classify yourself as a gamer?	
	Non-Gamer	
	Casual Gamer	
	Gamer (Regular)	
	Hardcore Gamer	✓

Question 3	What do you particularly look for when choosing to play an AVG?		
	Fun		
	Learning		
	Exercise		
	Competition	✓	
	Distraction		
	Pleasure		
	Other		

Question 4	How are you feeling right now?
	I am happy and feel very good

Cape Peninsula
University of Technology

Introductory letter for the collection of research data

Adele Braaf is registered for the M Tech (IT) degree at CPUT 211241369. The thesis is titled "A grounded theory for active video game design to promote gamer engagement and immersion" and aims to produce a theory for in-game design factors that will enhance engagement and immersion in active video games. The supervisor(s) for this research is/are:

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	Thesis	Conference Paper	Journal article	Research poster
YES	X		X	
NO		X		X

Signature _____

Name & Surname _____   Date 18|02|2017

OBSERVATION FORM

Alias	Juniorkidd, 2Awesone, Toehm.
Date of observation	18 Feb 2017
Research Activity	PS4

AVGS

This form is to be used in conjunction with the interview form. Take note of key aspects that you observe before and/or during the research activity. Indicate if you have asked the participant about something you have noted.

Pictures may be used to facillitate observations

The Person	Take note of the level of engagement, emotions, reactions to questions and body language	CHECK
	2Awesone, Toehm; Juniorkidd all excived, but neutral	
The Environment	Take note of the context and setting	
	Home. In the livingroom. Very interactive environment.	

The Research Tool	Take note of how the tool is interacted with	
	Very comfortable for each.	
The Researcher	Behaviour and reflective practice	
	Calm ; to clear headed.	
Other		

MEMO

AVGS

TITLE/NAME	PS4 Workshop		Memo Date	18	Feb	2017

		Participants referred to:	Toefm
			Juniorkidd
			2 Awesome

Research Activity	PS4
Research Activity Date	18 Februrary 2017

PURPOSE OF MEMO

Observation	✓	Event		Theory Implication	
Data Comparison		Idea		Other	

Rabbids Invasion:
No one watching start cinematic.
Toefm looks interested in playing Juniorkidd distracted
2Awesome. distracted. All 3 browsing main menu and
negotiating which round to play.
Juniorkidd asked what to do.
Toefm observing them play. very engaged. 2Awesome
verbal engaged. Toefm finding round funny.
Both viewing scoreboards. Juniorkidd frustrated by
missing mates in hunt. 2Awesome + J.K engaged
watching the cinematic.
Trying to stand in range of the sensor.
All 3 very engaged watching 2Awesome + J.K
play. Laughter when someone spots the object
first. Surprised when someone wins but
spots the object last.
Toefm very engaged watching the others play.
Toefm acts the movements although not playing.
No body movement when watching the cinematic.
Like scoring points against someone. why
J.K. interested in characters r asked why
not use minions.
TV series genre is very engaging.
2Awesome getting a little tired
Winner vocal + full body stance

KEY POINTS

MEMO

AVGS

TITLE/NAME	PS4 Workshop	Memo Date	18	feb	2017

Participants referred to:	Toefm
	2Awesome
	Juniorkidd

Research Activity	PS4
Research Activity Date	18 feb 2017

PURPOSE OF MEMO				
Observation	✓	Event	Theory Implication	
Data Comparison		Idea	Other	

Toefm + 2Awesome choose to progress to
a new episode instead of repeating a round.
Toefm likes the sounds in game of the
characters. 2Awesome showing easy navigation
of menu.
& 2Awesome + Toefm:
Juniorkidd observing, but very engaged.
Toefm very keen to beat his opponent
2Awesome.
2Awesome covers face when losing. Both very
engaged watching cinematic and searching for items.
Good team work / sportsmanship when drawing
a round.
Juniorkidd is quiet, but engaged and
randomly gives comments as too other two
play. Toefm enjoys spotting of object first
and winning. All 3 find watching the story
amusing and are laughing.
Very competitive.
Frustrated when missing spotting on item.
Juniorkidd very interested in whats going on
in plot. - All 3 are.
Very engaged while whole body is not
moving, because of watching the TV
show while playing.

KEY POINTS	

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MEMO

TITLE/NAME	PS4 Workshop	Memo Date	18	Feb	2017

	Participants referred to:	Junior kidd
		Toefm
		2Awesome.

