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Fantastic Narrative Structures, and How to Evaluate Them
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**Abstract:**

As the game-industry keeps growing larger and larger, the need for accurate ways of measuring what keeps players engaged with a game grows accordingly. While measuring e.g. engagement, flow or immersion in games are, no doubt, important for the future of game development, we argue that the desire to continuation is absolutely essential for a game's success.

*"How can a test methodology framework be designed to evaluate continuation desire in interactive narratives, in a way that gives deeper insight into the specific causes of engagement, and how does the presentation of narrative structures affect players' level of continuation desire?"*

Based upon research in topics such as engagement, interactive narratives and continuation desire, we constructed a methodological framework for measuring continuation desire in an interactive narrative game, allowing insight into the attributing factors. This framework was used to evaluate different narrative structures' affect on continuation desire.

The results of the experiment, conducted to evaluate the success of the framework, showed that the framework is, indeed, able to measure continuation desire, but also shows that further work is required to ultimately confirm its validity. Furthermore, the framework doesn't take into account how much each category of continuation desire contributes to the overall score. Finally, the experiment shows that narrative structures does not have a significant impact on players' continuation desire, but some structures might affect players' desire to re-play a game.

# Fantastical Narrative Structures, and How to Evaluate Them

*- Evaluating Continuation Desire in Interactive Narratives -*

A Master's Thesis by
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# Contents

# Chapter 1

# Motivation

The motivations behind this project are manifold; There are personal, academic as well as professional reasons behind our choice of project, which we will describe in the following chapter.

## 1.1 Personal Motivations

To start with we will describe our own, personal, motivations for choosing to work with this specific topic, first from a shared point of view, then from each of our individual perspectives.

### 1.1.1 Shared Perspective

Throughout our education (both our Bachelor's, as well as our Master's degree), we have been working with interactive narratives - Our first semester project revolved around the construction of an interactive horror game, in which the player saw short movie clips, and were then asked to pick a choice about how to proceed. We have come a long way from this first game of ours, but our interest in interactive narratives (specifically in relation to video games) as a story telling medium have been kept intact. We have since then delved deeper into the topic, finding an interest in branching story arcs, the theories behind what makes a game enjoyable (e.g. engagement) and what keeps players' attention and retains their engagement (e.g. continuation desire). Thus, it seemed logical to continue building on our knowledge and understanding of these topics, which is a primary motivator behind choosing to work with continuation desire in relation to interactive narratives. Furthermore, we are both immensely interested in the development of games, and are both currently working on an indie game, *"Aporia: Beyond the Valley*, set to release early this summer.

### 1.1.2 Patrick's Personal Motivations

I've always had a passion for game design, even at a young age I tried to analyze games and understand the design decisions behind them. When I started at Aalborg University, I started to develop my programming skills and began to understand the underlying systems as well as the challenges of game design. Along the road, player engagement and narrative structures got my attention, and is now one of my passions as well. For this project I want to expand my understanding of continuation desire, interactive narratives and their structures, while developing my programming skills.

### 1.1.3 Frederik's Personal Motivations

My primary interest lies with 3D-Modelling and, more specifically, character creation - 3D modelling is the very reason I chose Medialogy as my education to begin with, as it offered a chance to work with the field I find interesting, while also giving me a strong education to fall back on if, for whatever reason, 3D art proves to not be a feasible career path for me. For this project, I intend to use a framework for creating appealing characters, I developed as part of a previous semester course, to create the characters for the game, thereby putting theory into practice. Academically, I find engagement with games (more specifically, continuation desire), really interesting, and I have been working with the concept to some extend for most of my time at Medialogy. I find the topic motivating, because I believe that the desire to continue playing, is the cornerstone of what makes a successful game - Or rather, what *defines* a subjectively successful game.

## 1.2 Professional Motivation

The professional motivations behind this project can roughly be divided into two categories; the scientific value of advancing the field of understanding and evaluating video game engagement (which in turn can be used to create even more engaging games), and the practical value of being able to utilize our skills in our respective areas of expertise in the design, implementation and testing of a game, suitable for our experiment, building upon our portfolios.

## 1.3 Academic Motivation

Engagement in video games is a topic that have been researched for a number of years now, and we are slowly (but steadily) coming closer to a shared understanding of what the concept entails, and more and more methodologies for measuring engagement (or flow, immersion, etc. - All concepts that can be said to lie under the umbrella term "Engagement") are being developed. And as the game-industry

keeps growing larger and larger, the need for accurate ways of measuring what keeps players engaged with a game grows accordingly. 'Continuation Desire' as defined by H. Schoenau-Fog is a term used to, as the name implies, describe the players' desire to keep playing a game (and by extension, their desire to re-engage with a game in a future play-session). While measuring e.g. engagement, flow or immersion in games are, no doubt, important for the future of game development, we argue that continuation desire (or similar concepts, revolving around what *keeps* a player engaged) is absolutely essential for a game's success - Because if players do not want to continue playing a game, the rest of game's value arguably becomes irrelevant. Therefore, we find researching the topic, and how to accurately measure it, to be extremely important, which is why the topic is such a strong motivator behind this project.

# Chapter 2

# Introduction

Building upon previous semesters' experience and knowledge (e.g. our bachelor's project [Atchapero et al., 2015]), we knew that we wanted to, academically, work with "Continuation Desire" and "Narrative Storytelling" in a games context. Furthermore, based upon our motivation (Recall Chapter 1), we knew that we wanted to incorporate topics such as narrative branching and character design, along with utilizing the practical skills (e.g. programming or 3D graphics) that we have acquired throughout our education. These points led us to the following initial problem statement, which we will use as the basis for our research;

## 2.1 Initial Problem Statement:

*"How can a framework be developed to measure continuation desire in interactive narratives, and how is continuation desire affected by different narrative structures?"*

# Chapter 3

# Research

As we are primarily going to work with continuation desire and narrative structures, these two topics form the basis of our research. As continuation desire is an element of the umbrella-term "engagement", we will start by researching engagement as a general concept, before continuing to continuation desire. Likewise, before researching narrative structures, we will start by looking at interactive narratives in general, in order to provide a properly argued foundation for our experiment. The following chapter will present the findings of our research, which will ultimately lead to our final problem formulation.

## 3.1 Player Engagement

As the media have grown, so too have the budgets and the amount of people required to make a "triple-A" video game - A quick internet search will reveal that some games are reaching development costs in the multiple hundreds of millions of dollars [ESA, 2017].

### 3.1.1 Defining "Engagement"

While this increase in development budget seems to merit research into what makes games enjoyable to play, it has been somewhat neglected, and we are only slowly starting to catch up, academically [Boyle et al., 2012]. While it is getting better, as more and more research are being conducted, there is still a lack of shared vocabulary, when it comes to defining terms such as e.g. "Engagement" [Wirth et al., 2007, O'Brien and Cairns, 2016]. Laurel describes User Engagement (UE) as *"The state of mind that we must maintain in order to enjoy a representation of an action"* (Laurel [1993], pp. 112-113), [Quesenbery, 2003] suggests that UE is a component of usability that encourages interaction and "draws" people in. [Brockmyer et al., 2009] divides the term "engagement" (in the context of games) into four sub-

categories of engagement; *"Absorption"*, *"Flow"*, *"Presence"* and *"Immersion"*, which relates to the theory that UE can be defined according to the characteristics it manifest in users - Jaques ([Jacques, 1996] as mentioned in [O'Brien, 2016] and O'Brien [O'Brien and Cairns, 2016] suggests that UE can be defined as a *"category of user experience characterized by attributes of challenge, positive affect, endurability, aesthetic- and sensory appeal, attention, feedback, variety / novelty, interactivity and perceived user control"* ([O'Brien and Toms, 2008], pp. 2-3). Others have chosen to evaluate UE in a more general context of user experience, and chooses to focus their attention on what causes engagement in people, and what makes them sustain this engagement (e.g. Dobrian et al. [2013], Schønau-Fog and Bjørner [2012]). Clear definitions are further hampered by disagreements within the research community - [O'Brien and Toms, 2008] notes that, as an example, [Brandtzæg et al., 2003] argues that control is a major element of user engagement, whereas [Webster and Ahuja, 2006] argues that engagement is specifically "Flow **without** user control".

### 3.1.1.1 Engagement Defined for This Project

While the ideal practice for working with engagement would be to have a common definition, and a shared vocabulary, this is not the case, and could form the foundation for a research project on its own. As defining engagement is not the central problem behind this project, we will instead present research on the topic, in order to gain an understanding of how engagement is used. The research presented in the following sections will serve as the definition for how we understand the term *Engagement*.

### 3.1.2 Categories of Engagement

As mentioned in the previous section, [Brockmyer et al., 2009] defined engagement as being comprised of four sub-categories. In the following sections, we will look closer at the four categories individually.

### 3.1.2.1 Flow

"Flow" is a term originating from psychology and coined by [Csikszentmihalyi, 1991]. "Flow" is defined as the feeling of enjoyment that is experienced when there is a balance between a highly challenging task, and being highly skilled at performing this task - I.e. the individual performing the task (e.g. the player of a game) are being challenged, without being overwhelmed [Boyle et al., 2012, Hamari et al., 2016]. The feeling of flow is often described as being in a state of timelessness and of being "removed" from the real world - People often describes having a very distorted sense of time, having hours go by in what feels like minutes, or the opposite; having mere seconds feel like an eternity [Strati et al., 2011]. Likewise, the state of flow is often accompanied by a strong sense of being in control, partly due to the

fact that many forget their worries and other responsibilities, while experiencing flow.

[Schmidt et al., 2014] presents the conditions that Csikzentmailyi argued are the precursors for the experience of flow; *Autoletic Activity*, *Clear Goals*, *Immediate Feedback* and *Balance of Skill and Challenge*.

- **Autoletic Activity:** From Greek (auto = self, telos = goal), an autoletic activity describes an activity, where the activity, in itself, is the goal of the activity [Strati et al., 2011]. This is, for example, true in the case of most hobbies - These are activities that we partake in, simply for the enjoyment we get out of doing them, and not because of any goal or reward. [Strati et al., 2011] argues that it is simply the desire to reenter a state of flow with an activity that can motivate repeating the action. The statement that the activity should be a goal in itself, should not be confused with there not *being* any goal - The goal is simply not the motivator of the action.

- **Clear Goals:** A major component of flow activities, is the knowledge of *what* needs to be done and *how* it should be done - There is often an overarching goal in mind (e.g. completing a level in a game, finishing a painting, etc.) which presents a stream of sub-challenges (e.g. defeating a certain enemy in a game, getting the colors of a face right while painting, etc.) that needs to be completed to accomplish this goal. Completing these sub-challenges provides a steady stream of feedback, which can not only be a positive experience in itself, but it also shows a continuous amount of progress towards completing the activity. [Strati et al., 2011] suggests that this pleasure from solving problems is a key component in why people enjoy solving puzzles.

- **Immediate Feedback:** As the goal of the activity, as well as the sub-goals, that needs to be accomplished becomes clear, it is easy to evaluate the progress made towards achieving the overarching goal, as solving each of the sub-goals provides immediate feedback towards how well the goal is being completed. This steady stream of feedback can also come from the *process* of completing the goals (e.g. dodging or being hit during a boxing match, scoring or missing a goal in a game of soccer, etc.) - Whether the feedback is positive or negative matters little, as even doing something wrong provides feedback of what not to do, and in turn improves ones performance. *Balance of Skill and Challenge:* This is often the primary condition that people mention, when explaining flow [Csikszentmihalyi, 1991, Strati et al., 2011, Boyle et al., 2012] and it can be argued that this balance between skill and challenge is essential for attaining the previous conditions - Without the knowledge about how a certain task is done, it can be hard to gain clarity over the task at hand, and the sub-goals that requires solving, in order to accomplish the primary

goal, for example. It is this balance between high skill and high challenge that Csikszentmihalyi [1991] originally argued as the foundation of flow.

**Flow Channels:** Flow theory suggests that a person's psychological state of mind can be predicted based on the relation between the challenge presented to the person, and the person's skill level at accomplishing the challenge. Csikszentmihalyi [1991] created a diagram, showing the expected psychological state of mind, based on the relation between skill and challenge:
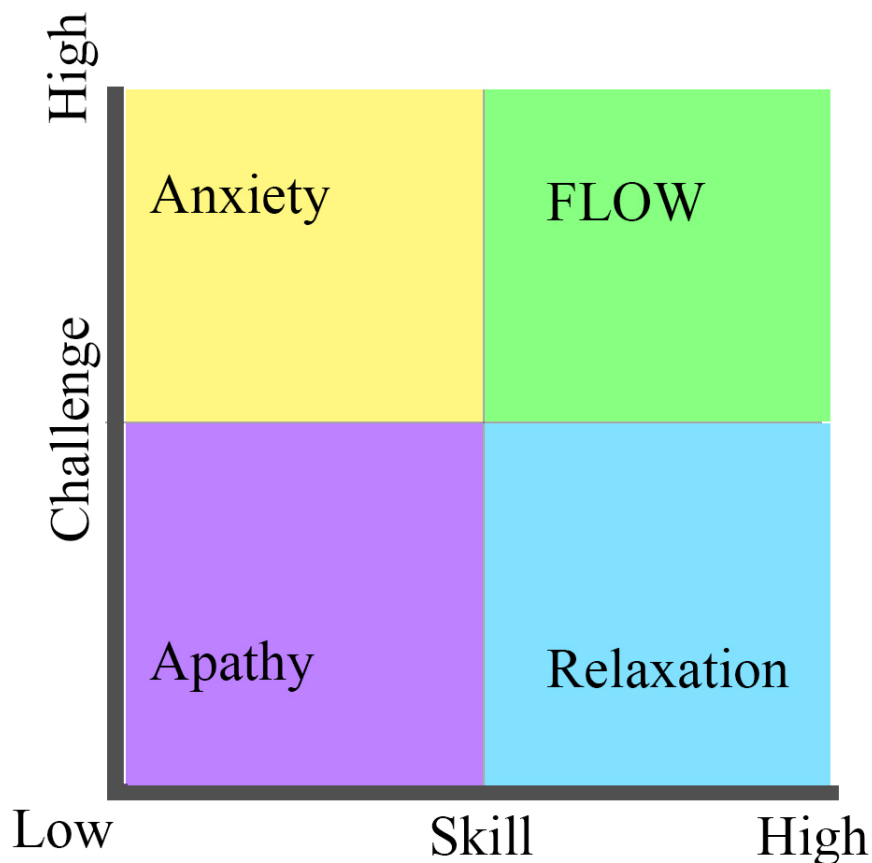


**Figure 3.1:** Simple model of "Flow", based on [Csikszentmihalyi, 1991]

This model shows how skill (horizontal axis) and challenge (vertical axis) predicts certain psychological states of mind;

- **Apathy:** A low challenge level, coupled with a low skill level, predicts a feeling of apathy in a person - The person is not skilled enough to breeze over the task, but the task is not challenging enough to feel any noticeable

skill development. As a result of this, it is expected that people will feel apathetic towards the action [Strati et al., 2011]. This can often be seen in cases of "repetitive tasks", such as e.g. transferring test data from notes into a spreadsheet.

- **Anxiety:** When presented with a challenge far exceeding a person's skill level, it is predicted that a sense of anxiety will be invoked in the person - The person is overwhelmed by the demands of the task at hand, and is not skilled enough to manage it. We will argue that in some contexts, "challenge" might not necessarily just refer to the difficulty of the task, but can also encompass other factors that can make a task less manageable - e.g. time constraints or expectations. This could as an example be an examination scenario, where a person might be skilled enough to overcome the challenge in terms of *difficulty*, but might be overwhelmed due to other factors, such as expectations or time limits (e.g. needing a certain grade to get a scholarship).

- **Relaxation:** In the other end of the spectrum, we find that people with a high level of skill, met with tasks that are of little to no challenge to them, would be expected to be relaxed - The demands of the task are so low, and their skill level so high, that they are able to easily breeze through the sub-goals and complete the overarching challenge, without much effort. Using the examination example from above, this time the student is confident in their abilities, and feels on top of the challenge, which in turns will have an relaxing effect on them.

- **Flow:** As the balance between the challenge of a task, and the skill of the person performing the task, is in equilibrium, a person is expected to experience a state of flow - The person's skills are utilized and are being stretched to their full potential and are suited to the requirements of the task. The task feels challenging, without feeling too *difficult*, and the learning outcome of the task is high.

This model is dynamic, as it refers to relative skill- and challenge levels, and not absolute levels - As a result, it is necessary to continuously increase the level of challenge of tasks, as a person's skill level increases, in order to achieve and maintain a sense of flow [Strati et al., 2011]. Csikszentmihalyi [1997] later expanded upon the model, dividing each channels into intermediate sub-channels (*Boredom*, *Worry*, *Control* and *Arousal*):
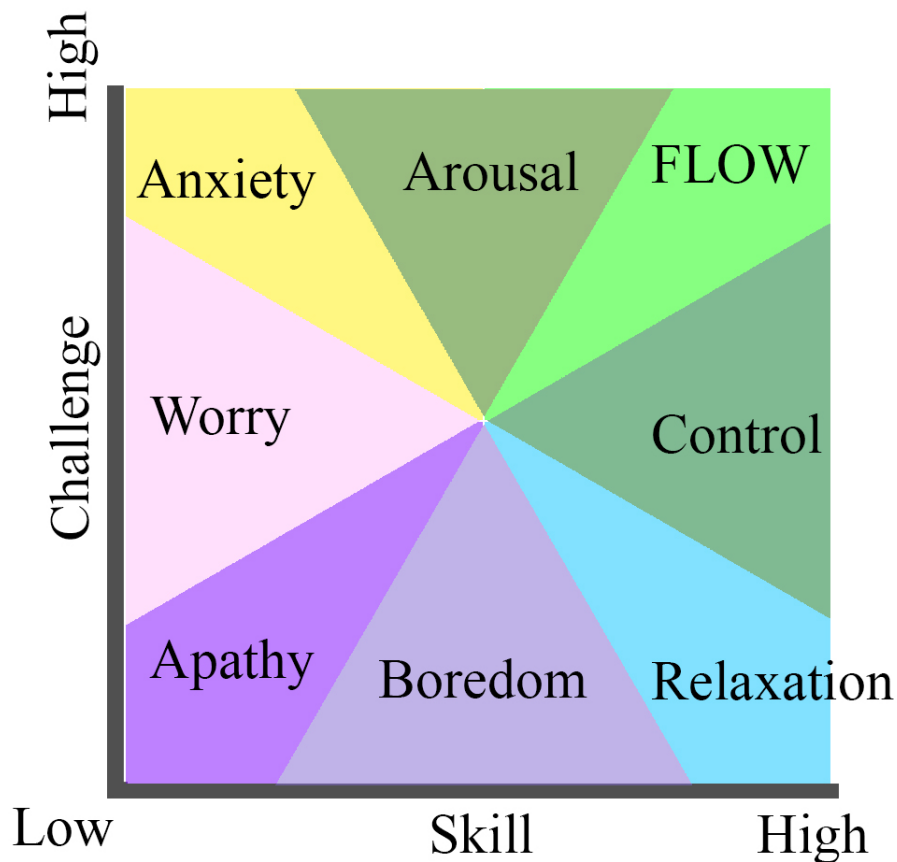
**Figure 3.2:** Revised model of flow, based on [Strati et al., 2011, Csikszentmihalyi, 1997]

The four new states (or "channels") introduced into this revised model, are transitional states between the original four, and helps deepening our understanding on how the experience of flow is achieved. These four new states each combines features from two of the original states, to allow for a higher resolution of definition. As an example, *arousal* can be used to describe the situation where the challenge is just above a person's skill level, without being overwhelming - This situation is often encountered when progressing skills, as the challenges faced are only just above the initial skill level, pushing progress and encouraging learning [Strati et al., 2011].

### 3.1.2.2 Immersion

Immersion, in relation to game psychology, is not a rigidly defined term; there are various definitions and usages - Some use it to describe the experience of becoming

engaged in the gameplay experience, while keeping awareness of the real-world surroundings [Baños et al., 2004], whereas others define it as a game's ability to induce a feeling of *"being part of the game"* [Wirth et al., 2007], other still associate immersion with realism, but [Brown and Cairns, 2004] argues that realistic games are not necessarily immersive (and vice versa). However, according to McMahan [2003] and Jennett [2010], Janet Murray's definition of *immersion* is the most widely accepted one;

> *"A stirring narrative in any medium can be experienced as a virtual reality* [1] *because our brains are programmed to tune into stories with an intensity that can obliterate the world around us... The experience of being transported to an elaborately simulated place is pleasurable in itself, regardless of the fantasy content. We refer to this experience as immersion. Immersion is a metaphorical term derived from the physical experience of being submerged in water. We seek the same feeling from a psychologically immersive experience that we do from a plunge in the ocean or swimming pool: the sensation of being surrounded by a completely other reality, as different as water is from air, that takes over all of our attention, our whole perceptual apparatus... in a participatory medium, immersion implies learning to swim, to do the things that the new environment makes possible... the enjoyment of immersion as a participatory activity"* - [Murray, 1997]

[Jennett, 2010] argues that immersion can be experienced in various different contexts, from monopolizing the senses of the user by, for example, equipping them with virtual reality (VR) head-mounted display (e.g. the Ocolus Rift or the HTC Vive), letting them "enter" the experience, to simply being "mentally absorbed" in the game, as is the case when referring to immersion in relation to e.g. reading books, watching movies or playing games in a more traditional setup (e.g. using a 'normal' sized monitor). [Jennett, 2010] argues that the term "Suspension of Disbelief" is a key component in achieving immersion with any media, and that poor design can be highly damaging to immersion. This argument is supported by the first of McMahan [2003]'s three essential conditions, required to achieve immersion with a given media;

1. *"The users' expectations of the game or environment must match the environment's conventions fairly closely."*

2. *"The user's actions must have a non-trivial impact on the environment."*

3. *"The conventions of the world must be consistent, even if they don't match those of "meatspace"."*

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[1]It should be noted that the "Virtual Reality" referred to here, is not necessarily the same kind of "Virtual Reality" seen in modern technology (e.g. the HTC Vive headset), but rather a virtual environment (e.g. a game world).

McMahan [2003]'s second condition (that users' actions must have a non-trivial impact) is supported by [Qin et al., 2009a], who argues that, as games differ from traditional means of narrative story telling (e.g. books) because they are interactive, the aim of video game narratives is not only to tell a story, but also provide an opportunity to play with an environment, and that part of the story is created from the player's active participation with the narrative. Furthermore, Qin et al. [2009a] argues that players 'project' themselves into their avatar; The player is not frustrated at their avatar's performance for losing the game, but rather frustrated at themselves and their own performance. In the other end of the spectrum, [Jennett, 2010] argues that in video games, the narrative, interaction and characters are not all essential to immersion - Sometimes the environment alone can be enough for a player to fell immersed - This type of immersion can be explained as *"Spatial Immersion"*, as argued by Bjork and Holopainen [2004], which is a type of immersion that relates to the perception of the simulated world. The idea of dividing *immersion* into categories is explained by Adams [2004], who argues for three distinct categories of immersion;

- **Tactical Immersion:** Described as the immersion caused by the moment-to-moment interaction with the game. It is the sense of immersion one might experience during fast-paced and highly intense games, such as many first-person shooters. This type of immersion is primarily determined by the action of the gameplay.

- **Strategic Immersion:** As the name implies, this type of immersion is caused by the mastery of the game's strategy - Knowing how to react to any move, and the ability to predict future moves. This type of immersion is mostly determined by the game's mechanics.

- **Narrative immersion:** This type of immersion is determined by the characters and the unfolding of the narrative in the game - it is similar to the type of immersion one might experience while watching a movie or reading a book. Good storytelling is the primary catalyst of achieving narrative immersion.

While these three categories of immersion can seem (and indeed sometimes are) contradictory to each other, Adams [2004] argues that it is possible for a game to be immersive in all three categories. Graded Immersion Instead of trying to define types of immersion, Brown and Cairns [2004] chose to research the gradation of immersion, in order to explain the level, or intensity, of immersion, which allows for a more accurate description of a game's immersiveness, rather than a binary definition of whether or not a game is immersive. They defined three stages of immersion; *"Engagement"*[2], *"Engrossment"* and *"Total Immersion"*, but rather than being a

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[2]Different from the overarching term "Engagement" - A brilliant example of how loosely defined

progressive path of steady incline from engagement towards total immersion, they found that the experience of immersion was fleeting, and that the player's immersion level would change rapidly depending on several momentary factors, such as e.g. events in the game, etc. The levels of immersion are described as follows;

- **Engagement:** A user is described as being *engaged*, once mastery of the controls and mechanics of the game have been achieved, and are now "fluent" in how to interact with the game.

- **Engrossment:** A user is *engrossed*, once their emotions are directly affected by the game, and once their self awareness have been reduced, compared to before starting playing the game.

