



## All at once or one by one: animation playback in digital game titles

A research through design driven project about how variants of animation playback styles in strategic turn-based games affects a player's understanding of causality and understandability in gameplay

Master's thesis in Interaction Design and Technologies

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Adam Rohdell



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Gothenburg, Sweden 2023

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Cover: An overview of the Proof-of-concept application developed in this project.

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## Abstract

Within the realm of digital game titles, animations plays an important role in delivering narrative, causality through feedback, player appeal, and a multitude of player experience factors. When considering strategic turn-based deckbuilder game titles, this holds true as well. When playing back animations one has to decide on a strategy for deciding when and how an animation should be played on a specific actor. Gothenburg based game studio Box Dragon, a stakeholder in this project, has developed their own system for animation playback. We call these systems animation playback styles and the aim of this project was to study how different animation playback styles affects the player's understanding of causality and perception of the gameplay. To research this question, a proof-of-concept application was developed to comparatively evaluate how different animation playback systems influences the player's experience. The application was developed using Unity, utilizing existing assets as well as creating our own to develop an aesthetic that maps to commonly used themes within the strategic deckbuilder genre. The application features an animation playback system similar to the one that has been developed by Box Dragon. Once the application was developed a qualitative study was conducted with six participants where they got to play through the application, fill out questionnaires, and lastly discuss their experience with the application in the form of a semi-structured interview. The findings of the study indicates that there is a causation between animation playback styles and the player's understanding of causality and perception of the gameplay. However, as the results stem from a qualitative study with six participants matching Box Dragon's intended audience, they are non-exhaustive in regards to how representative it is for players that do not meet the inclusion criteria of our study. The results of the study also indicates that animations and their implementation in games is a wicked problem, and this report suggests some factors that would be of interest to pursue in the future.

Keywords: Animation, parallel animations, computer science, PX, qualitative study, research through design.



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Marcus Neidert, Adam Rohdell, Gothenburg, 2023-05-19



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# Glossary

**Actor** - a character in the game, sometimes referred to as a unit. 1

**Event** - an occurrence or action within gameplay triggered by the player's input or through NPCs coded behaviour. 2

**Eventnode** - an entry in our graph, representing a node in a graph, or tree, data-structure. An eventnode is connected to an actor and an animation. 28

**Gameplay** - consists of the features regarding how the game is played and what its narrative is. 4



# 1

## Introduction

### 1.1 Introduction

Animations and aesthetics of interactions within a digital game are key elements in creating value, immersion and appeal, so much that it might be the deciding factor whether a game has success or not (Hicks et al., 2019; Andersen et al., 2011). Poor aesthetics, including animations, can lead to immediate negative judgements and subsequent negative client response furthermore highlighting its importance (Schlüter et al., 2021). Subsequently, a designated and thought-out design of game aesthetics, that caters to the intended audiences mental model and expectations, or excites the player due to novelty or innovative design, is of importance.

In the realm of turn-based games, there are usually computer-controlled Actors interacting with each other as they carry out the will of the player. This is accompanied with visual and audible effects such as animations and sounds. Normally, turn-based games either immediately play the sequence of animations that are connected to a player's action, or they stack them until the player marks the end of their turn. In the long run, it can become frustrating for the player to wait for these animations to play since they do not have an impact on the state of the game itself and often acts as limitation to player interactions. Some games, such as Slay the spire, solve this issue by allowing players an option to turn off, or speed up, animations in the game. In Heroes of Might and Magic 3, the developers have included a setting for the player to enable "auto combat", meaning that the combat will play out without any animations and simply update the game state. In this project, we aim to use our experience within Interaction Design to create a more seamless experience which allows players to play at their own pace without compromising the immersion that animations and sounds bring to a game.

#### 1.1.1 Research Question

The research problem in this project is mainly focused on the impact different levels of parallel playback of animations has on players' perception of causality, and understandability, of the game state. When simply compressing the sequence of animations as much as possible, causality is quickly lost. This means that it is no longer possible to understand why a specific actor behaves in a certain way, as the reasoning for their behavior has yet to be shown in an animation. For example, if two or more units attack the same target at the same time, it can become confusing as

to which unit did what damage and in which order Events occurred. Further, some important question that arises when playing back this minimalistic timeline: How does asynchronously playing animations affect the players perception of the game state? Can the player maintain an understanding of the causality of the current game state?

This leads to the following research question:

“How does asynchronously playing animations affect the player’s perception and understanding of causality in a strategic turn-based game?”

To investigate the research question, we sought to bring forth insights regarding what effects varying levels of parallel playback has on the player’s experience. This could be explored by creating multiple renditions of a game scenario in a controlled environment and evaluate each rendition respectively as well as comparatively.

### 1.1.2 Aim

In this project, we aimed to gain an understanding of how the computer game development industry utilizes animations in strategy games. The research intended to provide insights regarding in what ways different implementations affects Player Experience (PX), a commonly used term roughly translating to an extended version of User Experience in the realm of game research (Gerling et al., 2011). In accordance with the research question in section 1.1.1, the main focus was on the animations role as a mediating object for visual feedback of causality.

One of the stakeholders of this project, Box Dragon, is a small game studio located in Gothenburg working on their first release. They proposed a model of the current state of the problem in the form of a Directed Acyclic Graph (DAG), a concept that is expanded upon in section 2.3. We sought to investigate their use of DAGs to gain insights into how it can be used to implement different levels of parallel playback of animations. In conjunction with this, we sought to continuously draw inspiration and feedback directly from Box Dragon to ensure that we were mimicking the core functionality of their system.

The goal was to create a digital artifact in the shape of a Proof of concept (POC) of a controlled environment where an evaluation of different solutions to the problem could be conducted and present them to the user in a clear and understandable way that highlights the problem. The POC was developed in Unity and acted as the foundation for a qualitative evaluation of three version differing solely by animation playback styles.

To evaluate the results, the aim was to conduct empirical studies in an evaluative manner to justify and display the effect of how animations acts as a means of feedback of causality and in which way different animation playback systems impact the player's experience. Once these studies were completed, an analysis of the findings and extraction of conclusions was compounded into a list of insights relevant to the research field and to the game development industry.

## 1.2 Background

When creating games, developers are constantly put in difficult situations where they have to weigh their vision of their game against the needs and wants of their different stakeholders. In some games the expert user and the novice users' need differ drastically, and the game needs to be able to cater to both users without losing its original vision. In turn-based strategy games, this can often be the case with animations, while beginner users could find new and interesting animations entertaining, the expert user may find them tedious and an annoyance. This is indicated by several different games within the same genre developing features which allows players to skip parts, or aspects, of the game to allow for greater speed.

From another perspective, deadlines for a project may provide a constrained time frame for finishing a project, leading to cutbacks or trade-offs. The company may need to prioritize functionality over aesthetics, and scrap features that were part of

the original vision of the game. Further, there may not be room within a budget for all of the intended features of a game, again leading to cutbacks.

### 1.2.1 Research area and problem

The main focus of this project is to evaluate the effects of different animation playback systems with regards to PX and the player's understanding of the game state, in a turn-based strategy game. In short, it is a question of finding out if and when animations should be played in parallel, and what the implications of doing so are. The relevant research areas that are related to this problem are:

- Cognitive load and user experience, within usability.
- Directed Acyclic Graphs (DAGs), within graph theory.
- Immersion, presence, and flow, within game theory.

### 1.2.2 Related work

In the realm of computer science, the Task scheduling problem, is closely related to the model used in this project. The task scheduling problem involves scheduling and mapping of a precedence-constrained task graph to processing units in a closed system, and is considered one of the most crucial NP-complete problems in the parallel and distributed computing systems (Omara & Arafa, 2009). Considering that the problem is NP-complete, no efficient solution algorithm has been found yet. Even though no efficient solution has been found, other algorithms that solve the problem has been found, but of course they come with some downsides. The problem has been attacked from many different angles and many common solutions have been implemented in different operating systems (where this problem commonly occurs.) (DataFlair, 2021). Common solutions include First-Come, First-Served Scheduling, Shortest-Job-Next Scheduling, Priority Scheduling, Shortest Remaining Time, etc. All of the above solutions have their own strengths and weaknesses but all handle the problem in one way or another. Further, genetic algorithms have been proposed as an adaptive way to solving this problem (Omara & Arafa, 2009; Amalarethinam et al., 2011).