Research Activity	PS4
Research Activity Date	18 Feb 2017

PURPOSE OF MEMO					
Observation	✓	Event		Theory Implication	
Data Comparison		Idea		Other	

Both don't watch ending cinematic.
☆ Toefm + Juniorkidd playing.
Chose to select a new round
Sensor malfunction breaks immersion.
Distracting for everyone.
Juniorkidd sniggering to get picked up by
sensor. Causes a big distraction when
sensor doesn't pick up
Sensor not picking up properly, causes Gem
to turn off entire game and restart.
Toefm left the room. Very disengaging
and breaks immersion.
Chose to select a different mini-game after
starting up again.
☆ Not much space to move around.
Everyone very engaged. Full body movement.
Sensor not picking up J.K properly.
Frustrating when Toefm loses a hand from not
being picked up by the sensor.
Very engaging, getting moves right and winning
scoring points.
Both enjoying close competition.
very verbal sounds.
2Awesome very observant while others play.

KEY POINTS	

ICARUS

PARTICIPANT CODING AND INFORMATION

AVGS

Full Name		
Gender	Male ✓ Female	(Tick box where applicable)
Cell Number		
Email Address		
Age		

Alias	ICARUS
Research Activity	1 - fix
Date	

Medical Conditions	Yes	No ✓
If yes, specify		

STEPS	
CHECK	**INSTRUCTIONS**
	Talk about the project
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	Talk about the person
	Ask the participnt if they have any questions or concerns
	Note down any that they have and answer their questions
	Research interes

	Talk about the process
	Introduce the research activity
	Explain any tools that you will be using
	Inform the participant of the aproximate duration of the activity
	Restate that all activities are voluntary and that they are able to stop participating at any point during the session

	Talk about the protocol
	Introduce the ethics process and consent form.
	Walk the participant through the form
	Note down any concerns and how you addressed them
	None

Would you agree to the following:	Yes	No
Being voice recorded during interviews?	✓	
Being visually photographed before and during gameplay?	✓	
Allow pictures taken in workshop to be published in thesis	✓	

Please note, all voice and video recordings, as well as pictures taken are solely for the purpose of reflection and analysis from the researcher. None of these materials will be published or made available to the public and will be deleted on completion of analysis. If the researcher would like to use an image, you will be personally contacted to ask for permission to make use of said material. Should you not wish to have your picture used you may decline permission and the researcher will not make use of it.

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	Thesis	Conference Paper	Journal article	Research poster
YES	X		X	
NO		X		X

Signature _____

Name & Surname _____   Date 03/01/2017

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PRE-TEST EVALUATION

Participants Alias	ICARUS

Date	03/02/2017

Question 1	How would you rate your current level of physical fitness?	
	Unfit / Inactive	
	Moderately Fit	
	Fit	
	Super Active	✓

Question 2	How would you classify yourself as a gamer?	
	Non-Gamer	
	Casual Gamer	
	Gamer (Regular)	✓
	Hardcore Gamer	

Question 3	What do you particularly look for when choosing to play an AVG?	
	Fun	✓
	Learning	
	Exercise	
	Competition	✓
	Distraction	✓
	Pleasure	
	Other	

Question 4	How do you feel right now?
	Excited to play.

OBSERVATION FORM

Alias	ICARUS
Date of observation	3 feb 2017
Research Activity	XBox workshop 1

AVGS

This form is to be used in conjunction with the interview form. Take note of key aspects that you observe before and/or during the research activity. Indicate if you have asked the participant about something you have noted.

Pictures may be used to facillitate observations

The Person	Take note of the level of engagement, emotions, reactions to questions and body language	CHECK
	Very engaged and excited. 4 Full body movements. High energy levels. Very verbal and engaged. Encouraging of Pineapples.	
The Environment	Take note of the context and setting	
	BTech lab. Large, empty space. No disruptions. Dimly lit room. Quiet area. Safe environment.	
The Research Tool	Take note of how the tool is interacted with	
	Very eager, willing and comfortable handling the console.	

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The Researcher	Behaviour and reflective practice
	Calm, quiet, focused. Non-intrusive. Provided instruction when asked or needed.

Other

MEMO

AVGS

TITLE/NAME	~~Xbox~~ Workshop 2	Memo Date	3	2	2017

		Participants referred to:	Icarus

Research Activity	XBox
Research Activity Date	3 Feb 2017

PURPOSE OF MEMO

Observation	✓	Event		Theory Implication	
Data Comparison		Idea		Other	

Kinect Adventures:
Showed frustration at sensor not picking up.
Full body movement.
No trouble adapting to controls
Neutral game face.
Verbal dissatisfaction at missing coins.

Liked seeing snapshots of himself at end of round.

Chose to progress to next level instead of choose another.

Verbal (positive) feedback at viewing score.

Comfortable playing next to a stranger.

Extreme excitement at scoring jackpot. (in game goal).
Disappointment at missing a target.
Verbal disappointment at missed
Loved to view his pics or score.
Screaming in elation at final score.

⊕ Chose to progress and then to select a new mini game.

KEY POINTS

Next mini-game. Reads onscreen instructions well.
Flailing his arms at balls flying.
Confusion on face when coins flew past.
Not sure what to do.
Very immersed. Very into hitting flying basket balls.
- Starting to show signs of fatigue.
- Becoming neutral to viewing pics at the end.
  Neutral to score over time.