- **Total Immersion:** *Total immersion* is achieved when the user feels so far detached from reality, that the game *becomes* their reality (even if only momentarily), and the game is all that matters to the player. *Presence* (which will be explained later) is an important component of total immersion.

This notion of defining immersion as a graded experience is supported by e.g. Bayliss [2007] and Carr [2006] who argues that the player's focus might, initially, come from learning the controls and mechanics of the game, but once certain levels of mastery is achieved, the player's attention is free to focus on e.g. the narrative elements, and thereby increase their immersion with the game. On the other hand, Arsenault [2005] argues that the concept of immersion being reliant on plot or narrative, might not be completely accurate, as games notoriously known for their lack of plot ("Doom" is given as example) can still feel immersive, in the sense that the player feels "detached" from reality, while not feeling "projected" into the game environment. It can be argued that this type of "immersion" might be more closely related to the sense of "flow" (as defined earlier), rather than immersion.

### 3.1.2.3   Presence

[Sutcliffe, 2016] argues that the origins of presence (in a video game-engagement context) comes from VR[3], and argues that presence is related to immersion, as both describe the experience of feeling like you are actually *in* the world. [Boyle et al., 2012] defines presence as *"A state of consciousness"* and as *"an experience of being inside the game"*. [Wirth et al., 2007] argues that presence can be interpreted differently, depending on the context of what media is used; He argues that the "presence" experienced while reading a good book, is a case of presence driven by the reader's imagination, whereas presence in a game context, often is driven more

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these terms are - Brockmyer et al. [2009] defined immersion as being a component of engagement, Brown and Cairns [2004] defined engagement to be a level of immersion.

[3]Again, the "old" definition of VR, or "Virtual Environment" - Though the theory very much applies to "modern VR" as well.

by perception (which is especially true in relation to "modern" VR-experiences). [Witmer and Singer, 1998] describes presence as a feeling of "being there" in a virtual world, and argues that the interaction methods of a game are directly related to presence; *Embodied Interaction* (also described as *Immersed Interaction*), which is described as a type of presence, where the controls feels very natural and "real" - As is the case with e.g. the HTC Vive's remotes, where the player can physically pick up objects in the virtual world, in a life-like manner. Sutcliffe [2016] argues that the interaction methods of a game need not, necessarily, be more complex than e.g. a mouse and keyboard, as long as the controls feels natural enough that controlling the game becomes a subconscious effort. [Sutcliffe, 2016] argues that it doesn't take much to create an illusion of presence, and argues that our powerful imaginations only need a few hints to get us started. [Slater and Wilbur, 1997] have produced three theories about what presence is, and what causes it;

- Presence is a subjective, as well as an objective, description of a person's state in relation to a game. The subjective state is the *feeling* of being part of the virtual world, also often described as the *suspension of disbelief*. The objective state is an observable phenomenon where people behave in a similar fashion within the virtual environment, as they would in the real world.

- Another description of presence, is an *increased state of immersion* - [Slater and Wilbur, 1997] argues that the modalities (e.g. graphics or audio) through which the media is mediated, are important factors in causing immersion (and by extension, presence). They also argue that both the quality of the modalities, as well as the users' preferences regarding the quality of the various modalities, are important - Some people might not care particularly about e.g. the sound, whereas others might gain an increased level of immersion from a good soundtrack.

- [Slater and Wilbur, 1997] argues that the plot line of a narrative have the potential to "remove" a person from everyday reality, thus inducing a sense of presence. They further argues that the susceptibility for a person to enter a state of presence is highly individual - Some people might be able to easily enter a feeling of presence, whereas others might not be able to at all.

### 3.1.2.4   Absorption

In psychology, absorption is defined as a state of total engagement in an experience [Irwin, 1999]. As with the other categories of engagement, described in the previous sections, there are degrees of overlap in the definitions of the various terms - and absorption is no different. The definition of absorption is almost exactly identical to that of *total immersion*, but includes an altered state of consciousness like in flow theory. [Funk et al., 2006] argues that the distinguishing factor between flow

and absorption is the type of affect experienced, along with motivation. They argue that games can induce negative affect, which is counterproductive to the flow state. In the previous sections, we argued that flow is thought to be autoletic, but [Brockmyer et al., 2009] argues that factors in video games, other than the act of playing itself (e.g. social aspects), can be the primary contributor to a deep state of engagement, which would then be described as absorption instead of flow.

Brockmyer et al. [2009] argues that absorption can lead to a state of "non-pathological dissociation", which is a state where actions become unconscious and automatic, and gives the example of a driver acting on "autopilot", where the drivers' consciousness is occupied with things unrelated to driving, but at the same time without interfering with their ability to operate the vehicle - It simply becomes an automatic, subconscious process.

## 3.2 Continuation Desire

While understanding what makes people become engaged with playing games is undeniably important, another, perhaps equally important, aspect of engagement is what keeps players engaged, and what makes them re-engage after disengaging from an experience. Because while a game might be extremely engaging, it is assumed that a point comes, where players will stop playing a game - No matter how engaging that game might be! But often, players return to the game after a while - The re-engagement-process, and what makes a player re-engage with a game, is particularly interesting, as continuing to re-engage with a game, session after session, is what gives a game longevity. While this re-engagement process have been attributed to "addiction", and while it is true that, according to [Grüsser et al., 2006], game playing can have many of the attributes of addiction, [Cairns, 2016] argues that associating excessive gaming with e.g. drug addiction, is a bit extreme. Furthermore, [Cairns, 2016] mentions that there seems to be evidence that video games "addiction" and high engagement in video games are two distinct phenomena, e.g. the work of [Charlton and Danforth, 2010]. While the connection (or possible lack of) between engagement and addiction to video games merits consideration, it is beyond the scope of this project, and will therefore not be researched more thoroughly - But we found it important to mention, as it is a problem that have been debated heavily. Going back on topic, namely what makes players become re-engaged, and furthermore, what keeps them engaged - For as explained previously, immersion (and by extension, engagement) is a continuous process, and it would therefore seem logical that engagement could be seen as a process starting with becoming engaged with the game, until, at some point, the players engagement level would drop, only to increase again to the point of re-engagement. This theory have been explained by [Schoenau-Fog, 2011a] as *"Continuation Desire"*, which, as the name implies, is a term used for the urge that

causes players to keep playing (e.g. keep re-engaging) with a game. Based on surveys, grounded theory and analysis, Schoenau-Fog [2011a] found that engagement can be described as a process containing the following components;

- To become engaged with a game, players are often either drawn by game-related novelties (such as e.g. "hype"[4] (an idea supported by e.g. [O'Brien and Toms, 2008]) or by social motives (e.g. wanting to play with friends).

- During gameplay, the game will most often set up objectives (e.g. completing a level, defeating a boss, etc.), or the player will set up self-defined objectives (e.g. build a castle, obtain a certain item, etc.) or a mix of both.

- These objectives triggers activities for the player to participate in (e.g. exploration or experimentation).

- As long as the player is engaged with the game, they will have the desire to continue playing until they have completed the objectives, in order to experience a sense of accomplishment.

- As a result of completing an objective (or failing it, for that matter), the players can experience some sort of affect (e.g. satisfaction from completing an objective or frustration from failing one).

- If the experienced affect is perceived positively, the player might sustain their engagement and might set up new goals and objectives (as per the second point), which initiates a restart of the cycle (e.g. initiates re-engagement with the game). [O'Brien and Toms, 2008] argues that even slightly negative experiences can initiate re-engagement (e.g. frustration about *just* not completing a level in time), as long as the player feels that they are making progress, and that reaching their goal would be within their abilities - This experience can relate to the "arousal" state of flow theory (as explained earlier), where the challenge faced by the player is *just* beyond their current skill levels, so they feel progress towards overcoming the challenge.

[Schoenau-Fog, 2011a] visualizes the Player Engagement Process (PEP) as *Objectives*, *Activity*, *Accomplishment* and *Affect* in the OA3 model:

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[4]Internet-terminology for something being highly anticipated, often in a recursive manner (e.g. people's shared hype about a product will increase each others' anticipation for the specific product)
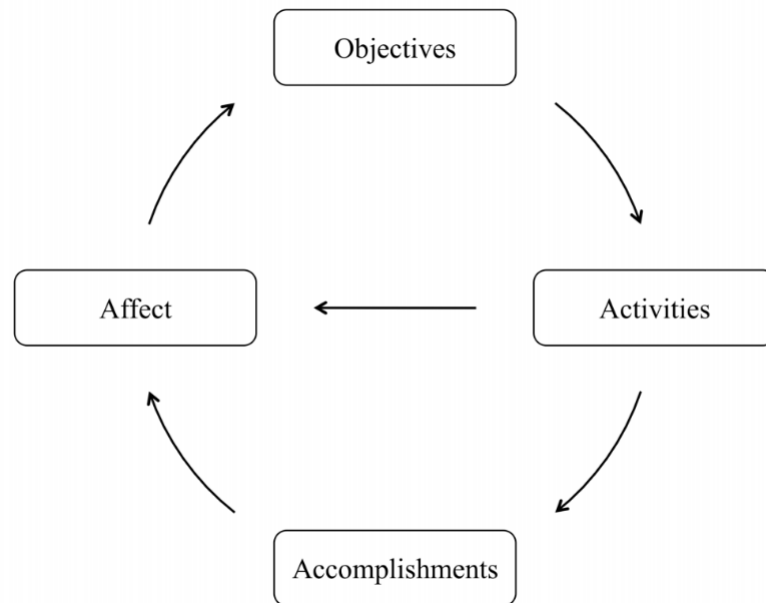
**Figure 3.3:** The OA3 model, depicting the relations between Objectives, Activities, Accomplishments and Affect, as well as illustrating how activities can lead to affect, thus restarting the cycle (i.e. continuing engagement) [Schoenau-Fog, 2011a]

These four components of player engagement are further explained by Schoenau-Fog [2011a];

- **Objectives:** Objectives are described as the game-related triggers that motivate players to continue playing the game. This can further be divided into two distinct categories;

    - *Extrinsic Objectives:* Goals set up by the game, such as e.g. quests, mission objectives or time restraints on completing certain challenges, are described as extrinsic objectives.

    - *Intrinsic Objectives:* Self-defined goals, such as i.e. reaching a certain character-level, defeating a boss without being hit by anything, etc. are defined as intrinsic goals.

    Both of these categories of objectives are argued to be essential to a player's desire to continue.

- **Activities:** Schoenau-Fog [2011a] argues that activities, as a component of PEP, are described as what players *want to do* in order to complete an objective. He further argues that this is not strictly limited to activities *within* the game, but can also include mental tasks of trying to solve a given challenge. Activities are also split into a number of distinct categories;

– *Solving:* This category describes the processes where players are engaged in mental tasks, related to solving intellectual challenges and puzzles, and is often seen in e.g. puzzle games, strategy games and games of chance (i.e. calculating the probability of a certain outcome, weighing risks versus reward).

– *Sensing:* Engagement through sensory input, is related to the game's aesthetic qualities (e.g. its graphics or its audio), and describe a process where these qualities alone is enough to engage players. This type of engagement can be argued to be a core feature of modern VR headsets (e.g. the HTC Vive or the Oculus Rift), and as we haven't been able to find any recent research on this specific topic[5], it could be an interesting prospect for future work.

– *Interfacing:* Schoenau-Fog [2011a] defines the Interfacing category of activity as the engagement triggered by a game's controls, whether it is using a mouse- and keyboard configuration or a more embodied interaction method such as e.g. the Wii-mote controllers. While the engagement caused by interface can certainly be enough to cause players to want to continue playing a game, it is perhaps more commonly seen as a disengagement factor if the controls are badly designed.

– *Exploration:* Exploring a virtual world can be really exciting to some players, and can be a major (if not primary) cause of engagement. Exploration in games is often rewarded by e.g. collectibles, which can further incentivize some players to continue playing a game, but as with almost all categories of activities in games, buggy, badly designed (or implemented) features can also be a cause of disengagement, e.g. when the player is stuck, or traveling takes too long (worse still, if the player is forced to backtrack after having explored a cave, for example).

– *Experimentation:* Customization and experimentation (e.g. experimenting with different "talent builds"[6] in Roleplaying Games (RPGs) can be a source of engagement for some players. This form of engagement can also be seen "outside" a game - e.g. people modifying (modding) games, thereby creating different experiences.

– *Creation:* As the name implies, the Creation category describes a form of engagement caused by being able to creating things inside a game. This is commonly seen in e.g. city-building simulation games, but many games incorporate some element of creation or building.

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[5]Possibly due to the only very recent emergence of hardware with enough power and technical fidelity to afford high quality experiences with VR.

[6]Allocation of "skill points", modifying how a character performs, or how the character is specialized.

- *Destruction:* Contrary to creation, some players find engagement from being able to destroy things inside the game. Schoenau-Fog [2011a] notes there are indications that engagement from destruction might be a fleeting experience, however, as the novelty of e.g. blowing things up, can fade fast - This might, however, more be due to a lack of variety, rather than an inherent problem with destruction as an engagement form.

- *Experiencing the Story:* Many players find engagement in experiencing the story telling powers of the medium of video games. This type of engagement is highly similar to the type of engagement one would expect to be present in other media, e.g. books or movies, as elements such as i.e. anticipation or cliff-hangers are also central to storytelling in games.

- *Experiencing the Characters:* Related to engagement from experiencing the story, some players find engagement in experiencing the characters of a game - How they develop and evolve throughout the game. This type of engagement can transcend singular games (e.g. in the case of game series, or multi-media stories, where characters can be followed in media outside the games).

    * As a side-note, it can be argued that engagement from characters and from the story can both be described as "Narrative Engagement", but keeping the two categories separate can be beneficial in evaluating the sources of engagement in games.

- *Socializing:* Most apparent in multiplayer games, the social aspects of playing games (e.g. playing with friends) can be a highly motivating factor in itself. This type of engagement can have many causes; Some people like the challenge that playing against real people (instead of AI) proposes, where others might like being able to face the game's challenges alongside their friends. Furthermore, engagement from socializing can even come from outside the game, by talking with peers in the real world about the game.

- **Accomplishments:** The feeling of accomplishment that can accompany completing objectives within a game, can be a highly engaging experience for some people. Schoenau-Fog [2011a] further distinguishes types of accomplishment by divides it into three distinct categories;

    - *Achievements:* The desire to achieve something (e.g. getting a new weapon, or unlocking pre-defined "achievements"[7]) can be a highly motivating factor for some people. The incentive to complete these achievements

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[7]As seen in modern games; Achievements are often defined by the game developers as certain challenges, such as completing a boss without using certain mechanics, within a certain time, etc.

can be varied; it can have an associated reward (e.g. obtaining an item), it can serve as a point of bragging (often with peers - Highly associated with social engagement in games) or it can simply be an intrinsic goal set by the layer themselves.

– *Progression:* While the feeling of completing a challenge is often very enjoyable, sometimes the process of progressing towards completion of the challenge can be an engagement factor in itself - This can for example be seen in extremely challenging boss fights, where players might attempt to defeat the boss dozens, if not hundreds of times before finally succeeding. This type of engagement can be argued to be a form of build-up, where the process itself might not always be enjoyable, but through frustration (as argued by [O'Brien and Toms, 2008]) the player keeps engaged with attempting to overcome the challenge, in anticipation of the feeling of accomplishment that will follow a success.

– *Completion:* Finally, a desire to achieve a sense of completion can be a highly motivating factor to some players - E.g. defeating the final boss, finding all the collectible items, etc. This type of engagement is often accompanying, if not the driving force behind the engagement that comes from progressing towards a goal.

• **Affect:** Finally, Schoenau-Fog [2011a] argues that games have the power to affect players' emotions, and that this affection can contribute to the players' desire to continue. He argues that Affect as a category of continuation desire can further be divided into three distinct categories;

– *Positive Affect:* Positive affect, such as e.g. enjoyment or satisfaction, plays an important role in engagement as many players use games as a past-time activity. The type of positive affect experienced by people can vary highly, and different games (and by extension, different types of affect) can be desired at different moods. As an example, stressed people might want to play a game that can take their mind off of things, and look for a highly engaging game that demands much of their attention.

– *Negative Affect:* On the opposite end of the spectrum, negative affect (such as e.g. boredom) can result in disengagement with a game. But on the other hand, some types of negative affect (such as e.g. frustration) can also be a motivating factor increasing sustained engagement, to some degree - It depends on the situation, the player, the player's mood and the end-goal of the cause of negative affect.

– *Absorption:* As explained in previous sections, Schoenau-Fog [2011a] too argues that a feeling of absorption in a game can be a strong trigger of engagement.

[Schoenau-Fog et al., 2013] later took a more narrative-focused approach to continuation desire, and built upon the Model of Narrative Comprehension and Engagement by Busselle and Bilandzic [2008], upon which they added a fourth dimension; Game World.
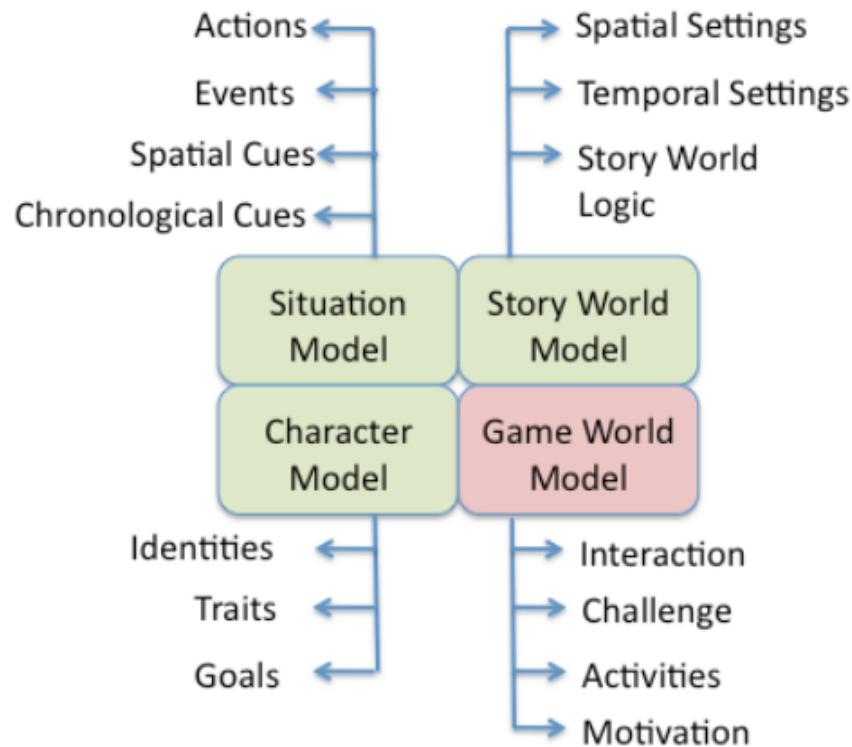


**Figure 3.4:** The Model of Interactive Narrative Comprehension and Engagement [Schoenau-Fog et al., 2013]

### 3.2.0.1 Skinner's Box - The Ultimate Continuation Desire

As an example of how continuation desire theory[8] have been used in games, Siang and Rao [2003] explains a concept known as "The Skinner Box" - A term originating from psychology, which explains that in-frequent rewards to a given task might be more motivating than a certain reward. This concept have been used in many games (often in the RPG-genre) as a means of keeping players playing the game. Continuation desire from a "Skinner's Box" is often seen as a drive to continue doing a repetitive, boring task in a game, to obtain a certain elusive reward - But while this drive is *technically* a desire to continue, it can be argued that this

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[8]Or rather, the theory behind what makes people continue playing a game - Not "Continuation Desire" as defined by Schoenau-Fog.

type of continuation desire is different to the one described in previous sections, as it is not motivated by *desire*, but rather by the prospect of obtaining a reward. Furthermore, it can be argued that this method of inducing continuation desire can have a damaging long-term affect on players' desire to re-engage with the game.

## 3.3 Player Behavior

Every player have different motivations to play a game. Some people like to explore the game's environment, where others might like diving into the story of the game, while others still may enjoy excitement, such as action and combat. If we are going to test a continuation desire framework, we need to know what motivates the players. As described in the continuation desire section, previously, players go through four dimensions (Objectives, Activities, Accomplishments Affect) when experiencing an interactive narrative. When evaluating players' continuation desire, it would be valuable to know what kind of activities these players enjoy, as well as what they do not enjoy. Analyzing player behavior will allow us a deeper insight into the reasoning behind the test participants' answers, and will help us build a framework that supports multiple types of player behavior. N. Yee and N. Ducheneaut, two research specialists in game behavior, formed the company *Quantic Foundry*, which uses questionnaires to gather data about game behavior, which is accessible in a data library used by designers, marketing and analytics teams Yee and Ducheneaut [2015]. This framework is useful as an inspiration for how to approach evaluating players' behavior types, and by extension how to evaluate how this might affect their desire to continue playing. They have defined a number of categories of player behavior;

- **Action:**

    - *Destruction (Guns, Explosives, Chaos and Mayhem):*
      If a player have a high destruction score, the player would most like be more aggressive in their play style and loves to be surrounded by visual feedback. A player with a high score in this category would most likely enjoy games such as: "Diablo", "Grand Theft Auto" and "Bulletstorm".

    - *Excitement (Fast Paced, Action, Surprises and Thrills):*
      If a player have a high excitement score, the player would most likely enjoy fast paced action games, such as e.g. "Counter Strike", "Call of Duty" and "F.E.A.R.".

- **Social:**

    - *Competition (Duels, Matches and High on Rankings):*

If a player have a high competition score, the player would like to either challenge friends in a game, to prove that they are the more skilled, or simply get the satisfaction by beating a landmark on a high score list. A player with a high score in this category would most likely enjoy games which include elements such as: "Cooperative Gameplay", "Online Ranking" - E.g. "League of Legends" and "Call of Duty".

– *Community (Being on a team, Chatting and Interacting):*

If a player have a high community score, the player would like to chat or play with friends to achieve a higher goal. A player with a high score in this category would most likely enjoy games such as: "World of Warcraft", "Portal" and "Runescape".

- **Mastery:**

– *Challenge (Practice, High Difficulty and Challenges):*

If a player have a high challenge score, the player likes games that have a high skill cap, which means that it has a high learning curve. It might take multiple attempts for the player to complete a level, or obtain a certain score, but once the goal is reached the player will be very satisfied. A player with a high score in this category would most likely enjoy games such as: "Tetris", "Raiden" and "Counter-Strike".

– *Strategy (Thinking Ahead and Making Decisions):*

If a player have a high strategy score, the player likes games that have a require you to analyze your opponents and think ahead. A player with a high score in this category would most likely enjoy games such as: "Chess", "Starcraft" and "DOTA".

- **Achievement:**

– *Completion (Get All Collectibles and Complete All Missions):*

If a player have a high completion score, the player likes games, where there are much optional content, such as side-quests, collectibles, etc. Some of these games might even reward special items or endings from full completion, further encourages this behavior. Examples of games, players with high scores in this category might enjoy include; "Batman: Arkham Knight", "Jack and Dexter" and "The Elder Scrolls: Skyrim".

– *Power (Powerful Character and Powerful Equipment):*

If a player have a high power score, the player likes games that have a requires spending time on character progression. A player with a high score in this category would most likely enjoy games such as: "World of Warcraft", "Borderlands" and "Diablo".

- **Immersion:**

  – *Fantasy (Being Someone Else and Being Somewhere Else):*
    If a player have a high fantasy score the player likes games that allows them to immerse themselves in the game universe, while pretending to be the character or something else. A player with a high score in this category would most likely enjoy games such as: "Dear Esther", "Aporia: Beyond the Valley" and "Waltz of the Wizard".

  – *Story (Elaborate plots, Interesting Characters):*
    If a player have a high story score, the player likes games that have an interesting narrative or setting. A player with a high score in this category would most likely enjoy games such as: "Bioshock", "The Walking Dead" and "Uncharted".

- **Creativity:**

  – *Design (Expression and Customization):*
    If a player have a high design score, the player likes games that lets them be creative by customizing characters or worlds to their own design. A player with a high score in this category would most likely enjoy games such as: "The Sims", "Cities Skylines" and "Spore".

  – *Discovery (Explore, Tinker and Experiment):*
    If a player have a high discovery score, the player likes games that let them experiment with the narrative structure or let them roam free in a randomly generated world. A player with a high score in this category would most likely enjoy games such as: "The Wolf Among Us", "Minecraft" and "Rust".

We are going to use these categories in order to acquire data about how the players see themselves, in relation to player types, and how this matches their behavior in the game.

## 3.4  Interactive Narratives

In order to understand the details about our problem, and in order to properly implement the narrative systems we're evaluating, a deeper understanding of these topics are required. The following chapter will present the findings related to interactive narratives, upon which our game, as well as our experiment, is based.