Slay the Spire is a roguelike deck-building video game developed by American studio MegaCrit and published by Humble Bundle (*Slay the spire*, 2023) (*Slay the spire on Steam*, n.d.). The game features a turn-based fighting system where the player first draws cards and performs actions until it runs out of resources and pressed end turn (see fig 1.1). Once the turn has ended, the enemy / enemies gets to perform their intended actions. Whenever an action is performed, from either the player or an enemy, the accompanied animations are played before the next action can be performed. As a novice player, these animations may feel new and fresh, and perhaps not seen as an obstacle in the Gameplay. But as you progress as a player, it will become natural for you to plan your actions ahead of time, as you have become aware of what implication different actions in the game has and you can predict what should be done. When you start to want to perform actions faster, you can experience

that the animation-time is slowing you and the gameplay down. To counteract this, the developers have given the player an option to speed up all animations and interactions in the game, and therefore speeding up the gameplay. This solution gives the player an option whether to use it or not, but it is not applicable to our problem since it speeds up or even shortens animations. This is something that we want to avoid in accordance with Box Dragon’s vision of ensuring full playback of animation.



Figure 1.1: An in-game image from Slay the Spire

Heroes of Might and Magic 3 is a turn-based strategy game developed by Jon Van Caneghem through New World Computing originally released for Microsoft Windows by The 3DO Company in 1999 (see fig1.2)(*Heroes of might and magic III*, 2023; *Heroes of might and Magic® 3: Complete*, n.d.). The game was re-released through Steam in 2015, cementing its popularity and longevity as a staple in the strategy game genre. Since its re-release, it has an estimate of about one million copies sold (SteamDB, 2023). The strategy game features a combat system that is turn-based, and focuses on letting the player take actions on all of their different units in their army, while facing an enemy army doing the same thing. Since combat is far from the only important state in Heroes of Might and Magic, it can sometimes feel tedious, as the mere size or composition of your army can almost certainly predict the outcome of many battles before you play them out. This led to the developers adding an option for Auto-Battle, which lets the computer take control and completes the battle for you, using some basic behavioral logic and decision making. This can lead to a non-optimal battle sequence, but the feature has become a staple in all following Heroes - titles to be released.

In Hearthstone, Blizzard’s turn-based digital collectible card game, the player uses their deck to battle opponents over a board (Entertainment, 2014). Since its release in 2014, Hearthstone remains one the most popular online card games to this day, never going below 2.4 million active monthly players in the past four years (of ActivePlayer, 2022). There exists a few different card types, namely minions, spells and weapons, each with their own specific mechanics and traits. When playing out their turn, the player is limited by a timer that indicates how much time left the player has until it automatically ends its turn. During this time window, the player



Figure 1.2: In-game image from Heroes of Might and Magic 3.

can play their cards or use their minions that they played on previous turns to attack. All of these actions evoke animations that accompany them, which all takes time to complete. When performing many actions during a single turn, the player can find themselves stressed over the amount of time these animations takes and how it can feel limiting in what choices the player can make (ApolloMalo14, 2021). While it can be frustrating, it is seen as a gameplay mechanic in the game, and not something that is intended to simply be aesthetic. In short, the amount of actions you want to take during a turn is not only limited by the amount of available actions to you, but also how you choose to prioritize these actions, with respect to their animation lengths. Not every action needs to wait for their predecessor to be completed however, but in the case where the action you want to play directly depends on the previous action, the animation length comes into effect. An example of this would be, after attacking with a minion, draw a card, where your intended action is to play the card that you draw.

Songs of Conquest is a turn-based strategy game developed by Lavapotion (LavapotionAB, 2022). It has similar auto combat mechanics to Heroes of Might and Magic, where it allows its players to skip the combat phases and instead allowing the computer to play out all of the battles. This lets the players instead focus on the other, strategic aspects of the game. The mode is called "Quick Battle" and is something you can choose every time you come across a battle, rather than a setting you can enable permanently.

# 2

## Theory

This chapter describes the different concepts, frameworks and related research within this project, as well as provides the relevant theory behind it.

### 2.1 Frameworks and concepts

This section aims to describe the different frameworks and concepts intended to be used in the project. It also describes the underlying theory behind the different methods we will use.

#### 2.1.1 User Experience and Player Experience

User Experience(UX) is a known concept within Human Centered Design(HCD) and Human Centered Interaction(HCI). The definition of UX varies considerably but two widely recognized interpretations of UX are attributed to the ISO standard and Nielsen that states that ”User experience” encompasses all aspects of the end-user’s interaction with the company, its services, and its products.” (ISO, 2019; Nielsen & Norman, n.d.). In brief, Nielsen’s and the ISO definition of UX congruates considerably. The ISO definition reads as:

”

person’s perceptions and responses resulting from the use and/or  
anticipated use of a product, system or service

”

According to Gerling et al. (2011), PX is derived from the ISO definition of UX and Bernhaupt (2015) claims that the two terms can be used interchangeably within the realm of games. These both agree that the user’s perception and responses to a presented artifact, service or system, as in UX, is representative for a player’s experience in the context of games. Furthermore, Bernhaupt’s (2015) definition of experience follows: ”Experience is both the process and outcome of the interaction of a user with the environment at a given time.” which resonates with the ISO definition with a modified property of time context. The concept of PX and the theory behind it helps us as designers to investigate player perceptions regarding qualitative properties, such as immersion and understandability in gameplay, by giving us a framework to adhere to.

### 2.1.2 Usability

Usability is a common concept within HCI where the ease-of-use of an interface is central. As a concept, it heavily relates to design and evaluation of user interfaces and requires a holistic perspective which incorporates the user, context and tools. Nielsen (2012) defines usability through five quality components :

**Learnability:** How easy is it for users to accomplish basic tasks the first time they encounter the design?

**Efficiency:** Once users have learned the design, how quickly can they perform tasks?

**Memorability:** When users return to the design after a period of not using it, how easily can they reestablish proficiency?

**Errors:** How many errors do users make, how severe are these errors, and how easily can they recover from the errors?

**Satisfaction:** How pleasant is it to use the design?

In addition to the definition, Nielsen (2020) proposes 10 heuristics which act as generic usability guidelines.

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

Another suitable framework to design interfaces by is Patrick W. Jordan's 10 principles for usable design found in his book on usability (Jordan, 2002). The 10 principles hold many similarities to the heuristics proposed by Nielsen (2020). Following this, it may seem redundant to utilize both frameworks. In this project, Nielsen's 10 usability heuristics will be the prominent framework for interface design, as it is a widely accepted framework within UI and GUI design.

### 2.1.3 Playability

When evaluating games, common usability heuristics needs to be extended to properly evaluate PX. This has led to the concept known as playability (Sánchez et al., 2012).

Playability describes a games quality while focusing on four main factors: rules, mechanics, goals, and design. When looking at how playability can be used to evaluate PX in video games, it can be defined as:

”

A set of properties that describe the PX using a specific game system whose main objective is to provide enjoyment and entertainment, by being credible and satisfying, when the player plays alone or in company (Sánchez et al., 2012).

”

Further, after analyzing video games from a research perspective, Sánchez et al. (2012) proposes seven characteristics to measure playability in video game systems: *Satisfaction*, *Learnability*, *Effectiveness*, *Immersion*, *Motivation*, *Emotion* and *Socialisation*. Each attribute comes with a unique set of properties which aids the researcher when measuring them. The attributes, and a brief description of their definition, are listed below.

**Satisfaction** is described as the pleasure gained from playing a video game, or an aspect of a video game, such as mechanics, graphics etc. It is further explained that satisfaction is highly subjective, and is by its definition difficult to measure, since it can vary so greatly from one player to the next.

**Learnability** is defined as the player’s understandability and their ‘learning curve’ within a game. It is based on properties such as prior game knowledge, the difficulty of a game, and the speed of which new concepts are introduced to the player.

**Effectiveness** is used as a measure of how much time and resources are needed to ensure that the player is enjoying their experience while completing various objectives/goals within the game. An effective video game is described as being able to engage the player’s attention throughout their whole experience within the game.

**Immersion** is defined as the measure of believability of video game elements to the extent that the player is directly involved with the virtual world of the game. The highest level of immersion is described as the player effectively becoming a part of the virtual world and interacting with the rules that characterise it.

**Motivation** is described as a set of characteristics or events that encourages the player to realise, perform, and evaluate actions and events that take place within a game. These aim to invoke a positive attitude towards challenges by rewarding the player for perseverance and exploration.

**Emotion** is an property that induce emotional response to different events and interactions in the game. A good usage of emotion may prompt desirable PX in a game through a dynamic range of emotional reactions and attitudes.

**Socialisation** is an aspect that promotes the social experience within a game, often enabled through game’s design, resources and entities. It does not only include the interaction player to player, but also considers player to game element relationships. For example which characters that can be chosen, how they can be modified and

what makes them relatable or representative for the player.