- Questioned having to play one at a time. a time.

  - Very engaged in watching someone else play.
    ↳ Lots of verbal comment.

⊗ Wants to play another round after watching

  Pineapple SS.
  - Wants to show others how to play

  properly
- very happy at the end.

_____

DC3:
- Not sure how to navigate menu.
- Not comfortable with higher level of difficulty.

- Selected beginner.
● Chose to change dance avatar.
  ↳ Selected a male character.
    ↳ The guy wearing shorts cause

MEMO

TITLE/NAME	Workshop 2.	Memo Date	3	Feb	2017

Participants referred to:	ICARUS

Research Activity	
Research Activity Date	

PURPOSE OF MEMO

Observation	✓	Event		Theory Implication	
Data Comparison		Idea		Other	

Icarus is wearing shorts.
- Very comfortable. Smiling. Nodding head.
- Singing with the music. Full body movement.
facial expressions.
Quiet at missing moves
- More into it when successfully hitting a dance move.
- Really engaged at the freestyle setting during gameplay
- Loved the dance game. Loved score being.

✱ Pineapple very quiet + non-expressive when watching.
♦ Chose to dance to a new song.
Kept the score greater
- Singing along while dancing.
- Very comfortable looking silly infront of Pineapple SS.
♦ Loved freestyle dance.
- Stamina good.
- Clapping when done playing.
♦ Pineapple extremely quiet watching Icarus play.
- Doesn't want to do my difficult songs.

KEY POINTS

- Love dance-off.

♦ Competition on video.
- Still dancing even when its not his turn.

DBZ:

Icarus still dancing after DC3.

- Looks excited about playing DBZ.
  ↳ Making reference to tv series fighting

- Confused navigating menu.
  ↳ Can't see tutorial option at bottom (took a while.)

- Following tutorial well. ✓

✗ Pineapple giving verbal input.

- Both participants interacting well.

- Getting frustrated not getting more right. Verbally stated his not sure what to do.
  ↳ Needs help executing the moves.

- Looks excited to play Serger.

- Watches the cinematic
  ↳ Says words from the series.

- Very frustrated at accidental pause. Verbal frustration.

- Very animated.

- Looks disrupted when playing and cinematic starts out of nowhere.

- Shouts frustration when attack fails.

✗ Loves the special beam cannon. Comments about show tv series. Smiling.

- Looks fatigued
  watches end cinematic.

- Sounds tired.

- Amused at final score.

INTERVIEW QUESTIONS

Alias	ICARUS
Date of interview	
Research Activity	

AVGS

Question 1	Were you engaged and/or immersed? How did you feel?

Very comfortable behind closed doors.

At which points did you feel engaged/immersed?

Before: excited / During: Happy / After: Disappointed that you won't play again.

Engaged after the tutorial in DBZ.

Engaged through all of them & Aim to beat your own score.

DC3: Liked the grade mode.

What aspects about this activity engaged/immersed you most?

DC3 the middle of the song

Choosing songs that you do like
make the dances more interesting

What aspects about this activity frustrated/put you off the most?

DBC: Unclear tutorials. Stepping out of range of the sensor.

DC3: vision. Had to make the avatar transluscent to see what is ahead of you.

Kinect Adventures

Want the outline of the avatars body.

Question 2	What will make you want to play this game again?

Its a great way to exercise
Enjoy the challenges
Learn a lot of dance moves. ✓
You want to finish the DBZ gameplay.

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* Liked the accuracy of the sensor + user interface.

What features would you like to see added/removed?
- Change the avatar more translucent
- DBZ: Show motion for the mini pictures of upcoming moves.
- DBZ: Tutorials. Having such of a move.
  4 Show the actual movement (Gif image).
- The music gets the more well to DBZ.
* Take out all the colours in Kinect adventures. Prefer something more natural + realistic looking.

What was your opinion about the challenges in the game?
Happy with the challenge.
Easy to adapt to challenges of each game.
Liked diversity

Question 3	How did you feel playing alongside somebody? Comfortable.
	Would you prefer playing alone or with someone?
Disappointed by lack of competition.	With someone. Like the challenge others to get better. Without competition, prefer to play alone.
	How would you describe your relationship to the other participant?
	Total Stranger.

Question 4	Did you at any point feel silly or uncomfortable playing
	Silly. Childish. Loud. Considering location; not uncomfortable.
	Does how you look when playing bother you around another gamer?
	Why, or why not?
	No.

Question 5	Do you feel as though your needs as a gamer were met?
	Competition wasn't met.

AVG's a means of social interaction

APPENDIX E: GLASER'S CODING FAMILIES

Table 3.X: Glaser's Theoretical Coding Families