### 3.4.1  Interactivity and Narrative Structure

Interactive narratives is used in a huge variety of digital media, such as e.g. interactive movies, computer games and art installations. The primary reason to

incorporate interactive narratives into these media, is to help support and maintain engagement, since interactivity can encourage motivation and entertainment. Researchers have tried to accommodate for the incoherence of the development of an interactive narrative. Ryan is one of these researchers who have studied interactivity and interactive narrative structures. Ryan [2015] provides tools for guidance when creating an interactive narrative. When Ryan talks about interactivity there are four modes; *Internal-Exploratory*, *Internal-Ontological*, *External-Exploratory* and *External-Ontological*. In order to understand what these modes provides, they are divided into two categories; "Internal against External" and "Exploratory against Ontological".

- **Internal:** The internal mode is when the user projects themselves into the fictional world by identifying with their avatar, or the first person perspective [Ryan, 2001].

- **External:** In contrast to the internal mode, in the external mode, the player feels separated from the virtual world - They are either playing the role of a god, controlling the world, or as navigating a database [Ryan, 2001].

- **Exploratory:** In the exploratory mode, the player has freedom to navigate the game, but their activities does not affect the narrative, nor does their actions impact the ending of the story [Ryan, 2001].

- **Ontological** In contrast, the ontological mode describes a situation where the player controls the story, by directing it down different, forking paths. These paths may alter the outcome of the story, giving the player a high degree of control over the narrative [Ryan, 2001].

When it comes to narrative structures, there are many possibilities as most structures are changed and manipulated, based on the needs of the interactive media. Provided with the explanation from Ryan [2015], we can look into the basic narrative structures that many of the more common narratives are based upon.

- **The Directed Network:** The Directed Network is a structure that gives the player the ability to be reflective, when experiencing story elements and exploring different paths in the story structure. This structure is often used to guide the user into alternative endings or paths during the game's narrative.
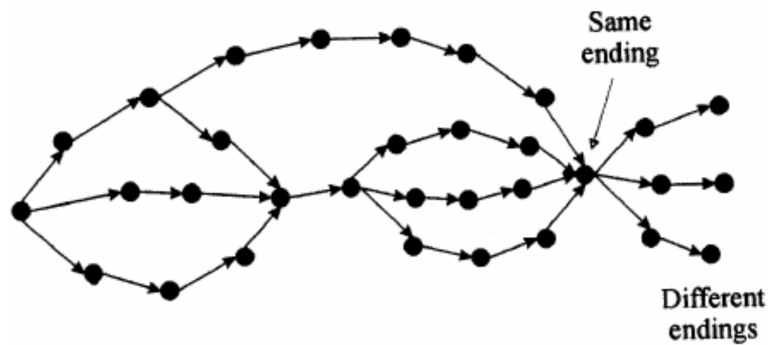
FIGURE 9 | The directed network, or flow chart

**Figure 3.5:** Directed Network Structure [Ryan, 2015]

- **The Vector with Side Branches:** The Vector is a structure that gives the player the ability to take a road in the narrative that leads away from the main path. This allows the player to experience other parts of the story within the narrative. This structure is often used to help provide additional information about the story-world or characters in the application.
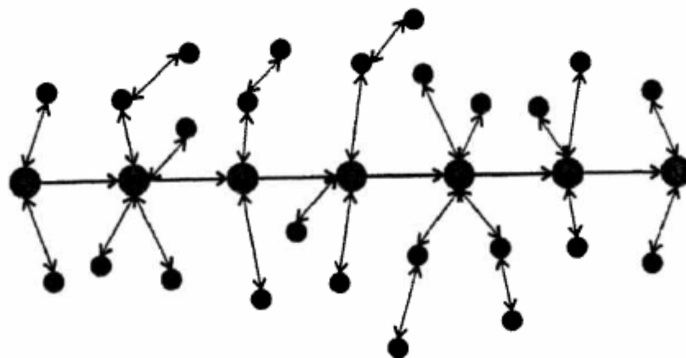


FIGURE 7 | The vector with side branches

**Figure 3.6:** Vector Structure [Ryan, 2015]

### 3.4.2   The Eliza Effect

While researching narrative structures it seems that some researchers are researching the flaws in these structures. According to Mitchell, the use of structures, such as the Directed Network, can lead into "The Eliza Effect", which is a phenomenon explored in Mitchell [2015].

"The Eliza Effect" is named after a chat-bot named Eliza, made by Weizenbaum [1966], that was able to respond to users, as they wrote text messages to it. The

initial expectations of the users, was that the system was highly complicated, but after having used the program a few times, they found that the system was in reality rather simple, and thus easy to manipulate. "The Eliza Effect" happens when the user sees an underlying branching system in a narrative structure as being more complex than it actually is. This is not a problem unless the user decides to enter the state of reflective rereading, which is a process of replaying or rereading a narrative, while having a critical or meditative mindset, as to how the system works. In the case of an interactive story, it could give the user a deeper understanding of how the underlying systems function, and therefore give a deeper understanding of how the story can be manipulated. If the user begins reflective rereading while under the "The Eliza Effect", the user can become aware of the level of complexity in the system. If the system is too simple, the user might be left unsatisfied and lose motivation to proceed in the interactive narrative.

### 3.4.3   Author-Audience Distance

After researching The Eliza Effect we came to the conclusion that there is no curtain method to detect or measure the effect. All we had to go for is whatever the application has a simple or complex narrative structure. After doing some research into Narrative Intelligibility we might have found a way to measure the perceived complexity of a narrative structure. Narrative Intelligibility is a rather huge subject which means we won't be able to cover all of the details in this project, so we will keep this part short. Narrative Intelligibility is a term used to describe the degree of how the player is understanding the story or plot as it is intended by the author. According to Bruni and Baceviciute [2013] this distance can be defined as Author-Audience Distance.



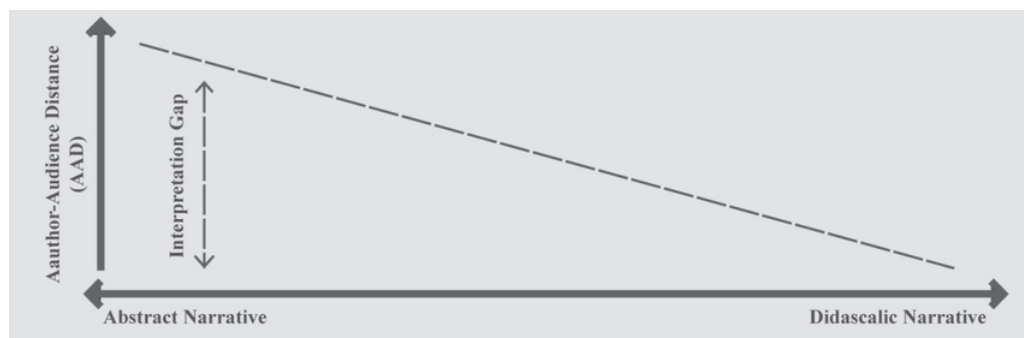**Figure 3.7:** Author-Audience Distance - Bruni and Baceviciute [2013]

Author-Audience Distance is a measurement tool that can pin point how large of a interpretation gap there is between the author and the user. If the narrative is more didascalic, it indicates that the story is more self-explanatory, and the user is understanding the story mostly as intended by the author. On the opposite site of

the scale, if the narrative is abstract, the story might not be as self-explanatory and the user will have to use their imagination to fill the gaps of the story. This can lead to an understanding of the story, rather different from the author's intended story. We intend to use this method to attempt to determine the complexity of a narrative system. We are going to replace the concept of interpretation story elements with the idea of understanding and the interpretation of the system within the narrative.

## 3.5   Delimiting the Problem: The Final Problem Statement

Based upon the research presented in this chapter, we have specified our problem statement to more accurately reflect our project, and to better account for the new knowledge gained through our research. We have decided to construct a methodology of measuring continuation desire in interactive narratives, based upon previous experience from our bachelor's project [Atchapero et al., 2015], which was based largely upon the Game Engagement Questionnaire [Brockmyer et al., 2009] and Schoenau-Fog's work in developing and evaluating the concept of continuation desire, along with the theories presented in the previous sections. Furthermore, we wanted to investigate how different narrative structures might affect a player's desire to continue, as well as to what extend these systems are apparent to participants. Finally, in order to test our problem, we have decided to create a game to be used as the basis of our experiment, in order for us to limit the amount of variables in each test, to just the specific condition being tested.

This lead us to our final problem statement;

> *"How can a test methodology framework be designed to evaluate continuation desire in interactive narratives, in a way that gives deeper insight into the specific causes of engagement, and how does the presentation of narrative structures affect players' level of continuation desire?"*

# Chapter 4

# Methods

In order to create a methodology, capable of measuring players' levels of continuation desire in a game, and the effects of the different narrative structures, we need to deconstruct the ideas and concepts found in the research into their base components, in order to create a methodology encompassing the many aspects of engagement and continuation desire in games.

## 4.1 Scientific Methodology

Our experiment is going to be designed using a "Convergent Parallel Mixed Methods" approach, as described by [Bjørner et al., 2015], which is a methodology where qualitative and quantitative data are collected in parallel, and used in combination with each other to answer a problem. The test will gather scores (e.g. players' desire to continue) using an experimental design (e.g. looking for differences between conditions), as described by [Field and Hole, 2013]. Finally, we will use an independent measures approach, meaning that each participant will only contribute one result to the experiment (so no participants will be exposed to more than one condition).

## 4.2 Test Procedure

In order to evaluate the narrative structures' affect on continuation desire, we will be testing three different versions of a game;

- A version where every option is presented to the player, allowing them to choose how to progress the story, regardless of their actions.

- A version where the players' actions are evaluated, and narrative choices are made for the player, depending on this evaluation.

- A hybrid version, where the players' actions are evaluated, and the "suggested" choices are emphasized (or non-suggested choices are simply grayed out), allowing the player to see what choices they're missing out on.

Based on previous experience (e.g. [Atchapero et al., 2015]), as well as our research (see chapter 3), we have decided upon the following test procedure, which we believe is a good compromise between a non-intrusive methodology, and getting the desired amount of information;

- **Before Playing the Game:**
  - To start with, simple demographic questions are asked, such as e.g. gender, age, preferences in video-games, etc.
  - Preliminary questions regarding the player's initial expectations and their desire to start playing

- **During the Game:**
  - At pre-defined key points in the game (i.e. natural breaks), the player is asked a few questions regarding their desire to continue playing the game.

- **After Playing the Game:**
  - Questions regarding overall engagement, continuation desire (or the desire to re-play the game) will be asked.

- **"Behind the Scenes:"**
  - During the game, we will evaluate the players' "Player Type" (as explained in section 3.3), based on their actions in the game. This information will be used to see evaluate the relation between Continuation Desire, and the alignment (or misalignment) between player type and game type.

### 4.2.0.1   Test Strategy

The test is planned to be conducted in three phases;

- **Phase 1:** Utilizing the power of the Internet and social media, we will conduct remote, online tests of the product, using built-in questionnaires to allow test participants to test the game on their own. Each test participant will randomly be assigned one of the three versions of the game to test, giving an un-biased distribution of test results.

- **Phase 2:** As remote tests can not fully be relied upon, we will conduct real-life tests of the game, conducted in the same manner as the remote tests, with the exception that we might choose which version of the game we will test, in order to rectify any skew in the amount of data we have for each version.

- **Phase 3:** After having evaluated the test results, a third phase of testing can be considered, using the knowledge gained through the previous experiments, in order to tweak and improve the methodology.

### 4.2.1 Expected Test Data

The questionnaire will largely emphasize quantitative data, utilizing Likert-scales to gain quantifiable data, thus affording more easily comparable data sets. In addition to the quantitative data, some qualitative questions will be asked, in an attempt to elaborate on the quantitative data.

## 4.3 The Questionnaire

The questionnaire is largely based on the Narrative Engagement Questionnaire (NEQ) [Atchapero et al., 2015] which was inspired by the Game Engagement Questionnaire [Brockmyer et al., 2009], The Continuation Desire Model [Schoenau-Fog, 2011b] and Player Immersion in the Computer Game Narrative Questionnaire [Qin et al., 2009b], but incorporates both the knowledge gained from testing the NEQ, as well as the research gathered during this project.

- **Continuation Desire:**

  - Attention Focus
  - Narrative Presence
  - Comprehension of Narrative
  - Emotional Engagement & Character Identification
  - Experimentation
  - Disengagement

- **Engagement:**

  - Absorption
  - Flow
  - Presence

- **Immersion:**

    – Curiosity

    – Comprehension

    – Challenge & Skills

    – Empathy

    – Concentration

    – Control

    – Familiarity

## 4.4  Iteration Process

At this point we had the categories combined into one questionnaire and since the some of the questionnaires had some similar questions some of the questions had to be removed. We kept all of the questions from the CD questionnaire and added the questions and categories that we found necessary. This was a balance act since we wanted to get as much data from the test participants but we didn't want to ask them to many questions as they could lose the motivation answer honestly. The mixed questionnaire can be seen in appendix A.1.

### 4.4.0.1  First Iteration

The first iteration was tested on a few participants and some of them in a small-scale focus group. They were first asked to play a small section of Telltale Game's "The Guardians of the Galaxy". They were then asked to answer the questions by interview and tell their thoughts about the questions. This was then used to refine the questions in further iterations of the questionnaire.

- While playing, I forgot about my own issues.

Some of the test participants found this question weird, and perhaps too intrusive. We decided to remove it from the list of questions since it wasn't absolutely essential to our project.

- I felt that the game was very static, leaving little to no room for exploration and experimentation.

Most of the test participants found the word "static" weird, and did not understand it correctly. We replaced it with the word "linear".

- Many events in the game story are novel.

This question had a similar problem. The test participants did not understand the word "novel". We decided to rephrase the question: "I recognize some of story presented in the game". The changes to the questionnaire can be seen in the appendix A.3

#### 4.4.0.2   Second Iteration

The second iteration was tested on mixed poll of new participants, as well as a few from the first iteration. This time they were asked to play a small section of Procedural Arts' "Façade". The followed the same procedure as the first iteration. In this interview it seemed that everyone understood the questions as intended.

Since we wanted to have multiple measurement points during our test, a small-scaled questionnaire was designed to be presented during the game session. We removed the questions that did not make sense to ask twice in such a shot play session. The questionnaire ended up containing the aspects of attention focus, narrative presence, experimentation, challenge and skill. We then added a small questionnaire with narrative questions in the end of questionnaire to gain info about the test participants' level of narrative intelligibility, their behavior and actions within the game. We came to the conclusion that it would be beneficial to add questions asking about their continuation desire directly. These questions were added before, while and after playing the game. These questions would also serve as control data for the evaluation of our questionnaire's ability to measure continuation desire.

## 4.5   Final Questionnaire

This is how the final questionnaire will be presented.

### 4.5.1   Before Playing Game

- **Demographic Questions + Initial Continuation Desire**

    - Age.
    - Gender.
    - Hours spent playing games every week.
    - Name three of your favorite games.

- **Before-Game Continuation Desire**

    - Would you like to play the game.

### 4.5.2   While Playing Game

- **Mid-Game Continuation Desire**

    - Would you like to continue.

- **Attention Focus**

    - While playing, I lost track of time.

- – I was able to concentrate on the game during play.
- – During play, I sometimes found my mind wandering / found I was thinking of other things.
- – During play, I noticed a lot of small details about the game.

- **Narrative Presence**

  - – During the game, I found myself paying more attention to my real-world surroundings, rather than the story of the game.
  - – During play, I felt like part of the story.
  - – During play, I was eager to find out what would happen next.
  - – During the game, I felt like the narrative had created a world that I, as a player, was living in, while playing.

- **Experimentation**

  - – I tried to explore the world, as much as possible.
  - – I didn't really feel like the choices I made, during the game, had a noticeable effect on the story.
  - – I tried to find alternative ways to complete the game.
  - – I felt that the game was very linear, leaving little to no room for exploration and experimentation.

- **Challenge and Skills**

  - – Parts of the story are formed by me in the course of playing the game.
  - – Some tasks or conflicts in the game story are stimulating and suspenseful.
  - – I feel successful when i overcome the obstacles, tasks or opponents in the game.

### 4.5.3   After Playing Game

- **After-Game Continuation Desire**

  - – Would you like to continue.

- **Attention Focus**

  - – While playing, I lost track of time.
  - – I was able to concentrate on the game during play.

- During play, I sometimes found my mind wandering / found I was thinking of other things
  - During play, I noticed a lot of small details about the game.

- **Narrative Presence**

  - During the game, I found myself paying more attention to my real-world surroundings, rather than the story of the game
  - During play, I felt like part of the story.
  - During play, I was eager to find out what would happen next.
  - During the game, I felt like the narrative had created a world that I, as a player, was living in, while playing.

- **Comprehension of Narrative**

  - The story quickly grabs my attention at the beginning.
  - I found the story logical and convincing.
  - I felt like I understood why the characters were acting the way they did.
  - During the game, I had a feeling that I knew what would happen next.
  - I felt that the plot of the story was very predictable and uninspiring.
  - I am not sure that I understand the characters.

- **Emotional Engagement & Character Identification**

  - I had an easy time identifying with the characters in the story.
  - I felt like I was able to understand the events of the story, in a similar way to how the characters of the game understood them.
  - I could easily imagine myself being put in the situation of some of the characters.
  - At some points, during the game, I felt an emotional connection with some of the characters.
  - The story had no emotional effect on me.
  - After finishing the game, it takes a long time for me to return to the real world psychologically and emotionally.

- **Experimentation**

  - I tried to explore the world, as much as possible.
  - If I had the chance, I would have changed some of the choices I made during the game.

- – I didn't really feel like the choices I made, during the game, had a noticeable effect on the story.
- – I tried to find alternative ways to complete the game.
- – I felt that the game was very linear, leaving little to no room for exploration and experimentation.

- **Disengagement**

  - – I felt like my choices didn't really matter to the outcome of the story.
  - – I didn't understand the goals of the characters.
  - – I felt that the gameworld was both rich and interesting.
  - – I found the story interesting.
  - – While playing, I felt a bit too stressed about other things, to really enjoy the game.

- **Challenge and Skills**

  - – Parts of the story are formed by me in the course of playing the game.
  - – Some tasks or conflicts in the game story are stimulating and suspenseful.
  - – I feel successful when i overcome the obstacles, tasks or opponents in the game.

- **Control**

  - – I can control the game interface.
  - – I can control the character to move according to my arrangement.
  - – I am interested in the style of the game interface.

- **Familiarity**

  - – I am familiar with the cultural background.
  - – I found many events in the game story original.
  - – I recognise some of story presented in the game.

- **Narrative Questions**

  - – Briefly describe what the story was about.
  - – Briefly describe how you behaved in the game.
  - – Briefly describe your actions in the game.
  - – Feedback.

- **Replay Question**

  - – Would you like to play the game again.

## 4.6 Design Requirements

As the game we created for this project is intended to be used as a product for testing narrative structures' affect on continuation desire in interactive narratives, we will have to ensure that it met certain criteria to ensure its viability in testing our hypothesis. Furthermore, we have a list of elements we wanted to incorporate into the design, either from a practical or motivational standpoint. As a result of this, we made the following list of requirements for our product, before we started the design process;

- The game must allow for three distinct types of narrative structure.

- The game must be able to incorporate our questionnaire, to remove the need for external sources (e.g. printed or online-hosted questionnaires).

- The game must be able to record and document certain elements of the gameplay, to use for analysis.

- The game should allow test participants to test the game remotely - e.g. the game should be able to send the test data to us.

- The game (including e.g. environment design) must afford players of multiple player types (as described in section 5.2) to have something to do, related to their player type.

# Chapter 5

# Design

In order to ensure that we would have access to a product that would suit the needs of our experiment, and to ensure that we would be able to make adjustments, as required by our test methodology, we decided to create a game ourselves. Creating the game ourselves allowed us unrestricted freedom in tailoring the game to our test, rather than the other way around, and allowed us to test all conditions on a single game, rather than having to find a set of games that would suit each condition (e.g. games with different narrative structures). This removes a lot of potential bias that occurs from attempting to test specific conditions on different games, but on the other hand introduces other potential bias, as it is impossible for us to achieve the same level of polish and scale that a professionally produced game would have, within the time constraints of this project - These bias, however, should not affect the validity of our test too much, as any bias encountered will be consistent between all versions, and as such, should not affect the comparative results of the tests. As an added benefit, and level of motivation of creating the game ourselves, is that it allows us to utilize the practical elements of our education, such as e.g. programming and 3D modelling.

## 5.1 Narrative Design

In this section we will explain the design decision behind the narrative structure, dialog system, choice system and story.

### 5.1.1 Narrative Structure

We are going to base our narrative structure on the research of "The Eliza Effect" (recall section 3.4.2) and observations of "State of the Art" games. The problem with "The Eliza Effect", seems to be in high effect when the player gains full knowledge of the underlying system of the narrative structure. If we are to make sure that we

have structures with both a high and a low effect, we are then to find games with simple and complex systems, and try to recreate their narrative systems.

### 5.1.1.1   Simple Structure

As for the simple structure we are going to use Telltale Games' "The Walking Dead" as inspiration. This game suffers from a high degree of "Eliza Effect", as the system is very easily seen through by the player. If we are using the Author-Audience Distance graph to detect what makes the system obvious to the player, it seems that the game are throwing all of the choices at the player right away. This can provide the game with a high re-playability value, as the player sees multiple ways to proceed through the narrative, and might therefore be curious about where the other paths would lead the story.
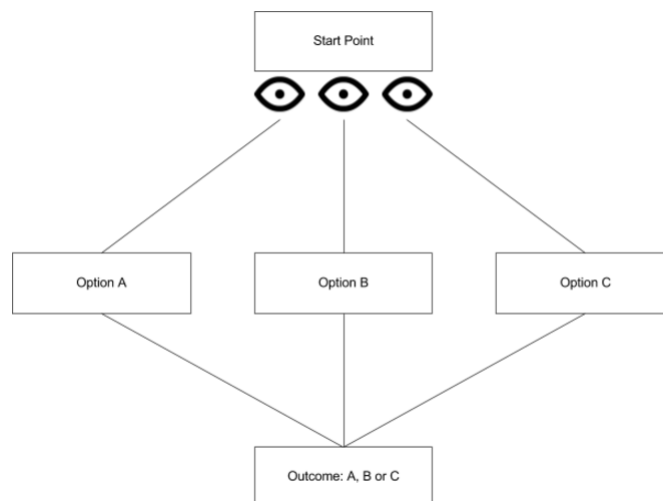


**Figure 5.1:** Simple Narrative Structure

We are going to design our simple structure to be linked with a User Interface (UI) system that provides information about all the choices that are available to the player. This approach is similar to that of the Telltale Games series. As seen in Figure: 5.1, the player will be able to see the available options (in this example, A, B and C), and decide what choice to take, forming the outcome of the story.

### 5.1.1.2   Complex Structure

As for the complex structure, we are going to use games such as Toby Fox's "Undertale" and Procedural Arts' "Façade" as inspiration. In these games, the structure is hidden from the player, and it is mostly during the second play through that the player starts to gain knowledge about how the system works. If we are using the

Author-Audience Distance model to detect what makes the system hidden to the player, it seems that the game is using an 'trial and error' method, which forces the player to play multiple times, if a new outcome is wanted. This can provide the game with a mixed re-playability value as the player has to progress through the game multiple time to obtain the desired outcome.
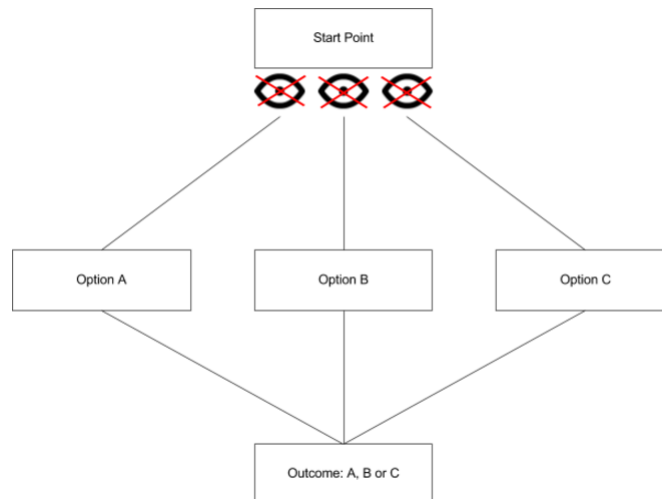


**Figure 5.2:** Complex Narrative Structure

We are going to design our complex structure to be linked to the players' behavior. In this way, all information about narrative branches is hidden to the player, and it might require some exploration to achieve the desired narrative outcome. As seen in Figure: 5.2, the player will not be able to see the available options, and will have to explore the game and its mechanics, in order to discover the other branches.