Following that this project mainly focuses on the player's perception of causality and understandability in gameplay, the most relevant attributes are satisfaction, learnability, immersion and emotion.

### 2.1.4 Research Through Design

Research through Design (RtD) is a well known approach to research within HCI that seeks to bring forth new insights, concepts and solutions through exploration and implementations of design processes. The methodology primarily focuses on the creation of observable prototypes and designs which open discussions as a means of unveiling relevant research knowledge (Stappers & Giaccardi, 2017). Generative ideation often requires the designer to account for constraints native to the stakeholders' and research area's scope. As the designer considers these constraints as prototype design ensues, one procedurally discovers problem- and solution insights (Stappers & Giaccardi, 2017). Michel describes the importance of extraction of communicable insights from the process of designing a prototype:

”

The designing act of creating prototypes is in itself a potential generator of knowledge (if only its insights do not disappear into the prototype, but are fed back into the disciplinary and cross-disciplinary platforms that can fit these insights into the growth of theory). (2007)

”

Game development has been described as a wicked problem, meaning that while you progress through a project, you gain new insights and a range of perspectives within the problem space (Eladhari & Ollila, 2012). This in turn, leads to a need for adaptation when developing games. Therefore, it is suitable to apply an iterative design methodology to continuously evaluate the effects different implementations have on gameplay dynamics and the player's experience. Following this, game development and RtD go hand in hand and share many similarities. This further highlights the central role RtD plays in this project with the POC as a vessel of exploration and insight generation.

## 2.2 Methods

The chapter describes a list of suitable methods that we seek to utilize throughout the project. They will be practiced in accordance with 3 Methods. As the project progresses and new knowledge and information from stakeholders surfaces the methods are subject to change which conforms with an agile workflow.

## 2.2.1 Ideation

In the early stages of project we seek to understand the problem and context followed by a generative phase where the aesthetics and gameplay of the POC are created. It is believed an iterative design process is suitable, based on a POC foundation generated through a set of design methods executed within the boundaries stemming from stakeholders and project scope.

### 2.2.1.1 Image boards

Image boards, also known as moodboards, is a method of collecting illustrations, images and other visual entities that collectively should form a holistic aesthetic. The method acts as a communicative tool within the project group and towards stakeholders (Bruce & Martin, 2019). We aim to use it to gather inspiration and investigate different aesthetic possibilities for the POC.

### 2.2.1.2 Drawing

Drawing, or sketching, is the general method of visually presenting ideas by physical or digital drawings (Bruce & Martin, 2019). The method is suitable as a communicative tool both within the project group and towards stakeholders. Furthermore, the scope of the method's utilization space is basically unlimited based on the practitioners prowess and creativity, providing a great flexibility of its use cases.

## 2.2.2 Empirical studies

To gain knowledge about the needs and requirements of stakeholders of the project we seek to conduct empirical studies that outlines the scope of the POC and its subsequent iterative design process.

### 2.2.2.1 Interviews

In general, there are three variations of interviews that are commonly mentioned in the realm of empirical studies:

Unstructured interviews - Seeks to investigate research areas and gain entry-level understanding of a problem space with its inherent context and users. It can be described as a non-standardized interview where neither questions nor answers of the interviewer and interviewee are predetermined, and instead relies on informal conversation with some reservation for probing.

Semi-structured interviews (SSI) - Builds on some predetermined questions where space is allocated to ask follow-up question based on the interviewee's answers. The method seeks to in a more nuanced manner understand the context, product utilization and subjective values of the user.

Structured interviews - Seek to collect answers to specific questions which are all predetermined (Wildemuth, 2017).

Following that we aim to investigate the problem space, playability aspects, and PX in accordance with stakeholder values, unstructured and semi-structured interviews are valued over structured interviews.

### 2.2.2.2 Questionnaires

Bruce and Martin defines questionnaires as: "...survey instruments designed for collecting selfreport information from people about their characteristics, thoughts, feelings, perceptions, behaviors, or attitudes, typically in written form." (2019). The intended utilization of the method is to evaluate playability, PX and cognitive understanding of the updates of game states the user perceives when presented with the POC. We seek to collect subjective responses in the form which in conjunction with interviews may triangulate insights of relevance to the research field.

### 2.2.3 Evaluation of current system

We intend to design the POC with inherent attributes native to the current system and gameplay Box Dragon's project provide. Therefore it is of importance to delve into these aspects by evaluating their project's current state. In doing so, we aim to gain a deeper understanding of the needs and requirements that should translate to the foundational elements of the POC design.

#### 2.2.3.1 MoSCoW prioritization

MoSCoW prioritization is a method used to categorize different needs and requirements into sections based on how prioritized they are, considering the given time frame (AgileBusiness, n.d.). MoSCoW is an acronym for:

**M**ust haves.

**S**hould haves.

**C**ould haves.

**W**ould haves.

The method is well suited when there is a limited time frame in which a project takes place as it structures which parts of the projects that are prioritized. Additionally, it acts as an explanation about what group members and stakeholders can expected regarding completion and resolution of each listed element(AgileBusiness, n.d.).

We aim to utilize a MoSCoW as a means of listing needs and requirements for the POC in a prioritized manner.

#### 2.2.4 Analysis of empirical data

To extract key needs and requirements, assess feedback from stakeholders and evaluate the effect of the POC we seek to implement an analysis method for the empirical data. Additionally, we seek to compare gathered data to the heuristics frameworks that the POC should consider.

## 2.3 Related research

In game theory, three large concepts that are reoccurring are: Immersion, Flow and Presence. While similar, these three concepts have been thought as different dimensions when analyzed in video games (Banyte & Gadeikiene, 2015). Immersion is described as a level of engagement that is related to cognitive engagement. This, in short, means that the actions you take in a game feel like your own, and not a translation from your actions in the real world to the game world, you are fully immersed in the game. Presence is described to be similar to immersion, still within the realm of cognitive engagement. It has been described as losing sense of time and moving into a state of automation, where your decision making and actions come automatically to you. Lastly, flow is described to act more on an emotional plane, but achieving a state of flow is what makes you forget about the space around you. Flow has been described as a state one enters when performing an *autotelic* activity, meaning an activity that in itself is rewarding, as opposed to the result of reward of the activity bringing the enjoyment (Nakamura & Csikszentmihalyi, 2001).

The task scheduling problem, which exists in multiprocessing systems, is a well known NP-problem. In situations ranging from aircraft carriers waiting for landing clearances and bank customers waiting in line to be serviced, to programs needing to be run in parallel in a computer system, all of them share the need for scheduling (El-Rewini et al., 1995). Characteristically, the problem with scheduling these scenarios appears when there is specific orders and distributions that come into consideration. For instance, say airplane number one needs to land on a runway that is larger than a specific length, or needs to land before airplane number two. When modeling these scenarios, the common entities becomes consumers (bank customers, aircrafts, etc.) and resources (bank tellers, runways, etc.), as well as the constraints and dependencies between them. All of these factors affect the policies which will dictate how the scheduling will be performed, and therefore the system can be described as a set of consumers, a set of resources and a scheduling policy. This model has been studied extensively and leads to a NP-complete problem of scheduling, which can be applied and studied in many different fields, but perhaps predominantly in computer science (El-Rewini et al., 1995).

In standard graph theory, directed acyclic graphs (sometimes referred to as acyclic directed graphs), is a directed graph, with no edges that connect the nodes in a way that allows for cycles to be created (Thulasiraman & S., 1992). These types of graphs are often used to model dependencies in systems, but are widely used in a multitude of research areas. With the usage of DAGs, one can model different problems to then use different algorithms such as shortest path, critical path and so on, to solve, or gain insight, in the problem.



# 3

## Methods

### 3.1 Process

The results of this project builds on a POC in the shape of a digital artifact. The POC should utilize the results of conducted research and empirical studies as a foundation for its design. This foundation should frame needs and requirements for the ideation process which in turn guides the implementation. As we intend to evaluate the POC, iteration of the design naturally follows. Subsequentially, the designated design process mainly iterates over three phases: Ideate, Implement, Evaluate. The evaluation phase has been covered in section 3.2 .

#### 3.1.1 Research through design

Throughout the whole implementation phase of this project, we sought to follow the model of Research Through Design, as it naturally aligns with the game development elements of this project (Eladhari & Ollila, 2012). While implementing, new feedback is constantly fed back into the design process as a direct result of gaining new insights into the problem space and getting familiar with the systems at hand. When insights were gained, they were discussed and their relevance to the project was evaluated, before being documented to be used as a tool in the process. This way of processing also falls naturally into the context of an agile workflow, which is what we followed throughout this whole project as well, further expanded upon in section 3.1.6.