### 5.1.1.3 Mixed Structure

After doing research on the different structures, we wanted to add another structure. The two previously described structures should cover each end of the "Eliza Scale", but we found it interesting to see how a mix of these would perform - I.e. a narrative structure, where information is presented to the player, but the available choices are limited by their actions, possibly encouraging exploration to figure out how to unlock the locked choices.
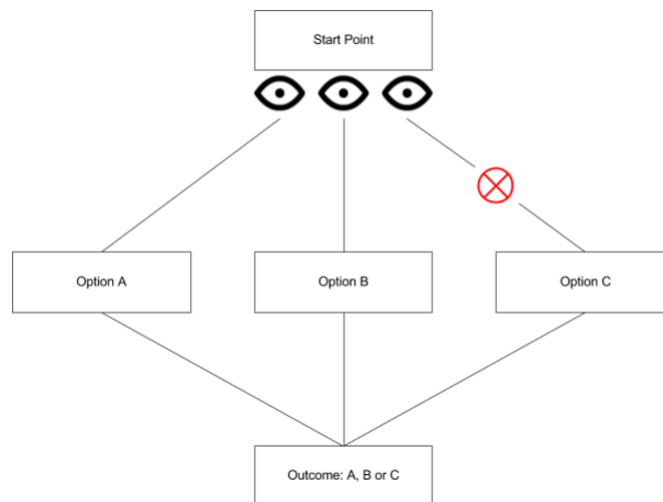
**Figure 5.3:** Mixed Narrative Structure

We are going to design our mixed structure as a mid-way between the two previous structures. The options will be shown to the player, as in the simple version, but only one choice will be available to the player, as in the complex version, as seen in Figure 5.3.

### 5.1.2   Choice System

In this section, we going through the design of how we are going to inform the player about their choice. Based on the design of our narrative structures, we are going to need a choice selection system for the simple and mixed version of the game.

**Figure 5.4:** Choice Selection - The Walking Dead

Before we are able to design our own system, we need to do some research on games with choice systems that has a high "Eliza Effect". We begin with Telltale Games' "The Walking Dead" (Figure: 5.4). In games like "The Walking Dead", the player is presented with a few options to pick from, with only the text as information. Most of the time the dialog system is based on time, which forces the player to make a decision fast, to keep the flow going. The choice system is something we can be inspired of for our version, but the time aspect does not match the intentions of our game.



**Figure 5.5:** Choice Selection - Deus Ex: Mankind Divided

After doing some research, we found the dialog system from Eidos Montréal's game "Deus Ex: Mankind Divided (Figure: 5.5). In this game, the player is not limited by time and have unlimited time to make a decision. The controls for choosing an option, as well as the simplicity of the descriptions of each choice, is something we will use as inspiration for our own design. We 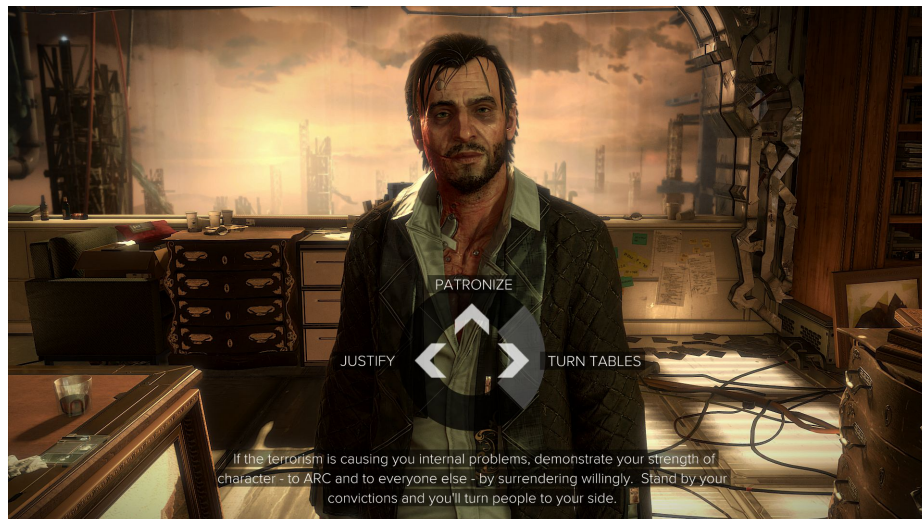do not like, however, the amount of text, the player needs to read, in order to understand what the effect of their choice indicates.



**Figure 5.6:** Choice Selection - Horizon: Zero Dawn

After doing some additional research we found Guerrilla Games' "Horizon: Zero Dawn" (Figure: 5.6). This games' choice system supports the text with symbols, as seen in Figure 5.6. In this case, we see the player is able to pick between three small sentences, all represented by a symbol. The fist represents being aggressive, the brain represents using intellect and the heart represents following the characters feelings. We got inspired by this approach and decided to do something similar.

In our game we decided to use the simple text and highlight system from "Deus Ex", and the symbols identification idea from "Horizon". We began by using different symbols representing being heroic, a killer and a pacifist. In the beginning we used concept symbols, and had small interviews in order to make sure that the symbol were understood as intended. These are the symbols used for the interview.

The collected feedback, gave us great insight into what people connected each symbols with, without the context of the game. As neither of us are specialized (nor really interested) in the creation of symbols, we used the website [DeviantArt, 2017], to get the art we needed. The symbols are based on silhouettes, and we used the following symbols:

### 5.1.2.1 Heroic Symbol



**Figure 5.7:** Heroic Symbol First Iteration

The heroic symbol started out as a sword, as seen in the figure above (Figure: 5.7). During the interview, the participants related the symbol to being heroic, but also aggressive behavior and death, which could be very misleading in our case. We then asked the participants what they found heroic. By combining the feedback we came to the conclusion that a kneeling man in a knight position (Figure: 5.8) would communicate the correct message.



**Figure 5.8:** Heroic Symbol Final Iteration

### 5.1.2.2 Killer Symbol



**Figure 5.9:** Killer Symbol First Iteration

The killer symbol started out as a skull (Figure: 5.9). During the interview, the participants related the skull to death. This seemed to be suiting our interest in what message the symbol should send, but it did have a downside; Some participants related this symbol to that this would lead to their own death, and not being hostile against the NPC (non-player character) in the game. We used some of feedback from the heroic symbol to change the skull into a hand with a knife (Figure: 5.10). The participants found this new symbol related to murder and the movie "Psycho".

**Figure 5.10:** Killer Symbol Final Iteration

### 5.1.2.3  Pacifist Symbol



**Figure 5.11:** Pacifist Symbol First Iteration

The pacifist symbol started out as a peace symbol. During the interview the participants related the peace symbol to peace. This seemed obvious, but we did receive some feedback that the symbol did not fit with the other symbols. We changes it to be a peace pigeon to keep the consistency of having three objects, and not two objects and a symbol.
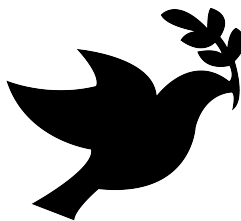


**Figure 5.12:** Pacifist Symbol Final Iteration

### 5.1.3  Story

After having planned and designed the narrative structure, it is time to incorporate a story that fits the structure. It is very important that the story is easy to understand and might contain recognizable elements. Instead of using our (admittedly) limited talents as story writers, we decided to instead use an already existing story, re-mediating it into a narrative fitting our game.

### 5.1.3.1 Remediation

We have decided to perform a remediation of the Danish fairy tale *Fyrtøjet* (The Tinderbox) by H.C. Andersen (Using the edition found in[Andersen, 2013]), as this is most likely a recognizable story to most Danish people, which would increase the chance of them recognizing story elements and characters, providing an initial interest in the story. When performing remediation of a text or media, it is important to keep in mind what the strengths (and weaknesses) of the targeted platforms are. In case of text, it is very linear and descriptive, one could even say that is has a very didascalic narrative. This is effective when it is a very specific story that the author wants to tell. If it is the case of the media being a movie, it has the strength of showing pictures which can be more descriptive than a simple line of text. From this comes the old saying "A picture can tell more than a thousand word". This, however, can also be one of the weaknesses of movies, as the narrative changes to be more abstract, as it is not possible for the viewer to catch every detail, like they would have with the story as text, since they viewer is not in control of the tempo and camera in the movie. In the case of our game, the platform (i.e. an interactive narrative) has the strength of being interactive, allowing the user to direct the outcome of the story to some degree. We are able to use the strengths of both the text and movie platforms, since the player is not limited by the flow of a movie, nor the lack of pictures from text. This however is also a weakness, as the author do not have as much control of what the user sees and discovers during the experience. At this point, it is up to the designer of the narrative to decide whether the narrative should favor an abstract or a didascalic narrative.

### 5.1.3.2 The Story Discourse

We aim to keep the story's discourse casual and logical. This means that we aim to create a connection between the elements and events. This is done to keep the story as simple as possible, since the player will already be busy to get their head around the underlying system of the game, and its mechanics.

- **The Plot of the Story:**

    - A soldier (The Player) enters the forest.
    - The soldier meets a witch which offers him a quests to find and enter a forgotten cave, to retrieve an ancient weapon.
    - The soldier meets the guardians of the cave, who sets the character on a trial, in order for him to be judged worthy of the weapon.
    - From this point it is up to player what happens with the witch.
    - The soldier is then sent to a nearby town, to perform tasks which will guide the judgment of the guardians.

> – When the day is over, the guardians will grant their final judgment to the soldier - The outcome of this depends on how the player have behaved throughout the game.

## 5.2 Game Design

In this section we will discuss some of the initial design decisions about the game. The game will be a internal-ontological Role-Playing Game (RPG) as it fits very well with the requirements of our experiment. The setting takes place in a similar environment as in *The Tinder Box* [Andersen, 2013]. The style of the game will be explained further in the graphic design section (see section 5.3). To support some of the behaviors, we are going to allow the player to choose between three classes (tied to the artifacts, found in the cave) - These include a "Warrior"-class, who carries a sword and a shield, a "Mage"-class, carrying a staff, and an "Assassin"-class, carrying a dagger and a light crossbow. These three classes will offer different abilities and play-styles- Furthermore, the player will be able to change between the classes throughout the game, allowing some degree of experimentation.

### 5.2.1 Player Behavior

While we would, ideally, prefer to account for all the categories of player behavior, we are not, realistically, able to support multiplayer and the accompanying social interaction within the scope of this project, meaning that we will not be able to support the social aspects of player behavior. The rest of the categories will be accounted for, as will be described in the following sections.

#### 5.2.1.1 Action

Our approach to tracking the destruction aspect is to track how many friendly NPCs and objects the player have been killing or destroying throughout the play session. The excitement aspect by how many enemies the player gets to kill, and how he is performing while doing it - e.g. whether the player likes to charge in recklessly, or if they take a more subtle and calculated approach.

#### 5.2.1.2 Mastery

The challenge aspect is going to be measured by tracking the players' health during checkpoints, to understand how fast he learns, and perhaps introduce dynamic difficulty. The strategy aspect will be tracked by the use of how the player understand the enemies, and if they are capable of thinking ahead, in order to avoid damage.

### 5.2.1.3 Achievement

The completion aspect is going to be tracked by how much gold the player has collected, and how many quest he gets to do before the game session ends. The power aspect is going to be tracked by the amount of (in-game) experience the player have earned, and the character level they have reached.

### 5.2.1.4 Immersion

The fantasy aspect is something that we would have a hard time tracking. So we are going to track how much the player is pretending to follow the characters' behavior, and support this with the players' own reports from the questionnaire. The story aspect is going to be tracked by detecting how much the player aims to follow story objects, and quests, or if they decide to ignore and skip these events.

### 5.2.1.5 Creativity

The design aspect is going to be tracked by how the player chooses to customize their character. As we are not going to have the time to create a character customization system, this has to be tracked by other means. We have decided to track the players' customization by letting them switch equipment, and see if that is something they would like to experiment with. The discovery aspect is going to be tracked by the use of emergent narrative. We are going to place small story elements, such as e.g. statues and pictures that connects to the overall story. The player is then able to find these hidden story objects, and it can contribute to the players story - And will form the basis of how we will track discovery (i.e. how many of these points have been found).

## 5.3 Graphical Design

A major motivation factor for this project, was designing and creating a graphical environment (and especially characters) for the game, we created to use for our experiment. As the game is primarily intended to be used as a basis of our experiment, the graphical design is not *as* important to consider, as the technical design, as it is much less related to the problem we're testing. Having said that, however, there are still elements of the graphical design that are important to the quality of the game, as a platform for conducting our experiment - e.g. a world that allows for some degree of environmental storytelling, and characters that are appealing.

### 5.3.1 Character Design

In a previous paper, [Frøling, 2016], we have worked with a theoretical framework for designing appealing characters for video games, which formed the founda-

tion of the thoughts behind the character design in this project. Before we began working on designing the characters, we first needed an overview of what characters, we needed for the project. As our game is experienced from a first-person's perspective, we wouldn't need to create a player character, which meant that we could focus on creating the other characters instead. As the narrative of our game is loosely based around H.C. Andersen's *"The Tinder Box"*), we are able to draw much inspiration from this story, as to what characters we could include;

- A Witch

- Three Hounds

- Some town's people

In addition to these, our game design called for some type of creatures, to serve as enemies for our quests, and to facilitate combat. In order to ensure some level of consistency between the characters, they all followed the same basic principles of design, based on the framework proposed in [Frøling, 2016];

- **Remember the Target Group:** The target group of this game is described as "young adults, with an interest in fantasy settings", which is, deliberately, a very broad target group, thus not limiting design space too much. Furthermore, this target group is based on the guidelines suggested in section **??**, as the experiment does not have a specific target group.

- **Design the Character Beyond the Visual:** For the game's setting, we chose a European late-medieval / early-renaissance time period as reference, with elements of fantasy to create a slightly more unique setting. Each of the characters were considered individually to some extend in relation to this point;

  - *The Witch:* The witch is largely inspired by a fantasy barmaid, in order to make her appearance less threatening than that of a stereotypical witch (i.e. she is not sporting a long nose with a wart), as she is intended to be more of a "Chaotic Neutral" (to use D&D terminology), than an evil character. She does, however, sport several Wiccan tattoos to associate her with being a witch. The character "Adria", from the Diablo franchise served as a major inspiration for her appearance.

  - *The Hounds:* The Hounds (or *the Guardians*, as we later called them), were a bit of an interesting concept to design - We wanted to keep the *idea* behind having three hounds as the "quest givers" (and as an homage to the fairy tale), but we didn't want to have them simply being talking dogs. We then came up with the idea of them being "Guardians", or demi-gods of sorts, which led us to a more anthropomorphic design.

We tried to give each of the three Guardians a personality, associated with their role (e.g. the Guardian of Death are designed with the *Grim Reaper* as inspiration).

– *The Town's People:* The town's people are mainly designed with the setting in mind - They are inhabitants of a semi-remote town, plagued by a local curse. The city guards are designed to have a slightly less rural feel to them, as the idea is that they are merely stationed there, but belongs to a national army. The farmer draws on the concept of the stereotypical "Hillbilly", to emphasize his profession as a farmer.

– *The Enemy Creatures:* We originally intended for the "bad guys" to be human bandits, living in the forest, terrorizing the city, but we opted out of using humans as the enemy, as we thought that even though these were supposed to be bad guys, it conflicted with our idea of the "hero path". This led us to the idea of instead creating a story about a town curse, causing the dead to rise (possibly linked with either the Guardians or the Witch), so we chose instead to have the enemies be 'undead' soldiers.

- **Consider the Character's Presentation:** The characters will be designed around their role in the game - E.g the Guardians will be slightly larger than the player, in order to convey a feeling of them being beings of power, whereas the city guards will be roughly the same size of the player (i.e. they will be eye-to-eye), to convey a feeling that they are about as powerful as the player.

- **Visual Impact:** In general, the game is going for a slightly stylized visual style. This is chosen partly as an aesthetic choice, but also as a measure against *the Uncanny Valley*, first coined by M. Mori (in relation to robotics) more than 40 years ago, and described by [Hartas, 2005] as "a sudden drop in appeal, when something becomes too reminiscent of a human, but not enough to be believable". Furthermore, the color palette of the characters will, to some extent tie in with their personality - This is especially true in the case of the Guardians (e.g. the Guardian of Dog wears black clothes).

### 5.3.2 Environment and Level Design

As environmental storytelling plays an important role in what we're testing, the environment- and level design of the game needs to facilitate this. Furthermore, it is important for the flow of the game (e.g. ensuring that play session-length remains roughly equal among participants) that the level is relatively streamlined, with a clear sense of where to go next. Finally, the environment needs to have a consistent feeling with e.g. the characters, graphically, in order to create a coherent

experience. This section will briefly describe the most important design decisions we made, in order to fulfill these criteria.

### 5.3.2.1 Level Design

The first step in the level design process, was to determine how the game should flow; We decided upon having a "quest hub" in the form of a cave, from which the game will be introduced, and where the game will ultimately end. For the main section of the game, we decided to build a more open area, where we try to guide players towards the primary objectives of the game, without dictating anything - We want the players to be able to explore the game as they wish, without making it difficult to figure out where to go next. In the "open world" (i.e. the main section of the game), we decided to have a town, serving as the center of activity (e.g. the town is where most quests are started and ended), which also serves the function of a point of reference, hopefully making it easier for the players to navigate the level. The town should facilitate some degree of exploration, both in terms of finding hidden treasures, but also in terms of finding areas of environmental story telling. Finally, the town will be the primary place to find Non-Player Characters (NPCs), apart from the enemy creatures. For the enemy creatures, we decided upon creating areas where the dead spawn - e.g. a graveyard, which serve as the primary objective for the "Hero Path".

## 5.3.3 Environment Design

While the environment design is largely an aesthetic consideration (e.g. it should fit with the graphical style of the game), certain elements needs more attention to detail, to convey an intended meaning. As an example, we designed the cave, where the Guardians resides, to convey a sense of importance - Specifically, we were inspired by treasure caves often seen in e.g. stereotypical pirate movies or Genie's Cave from Disney's *Aladdin*, as seen below;

**Figure 5.13:** *"The Cave of Wonders"* from Disney's *Aladdin* [Disney, 1992]

The graveyard is another example of how the environmental design is important to convey a feeling; The intention behind the graveyard is that the area should feel cursed (after all, the dead are being raised), so the place should feel eerie and uncomfortable. The area was heavily inspired by fantasy graveyards, such as those seen in e.g. the *Warhammer* or the *Diablo* universes. Specifically the *"Cemetery of the Forsaken"* and the graveyards surrounding *Tristram Cathedral* from *Diablo* were major sources of inspiration.



**Figure 5.14:** *"Tristram Cathedral"* from Diablo 3 [Blizzard, 2012] - This image is one of the sources of inspiration for our graveyard.

# Chapter 6

# Implementation

This chapter will present the most interesting aspects about the implementation of our game, which we used to test our problem statement. As in the design chapter before (5), this chapter will be split into two major sections; Graphical Implementation and System Implementation.

## 6.1 Graphical Implementation

This section will describe how we translated the design (as presented in the section 5.3) into an implementation, in the form of our game. We will not present everything, but only the most noteworthy or important aspects, so as to reduce redundancy.

### 6.1.1 The Characters and Assets

By far, the most essential element of our graphical implementation, and the element we spend most time on, was the characters. In total, we created six distinct characters, with variations (e.g. skeleton archers and swordsmen) bringing this number up to nine (see Figure 6.1). In addition to the characters, we also created a range of assets (e.g. buildings and weapons), as needed for the game. This section will present the process of creating the characters, including modelling, texturing and animation.

**Figure 6.1:** The characters, including variation, rendered real-time in Unity

#### 6.1.1.1   The Guardians

The Guardians were particularly interesting characters to develop. As they are based upon the hounds of *The Tinder Box*, the original idea for them were to create hound-like monsters, similar to those described in the story. As the game developed, however, we decided against this, as we thought that it would make them appear a bit too 'out of place', and possibly a bit too comical in nature. Furthermore, it didn't fit their role as "Guardians" - They were supposed to be demi-gods, responsible for the recruitment of heroes to join their cause. This led us to the idea of creating anthropomorphic creatures, part animal, part human (similar to e.g. minotaurs from Greek mythology). Implementation-wise, they were also a challenging character to create, because, unlike the other characters, we did not have any specific concept art or inspiration to follow - Which meant that we had to find inspiration and reference elsewhere. The dog face was heavily inspired by that of a Saint Bernard dog, as this breed of dog has a very distinct face, which we thought would lend itself well to the anthropomorphic nature of the character, whereas the robe (and by extension the human part of the character) was heavily inspired by *The Dark Wanderer* from the Diablo universe.

**Figure 6.2:** The combination of inspirations for the Guardians - The Dark Wanderer [Blizzard, 2012] mixed with a St. Bernard's hound.

The first iteration of the characters, consisted of a dog-faced figure in a robe, with no really interesting or unique features, apart from the dog face. In order to create interest to the character, we went through a series of iterations, adding details such as books and symbols, in order to give them some measure of character, while still keeping some of their mysterious nature.



**Figure 6.3:** The iterative process of adding details to the Guardians.

### 6.1.2  Texturing

Depending on the requirements and importance of the assets, we have generally used three different methods of creating the textures for the game, often in combination with each other;

- **Hand Painted Textures:** For the most important assets (e.g. the characters), we chose to hand-paint the textures, using Autodesk Mudbox, Adobe Photoshop and the Quixel Suite. This process is very time consuming, however, but also provides the highest level of accuracy, and affords the highest attention to detail. This method was primarily used for the characters, especially for their eyes.

- **Procedurally Generated Textures:** For some of the less important assets, we created the textures by using a 'procedural' texturing technique, using the Quixel Suite. This method of creating textures is relatively fast, but requires a significant amount of set up (the objects need proper unwrapping, ID-maps needs to be created, etc.). It is a very efficient method of creating good textures, but it offers slightly less accuracy and affords a lower level of attention to detail than hand-painting the textures. This method have been used on most of the smaller assets in the game, such as the weapons used by the player, and have also been used in combination with hand-painting to create the many of the character's textures (such as by adding dirt to the characters' clothes, for example).

- **Tiled Textures:** Finally, for the largest, and for the least important assets, we used tilable textures, as this process is, bar far, the most time-efficient method of creating textures, while also allowing us to use relatively small files, even on large objects, without losing pixel density. This method is primarily used on large assets, such as the buildings, or the piles of gold in the treasure cave.

Examples of each texturing method is depicted below, and includes the textures for one of the characters' eyes, some of the books and other small assets in the game, and the tiled texture used for the gold piles in the treasure cave;



**Figure 6.4:** The three methods of texturing. From Left to right: Hand Painted, Procedurally Generated and Tiled.

### 6.1.2.1 The Witch

The Witch is a particular interesting example of how each of these texturing process were utilized, as all three methods were used for her. To start with, we hand-painted her textures, including details such as e.g. her tattoos, focusing on the overall colors, as well as shading and highlighting. We then used Quixel DDO to add details (such as fabric detail to her dress, or imperfections to her skin, etc.) as well as tweaking the hues of the colors slightly, and creating normal, ambient occlusion and metallic maps for her.
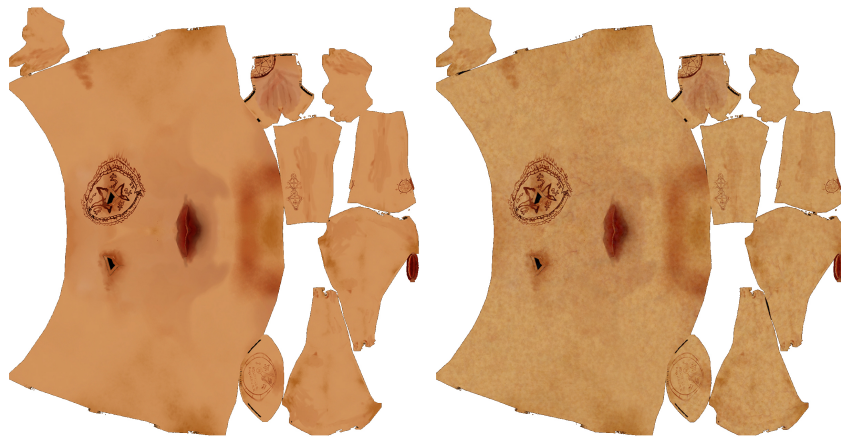


**Figure 6.5:** Example of how the painted textures (left) were modified by procedural textures (right). Notice the subtle change in hue, as well as the imperfections (color variations) added by the procedural process.

For the witch's hair and the string used to tie her corset and boots, we used tiled textures, as this not only saved considerable amounts of time, but also allowed us to get a much higher pixel density, while using a considerably smaller texture, saving processing power.



**Figure 6.6:** The completed witch in her T-Pose, rendered in real-time in Unity

### 6.1.3 Animations

As animation is an extremely time-consuming process, and as animation is not a primary focus of the project, nor part of our motivation, we chose to not put emphasis on this aspect, using Adobe's Mixamo[1] program to provide us with the animations we needed. This allowed us to quickly rig and animate our characters, with only slight problem solving (e.g. fixing skinning issues) in order to get acceptable results - This effectively allowed us to crea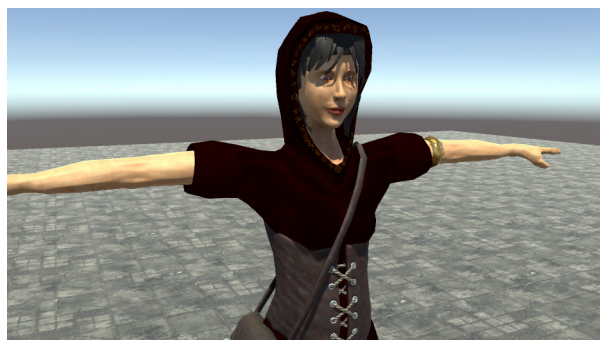te all of the characters, our design specifications called for, which would not otherwise have been realistically achievable.
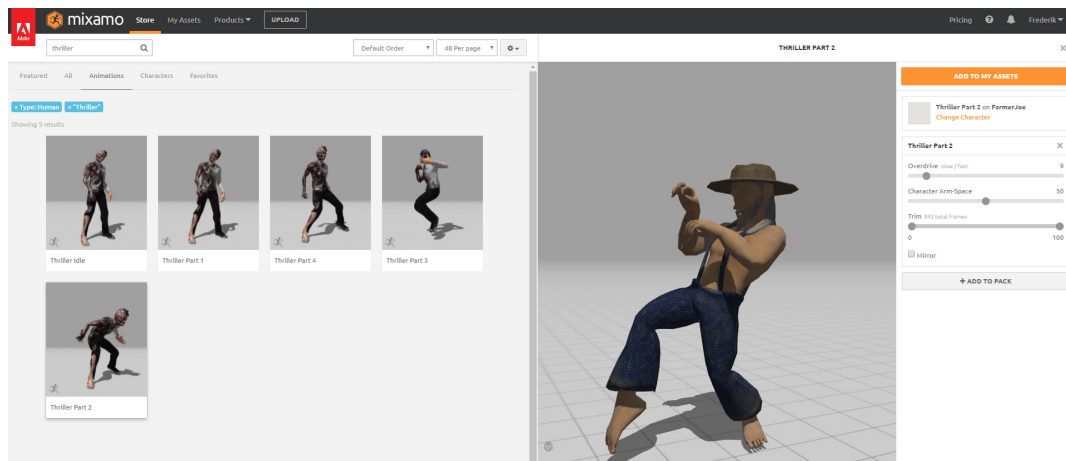


**Figure 6.7:** The user interface of Mixamo - Once the characters have been uploaded and rigged, a huge range of animations are available, though some tweaking of the skinning might be required.

### 6.1.4 Outside Assets

In order to supplement the assets we made ourselves, we used a few assets from outside sources - The trees and rocks we used, are free assets from Unity and CryEngine, respectively. We chose to use these assets instead of making our own, as these features were non-essential to our experiment, but relatively important to the overall finish of the game - Which is why we chose to spend our time on the more essential assets, and use these outside assets as supplement. These assets (especially those from CryEngine), were modified slightly (retopologized to have a lower polygon count, re-unwrapped, and new textures were created from them), before being imported into Unity.

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[1]A web-based software, currently in open testing, which allows people to auto-rig characters, and apply a large host of animations to them. It is currently free, even for commercial use.

### 6.1.5  Level Design

As described in the design chapter (see 5.3.2.1), the primary objectives of the level design, was to guide the player towards activities, while also affording a degree of exploration. The way we approached this design, was to use roads, lights and landmarks (e.g. the town) to guide the player - This approach is commonly used (although often in conjunction with other methods, such as e.g. maps) in other games, and should feel familiar to experienced players.
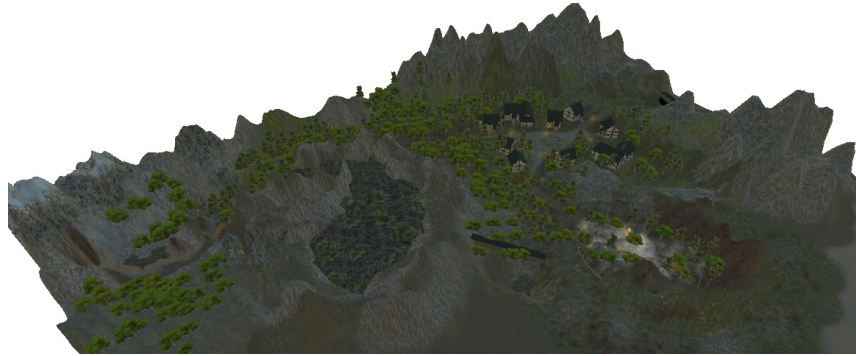


**Figure 6.8:** The game level, as seen from a bird's perspective.

We designed the main section of the game to be centered around the town as a "quest hub", from which the player would conduct all their activities - As a result of this, the town is placed centrally (in comparison to the other areas of activity in the game), which meant that not only could it be used as a constant point of reference for the players to find their way around, but it also ensures that the players would be guided towards the other important areas (e.g. the graveyard) of the game, by simply following the roads leading out of the town.
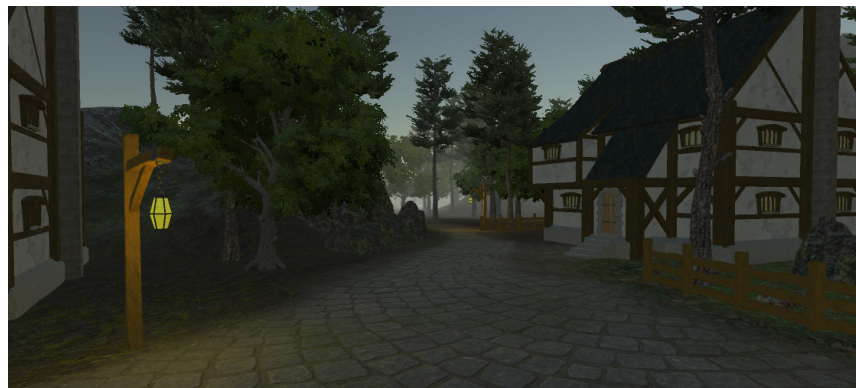


**Figure 6.9:** The road leading to the graveyard - While subtle, this approach to guiding the player proved relatively effective.

Another important element to include in the level design, was the inclusion (and placement) of collectible items (which in our game were tiny treasure chests), as these are required for catering to the *Achiever* player type, as described in section 5.2. These were placed around the world, some were hidden, some were placed openly - The latter were intended to be found easily, in order to inform players of the existence of collectible items, hopefully sparking a desire to find the rest.



**Figure 6.10:** An example of the collectibles (the small chest) - This one is hidden in plain sight inside the tavern.

### 6.1.6   Environment Design

As described in the design chapter (5.3.3), the environmental design is primarily important for the visual appeal of the game, but some aspects requires more focused attention, in order to facilitate the requirements of our experiment. As an example, the environmental design needs to incorporate some degree of environmental storytelling, in order to cater to the *creativity* aspect of player behavior (see 5.2) in the form of exploration. Our approach to catering to the explorative players, was to create small points of interest, telling a story about the area - This was done by e.g. framed paintings of characters or "saint statues" of the guardians, placed in remote locations throughout the game world.



**Figure 6.11:** One of the "saint statues" of the Guardians placed in the forest, near the town.

Apart from the collectibles and other elements designed to suit the various player behaviors, some areas of the environment also needed to convey certain feelings, as described in the design chapter. For consistency's sake, we will use the examples from the design chapter to show how these concepts have been implemented into our game.

### 6.1.6.1   The Treasure Cave

The cave, which also serves as the start- and end point of the narrative of the game, was designed to feel important and interesting. Our approach to convey this feeling, was to draw inspiration from stereotypical treasure caves, teeming to the brim with piles of gold and gems. In the inspirational image of *"The Cave of Wonders"* from *Aladdin* (see Figure 5.13), the cave is bathed in a golden glow, almost as if the treasure itself is illuminating the room. We tried to mimic this effect slightly, in an attempt to make the treasure stand out slightly - This was done by giving the gold texture a slight emissive quality (i.e. it is glowing), while also adding particle effects to simulate "glints" or sparkles, putting further emphasis on the treasure piles.



**Figure 6.12:** The treasure cave implemented, as described by the design in 5.3.3 - Notice how the gold piles contrasts with the surroundings.

### 6.1.6.2   The Graveyard

For the graveyard, we wanted to create an eerie and damp feeling to the area - It should not be a pleasant place to be. In order to achieve this feeling, made sure that the area was quite dark, only illuminated by singular lamps, not quite able to cover the entire area. Furthermore, we created particle effects to simulate a heavy fog, often thought of, when thinking eerie graveyard. Finally, we made sure to place the tomb stones in a disorderly manner, in order to create a slightly chaotic feel to the area.

**Figure 6.13:** The implemented graveyard, as seen in-game.

## 6.2   System Implementation

The game itself have a few systems that keeps track of the player, enemies, narrative and choices. In this section we will explain how these systems functions, and they are connected.

### 6.2.1   Narrative System

The narrative system is the *"Big Brother"* of the systems. This system contains all of the information about how the player, NPCs and enemies behaves. While keeping track of the narrative and the environment, this system also calculates the player's behavior throughout the game, based on the players' actions. This information is based upon the design, described in section 5.2.

#### 6.2.1.1   Narrative Structure

The narrative gets input from the player's actions and places the player in the narrative structure. Whenever the player makes a choice, the information is used to calculate the outcome, and current narrative path the player is on. The position of the player in the narrative structure is then updated, and the game adapts to the choice by changing possible dialog choices, the characters or the environment.

#### 6.2.1.2   Environment

The environment changes according to what information is given by the narrative system. We use this to adapt elements such as the time of day. In the open world chapter, we provide the player with limited time to get play the chapter, as there is a lot to do, and we do not want the player to experience everything the game has to offer (rather, we do not want the player to run out of things to do). In this

way, we can track what the player wants to do, and in what order. As the time goes, and the player achieves progress, the time in-game passes by, and the level will get progressively darker, as the time gets closer to midnight. When the timer hits midnight, the player is teleported into the next chapter.

### 6.2.1.3  Enemies

The enemies are controlled by a simple AI, and is based on either a ranged or a melee enemy script. The skeletons with swords, the guards and the peasants are based on the melee script. Killing any of these will either award action or destruction points for the player behavior, depending on whether the target is friendly or hostile. This script follows the method of a finite state machine. The enemy is either in a relaxed, charging, attacking or fleeing state. If the enemy has yet to discover the player, it enters the relaxed state. In this state, the enemy simply plays the idle animation, and awaits further information from the system. If the enemy discovers the player it enters the charging state. In this state, the enemies detects the player's position, and move towards the last know position. If the enemy reaches the player within a certain distance, the attack state is activated. In this state, the enemy is allowed to attack the player, which sends information about damage into the player script that will update the player conditions. If the enemy reaches low health, or leaves the combat area, it will enter the fleeing state. In the fleeing state, the enemy will either run away from the player if it has low health, or run towards its spawn point if it has left the combat area. The ranged script follows the same basic principles, as the melee script, with the major difference being changes to the attack distance, as it should be able to attack the player from further away. The ranged attack is based on shooting towards the last know player position, which makes sure that the player is able to avoid the incoming arrows, increasing his mastery points for the player behavior.

**Figure 6.14:** Ranged and Melee Enemies.

### 6.2.2   Dialog and Choice System

The dialog and choice system are both based on scriptable objects. Scriptable objects are objects, made within Unity, to help create systems that are based on specific parameters. These objects can contain information, specified by the user without having to create scripts. This helped us making dialog for every character in a fast and efficient way. In the case of the dialog object, we wanted to contain information about which character is going to say what, and for how long time. A function for sound was made as well, to support voice acting, which was unfortunately discarded, due to scope. The choice object contains information, similar to the dialog script, but includes elements such as which outcome the choice should have, and what the next logical step in the narrative structure would be. The narrative system uses this information, along with other choices, to calculate and update the narrative path.
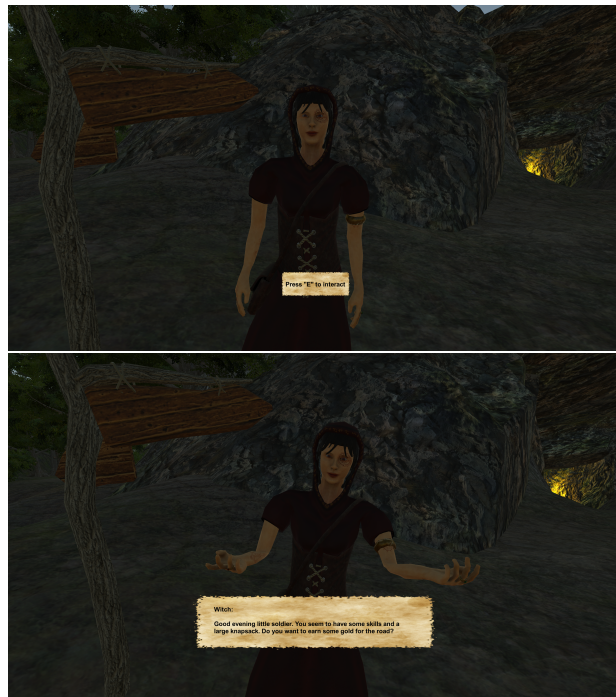
**Figure 6.15:** Dialog System

This is a walk trough of how the dialog and choice system works in practice. As seen i figure 6.15, the player approaches an NPC, in this case the witch, and interact info will enter the UI. If the player presses "E", while looking at the witch, a dialog will appear. While interacting with an NPC, the player will be locked in place, and any additional functions such as attacking, will be locked until the conversation is over.

**Figure 6.16:** Choice System

The choice system as seen in figure 6.16, is represented with our symbols and a small line of text. The first picture shows when all of the choices are available to the player, as they always should be in the simple version. The yellow icon indicates which choice that the player currently have selected, and is changed by moving the mouse in the direction of the symbol they want to select. Then the player simple has to press the mouse button to progress with the selected choice. On the picture below we are using the mixed version and the peaceful option is unavailable and has been turned slightly darker than the available options.

### 6.2.3   Player System

The player system have been build to support the measurement of creativity, mastery and achievement behavior.

#### 6.2.3.1   Character Movement

The character movement is build around acceleration and limited direction, which is designed for the mastery behavior. The player moves the character by using W,A,S and D in the desired direction[2], and can be supported by looking in a certain direction with the mouse. The character begins with slow movement speed, but

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[2]As has become the most common controls for player movements on PC.

accelerates faster as the player moves around. The acceleration stops, when the player loses momentum. This system has been created to make it harder to dodge enemy hits. It would require some practice to master the movement, and avoid more attacks.

#### 6.2.3.2 Player Classes

The classes are build around different play styles which are designed for the creativity behavior. Each class has it own play style, and different "armor values", which changes how much damage they take from each attack. The warrior has a high amount of armor, but has very slow melee attack which deal a lot of damage to enemies, and a shield granting further protection against attacks. The mage has a very low amount of armor, but uses his staff to cast frost magic as fast ranged attacks. The assassin has an armor value between the other two classes and uses both a small sword which hits the enemies fast but for a low damage and crossbow that hits hard but reloads slowly. While playing the game the player is able to switch between the classes and experiment. If the player uses this customization, it will be added to the calculation of the creativity behavior.

## 6.3 Questionnaire System

The questionnaire system works by taking feedback from the player, and from the narrative system. The player answers questions during the game session, and will be converted into a number between one and five, with one being the lowest value. This information is written into a notepad file which, contains demographics, mid-session questionnaire, after-session questionnaire and narrative feedback. After the test session have been completed we are able to take this notepad file and use it as input for programs, such as Matlab, to evaluate the test results. To help us provide a larger testing area, we added the function to the program which makes it capable to send the notepad file to us by e-mail. We want to automate this, to make it more convenient for the test participants. The mail system uses a Google mail address, specifically created for this project, and uses windows system programming to send the mail. The mail is send from our mail address and is received by the same mail address to make the system, as well as the test, less intrusive to the participants.

```
864    void SendMail()
865    {
866        MailMessage mail = new MailMessage();
867        System.Net.Mail.Attachment attachment = new System.Net.Mail.Attachment(path + "/TestData/TestInfo.txt");
868
869        mail.From = new MailAddress("masteraau@gmail.com");
870        mail.To.Add("masteraau@gmail.com");
871        mail.Subject = "Mail From Tester";
872        mail.Body = "New Test Results";
873        mail.Attachments.Add(attachment);
874
875        SmtpClient smtpServer = new SmtpClient("smtp.gmail.com");
876        smtpServer.Port = 587;
877        smtpServer.Credentials = new System.Net.NetworkCredential                        as ICredentialsByHost;
878        smtpServer.EnableSsl = true;
879        ServicePointManager.ServerCertificateValidationCallback =
880            delegate (object s, X509Certificate certificate, X509Chain chain, SslPolicyErrors sslPolicyErrors)
881            { return true; };
882        smtpServer.Send(mail);
883        Debug.Log("success");
884    }
885
886 }
887
```
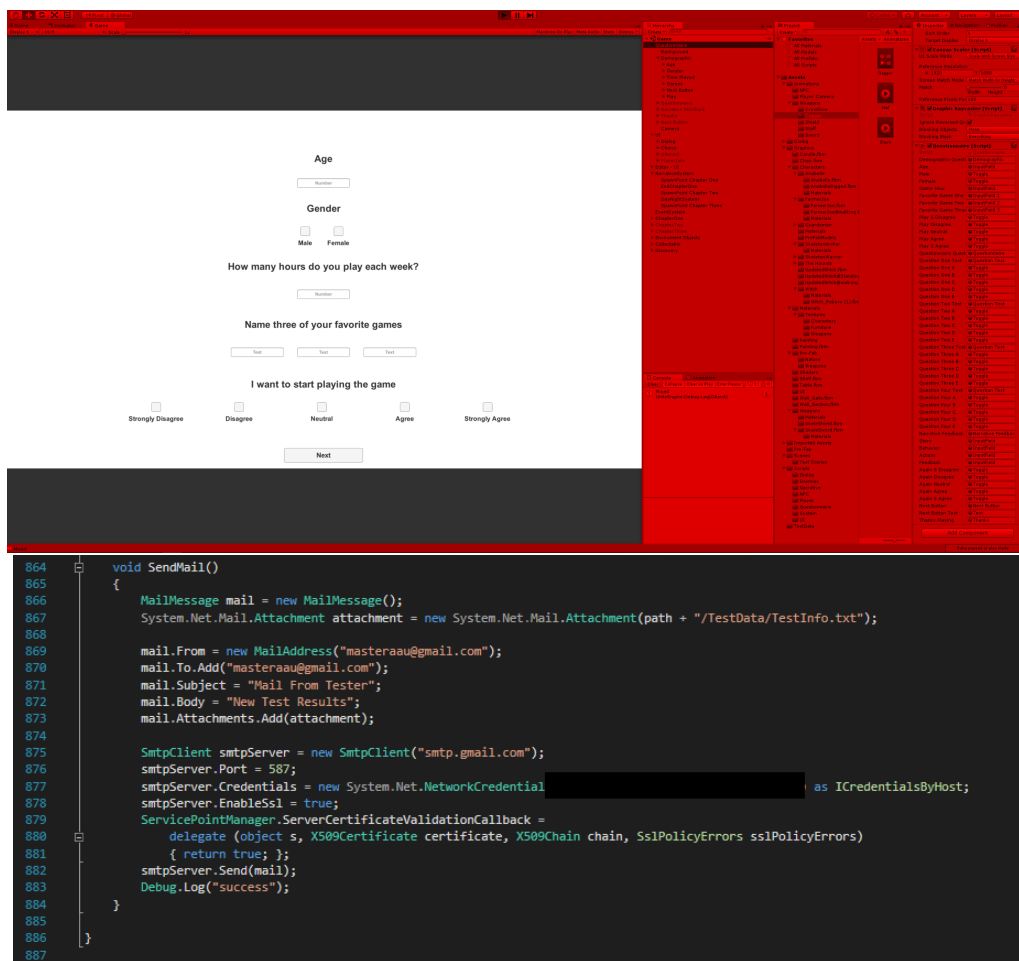
**Figure 6.17:** Questionnaire System

# Chapter 7

# Testing

In the following chapter we will present the requirements, as well as the procedure of how the test was conducted during this project.

## 7.1 Apparatus and Materials

For this experiment, it was important to make sure that every test participant gets an identical experience. In order to achieve this, we will only be using the game, developed alongside this project, for the evaluation of our problem statement, as the game is designed to be identical, with the exception of the specific condition we are evaluating (e.g. the narrative structure). We will make sure that the game runs as smoothly as possible on every device that meets the minimum requirements. These minimum requirements and optimizing is based on a five year old ASUS:N76V, which were able to run the highest graphics setting with an acceptable frame rate. Every version of the game, is set to the highest graphic settings and will be locked. If the computer is not able to run the game on this setting the test be considered invalid, and the test results will be removed from the final test data set.

An impotent note is that since we do not have any sound in the game, it is not allowed to listen to any music or sounds while performing the test. This is done in order keep the experience similar, and avoid to any corruption of the data.

### 7.1.1 System Requirements:

- CPU: Intel Core I7 3610QM, 2.3GHz.

- GPU: Nvidia Geforce GT 650M, 2GB.

- Memory: 8GB RAM.

- OS: Windows 7 or higher.

These specifications were the one used for our experiment - While slower machines will most likely be able to run the game to an acceptable quality, we chose to stuck to these for our testing, for consistency's sake.

## 7.2 Participants

We would like to test on a width variety of people to test our all of our player behaviors, because of this, we do not have any specified target group in mind. We do however have a few requirements that needs to be meet in order to participate. These requirements are made in order to make sure that the participants are able to complete the game and we get the test data we need. We do, however, understand that some participants might have troubles understanding the meaning of some questions, in which case we will assist. While the preferred language of answers is English, we do allow participants to answer the questions in Danish, in which case we will translate these answers into English as accurately as possible

### 7.2.1 Participant Requirements:

**??** While the experiment is not designed with a particular target group in mind, we have created a set of requirements to create a "pseudo target group", in order to ensure some measure of consistency in our participants. The participants should:

- Be in the age of at least twenty and not older than fifty.

- Have interest in computer games.

- Have experience in playing computer games.

- Be able to understand English.

- Be able to complete the game within one setting.

## 7.3 Procedure

The test will be divided, and performed in five phases. These phases have been incorporated into the game, which makes sure that all the participants have to do, is play the game and follow the instructions shown within the game. All of the phases will be presented and explained in this section.

**Phase One: Demographic Questions - (See Section 4.5.1)**

- The participants will be introduced to the questionnaire, and asked to answer five questions concerning demographics, as well as their desire to begin the game.

**Phase Two: Tutorial Chapter**

- The participants will be introduced to the game by learning about the story and game mechanics.

**Phase Three: Mid-Game Questionnaire - (See Section 4.5.2)**

- The participants will asked to answer sixteen questions concerning Continuation Desire, Attention Focus, Narrative Presence, Experimentation, Challenge and Skills.

**Phase Four: Open World Chapter and End Game Chapter**

- The participants will be using their knowledge from the introduction to freely roam around the game world. After being in the game world for seven minutes the game will use its information to generate the ending and send the player into the end chapter.

**Phase Five: End-Game Questionnaire - (See section 4.5.3)**

- When the game is over the final questionnaire will be activated. Here, the participants will be asked to answer 40 questions concerning Continuation Desire, Attention Focus, Narrative Presence, Comprehension of Narrative, Emotional Engagement, Character Identification, Experimentation, Disengagement, Challenge, Skills, Control and Familiarity. When these questions have been answered, the narrative questions and the general feedback section, will be unlocked in order for the participant to describe their story, behavior and their actions.

- If the participant is conducting the test on their own, and not during one of the test sessions we conducted, the mail system will gather the data and send the information to a mail-address, dedicated to our project, as described in section 6.3.

# Chapter 8

# Results

This chapter will present the results of our test, which we will then analyze in order to evaluate the success of our experiment, and ultimately use to conclude upon our final problem statement.

## 8.1  Demographic Information

For our experiment, we had a total of 90 participants, split into three separate conditions; The *Simple* version, which is a version where all narrative choices were presented and available to the players, the *Complex* version, which is a version where a choice is chosen for the player, depending on their actions, and the *Mixed* version, which is a mix of the two previously described methods; All choices are presented to the player, but they are only able to choose the one determined by the system. The gender distribution of the participants were as follows;

- **Male Participants:**

    - Simple: 28
    - Mixed: 27
    - Complex: 30

- **Female Participants:**

    - Simple: 2
    - Mixed: 3
    - Complex: 0

The participants had an average age of 26.17 for the simple, 27.6 for the mixed, and 26.17 for the complex version. They reported spending an average of 25.2 (Simple), 15.7 (Mixed) and 23.93 (Complex) hours per week playing video games. Based on

the games they provided as their favorites, we have converted into game genres
and key words. In the common section all of the shared genres are stored. If a
version has a unique genre it will placed within the version category:

- **Common:**

    - Action
    - Adventure
    - MOBA (Multiplayer Online Battle Arena)
    - MMORPG (Massively Multiplayer Online Role Playing Game)
    - RPG (Role Playing Game)
    - Platform
    - Shooter
    - Sport
    - Strategy
    - Storytelling

- **Simple:**

    - Augmented Reality
    - Exploration
    - Point and Click
    - Turn Based Combat

- **Mixed:**

    - Arcade
    - CO-OP (Cooperative)
    - Driving
    - Simulation

- **Complex:**

    - CO-OP (Cooperative)
    - Exploration
    - Point and Click

## 8.2 Narrative Questions and Player Feedback

In this section, we will present the qualitative feedback from our test. We have split the data up into three sections, matching the game versions. To get a better overview of the data, we decided to cut down any duplicated feedback, and keep only the essential data. This will provide us with a better overview of the narrative, and of the player feedback data. All of the original data can be accessed in the .zip file provided as digital appendix alongside this report.