##### 3.1.1.1 Stakeholder dialogue

We sought to involve Box Dragon in all stages of the project. Throughout the development of the POC, Box Dragon would help us troubleshoot technical hurdles and give insight into what techniques they utilized for their implementation. They highlighted important concepts regarding the system implementation, while presenting constructive feedback on the POC as a whole. Throughout the project we had weekly dialogue with employees at Box dragon. These conversations were either in the form of casual dialogue, unstructured interviews, feedback meetings or SSIs. This approach was deemed suitable to ensure that the project relates well to the project Box Dragon is currently undertaking.

### 3.1.2 Exploration through gameplay testing

To explore industry standards of how related game titles handle animations, we conducted several gameplay testings in addition to literature research. The game titles that were subjects of the testing were:

- Box Dragon’s unreleased project
- Slay the Spire
- Hearthstone
- Heroes of Might and Magic III

Although these games all share similarities with Box Dragon’s project, it is clear that there is a variance in how they approach animations. We sought to bring the differences into light to gain inspiration and insight into the research area. The main principles of how these titles handle animations were observed and conclusively there are a four common themes.

- Allowing players to skip animations or full scenes either by an in-game setting or as a modal feedback dialogue box.
- Increasing the general speed of in which animations are played.
- Have a toggle setting for fast mode that shortens the length of animations and increases the speed it is played back.
- Have full playback of animations at all times.

#### 3.1.2.1 Function listing

Based on the gameplay testing of the unreleased version of Box Dragon’s game, we performed a function listing. We observed elements in the game that are central to the gameplay in the context of combat. This were then extracted into documentation which would act as a foundation for the necessary entities fitting for our POC (see figure x). This was also a means to create an internal terminology of entities while working the POC.

Function	Description	Category	Internal terminology	Internal terminology
Play card	Spend Command and temp Charge to activate card	Action	Play Card	Required / necessary
Melee attack	Card that does melee damage	Action	Melee attack	Expected / Useful
Ranged attack	Card that does ranged damage	Action	Ranged attack	Out of scope
Buff unit	Empowers units offensive/defensive powers or heals	Action	Positive Status Effect (PSE)	
Move unit	Card that makes the unit switch row	Action	Move	
Debuff enemy	Paralysis, stagger, burn, armor shred etc.	Action	Negative Status Effect (NSE)	
Draw cards		Game mechanic	Draw	
Discard hand	Leftover cards after round are discarded	Game mechanic	Discard	
EoR intent	Passive action of units when turn has ended: attack/buff/debuff	Game mechanic	Intended action	
Debuff card	Malicious cards, in your drawhand or deck	Game mechanic		
Environment effects	Designated area that impact the units or card deck	Game mechanic		
Take damage	Lowers healthbar, displays SCT	Game mechanic / UI element	Take damage	
Gain temporary charge	Used for special cards, gathered outside of combat	Resource		
Refill Command	Refill the resource which is used to play cards	Resource	Action points	
Target card	Hover the element which the card should affect	UI element	Target	
End round	Button to declare that you are not making any more moves	UI element	End turn	

Figure 3.1: An overview of the card and action point system.

### 3.1.3 Ideate

In order to create a POC, we have utilized ideation and design methods such as Brain-writing, Conceptualization, and Sketching while taking the needs and requirements discovered through research into consideration. The goal was to process gathered knowledge into potential solutions, fitting aesthetics and sub-concepts. As concept fragments start to take shape, we combined the partial solutions and their visual representations into holistic concepts.

To establish the needs and requirements for our POC, we performed a MoSCoW prioritization. The prioritization was used on a collection of requirements that was created from our Function Listing, Stakeholder input as well as elements/systems derived from internal discussion, mainly our own mental models of turn based strategy games. The result of using this method was four large clusters of functions, all with their own order of priority. An overview of the four clusters can be seen in fig.3.2 below.



Figure 3.2: The results from the MoSCoW prioritization.

### 3.1.4 Implement

To evaluate our solution and highlight the problem, a POC was developed. The POC has been developed in Unity, and features an environment where we have different entities interact simultaneously with each other, and play accompanied animations. While developing this, we have both built and found existing assets that fit our needs, as well as appropriate animations. The majority of animations that has been used was found on Adobe Mixamo. The bulk of models and world-building entities were downloaded from Unity's Assetstore, a library with community created assets compatible with Unity. When creating, or modifying existing, objects and animations, Blender3D was used. All UI elements of the POC was created in Figma. The software is commonly thought of as a prototyping software mainly used for

webb and app development, but is a suitable tool for general design, illustrations and image editing.

#### 3.1.5 Iterate

Once evaluation of our POC was conducted, the gathered data was analyzed, and the iteration process started. As the intention was to work with agile software development, a natural part of the process was to receive feedback and bring it into the development loop. When the data from the evaluation had been analyzed, we ideated over the newly gained insights to check if we needed to alter our development scope / direction, and if so, in what way. This process was intended to repeat itself every time we went through a new implementation and evaluation phase.

#### 3.1.6 Project development method

Throughout the project, we have drawn inspiration from Agile workflow with regards to how the planning and project processes are conducted. Agile workflow emphasizes continuous communication between stakeholder and team members to reach a desired result, while keeping the end users needs and requirements central for the process. The framework thrives in a dynamic environment where knowledge about the project and its stakeholders frequently updates. This has been of great relevance to this project as meetings and input from the different stakeholders has been on a weekly basis.

According to Beck et al. (2001), there are four overarching guidelines that one should respect to follow Agile workflow:

”

Individuals and interactions over processes and tools

Working software over comprehensive documentation

Customer collaboration over contract negotiation

Responding to change over following a plan

”

Although these aspects predominantly relates to the process of creating a POC, it is widely applicable to the majority of the project.

A tool that is commonly used when working in an Agile context is an image board containing all of the tasks connected to the current sprint as well as all the previous sprints. For this project, we worked with a Trello board as our main tool for tracking tasks and their estimated effort. An overview of our board can be seen in 3.3.

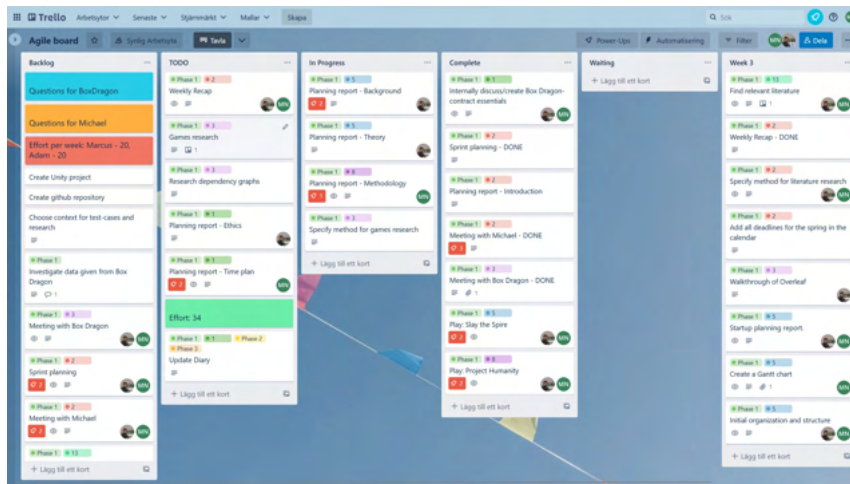


Figure 3.3: An overview of the trello board used in this project.

## 3.2 Evaluation

For the evaluation of the animation playback systems and their effect on player perception and understandability of causality in gameplay, we sought to conduct playtesting of each version alongside questionnaires and interview questions. The results of the evaluation were then to be compiled and analyzed through affinity diagrams to explore and extract insights relevant to the research area and to our stated research question.

### 3.2.1 Purpose and goals

Through the qualitative study, we aimed to bring forth research contributions to the understanding of the player's experience, specifically perception and understandability of causality, within the realm of animation playback. In doing so, we also sought to answer our research question. Additionally, as the nature of this project falls in line with RtD, we sought to bring forth new insights relating to research about game design and PX as a whole.

### 3.2.2 Sample selection

We sought to recruit participants in accordance with the intended player base of Box Dragon. Following this, we conducted an SSI with Co-founder and Game Director Kevin Chang (see appendix A). Furthermore, participants of the evaluation should meet additional criteria stated in appendix B. In consideration of the time frame of the project and the specifics of these criteria, we used convenience selection for participant recruitment. In accordance with the industry standard for qualitative usability testing described by Nielsen (2000), we sought to recruit seven participants in total whereof the first participant was presented with a pilot test of the study.