Our game is designed to allow for three types of "paths" (i.e. outcomes of the game), named the *Heroic Path*, which is the outcome from completing quests, only killing enemy NPCs, the *Killer Path*, which is the outcome from killing *any* good or neutral NPC (e.g. the town's guards) and the *Pacifist Path*, which is the outcome a player will be presented with, if they do not kill any NPC at all. In the following subsections, we will present the distributions of how many players took each path, as well as presenting some of the most noteworthy comments about e.g. the story (as experienced by the players) or their behavior (as described by themselves).

### 8.2.1 Simple Version

During the simple version (N = 30), the distribution of the paths were as follows;

- Heroic Path: **19**

- Killer Path: **7**

- Pacifist Path: **4**

#### 8.2.1.1 Story:

A sample of the more noteworthy examples of comments about how the players experienced the story, can be seen below:

- A man that is on an adventure with his guardians.

- A soldier that was chosen to purge the city.

- A soldier that was chosen to be a champion by the guardians/dogs and awaits judgment.

- A soldier that protects the city.

- A man that had to go through a trial.

- A man that helps a witch which grants a powerful weapon.

- A soldier that decided to kill everyone.

- It was a story about an evil wizard (The player) that took over the town.

- A soldier that avoids conflict.

- A soldier that saved the city from the dead.

### 8.2.1.2  Behavior/Action:

Likewise, we asked the players to describe their actions in the game:

- Followed Guardian.

- Helped / Protected / Defended the town.

- Killed skeletons.

- Followed the trial.

- Followed the quests.

- Collected Gold.

- Explored the world.

- I did the right thing / helped.

- I killed everything.

- I tried to be passive.

- Followed Objectives/Quests/Dialog Symbols.

- Followed the path of the guardian.

### 8.2.1.3  Feedback:

And finally, a selection of the most interesting comments regarding general feedback:

- Slow beginning / Long conversations.

- Fun to kill skeletons.

- Fun Combat.

- More enemies.

- Want more story with the guardians.

- Want to kill the guardian.

- More abilities/skills.

- More time in the city.

- Want to explore the other paths.

### 8.2.2 Mixed Version

As with the simple version, we tracked the distribution of paths the test participants took during the mixed version - Again, the sample size is (N=30):

- Heroic Path - 19

- Killer Path - 8

- Pacifist Path - 3

#### 8.2.2.1 Story:

We asked the players to describe the story, as experienced by them - Here are a few examples;

- A person that got a weapon and went crazy/spread chaos.

- A soldier that got tricked by a witch to do her bidding.

- The story is about three guardians that is searching for a new champion.

- Killing villagers and skeletons.

- Venturing into a cave to find a weapon.

- A person that wants to go through a trial.

- The soldier is selected as champion and defend the city from evil/undead.

- Helping the guardians defend the city.

- A soldier that ignored his duty and searched for treasure.

- A soldier that gave up his weapon to go on an adventure.

- A soldier damaged from many year of war. It leads him to become a killer.

#### 8.2.2.2 Behavior/Action:

Likewise, we asked them to describe their actions throughout the game:

- Killed a lot of skeletons.

- Became a killer.

- I tried to be a good guy.

- Running away from skeletons.

- Exploring the land/town.

- Found gold.

- Completed quests.

- Ignored quests.

- Being passive.

- I did what was told by the guardian.

- Walked around town and helped people.

- Followed the sword symbol.

- I did what i was asked.

In addition to these, a few people had some more elaborate and noteworthy comments about their actions;

- *"First I tried to be nice, but then I thought "Hey, this is a game", so I decided to kill a peasant before solving his problem. Then a little girl spoke to me, but the button bugged out on the "Make her pay with blood" - button, so I had to choose that one. I was like sure, and killed her, whilst the town guards watched in silent amusement. "*

- *"Tried to shoot just about everything with crossbow - guards didn't like it. Decided to go on killing rampage after the heroic guardian told me I was going down his route."*

- *"I killed the witch, which I felt good about. But I was forced into killing the little girl, which I didn't really want to do."*

#### 8.2.2.3 Feedback:

Finally, we asked the participants to write about any feedback they found relevant:

- It was strange only to be able to pick one option.

- A bit difficult to find my way around town.

- Would have been fun with more time in town.

- The crates are fine, but weird they don't do anything.

- Information about what the gold is used for.

- Sound feedback.

- Some interface to tell if you have collected everything / done quests.

- I would like some more story.

- What does the levels do.

- I really like the style of the characters, especially the soldiers.

- Some neat attempts at environmental storytelling that didn't do enough.

### 8.2.3 Complex Version

As with the other two versions of the test, we also tracked how many players took each path for the complex version (again, N=30).

- Heroic Path - 21

- Killer Path - 9

- Pacifist Path - 0

Notice the lack of people taking the Pacifist path.

#### 8.2.3.1 Story:

Again, we asked participants to describe, in their own words, the story they experienced:

- Soldier that is granted a weapon.

- A soldier that had enough of quests.

- A man that had to go through a trial.

- Soldier that kills innocent people.

- Being Judged by dogs/guardians.

- A man/soldier/champion that protects the city.

- A soldier that meets a witch which shows him the way to guardians/weapons.

- A lone wanderer who gets the opportunity of winning the favor of one of three gods.

#### 8.2.3.2  Behavior/Action:

The participants were also asked to describe their actions in the game:

- Followed the NPCs.

- Did heroic deeds by completing quests.

- My character did not like quests so he killed the NPCs.

- Exploring the world/city.

- I did the right thing.

- Killed everything i could find.

- Saved the city.

- I followed the guidance of the dogs.

- Tried to kill many enemies.

- Killed everything - Started as a mistake but ended up as a play style.

#### 8.2.3.3  Feedback:

And finally, the participants were asked to give any feedback regarding the game, they found relevant:

- Skip button in order to skip dialog.

- Slower text.

- It was fun killing skeletons.

- More guidance.

- More action / combat.

- More enemies.

- More information about the dogs.

- Sound.

- Different Animations for the characters.

- Better movement.

- Add something exciting to the NPCs while they talk.

- Would be nice with a quest tracker.

- It was fun that you could do whatever you liked to do.

## 8.3 Quantitative Feedback:

Along with the qualitative feedback, we also recorded a range of quantitative data from our experiment. We had a total of 90 participants, split into three groups of 30 each. This section will present these findings;

### 8.3.1 Continuation Desire:

During the questionnaire, we asked the test participants to report their continuation desire values at four points throughout the game; First by asking them about their desire to start playing the game, before the game started. Then two times during the play session, they were asked to report their current desire to continue playing the game, and finally, after finishing the game, they were asked to report their desire to play the game again (e.g. their desire to re-engage with the game).

#### 8.3.1.1 Simple Version:

The game using the 'Simple Version' showed relatively high continuation desire values throughout the game on average (Start: 3.97 (std.: 0.67), During 1: 4.03 (std.: 0.32), During 2: 4.67 (std.: 0,48), After: 3.87 (std.: 0.73)). These values are visualized in the following figure:
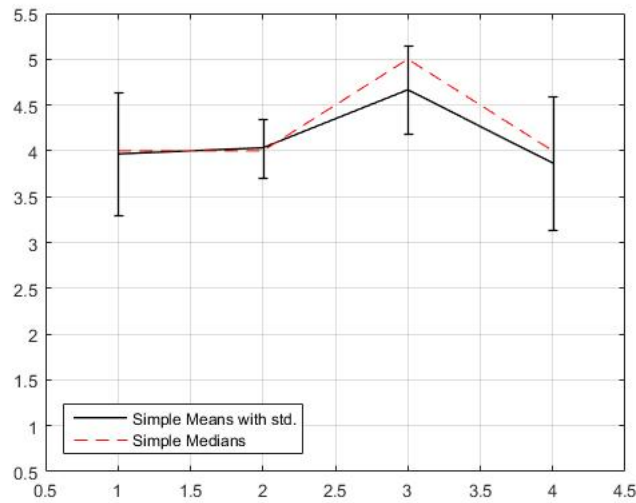
**Figure 8.1:** Average values throughout the game play experience of the simple version, accounting for standard deviation. The y-axis shows the degree of continuation desire (1 indicating a low CD, and 5 indicating high CD), and the X-axis shows the data collection point (1 being before the game, 4 being after the game)

The median values of the simple version were (Start: 4, During 1: 4, During 2: 5, After: 4), and are visualized in the following histogram:
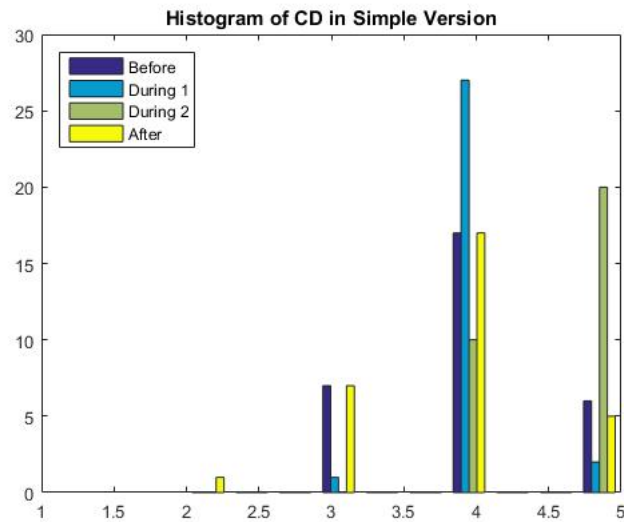


**Figure 8.2:** Histogram of CD during the simple version of the game. The Y-axis shows the amount of times a score has been given, and the X-axis shows the score (1 being low, 5 being high).

### 8.3.1.2 Complex Version:

The complex version of the game saw relative high average CD values throughout the game, but saw a rather substantial drop in desire to replay the game (Start: 3.87 (std.: 0.43), During 1: 4.13 (std.: 0.51), During 2: 4.70 (std.: 0.60), After: 2.57 (std.: 0.94)). The averages are illustrated in the following graph:
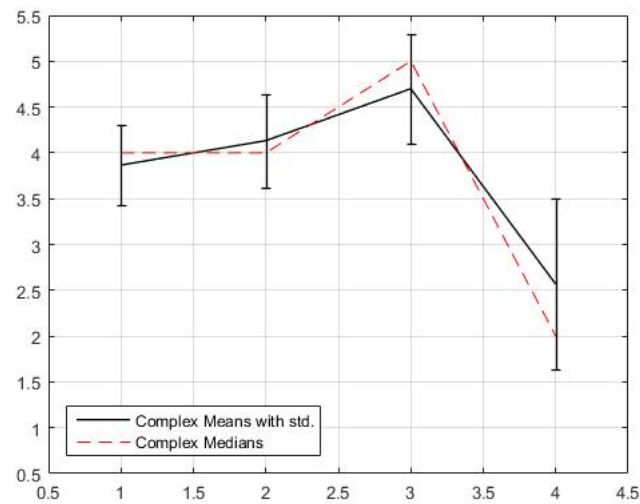


**Figure 8.3:** Average values throughout the game play experience of the complex version, accounting for standard deviation. The y-axis shows the degree of continuation desire (1 indicating a low CD, and 5 indicating high CD), and the X-axis shows the data collection point (1 being before the game, 4 being after the game)

The median values of the complex version were (Start: 4, During 1: 4, During 2: 5, After: 2), and are visualized in the following histogram:
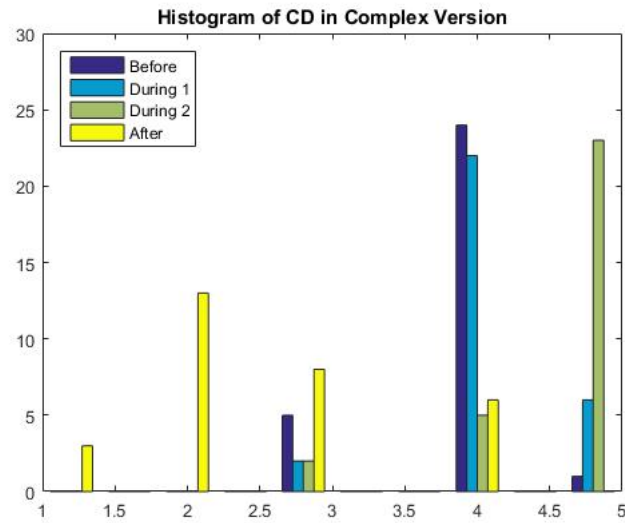
**Figure 8.4:** Histogram of CD during the complex version of the game. The Y-axis shows the amount of times a score has been given, and the X-axis shows the score (1 being low, 5 being high).

### 8.3.1.3   Mixed Version:

Players of the mixed version of the game reported a consistently high score of continuation desire throughout the game (Start: 4.30 (std.: 0.60), During 1: 4.13 (std.: 0.51), During 2: 4.17 (std.: 0.70), After: 0.66). The averages are visualized in the following graph:
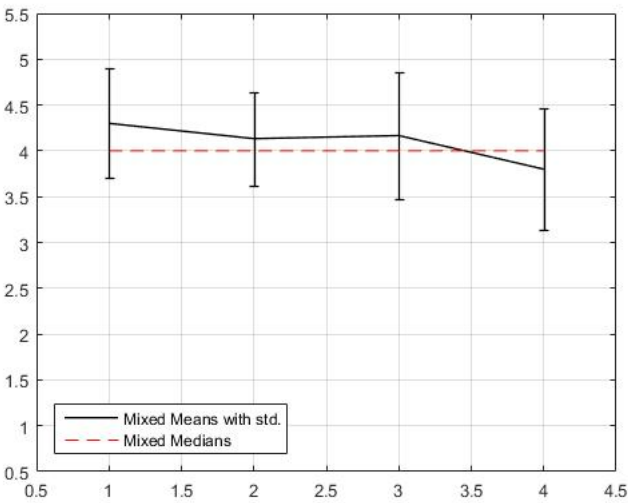
**Figure 8.5:** Average values throughout the game play experience of the mixed version, accounting for standard deviation. The y-axis shows the degree of continuation desire (1 indicating a low CD, and 5 indicating high CD), and the X-axis shows the data collection point (1 being before the game, 4 being after the game)

The median CD scores during the complex version of the game were completely consistent (Start: 4, During 1: 4, During 2: 4, After: 4). A histogram of the scores can be seen below:
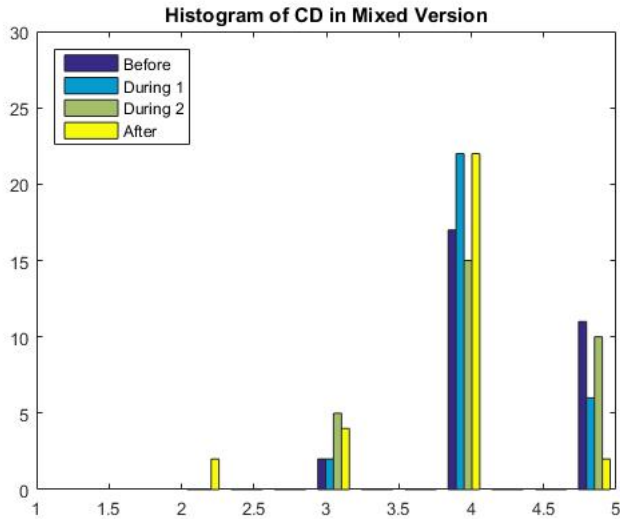


**Figure 8.6:** Histogram of CD during the mixed version of the game. The Y-axis shows the amount of times a score has been given, and the X-axis shows the score (1 being low, 5 being high).

### 8.3.2 Categories of Engagement:

As part of our methodology for measuring players' continuation desire, we asked them a series of questions related to categories of continuation desire (as described in 4.3). The idea behind these categories, is that they are the components that make up CD, which means that the combined score of these categories should yield a CD-score. Combining the scores from the categories into a singular CD score yielded the following results;

#### 8.3.2.1 Simple Version:

**Round 1:** The first round of questions in the simple version of the game, gave an average continuation desire score of 3.844 (std.: 0.149). To visualize the make-up of this average (i.e. the contribution of each category to the overall score), we created the following graph;



**Figure 8.7:** Graph showing the contribution of each category (the bars), compared to the overall average score (the red line).

**Round 2:** The second round of questions in the simple version (which included several more categories), showed an average continuation desire score of 3.681 (std.: 0.131). Again, we visualized the contribution of the various categories.

**Figure 8.8:** Graph showing the contribution of each category (the bars), compared to the overall average score (the red line).

#### 8.3.2.2 Mixed Version:

**Round 1:** First round of questions in the mixed version, showed an average calculated continuation desire score of 3.676 (Std.: 0.306). The categories' contribution to this score are visualized below;
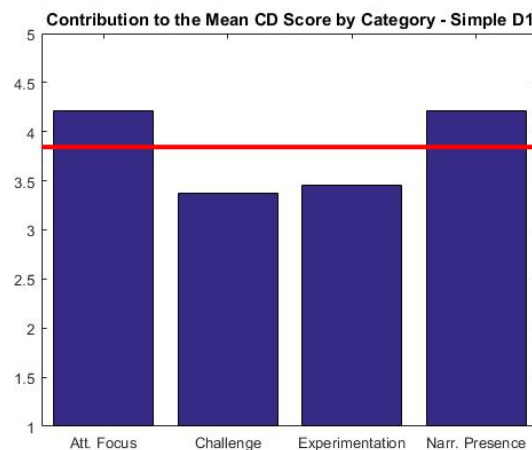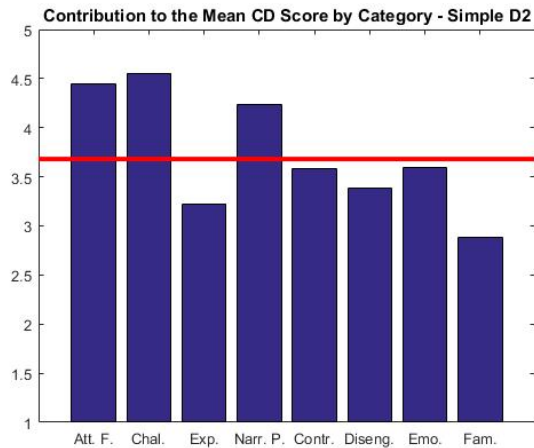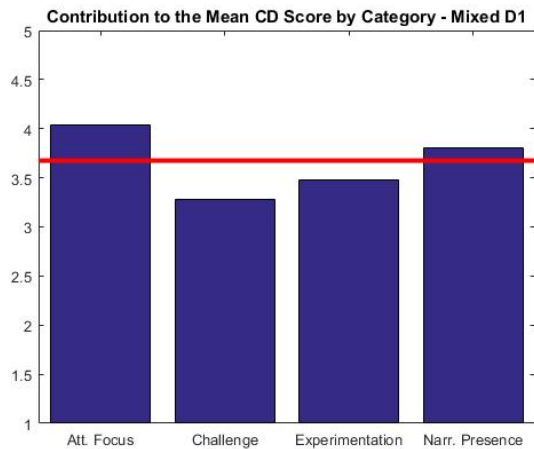


**Figure 8.9:** Graph showing the contribution of each category (the bars), compared to the overall average score (the red line).

**Round 2:** The second round of the mixed version questions yielded an average continuation desire score of 3.649 (Std.: 0.406). Visualized, the categories' affect on the overall average can be seen in the graph below;

**Figure 8.10:** Graph showing the contribution of each category (the bars), compared to the overall average score (the red line).

### 8.3.2.3   Complex Version:

**Round 1:** The average calculated continuation desire score for the first round of questions in the complex version was 3.251 (Std. 0.194). As with the other versions, we have visualized how each of the categories contributes to this score;



**Figure 8.11:** Graph showing the contribution of each category (the bars), compared to the overall average score (the red line).

**Round 2:** Finally, the second round of questions in the complex version showed an average score of 3.278 (Std. 0.088). Finally, as with the other, we have visualized the contribution of each category to the overall average;
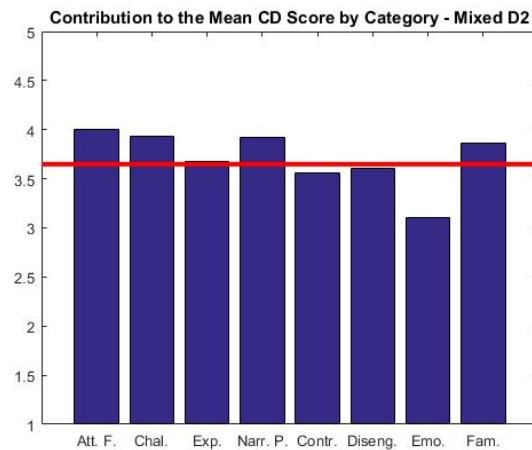
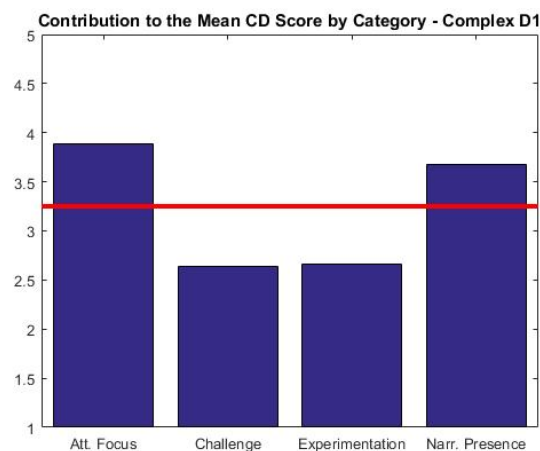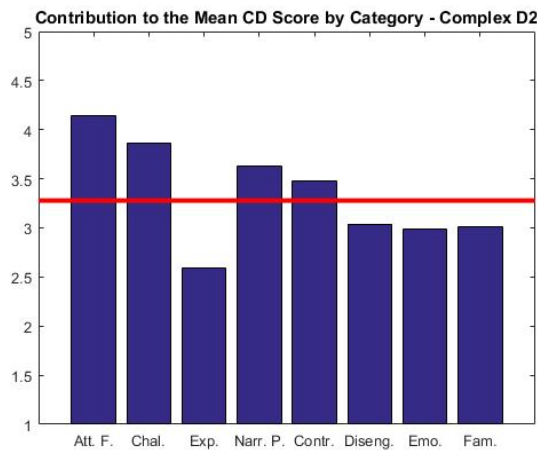**Figure 8.12:** Graph showing the contribution of each category (the bars), compared to the overall average score (the red line).

# Chapter 9

# Findings

Based on the results of our experiment, as presented in the previous chapter, we will now begin to analyze the results in relation to our problem statement. To start with, we will compare the results of our two methods of measuring continuation desire (i.e. one where players are simply asked about their desire to continue, and one where we ask questions which, according to our research and hypothesis, should measure a player's desire to continue, while affording a more detailed insight into what causes this score. We will then evaluate the difference in continuation desire between the three different narrative structures; (*"Simple"*, which shows the player all available choices, *"Complex"*, which evaluates the players' behavior and actions in the game, and takes a choice for them, and the *"Mixed"* version, which is a mix of the two - The players' actions will determine what actions are available to them, greying out the unavailable ones. This evaluation between the three versions, will culminate in an evaluation of how these three versions affect a player's desire to re-play the game.

## 9.1 Validity of Continuation Desire Test

In order to evaluate the validity of our continuation desire questionnaire, we will compare its results with those of the players' own report of their desire to continue, which we use as a our control-sample. As our continuation desire questionnaire only have two points of data collection (early ("Round 1") and late ("Round 2") in the game), we will only compare these two points against the control experiment, leaving out the players' desire to start playing, and their desire to play again. The comparison will be done separately for each version of the game.