### 3.2.3 Study design

We sought to meet the purpose and goals of this study through evaluative playtesting sessions of our POC with participants that fully met the criteria of the sample selection. The test plan in full can be seen in appendix B. This section describes the methods used and the reasoning for utilizing these specifically. The order in which the subsections to this section appear is the same order in which the study was performed for each participant. The only exception is subsection 3.2.3.5, which was performed once all of the studies were conducted.

#### 3.2.3.1 Playtesting

All participants were asked to play through each scenarios presented in the POC twice, to ensure that they had the opportunity to become familiar with the animation playback system of each version. While playing, the participant were prompted to ask any questions should they should arise. It was also made clear that the POC was the subject of the study rather than the participant. The participant was also informed that they should play at whatever pace they are comfortable with, but that they should not feel restricted by any of the visuals as the game allows for multiple chained interactions. A description of the gameplay, entities, mechanics and dynamics of the POC was presented to each participant before they began playtesting (see appendix G).

#### 3.2.3.2 Repeated measures design

We decided on a repeated measures design for the evaluation in order to evaluate the POC both per scenario and enable comparison between the experiences. Each participant playtested all scenarios in an identical manner. In order to diminish the effect of familiarity bias, the order in which the scenarios were played was different for each participant. With three dependant variables this resulted in six different playtest orders, one designated per participant.

#### 3.2.3.3 Questionnaire

Questionnaires is a survey method suitable to enable participant to self-report experiences and behaviours with a product. It can have positive effects on extracting important data when used in conjunction with other data-collection methods to triangulate insights and notions (Bruce & Martin, 2019). In this project questionnaires were mainly used to nuance and validate responses during interviews, while acting as a foundation for discussion with the participants.

A questionnaire containing control questions was presented before the study in accordance with appendix J, which sought to ensure that each participant met the criteria of the evaluation. After a scenario was played through twice the participant was presented with another questionnaire about their experience and perception of the scenario. The procedure was repeated for each playtest. The questionnaire requested the participant to rate their experience considering five statements:

- The game made it easy to understand what was going on throughout the gameplay.
- Visual updates within the game felt responsive.
- The gameplay felt fluid and smooth.
- The game allowed me to play at any pace I would like.
- The game did what I told it to instantly.

Each statement was rated by the participant based on a five value-Likert scale:

1. Strongly disagree
2. Disagree
3. Undecided
4. Agree
5. Strongly agree

#### **3.2.3.4 Semi-structured interview**

Semi-structured interviews are often used to extract more detailed or underlying sentiments from interviewees where a series of open- and closed ended questions aim to spark conversations on certain topics. Questions are prepared in advance but generally seek to generate answers which can be followed up by impromptu questions (Adams, 2015). SSI was used with each participant after they had completed all playtests. This was done in order to affirm notions from the questionnaires and to capture insights in relation to the research area as a whole. A template of the prepared questions can be found in appendix C, although follow-up questions were spontaneous and are not contributed in this report.

#### **3.2.3.5 Affinity diagram**

The method revolves around a bottom-up approach to structuring, grouping and categorizing meaningful insights, observations and sentiments in clusters, often referred to as themes. Participant notions and replies to questions are written on color-coded notes and then categorized based on affinity in clusters. The clusters are labeled with a representing phrase describing the theme. The result of an Affinity Diagram then acts as a voice for the participants and their sentiments in a structure that can be conveyed or discussed from different perspectives (Bruce & Martin, 2019).

One affinity diagram was created for each participant respectively, where sentiments and insight derived from the interviews in conjunction with the questionnaire entries. Once all diagrams were compiled and labeled, an overarching diagram was created where all notes once again was categorized in new themes that aimed to more accurately describe themes found throughout the study.



# 4

## Results

### 4.1 Creation of the POC

The following section describes the core systems that make the POC as well as the contributions that made it possible. Each system have been implemented based on the existing solution that Box Dragon presented to us, but with modification to fit within the context of this project.



Figure 4.1: An overview of the resulting POC.

#### 4.1.1 Aesthetics and gameplay design decisions

We sought to create an aesthetic that map to the participants' mental model of well-known strategic turn-based card game titles such as Slay the Spire and hearthstone. It was also in the interest of one of the stakeholders, Box Dragon, that the gameplay drew many similarities with that of their current project. An image board revolving the general aesthetics of the POC can be seen in fig.4.2 below. The full image board can be seen in appendix D. Following the general aesthetic ideation we sought to

### Intended Aesthetic

#### Medieval / (Fantasy) / Low Polygon

- Medieval lowers the amount of detail necessary to “sell the aesthetic”
- Established fantasy around roles or classes exists (Mental models etc)
- Low polygon = lower resolution → More easily live up to expectation on character and world behaviour.
- Low polygon - easier to be consistent
- Already have access to some assets (POLYGON Knights)

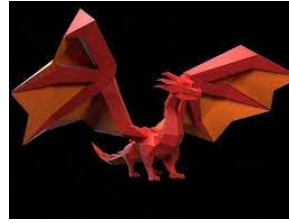


Figure 4.2: The resulting aesthetic from image boards.

create intended mechanics of cards and interactions within the game. We ideated card effects and discussed a fitting amount of strategic gameplay depth (see fig. 4.3). The strategic depth aimed to immerse the participants of the study into gameplay and cater to a strategic mindset where each decision notably impacts the gamestate, potentially for multiple turns. A full overview of the ideation can be found in appendix E. Each card-effect was translated into a card graphic. The graphics were designed to cater to a player’s mental model of strategic card games in order to enable the study’s participants to quickly understand how to interact with the POC. In conjunction with an informative design and following mental models, we focused on three usability heuristics for the card graphics: *visual clarity, consistency and standards* and *aesthetic and minimalistic design*. Throughout the design work, inspiration was drawn from aesthetics in games such as Slay the Spire and Hearthstone, while maintaining core elements from Box Dragon’s project and the general aesthetics from the image board. All playable cards can be seen in fig. 4.4. Design iterations and visual representation of the approach can be seen in appendix F.

To create a holistic game context, additional UI elements were designed in the same manner as the card graphics where each element has a specific functionality. In addition to the heuristics followed for the card graphics, they are designed by *recognition rather than recall* to ensure that the participant exerts less cognitive load while reading the interface. All essential UI elements are found in fig.4.5 below, while the process behind them are found in appendix F.



Figure 4.3: Sought after effects cards should have in gameplay.

## 4.1.2 Card system

The card system of the POC is designed to be similar to Box Dragon's system, which in itself is based on the common template of having a draw - and discard pile as well as a hand of cards. Each card is connected to a specific unit on the field, which will perform the action that is described in the flavour text of the card.

### 4.1.2.1 Draw and discard

When drawing cards, the player draws randomly from the draw pile, as long as it is not empty. If the draw pile is empty, the discard pile is shuffled into the draw pile and the drawing of cards can continue.

### 4.1.2.2 Action points

To present the player with some choice, each card has a cost associated with it. To be able to play the card, the player must have at least the amount of action points associated with the card, or more. Once all of the action points have been spent, or if there are no more cards in the player's hand that have a cost equal or lower to that of the remaining action points, the player has no choice but to end the turn.



Figure 4.4: Playable cards in the visual context of the draw pile.

### 4.1.3 Turn system

The whole POC is built upon a turn-based system where the player gets to perform actions during it's turn and once they have performed said actions they can end their turn and see what the enemy will do. At the start of each turn the player draws 5 cards and refills their action points (4).

During the player's turn, they can see the enemies **intended actions** that they will perform once the player ends their turn. These intended actions allows the player to strategically make their choice of which cards to play during their turn. For instance, the player can chose to play a card with a stun-effect to counter an enemies heavy-hitting attack. Once the enemy has performed their actions during their turn, the player starts their next turn. An illustration of the order of events in the turn system can be seen in fig 4.7.

### 4.1.4 Playback of animations

To be able to replicate the animation playback - system that Box Dragon uses, a data structure with an accompanied traversal algorithm had to be designed.

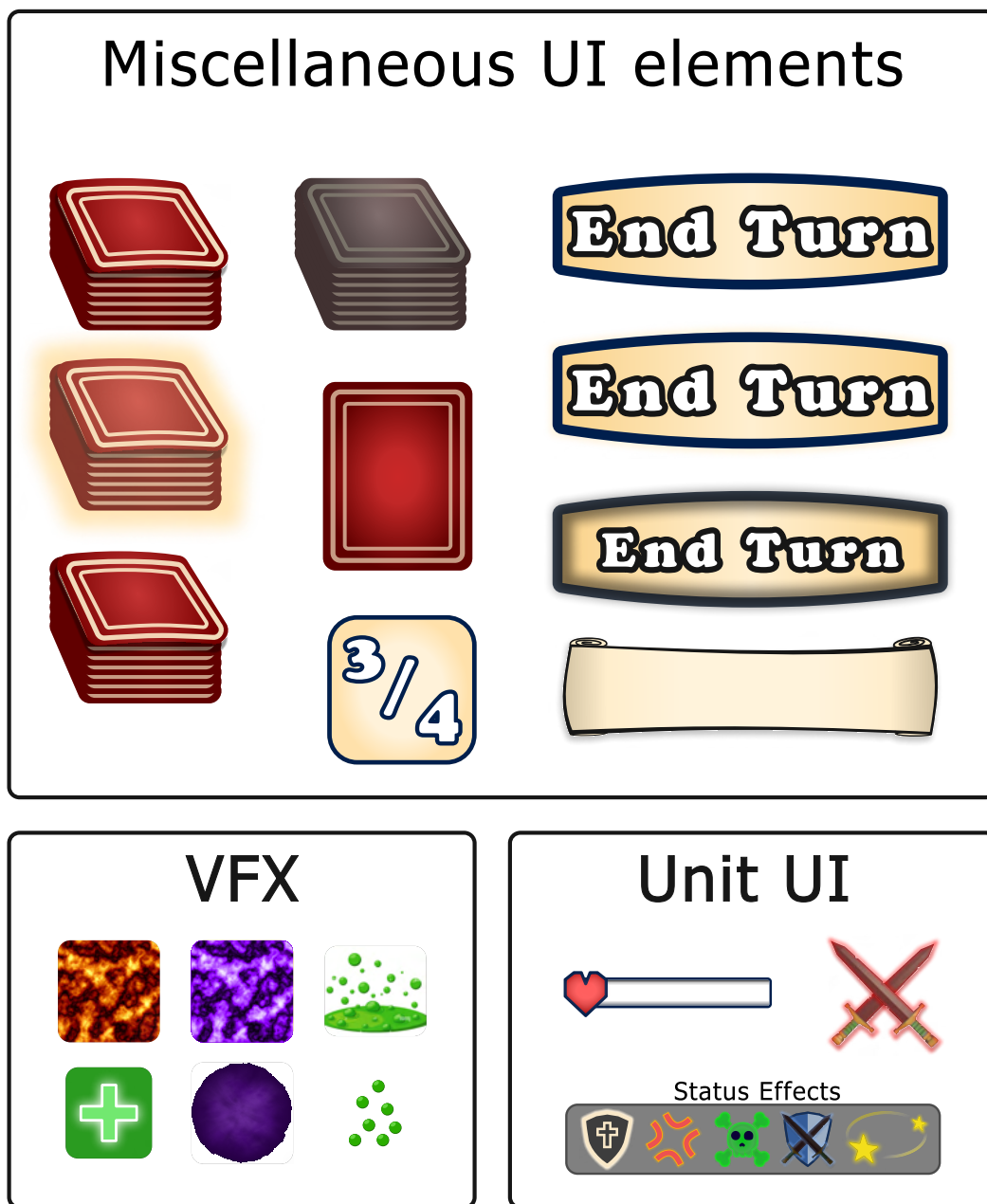


Figure 4.5: Each UI element has an explicit functionality and abides by multiple usability heuristics.

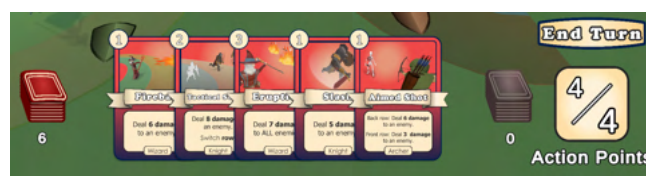


Figure 4.6: An overview of the card and action point system.

#### 4.1.4.1 Construction of the event graph

When performing actions in the game, such as playing cards or when the enemy attacks your units, there is an immediate handling of said actions in the "logic

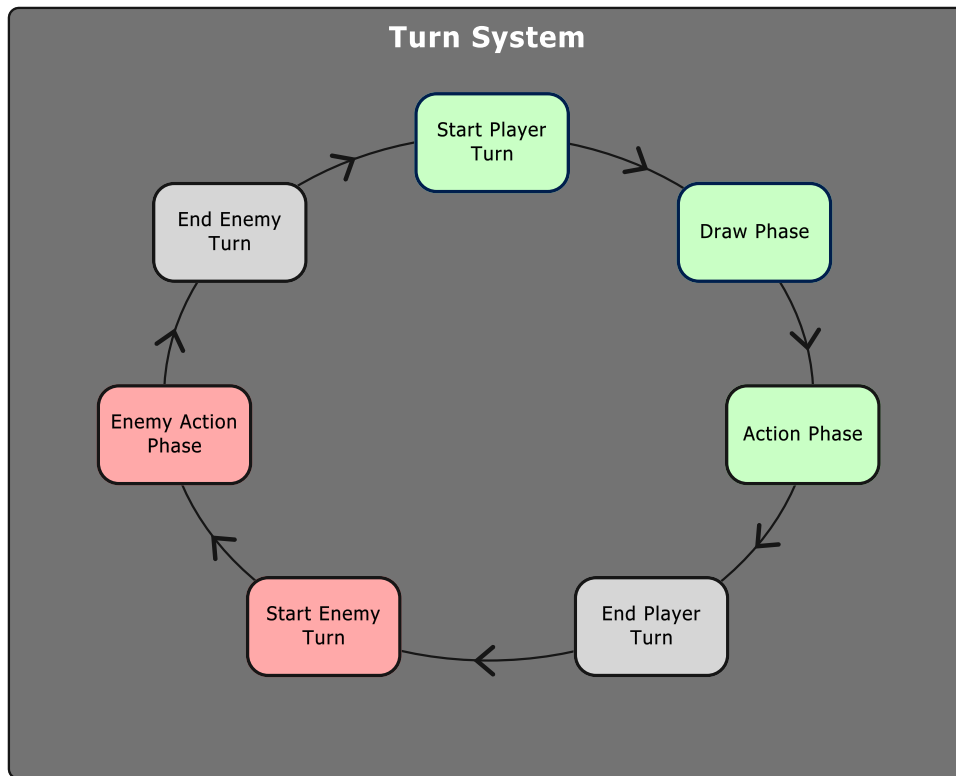


Figure 4.7: Graph showing the order of events in the turn system.

world” of the system. For the “visual world”, each action gets handled after it has been stored in an Eventnode, which is inserted into a graph. This graph, with a tree-like structure, will then be traversed to ensure that the actions are all shown in the order in which they were performed. The eventnodes can have one or more child-nodes which will enforce the order of the playback of the nodes. Separating the gameplay logic with the actual playback of the animations allows for more freedom in controlling blending between animations and allowing parallel playback where it makes sense. One alternative would be to immediately update the visual world to follow the logic world, but this would result in unwanted behaviour as actors would not finish their first action before visually performing the next one. An example of an event graph can be seen in fig. 4.8.

#### 4.1.4.2 Walker system

To traverse the event graph, an algorithm which we call the “Walker system” was developed. The walker system works by traversing the graph using a depth-first method, while respecting the actor-dependencies which are present in the graph. An actor-dependency is a dependency which prevents an event-node from being completed until the previous node, in which the corresponding actor is being used in, has completed.