### 9.1.1   Approach to Comparing the Tests

As we are looking to evaluate the validity of our continuation desire questionnaire against the control (i.e. we are looking to see if there is any significant difference between the two methods of measurement), we will conduct statistical analysis on the data. Given our experiment design, we know that according to [Field and Hole, 2013], we will either be using an Independent-measures T-test in the case of parametric data, or a Mann-Whitney U-test (also known as the Wilcoxon's Signed Rank Test) in the case of non-parametric data. The Independent-measures T-test evaluates the null hypothesis that the data comes from a normal distribution, with little to no difference, against the alternative hypothesis that it does not, indicating that there is a significant difference between the data sets. The Mann-Whitney test similarly tests to see if the data set comes from a data set with equal distribution, against the alternative that it does not - The difference being that Mann-Whitney does not assume normality. For all our tests, we use a significance level of 5%, as this the margin of error expected from our sample size [Field and Hole, 2013]. So in order to determine what test to use, the first step of the data analysis is to determine whether or not we're dealing with parametric data - Which, due to the way we have designed our experiment, is a simple matter of determining whether or not our data is normally distributed. This will be done using the Kilmogorov-Smirnov Test for Normality [Field and Hole, 2013]. As one data set consists of integer data (as the data comes from a single question), and the other consists of decimal numbers (as the data comes from means of multiple questions), and the data therefore are slightly different in nature, we decided to also perform the analysis on rounded off scores, in order to get a more even comparison[1]. Going forward, the three data types will be referred to as "Control" (which relates to our control experiment), "Calculated" (which refers to the mean score, based on our questionnaire) and "Calculated-as-integers" (which refers to the rounded off mean scores from on our questionnaire).

### 9.1.2   Simple Version

In the simple version, the players are presented with all possible choices, and are free to choose the one they feel like, regardless of their actions in the game. We started by testing for normality - Starting with the control test. We found that neither the first, nor the second round of data were normally distributed, and therefore not parametric, which means that we will have to use the non-parametric test (Mann-Whitney U-test), regardless of whether or not the other data set is parametric.

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[1]Note that we are not saying that this is the correct approach, but rather that it might provide a more even comparison - The result of this test will not be used as the foundation for our conclusion, but rather as an indication.

### 9.1.2.1 Round 1

We performed the Mann-Whitney U-test on our data sets (Control vs. Calculated, and Control vs. Calculated-as-integers). For Control vs. Calculated, the test yielded an h-value of 1, indicating a rejection of the null-hypothesis, meaning that there was a significant difference between the two data sets. Comparing the Control with the Calculated-as-integers, however, yielded an h-value of 0, indicating no significant difference. We have visualized these results as a box-whisker diagram to illustrate the data;
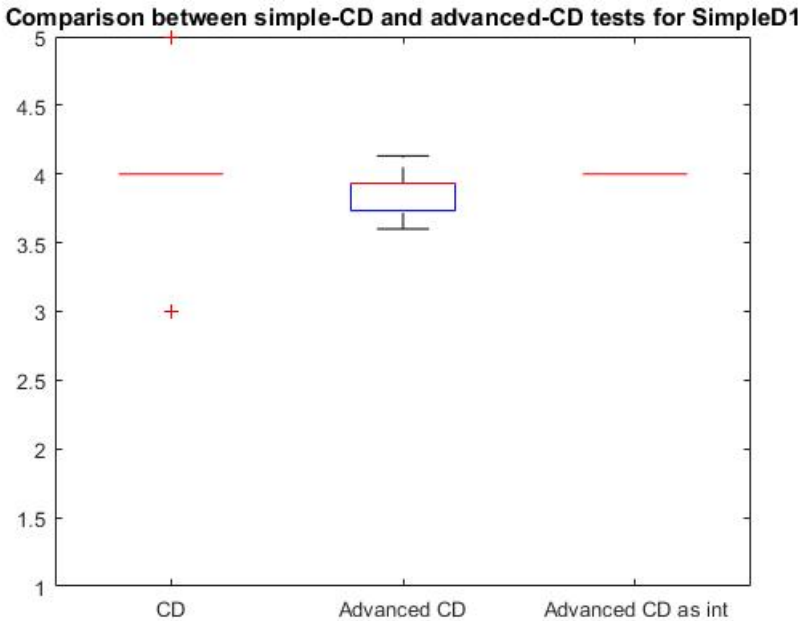


**Figure 9.1:** Box-whisker diagram of Control, Calculated and Calculated-as-integers

From this we can see that the data sets are nearly identical, with the exception of the Calculated data, which is slightly lower than the other two. This diagram illustrates our reasoning behind also comparing the calculated test as integers, as our test reveals a significant difference, while we can see that the score of the calculated test is still well above 3.5 (compared to the Control score of 4), hinting that the significant difference might come from difference in resolution (e.g. decimals versus integers), rather than a measured difference.

### 9.1.2.2 Round 2

Again, analyzing the data with the Mann-Whitney test shows that there is a significant difference between the results from the Control test, and the Calculated

test, whereas this is again not the case for the Calculated-as-ints. The results are illustrated below;

Comparison between simple-CD and advanced-CD tests for SimpleD2
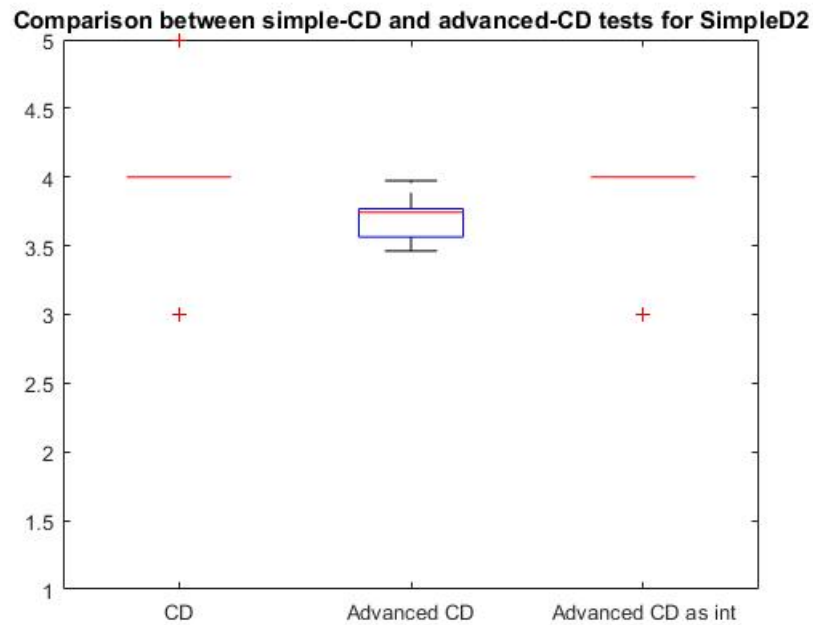


**Figure 9.2:** Box-whisker diagram of Control, Calculated and Calculated-as-integers

As can seen above, the scores of the three tests are nearly identical, and it could be reasoned that the significant difference might be caused by the difference in resolution of the data sets.

### 9.1.3   Complex Version

The complex version analyzed the players' actions and behaviors, and determined the appropriate choice accordingly. This meant that players were not presented with any choices at all.

#### 9.1.3.1   Round 1

The Mann-Whitney test for the first round of questions in the complex version showed a significant difference for both the Control vs. Calculated, as well as the Control vs. Calculated-as-integer tests.
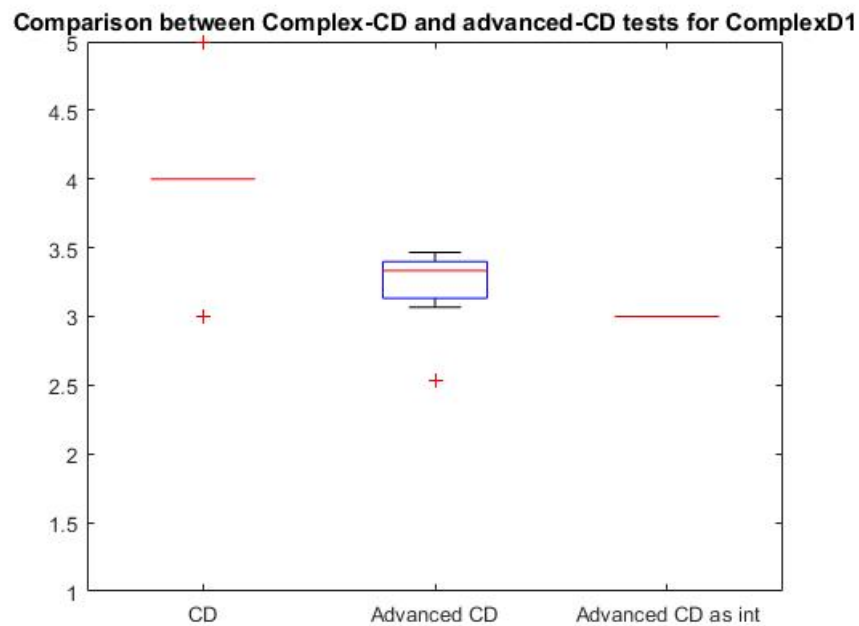
**Figure 9.3:** Box-whisker diagram of Control, Calculated and Calculated-as-integers

This difference is immediately apparent, when looking at the diagram above, as it can clearly be seen that the scores of the Calculated tests are much lower than the Control - Which is supported by the average scores of the two (4.13 for the Control and 3.251 for the Calculated).

### 9.1.3.2   Round 2

The second round of questions of the complex version also showed significant differences between the Control and both of the Calculated result.
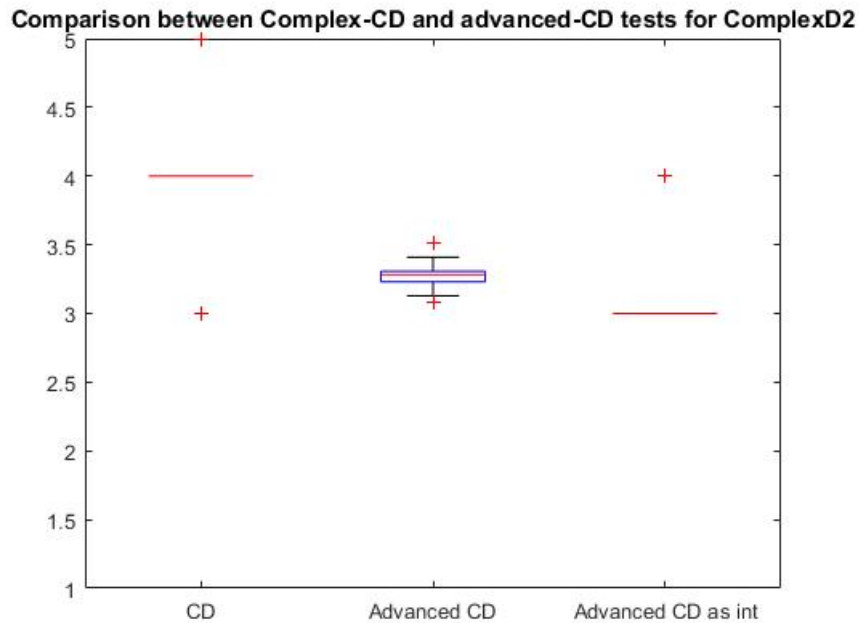
**Figure 9.4:** Box-whisker diagram of Control, Calculated and Calculated-as-integers

Again, this difference is very visible in the diagram above, and is supported by the average scores of 4.17 for the Control and 3.278 for the Calculated.

### 9.1.4   Mixed Version

The mixed version used, as the name implies, a mix of both previous methods; the game calculates the appropriate choice, depending on the players' actions, but all options are presented to them (with the locked choices being disabled). This way, the player is presented with all possible choices, but is limited to choosing one specific choice.

#### 9.1.4.1   Round 1

This time we found a significant difference for both Control vs. Calculated and Control vs. Calculated-as-integers, which is illustrated in the diagram below;
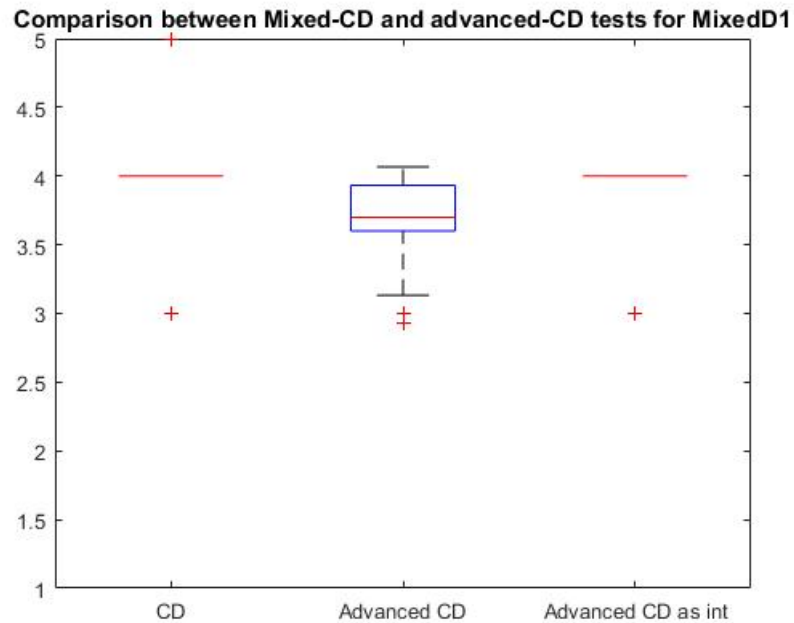
**Figure 9.5:** Box-whisker diagram of Control, Calculated and Calculated-as-integers

This time, the difference is not apparent just from looking at the diagram - One would rather assume that the results are very similar (which is why we do not, generally, use graphical representation as the primary means of evaluating data). Comparing the average score of the Control and the Calculated data sets, this difference become much clearer; The Control test yielded an average score of 4.13, whereas the Calculated data shown an average score of 3.676.

### 9.1.4.2 Round 2

The second round of the mixed version also showed significant differences, both for Control vs. Calculated and for Control vs. Calculated-as-integers.
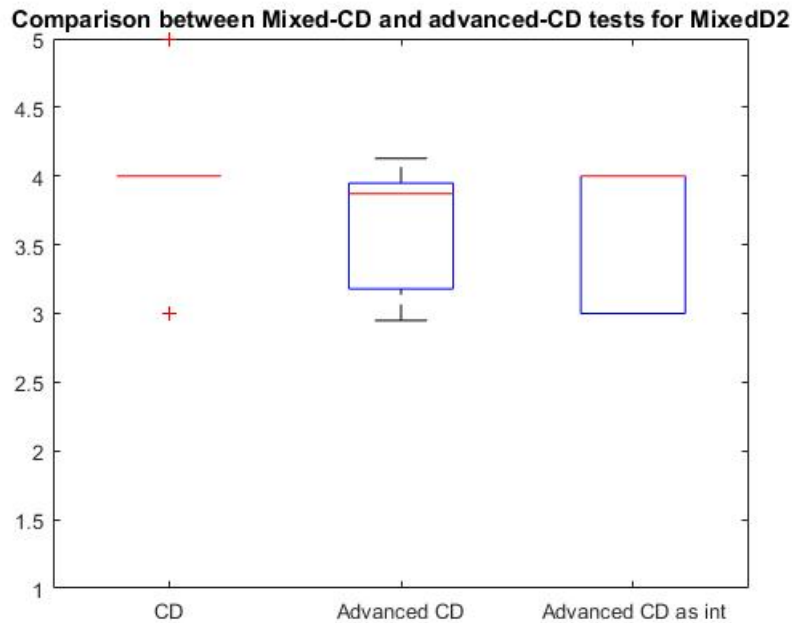
**Figure 9.6:** Box-whisker diagram of Control, Calculated and Calculated-as-integers

As seen in the diagram above, the difference is much clearer here - While the medians of all data sets are roughly equal at around 4, the spread of data is much greater in the calculated tests, compared with the control.

## 9.2   Difference Between Conditions

In addition to evaluating the validity of the two methods of measuring players' desire to continue, we are also evaluating how the three different versions of the game affected the players' desire to continue, as well as their desire to play again. This is done by evaluating the players' own expression of their desire to continue (e.g. the "Control" data, as described in the previous section). This is done to reduce bias introduced by our questionnaire potentially measuring continuation desire incorrectly.

### 9.2.1   Pre-Test Desire to Start the Game

Before every test, we asked the players to report their desire to start playing. As we have only explained the very basics of the game beforehand, we assume that these scores will be roughly equal. Comparing each of the three versions of the game against each other (Simple vs. Mixed, Simple vs. Complex and Complex vs. Mixed) showed no significant between Simple against the other two, but showed a

significant difference between Complex and Mixed.



**Figure 9.7:** Box-whisker diagrams of the players' desire to start playing each of the three versions of the game.

## 9.2.2 Round 1 Continuation Desire

The first round of questions were asked right before the players started the main section of the game, which means that they have just been introduced to the setting, controls and the goal of the game. From this point on, we expect that there might be differences in how much the players want to continue playing, depending on the version of the game they are playing.

As with the pre-test, we analyzed each data set against each other and found, yet again, that there were no significant difference between Simple and either of the other two, whereas there was a significant difference between Complex and Mixed. However, looking at the box-whiskers diagram of the three versions below, we see that they all appear to be exactly equal.
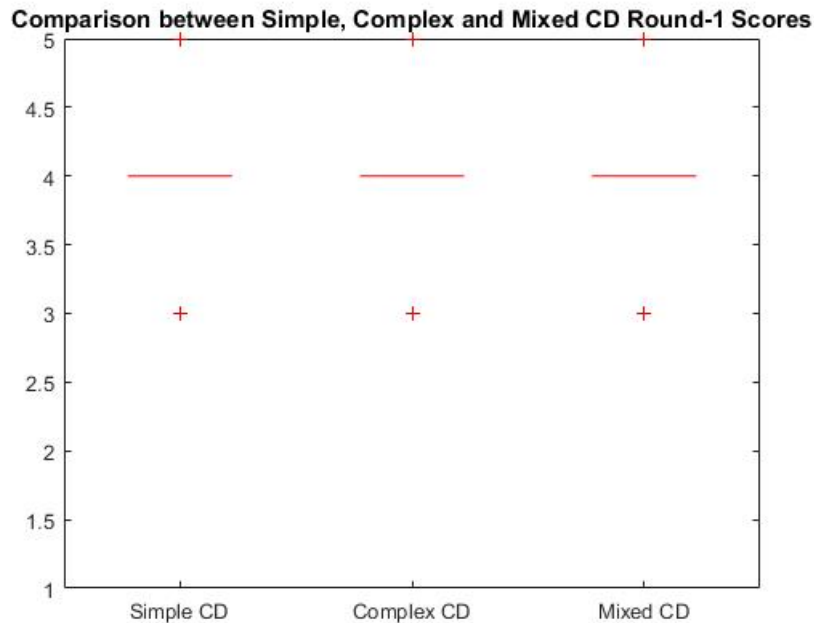
**Figure 9.8:** Box-whisker diagrams of the players' desire continue playing each of the three versions of the game.

This merits a closer look at the Complex vs. Mixed test, as that showed that there *should* be a significant difference, whereas the diagram indicates otherwise. The closer inspection reveals a problem with the results; While the test indicates a significant difference, the two groups are, in fact, exactly equal - The sum of the scores, the means, standard deviations and the medians are all exactly equal. This appears to be a problem with the calculation tool, and we can assume that there is in fact no difference between the two groups.

### 9.2.3   Round 2 Continuation Desire

The second round of questions were asked right after the player completed the main section of the game, indicating a natural break point in the game. Analyzing the data from the second round of questions, showed a significant difference between Mixed and the other two conditions, and no difference between Simple and Complex. This is visualized in the diagram below, where we see that both Complex and Simple have median values of 5, whereas Mixed has a median of 4, with higher degree of variability than the other two versions.
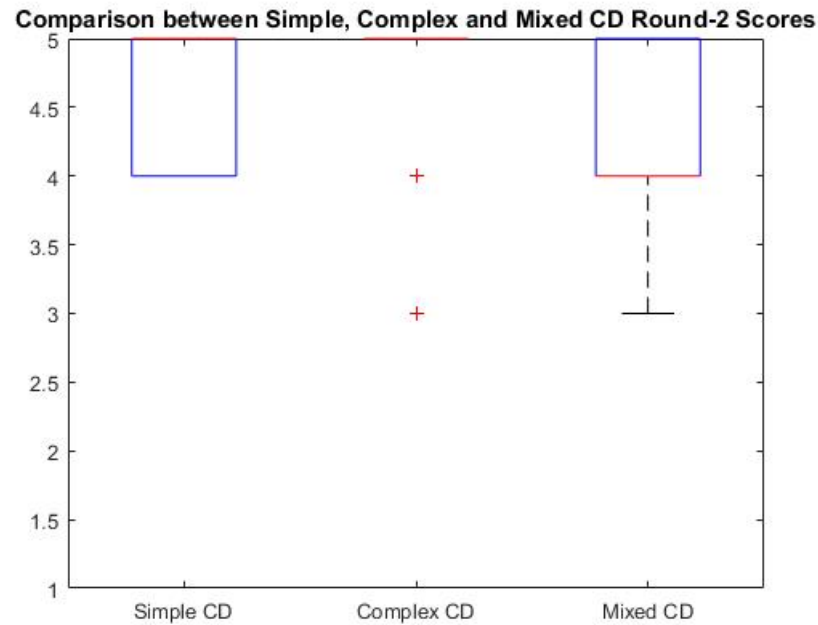
**Figure 9.9:** Box-whisker diagrams of the players' desire continue playing each of the three versions of the game.

### 9.2.4 Post-Test Desire to Play Again

Finally, we evaluated the players' desire to play the game again - This was the very last question they were asked, before the test was concluded. This time, we found no significant difference between Simple and Mixed, but found a that the results from Complex was significantly different from the two other versions.
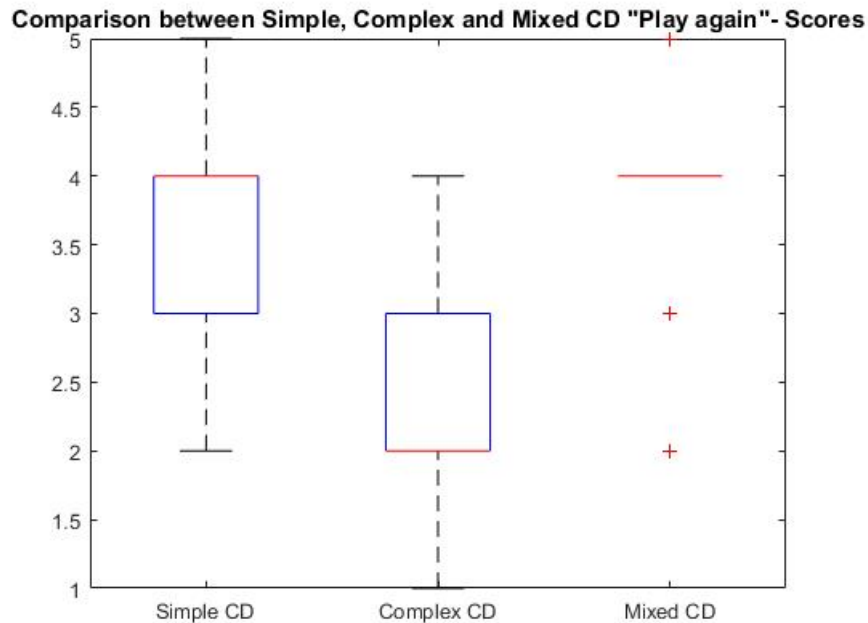
**Figure 9.10:** Box-whisker diagrams of the players' desire replay each of the three versions of the game.

## 9.3   Comparing Narrative Questions

Finally, we will evaluate how the players' perception of the story, their action and their generation feedback differed between the three versions of the game.

### 9.3.1   Story

Overall most of the stories that have been gathered from the versions seems to include similar elements.  They include the elements of the soldier that gets a weapon, and is send of to the town to prove his worth for the guardians.  There are, however, some participants that presents their own story that matches their path and behavior.  These small stories are found in all versions and is mostly linked to the killer/pacifist path.

### 9.3.2   Behavior/Action

When comparing the behaviors and actions between the three versions of the game, they all seem pretty similar - It is only when adding the feedback (next section) that it becomes apparent that some players did not intend to go down the killer path, but were forced to do so, due to their previous actions. Some of them attacked the witch since they saw her as evil - When they later want to perform a heroic

deed, they are simply not allowed to, because the game system remembers their past actions. Some of them sees this as a bug and might be a flaw in the design.

## 9.4 Comparing Feedback

Overall most of the feedback is mostly changes of the game mechanics or elements. This could be things such as more or less enemies, more or less story, more or less time in town. This all comes down to personal preferences and might indicate that we need more flexibility in the game to cater to everyone. One element that we do realize is the dialog system might lack some complexity, in not being able to skip and repeat dialog. Another element that we need to look into, is some UI systems that could have been implemented but has been overlooked, e.g. systems such as a quest tracker, experience bar, etc. Another element, which some participants felt like was deducting from the experience, was the lack of sound.

# Chapter 10

# Discussion

In this chapter, we will discuss, and reflect upon, the findings of our experiment, as well as consider what aspects we could have done differently. We will evaluate the validity of our continuation desire questionnaire, and how the three versions of narrative structure affected the players' desire to keep playing the game, as well as their desire to play again. Finally, we will present a range of possible biases we have identified.