When reaching a node, the walker evaluates potential dependencies and then completes the node (visually performing the corresponding action of the node) before moving on to the next node. Since all of the nodes in the graph are already getting

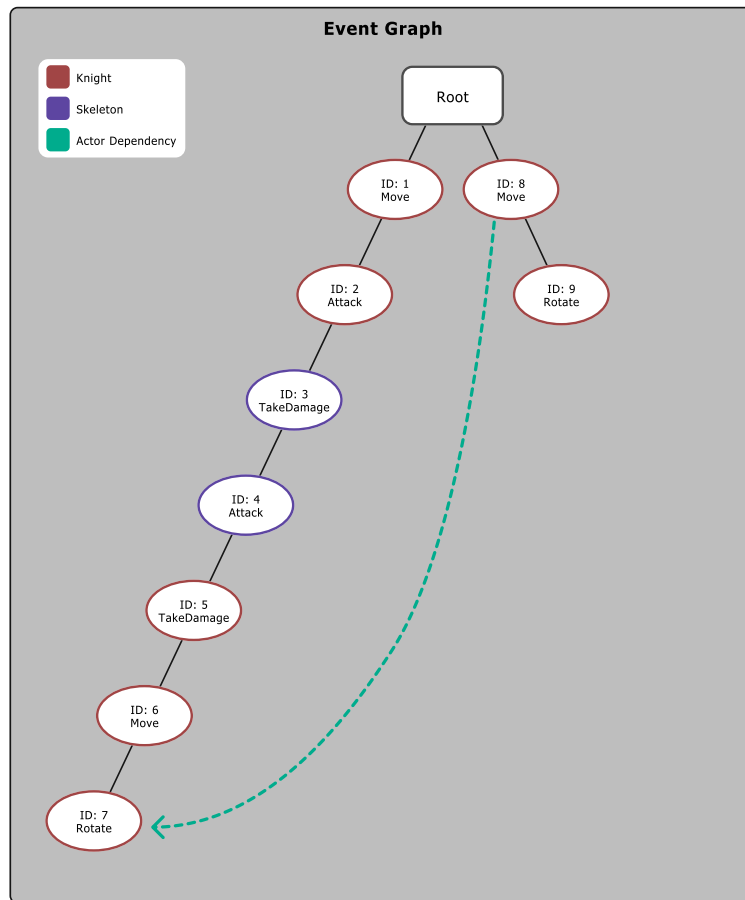


Figure 4.8: The walker system traversing an event graph without actor dependencies.

added from the logic world, it allows for some short cuts to be taken when playing the visual feedback of an action. An obvious example would be in the case of a retaliate effect, where the target being struck would strike back. If we did not evaluate this case until the first attack had stricken the target, then the attacker would walk back to their initial position before the target proceeds to move and attack the original attacker. Using our system, we can immediately use it to insert another eventnode (with the counter-attack) in before the attackers "move-back" - node. This would then result in an immediate response from the target before the attacker moves back to their original position. Of course, this is just an example of a situation where this is beneficial, the possibilities extend further than these kinds of scenarios. The actual visual playback is done by utilizing the build-in Animation Controllers in Unity and simply changing conditions that directs the controller in what animation to play next. This allows for fluidity when transitioning between animations, to not immediately move from one animation to the next, cutting it short while doing so.

Two examples of the walker-system traversing the graph can be seen in fig. 4.9 and fig. 4.10. In the first case, a Move-card has been played on two different units, which allows the walker-system to evaluate the nodes in parallel, if the current playback system allows it. In the other example, the Move-card is played twice on the same unit, which creates an actor dependency between the to sub-graphs, forcing sequential

playback regardless of animation playback system.

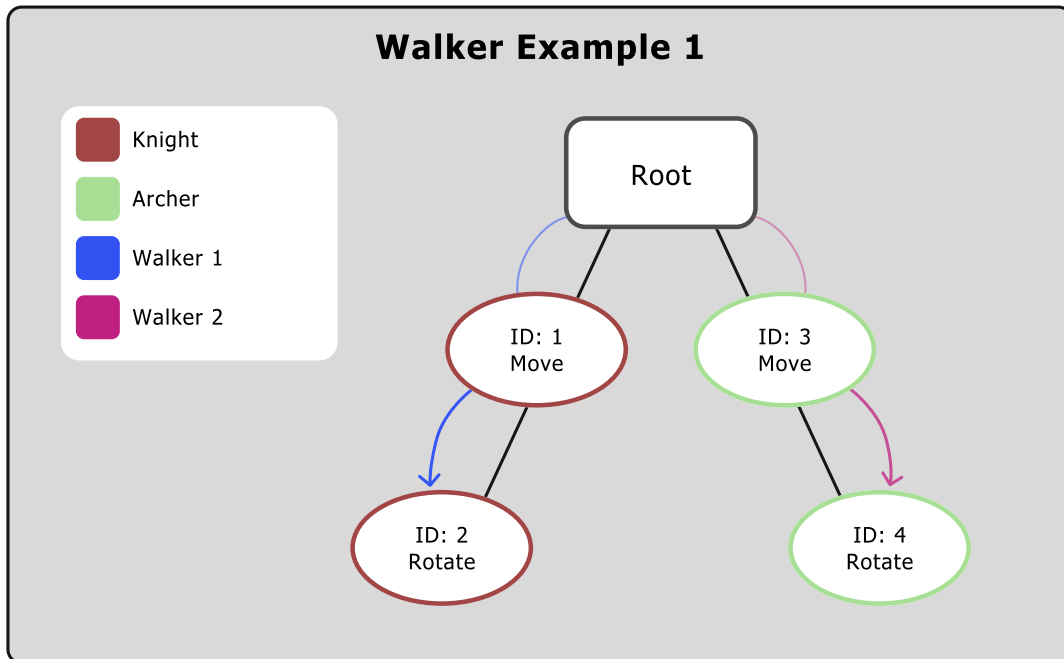


Figure 4.9: The walker system traversing an event graph without actor dependencies.

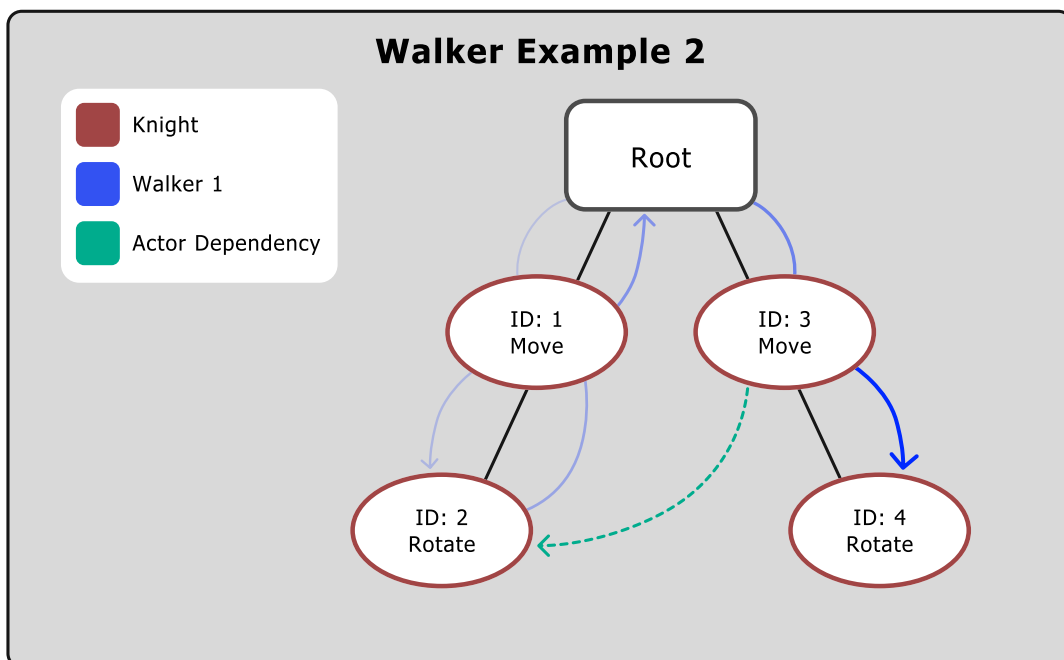


Figure 4.10: The walker system traversing an event graph with an actor dependency.

Another feature of using this system is that it allows for the ability to traverse the event-graph in parallel. By instantiating unique walker-instances for each child of a specific event-node, we can enable the ability to play out different actions at the same time. Note that these actions would still adhere to the actor-dependencies in the graph, or else it would not be possible for an actor to complete its tasks. Since it

is possible to control where this parallel setting would be applied, experiments of when and where to apply it has been done.

### 4.1.5 The different scenarios

The resulting POC comes with three different scenarios, each containing a unique animation playback style. The biggest difference in the technical aspect of the scenarios is the rules that the walker abides by. Additionally, the POC comes with one extra, dummy, scenario that the participants got to play prior the actual scenarios. The dummy-scenario features just one Knight unit and a target-dummy, to allow the player to get familiar with how to play cards and how to target enemies. The participant thereby gets a feel for the basic systems of the POC and how to gameplay works. Since the dummy-scenario only features one unit per faction, one knight and one target-dummy, the animation playback style will be fully sequential.

In **the first scenario**, seen in fig. 4.11, animations are played in complete sequence. This means that until an animation has finished, no other animation can be started, regardless if the next animation to be played is on another unit or not. This means that no two actions occur at the same time and the entire game play is completely sequential.



Figure 4.11: Scenario 1 with sequential animation playback.

**The second scenario**, allows for parallel animation playback, while abiding by some specific rules. In brief, actions are allowed to play out in complete parallel as long as the actor that will be affected by the action is not busy being affected by another action. Diving into the specifics, if a node has a sub-graph that contains an actor dependency to another actor, then the walker will skip the node for now, until the actor dependency has been resolved. In fig. 4.12, each of the enemy units have a unique target that is not busy, that is why they all can perform their actions in parallel.