## 10.1 Validity of the Continuation Desire Questionnaire

To start with, we will discuss our findings about how well we succeeded in measuring continuation desire, using our questionnaire, compared to our control test. First, we must point out a potential point of error in how we are assessing the validity of this test; We're evaluating the validity of our Continuation Desire Questionnaire, based upon the assumption that the players' report of their desire to continue (i.e. being asked "How much do you want to continue playing?") is a valid indication of their continuation desire level (after all, we must assume that the test participants are honest). Ideally, we would prefer to have a more thorough measurement of their continuation desire as a control test, but that is also exactly what we're trying to achieve with our questionnaire! So while we could (and maybe should) have used other methods as our control test (e.g. the method used by [Schoenau-Fog, 2011b]), we decided against it, as this would more than double the total length of our questionnaire - Which might potentially have acted as an even larger source of bias.

    With this note out of the way, we will now look at the results of our test; Our findings show that the calculated continuation desire (i.e. the mean score of all questions combined) compared relatively well with the control test - While our statistical analysis revealed significant differences in some of the comparisons, the results hints towards the difference being relatively small, which indicates that

the questionnaire might be a somewhat valid method of measuring continuation desire in interactive narratives. One thing of note here, is that we have based the calculated score of our questionnaire on the assumption that all questions are contributing equally to the score - An assumption which is most likely not ideal, as this would mean that each category's contribution to the overall score is largely determined by the number of questions asked. A possible solution to this problem, would be to determine 'weights' for each question, as well as for each category - Which is an idea we also explored in our bachelor's project [Atchapero et al., 2015], as well as by e.g. Schoenau-Fog [2011a]. While we were not able to discern how much each category contributes to the players' level of continuation desire, we were able to see how much each of the categories contributed to the continuation desire score we calculated from our questionnaire; As an example, we saw that e.g Experimentation contributed negatively to the average score, which could indicate a lack of things for players to play with (e.g. different combinations of weapons).

## 10.2    Narrative Structure's Effect on Continuation Desire

As we were trying to evaluate how presentation of narrative choice (or branches) affected players' continuation desire, we tried to evaluate the three versions of our game against each other, using the control-test measure of continuation desire as comparison point. This was done to limit the scope of this part of the analysis, as we have already compared the two methods of measuring CD against each other previously. Furthermore, we were specifically looking for re-play desire as well, which our continuation desire questionnaire do not include.

### 10.2.1    Pre-Test Analysis

As we started by asking the players about their desire to start playing the game, before they started playing (and thereby, before any difference between the versions were experienced), we expected this score to be somewhat equal for all conditions. We saw, however, a significant difference between Mixed and Complex, but looking at the box-whiskers diagram (Figure 9.7) of the two, we see that this difference might simply be a higher degree of variance in the Mixed version. Furthermore, examining the diagrams, we see that the variance in the Mixed version is similar to the outliers of the other two - Hinting that this variance might be a coincidence, rather than an actual difference (e.g. there are simply more outliers in the mixed version, compared to the other two).

### 10.2.2    Round 1 Analysis

The scores for the first round of Continuation Desire report reveals no significant differences between each group, with the exception of between Complex and

Mixed - Which, upon further inspection, appears to be a problem in the calculation tool, rather than an actual difference, as the two groups are, in fact, exactly equal. Hence we can determine that for the first part of the game, we see no measurable difference in players' reported continuation desire levels - Which is not surprising, seeing as the players have only just been introduced to the variance between versions, and it is therefore unlikely to have impacted them yet.

### 10.2.3   Round 2 Analysis

The second round of measurement reveals a more varied result; While there was no significant difference between the simple and the complex version, the mixed showed a significantly lower score than the other two versions. This might relate to the fact that some players experienced the mixed version's method of presenting choices (i.e. showing all possible choices, but only allowing the player to pick one) as being bugged e.g.;

> *"... Then a little girl spoke to me, but the button bugged out on me on the "Make her pay with blood"-button, so I had to choose that one..."* -Mixed version test participant.

This comment in particular casts doubt on the validity of the Mixed version, as it hints towards our implementation being flawed; The intent is to show people what choices they are missing out on, in order to encourage trying out different branches of the game, not to give the impression that the game is bugged, which means that this problem merits further investigation.

### 10.2.4   Analysis of the Re-playability

As a final point of comparison, we evaluate the players' desire to play the game again, under the assumption that a large portion of this replay desire might stem from a curiosity about what branches of the story they have missed out on. We found no significant difference between the simple and the mixed versions of the game, even though the simple version showed a much higher degree of variance than the mixed version. The complex version, on the other hand, saw a very significant drop in desire to replay, compared with the other two conditions. While some participants reported replay desire scores similar to those reported for the other conditions, the majority reported a much lower desire to play.

## 10.3   Game Improvements and Feedback

In this section, the player feedback will be discussed. Keep in mind that the feedback discussed here is only concerning improvements to the game. Personal preferences, such as requesting more enemies, have been discarded.

### 10.3.1  Story Interpretation

When comparing the three versions of the game, it seems that most of the test participants understood the plot and the overall story. While the participants with the heroic path had the original story, some of the other participants from the killer and the pacifist paths reported a story that were very character specific. This could have been linked with these players having a high value in the destruction behavior, which has a tendency to give them a lower story behavior. This matches with their overall interest in the story.

### 10.3.2  Mixed Improvements

The main problem of the mixed version of the game seems to be the test participants misunderstanding the system behind the mixed narrative structure: When the participant is presented with an unavailable option, they seemed to believe that it is a bug, that forced them to select the specific option. Improving the method of communicating why these actions are unavailable might be beneficial.

Another, related, problem was the mismatch of player behavior and character behavior. A few test participants mentioned that they take the choice of killing the witch. Later on in the game, when they meet the little girl, they are then forced to kill her, since it suits the character behavior. This, however, conflicts with the interest of the player, since some of them wants to either help, or leave her alone. This could, of course, be because of missing character development of the witch, as she is introduced early on in the game, and the choice is presented almost right after. This leaves very little time to develop any emotional connection to the character, which is also supported by the questionnaire in the category *Emotional Engagement & Char. Identification* (see 4.5.2). Here, the question *"The story had no emotional effect on me"*, showed a low overall score, indicating a low level of emotional affect. This "Player Behavior vs. Character Behavior", is a phenomenon that have to be researched further, in order to find a solution that suits both behaviors.

### 10.3.3  Complex Improvements

The main problem in the complex version, seemed to be that the test participants did not feel like their choices had any effect on the game, and found it very linear. This is indicated in the Experimentation category, which is drastically lower than in the simple and mixed version. This is interesting, since the complex version is the one optimized to bring a low "Eliza Effect". The system might have been too complex and non-informative, however, which lead to the players believing that there were no choices at all. This could potentially also explain why there were none in the complex version that ended up with the pacifist path.

### 10.3.4 General Improvements

Overall there are a few elements that could be improved upon: The dialog system need some additional features, such as the player being able to control the dialog progress (i.e. when next sentence is shown) themselves. This could, for example, by making buttons to control when to skip (or go back) in the sentences. By doing this we could also add another measurement tool for the player behavior, to detect how much the player care about the story. The UI could use few features as well. One of the most requested features, was a quest tracker to let the know the progress of the quest and when it is completed. The endings were fine overall, but a few of the participants wanted more from the story, or more action from the endings. In the original design the endings had addition content such as a boss battle if the killer path was chosen. This was unfortunately something that was left out from the implemented design, due to scope. Surprisingly, the least requested element was sound. This is something that clearly would have a large impact on the all of the factors that we are measuring, and is something that should be included if another test should be conducted.

## 10.4 Potential Biases with our Experiment

As with almost any experiment, there are a number of potential biases that might have influenced our results, even though our design have been made with the intention of keeping potential biases to a minimum. In this section, we will present the most significant biases we have identified, along with how we think these might have affected the results, and how they could have been avoided.

### 10.4.1 The Game Quality

As also mentioned in the previous sections (from 10.3), the quality of the game is not perfect, and certain issues might have influenced our results. While these issues might have caused some affect on the players' responses, it can be argued that these are largely irrelevant, as the issues are consistent between versions, and should therefore have influenced all versions of the game equally. The exception to this, is the perception that the narrative system in the mixed version was "bugged" or broken, instead of working as intended - This issue might have caused some inconsistencies in the results of our test, and future work should try to rectify this problem.

### 10.4.2 Target Group

Our target group, or rather lack thereof, might have caused some degree of inconsistency between groups in relation to the type of people who participated in the

test, but we argue that the sample size of our experiment (N=30 for each condition) should limit any significant influence this might have had.

### 10.4.3   Questionnaire Quality

While we have tested our questionnaire multiple times (including people's understanding of the wording of the questions), we cannot, for certain, exclude the possibility that some participants might have misunderstood some questions. Furthermore, while we have taken steps to limit the amount of questions asked to only the essentials, we cannot say whether we have had too many, or too few, both related to the 'stamina' required to answer the questions thoughtfully, but also related to the accuracy of our data. This issue, if existing, will only influence the external validity (i.e. usage of the framework on other products) of our test, however, as the internal validity should remain intact, as the same questionnaire have been used for all three versions.

# Chapter 11

# Conclusion

In this chapter, we reflect upon the project as a whole and, using our discussion as a foundation, conclude upon our final problem statement, which reads;

> *"How can a test methodology framework be designed to evaluate continuation desire in interactive narratives, in a way that gives deeper insight into the specific causes of engagement, and how does the presentation of narrative structures affect players' level of continuation desire?"*

As the problem statement is two-fold (creating a framework for measuring continuation desire, and evaluating narrative structures' affect on continuation desire), so too is the conclusion.

## 11.1 Conclusion of the Continuation Desire Questionnaire

Based on our findings and our discussion, we see that the questionnaire overall performed relatively well at evaluating continuation desire, compared to our control test (i.e. the players' own report of their desire to continue), while allowing us an insight into what have affected their engagement in what way. We cannot, however, with certainty see how much each of the categories of questions influence their overall level of continuation desire, and must therefore assume that each category is contributing equally - Which is most likely not a correct assumption, and casts some degree of doubt upon the validity of the methodology. Furthermore, our control test consisted only of the players' own report of their desire to continue, which might be a too simplistic method of evaluation. Overall, we can conclude that our framework partially succeeds in measuring continuation desire, but is limited by the fact that categories are weighted evenly, assuming equal importance of all categories. Furthermore, the basis upon which this success is measured, is not based upon solid foundations, and therefore limits the overall confidentiality in our conclusion, which means that we ultimately cannot, for certain, conclude

whether our framework succeeds in measuring continuation desire, but we see strong indications towards a success with room for improvement.

## 11.2   Conclusion on Narrative Structure's Affects on Continuation Desire and Re-playability

Our findings reveal that narrative structure have little to no impact on players' continuation desire, except in the case of our Mixed version, where some players perceived the implementation of the system as being faulty or broken, which might explain the drop in continuation desire seen in the second round of questions. Replay desire, on the other hand, appears to be largely impacted by the narrative structure - Our experiment suggests that a 'hidden' structure might cause players to not understand that choices are being made, which might make them feel like they have experienced the entire story of the game whereas, in fact, they have not. This might lead them to not feel like playing the game again, as they see no point in doing so. In conclusion, we can say that narrative structure appears to have minimal impact on players' desire to continue playing a game, but that a hidden structure (e.g. our 'complex' version) can cause a lower degree of re-play desire. This conclusion is based on the assumption that the drop in continuation desire found during the Mixed version is caused by a perception of the system being broken, rather than as a result of the structure itself. This means that a definitive conclusion depends on an investigation into whether this perception is in fact the cause of the drop in continuation desire or not.

# Chapter 12

# Future Work

Based on the results of our experiment, and the experience gained through working with the project, we have constructed a list of topics, that we argue would be of value to continue working on.

## 12.1 Weighting the Categories of the Continuation Desire Questionnaire

As described in the previous chapters, we have found that in order to properly be able to measure what specific elements of a game causes (or hinders) continuation desire, it is necessary to apply some measure of difference in how each category (or even how each question) contributes to the overall continuation desire score. This is something we have worked with previously, without success, which is why we chose not to focus on it for this project. One fundamental challenge with weighting the categories, however, is the fact that it can be argued that the weights of each category might be highly dependant on the genre of game being evaluated, if not on the specific game. This problem means that creating an adequate system of weights for general usage could very well be a topic for a thesis in its own right.

## 12.2 Testing the Continuation Desire Questionnaire on Other Games

While we are aware of flaws in the questionnaire (e.g. the lack of weighting of categories), it can be argued that further evaluation of the method would provide valuable feedback in how to approach using the questionnaire in a more general manner, rather than on our specific game. Therefore we propose that the questionnaire is used to evaluate other games.

## 12.3    The Issue of the "Bugged" Button

During the testing of the *Mixed* version of our game, we noticed that a number of players perceived the greyed-out choices as simply not being implemented or as being broken - Rather than as being choices they were unable to make, due to their actions in the game. Whether this is a fault of our method of implementation, or if it is, perhaps, caused by the unfamiliarity of this type of system, is worth exploring further - As this, in the case of the latter, would provide valuable feedback for developers considering implementing a similar system.

## 12.4    Exploring Sensory Immersion

Throughout this project, we have talked about VR and sensory immersion, and argued that sensory immersion (such as VR) can be a cause of engagement in itself, but we have only found very little (recent) research supporting this claim. As our game is relatively easily adaptable to VR, and as the continuation desire questionnaire *should* be able to measure any affect of sensory immersion, we should be able to test this topic, which could prove to be of value in a market where VR-headsets are becoming more popular.

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# Appendix A

# Appendix

## A.1 Continuation Desire Questionnaire

- **Attention Focus**

    - While playing, I lost track of time.

    - I was able to concentrate on the game during play.

    - During play, I sometimes found my mind wandering / found I was thinking of other things (-)

    - While playing, I forgot about my own issues.

    - During play, I noticed a lot of small details about the game.

- **Narrative Presence**

    - During the game, I found myself paying more attention to my real-world surroundings, rather than the story of the game (-)

    - During play, I felt like part of the story.

    - During play, I was eager to find out what would happen next.

    - During the game, I felt like the narrative had created a world that I, as a player, was living in, while playing.

- **Comprehension of the Narrative**

    - I found the story logical and convincing.

    - I felt like I understood why the characters were acting the way they did.

    - During the game, I had a feeling that I knew what would happen next.

    - I felt that the plot of the story was very predictable and uninspiring (-)

    - I am not sure that I understand the characters (-)

- **Emotional Engagement  Character Identification**

  - I had an easy time identifying with the characters in the story.
  - I felt like I was able to understand the events of the story, in a similar way to how the characters of the game understood them.
  - I could easily imagine myself being put in the situation of some of the characters.
  - At some points, during the game, I felt an emotional connection with some of the characters.
  - The story had no emotional effect on me (-).

- **Experimentation**

  - I tried to explore the world, as much as possible.
  - If I had the chance, I would have changed some of the choices I made during the game.
  - I didn't really feel like the choices I made, during the game, had a noticeable effect on the story. (-)
  - I tried to find alternative ways to complete the game.
  - I felt that the game was very static, leaving little to no room for exploration and experimentation (-).

- **Disengagement**

  - I felt like my choices didn't really matter to the outcome of the story. (-)
  - I didn't understand the goals of the characters (-).
  - I felt that the gameworld was both rich and interesting.
  - I found the story interesting.
  - While playing, I felt a bit too stressed about other things, to really enjoy the game (-)

## A.2   Immersion Questionnaire

- **Curiosity**

  - I want to know the rest of the storyline in the course of playing.
  - The avatar in the game is attractive
  - I feel successful when i overcome the obstacles, tasks or opponents in the game.

- – I explore actively what i want to in the game story.
- – I concentrate on the story for a long time.
- – The story quickly grabs my attention at the beginning.

- **Comprehension**

  - – I can make sense of the relationship between events.
  - – I think the position of the events in the whole story's progress is clear
  - – I can make sense of the relationship between the characters in the game story.
  - – I can comprehend the game story clearly.
  - – The avatar can be located in the interface easily.
  - – The obstacles or tasks do not influence my comprehension of the game story.

- **Challenge and skills**

  - – Parts of the story are formed by me in the course of playing the game.
  - – I like the tasks or conflicts which are difficult in the game story.
  - – Some tasks or conflicts in the game story are stimulating and suspenseful.

- **Empathy**

  - – My emotion often varies with the story's progress.
  - – Sometimes I think I really am the avatar in the game.
  - – After finishing the game, it takes a long time for me to return to the real world psychologically and emotionally.

- **Concentration**

  - – I become less aware of the real world and unhappy things around me when I concentrate on the progress of the game story
  - – I discuss my experience in the game story with other players (Will be removed)
  - – When i enter into the game story world, time always flies quickly.
  - – I know my next goal while finishing an event every time.

- **Control**

  - – I can control the game interface.

  – I can control the character to move according to my arrangement

  – I am interested in the style of the game interface.

- **Familiarity**

  – I am familiar with the cultural background.

  – Many events in the game story are novel.

## A.3   First Iteration of Questionnaire:

**Attention Focus**

- While playing, I lost track of time.

- I was able to concentrate on the game during play.

- While playing, I forgot about my own issues.

- During play, I noticed a lot of small details about the game.

**Narrative Presence**

- During the game, I found myself playing more attention to my real-world surroundings, rather than the story of the game.

- During play, I felt like part of the story.

- During play, I was eager to find out what would happen next.

- During the game, I felt like the narrative had created a world that I, as a player, was living in, while playing.

**Comprehension of Narrative**

- The story quickly grabs my attention at the beginning.

- I found the story logical and convincing.

- I felt like I understood why the characters were acting the way they did.

- During the game, I had a feeling that I knew what would happen next.

- I felt that the plot of the story was very predictable and uninspiring.

- I am not sure that I understand the characters.

**Emotional Engagement & Character Identification**

- I had an easy time identifying with the characters in the story.

- I felt like I was able to understand the events of the story, in a similar way to how the characters of the game understood them.

- I could easily imagine myself being put in the situation of some of the characters.

- At some points, during the game, I felt an emotional connection with some of the characters.

- The story had no emotional effect on me

- After finishing the game, it takes a long time for me to return to the real world psychologically and emotionally.

**Experimentation**

- I tried to explore the world, as much as possible.

- If I had the chance, I would have changed some of the choices I made during the game.

- I didn't really feel like the choices I made, during the game, had a noticeable effect on the story.

- I tried to find alternative ways to complete the game.

- I felt that the game was very static, leaving little to no room for exploration and experimentation.

**Disengagement**

- I felt like my choices didn't really matter to the outcome of the story.

- I didn't understand the goals of the characters.

- I felt that the gameworld was both rich and interesting.

- I found the story interesting.

- While playing, I felt a bit too stressed about other things, to really enjoy the game.

**Challenge and Skills**

- Parts of the story are formed by me in the course of playing the game.

- Some tasks or conflicts in the game story are stimulating and suspenseful.

- I feel successful when i overcome the obstacles, tasks or opponents in the game.

**Control**

- I can control the game interface.

- I can control the character to move according to my arrangement.

- I am interested in the style of the game interface.

**Familiarity**

- I am familiar with the cultural background.

- Many events in the game story are novel.

## A.4   Categories of Continuation Desire - Results:

### A.4.0.1   Attention Focus:

- Simple Version:

    - R1 - Mean 4.217 - Std 0.495
    - R2 - Mean 4.45 - Std 0.199

- Mixed Version:

    - R1 - Mean 4.042 - Std 0.063
    - R2 - Mean 4 - Std 0.112

- Complex Version:

    - R1 - Mean 3.883 - Std 0.208
    - R2 - Mean 4.142 - Std 0.083

### A.4.0.2   Narrative Presence:

- Simple Version:

    - R1 - Mean 4.217 - Std 0.3
    - R2 - Mean 4.233 - Std 0.466

- Mixed Version:

    - R1 - Mean 3.8 - Std 0.086
    - R2 - Mean 3.917 - Std 0.148

- Complex Version:

    - R1 - Mean 3.675 - Std 0.55
    - R2 - Mean 3.633 - Std 0.735

### A.4.0.3 Comprehension of Narrative:

- Simple Version:

    - R2 - Mean 3.528 - Std 0.809

- Mixed Version:

    - R2 - Mean 3.583 - Std 0.386

- Complex Version:

    - R2 - Mean 3.272 - Std 0.985

### A.4.0.4 Emotional Engagement and Character Identification

- Simple Version:

    - R2 - Mean 3.594 - Std 0.631

- Mixed Version:

    - R2 - Mean 3.106 - Std 0.869

- Complex Version:

    - R2 - Mean 2.983 - Std 1.14

### A.4.0.5 Experimentation:

- Simple Version:

    - R1 - Mean 3.45 - Std 0.548
    - R2 - Mean 3.227 - Std 1.305

- Mixed Version:

    - R1 - Mean 3.483 - Std 0.262
    - R2 - Mean 3.68 - Std 0.3

- Complex Version:

    - R1 - Mean 2.658 - Std 0.699
    - R2 - Mean 3.867 - Std 0.733

### A.4.0.6    Disengagement:

- Simple Version:

    – R2 - Mean 3.38 - Std 1.267

- Mixed Version:

    – R2 - Mean 3.607 - Std 0.673

- Complex Version:

    – R2 - Mean 3.04 - Std 1.078

### A.4.0.7    Challenge and Skills:

- Simple Version:

    – R1 - Mean 3.378 - Std 0.587
    – R2 - Mean 4.556 - Std 0.683

- Mixed Version:

    – R1 - Mean 3.278 - Std 0.237
    – R2 - Mean 3.933 - Std 0.1

- Complex Version:

    – R1 - Mean 2.633 - Std 0.318
    – R2 - Mean 3.867 - Std 0.733

### A.4.0.8    Control:

- Simple Version:

    – R2 - Mean 3.578 - Std 1.615

- Mixed Version:

    – R2 - Mean 3.556 - Std .0291

- Complex Version:

    – R2 - Mean 3.478 - Std 1.367

### A.4.0.9 Familiarity:

- Simple Version:

  - R2 - Mean 2.889 - Std 1.179

- Mixed Version:

  - R2 - Mean 3.867 - Std 0.521

- Complex Version:

  - R2 - Mean 3.011 - Std 0.712

## A.5 Link to A/V Production Video

The video can be accessed at:

- **Youtube:**

  - https://youtu.be/LaQ7LiwheyE

- **Google Drive:**

  - https://tinyurl.com/yaaj4974

## A.6 Link to Media-Technological Product (Game)

The game can be downloaded from:

- **Google Drive:**

  - https://tinyurl.com/yaaj4974

## A.7 Abstract: English

As the game-industry keeps growing larger and larger, the need for accurate ways of measuring what keeps players engaged with a game grows accordingly. While measuring e.g. engagement, flow or immersion in games are, no doubt, important for the future of game development, we argue that the desire to continuation is absolutely essential for a game's success.

> *"How can a test methodology framework be designed to evaluate continuation desire in interactive narratives, in a way that gives deeper insight into the specific causes of engagement, and how does the presentation of narrative structures affect players' level of continuation desire?"*

Based upon research in topics such as engagement, interactive narratives and continuation desire, we constructed a methodological framework for measuring continuation desire in an interactive narrative game, allowing insight into the attributing factors. This framework was used to evaluate different narrative structures' affect on continuation desire.

The results of the experiment, conducted to evaluate the success of the framework, showed that the framework is, indeed, able to measure continuation desire, but also shows that further work is required to ultimately confirm its validity. Furthermore, the framework doesn't take into account how much each category of continuation desire contributes to the overall score. Finally, the experiment shows that narrative structures does not have a significant impact on players' continuation desire, but some structures might affect players' desire to re-play a game.

## A.8   Abstract: Danish

I kraft af at spilindustrien bliver ved med at vokse sig større og større, stiger behovet ligeledes for præcise metoder til at måle hvad der holder spillere engageret i at spille spil. Selvom at måle f.eks. "Engagement", "Flow" eller "Immersion" uden tvivl er vigtigt for fremtiden af spiludvikling, argumenterer vi for at lysten til at fortsætte med at spille, er helt essentiel for et spils succes.

Vores problemformulering lyder:

> "How can a test methodology framework be designed to evaluate continuation desire in interactive narratives, in a way that gives deeper insight into the specific causes of engagement, and how does the presentation of narrative structures affect players' level of continuation desire?"

Resultatet af vores eksperiment, som blev udført for at evaluere hvorvidt vores framework var en succes, viste at det var istand til at måle lysten til at fortsætte, men viste ydermere at der er brug for mere arbejde for at bekræfte dens validitet. Ydermere tager frameworket ikke højde for hvor meget hver kategori bidrager til den egentlige lyst til at fortsætte. Afslutningsvist viste vores eksperiment at narrative strukturer ikke har signifikant påvirkning på spilleres lyst til at fortsætte med at spille, men at visse strukturer kan påvirke deres lyst til at genspille spillet.