**The third scenario** is similar to scenario 2, in that it allows for parallel playback, but in this final scenario, the rules are less strict. The main difference is that now the order of animations remain intact but the actor dependencies are no longer required to resolve before performing a unit's actions. For example, in scenario 2, if a unit was



Figure 4.12: Scenario 2 with parallel animation playback.

alone in the front row of the battle field, then sequential playback elements would be prevalent as the unit would continuously be busy with being attacked. This means that subsequent attacks from other units would be placed in a queue and carried out one by one. The same example in scenario 3 however, would allow for all of the units to attack the unit in the front row at once, queuing up the units stagger animations instead. This is displayed in fig. 4.13.



Figure 4.13: Scenario 3 with parallel animation playback and ignoring if a unit is busy.

### 4.1.6 Credits

To create the POC, several assets from the Unity Asset Store were used in conjunction with a music track taken from Youtube. The assets were the following;

- Fire and spell effects - Digital Ruby
- Low-Poly Simple Nature Pack - JustCreate
- Low Poly Weapons - SICS Games
- Lowpoly Medieval Skeleton - Polytope Studio

- POLYGON Fantasy Characters - Low Poly 3D Art - Synty Studios
- POLYGON Knights - Low Poly 3D Art - Synty Studios
- FANTASTIC - Village Pack - Tidal Flask Studios
- System of a Down - Toxicity - Medieval Style - Bardcore - Algal The Bard

Throughout the whole project, these assets have been either modified to fit, or directly added, into the POC. They have contributed to simplifying the process and have saved time and resources which could then be spent on other parts of the project.

## 4.2 Qualitative Study

In this section we will present the results from the qualitative study with participants. The approach and results from methods of analysis are also presented alongside references to the results in full.

### 4.2.1 Participant sample

All participants that were part of the study consented through the form presented to them (see appendix J). All participants met the criteria stated in appendix B, although the participants all had a varying degree of experience and interest in the genres mentioned. Half of the participants were in the age of between 20-25 years old, the other half was of age 26-30.

### 4.2.2 Pilot study

The pilot study acted as a means to review the study design and its content. Throughout

### 4.2.3 Questionnaire responses

The responses of the participants might indicate that there are subtle differences in how players experience, perceive and understand the three versions of animation playback systems. In total, the study yielded five questionnaire responses. The sixth expected response, by participant 6, was removed due to data contamination.

Comparatively, a sequential playback as in scenario 1 showed tendency to increase the understandability of the gameplay at a slight cost of gameplay fluidity and perceived pace.

For scenario 2, participant rated gameplay fluidity, responsiveness and pacing somewhat higher, at a marginal cost of understandability in comparison to scenario 1.

Scenario 3 was rated lowest in regards to understandability, although marginally. In other aspects the responses were distributed unevenly. Following that there were

only five responses in total, it is impossible to draw any statistically significant conclusions about the results, but it could be argued that the variation in rating in conjunction with interview responses indicate the potential impact of participant preference regarding animation playback styles.

All responses in detail can be found in appendix H.

### 4.2.4 Affinity Diagrams

To summarize and categorize the results from the participant studies, affinity diagrams were used. Each participant study was initially compounded into its own diagram, grouping different insights and sentiments together and also giving each group / theme a preliminary title. Once all of the studies were covered, the different diagrams were combined into a larger diagram, where another grouping of insights / sentiments was performed, revising the earlier groupings. All of the specific diagrams for each participant can be seen in appendix I. In fig. 4.14, the final compiled affinity diagram is shown.



Figure 4.14: Compiled affinity diagram

## 4.2.5 Compiled Insights

In this subsection we provide the compiled results from the affinity diagrams stemming from our user study. These results are categorized by how they tie into the overarching research question for this project. Firstly, we have insights that are directly related to the research question. Secondly, the results that are supplementary to the insights. Lastly, we have the results that stuck out as interesting findings within the research area, but not directly related to the research question.

### 4.2.5.1 Highly related

#### **Animation playback styles and understandability**

The majority of the participants found scenario 1 as the most understandable and clear. Other participants did not think there to be any major difference in understandability between the scenarios. It was argued that scenario 3 was the most difficult to understand following that animations played out of order following specific interactions. Roughly translated from swedish to english, Participant 5 reacted with “What just happened” aloud when two enemies attacked their knight at once. Participant 6 was surprised by a similar interaction and called out “They are really rushing me down now”.

Participant 5 found scenario 2 and 3 more difficult to understand due to animation order. Participant 4 stated that scenario 3 lacked visual clarity because of the order in which the enemies attacked in conjunction with the absence of target indication.

Most participants highlighted sequentiality and its innate slower pace as a reason for why the game was more easily read and understood. They also reasoned about the tradeoff between playback speed and understandability: The slower the pace, the more easily understood.

#### **Animation playback style and perceived gameplay pace**

Most of the participants perceived the pace of the game to be the fastest in Scenario 3. A few things are worth noting in the participants reflection on this topic:

- Participants that did not clearly state that Scenario 3 felt the fastest did argue that Scenario 1 felt slow.
- A couple of participants did not notice any significant difference between the scenarios (one had a 60 hz screen).

Overall the conclusion that most participants drew is that either Scenario 3 felt the fastest of Scenario 1 and 2 felt slower.

#### **Perceived gameplay fluidity and smoothness**

When asked about fluidity and smoothness of the scenarios, most participants still leaned towards Scenario 3 being the winner. Although, some contrary statements were found where participants argued that the unrealistic sequences of actions (skeletons attacking a knight that has not returned yet) broke the feeling of fluidity and instead

made them feel like something was wrong. One participant argued that something that is fluid means you don't think about fluidity, and then answered that would be Scenario 3.

### **Participant preferences**

The overall opinion of the participants is that they prefer the speed over the clarity of the gameplay. However, it does not seem to be a trade-off that they would like to make at all costs. Two of the participants were more lenient towards Scenario 1 as they like faster animations, but prefer the clarity of the sequential playback. Two of the participants also argued that the system lets you play at your own pace, but the enemies always play as fast as possible, which can be confusing if you don't play as fast as possible. Participant 3 mentioned that they preferred parallel playback for their own units but was not as sure when it came to the enemy. Participant 6 said they preferred the faster the better, especially when you have experience within the game and when you have seen the animations a lot of times already.

#### **4.2.5.2 Supplementary results**

##### **The POC in relation to the mental model of other games**

All of the participants perceived the system inputs and general gameplay as something they were acquainted with in past game experiences. The questions that arose concerning gameplay were generally targeted at specific cards or mechanics, where most participants described an accurate hypothesis in conjunction with their question. No core gameplay mechanics or entities in the POC were lost on the participants and all participants had reasonable success with the gameplay.

##### **Animations impact on immersion**

The participants stated that animations play a large role in maintaining and contributing to the immersion of the game. While stating that the game could be played entirely without animations, with textboxes and numbers updating on the screen, the participants state that the feel of the game would disappear without the animations. It also adds a layer of satisfaction to see your actions “resolve” through the animations.

##### **Dynamic user needs based on current proficiency and understanding**

When looking at all of the user tests, it became obvious that the participants played faster and faster the more playthroughs of the POC that they played. This would sometimes skew the participants' answers towards the final scenarios that they played would be the most clear and understandable versions of the POC. Many participants argued around this themselves without us pointing it out and reasoned around it affecting their answers. The results of this were most prominent in the tests where the participants played Scenario 3 early on in their playthroughs. Their focus was on the cards and the effects of the different actions in the POC as well as them playing a lot slower. When playing slower, the participants did not notice the different versions

of the animation playback system and it led to them being confused when searching for the differences between the scenarios. Further, it also led to some confusion during early turns where the participant was taking things slow; the enemy still performed their actions as fast as possible, which could lead to the participant not understanding what just happened.

The participants who played Scenario 3 last also argued that it probably would have been more confusing to play it first, when asked what they thought would happen if they would have played the scenarios in a different order.

### Limited parallel playback due to gameplay design

During the user tests it became clear that by playing the game in the most strategic way possible, led to situations that limited the parallelization of the animations. The specific situations occurred during scenario 2, when the play puts the knight alone in the front row, as a tank. The reason behind this is of course that in scenario 2, the actors can not start their actions towards another actor, unless that actor is available. This leads to complete sequential playback during the enemy's turn, as



Figure 4.15: A common example of a gameplay situation that limits parallel playback.

### Gameplay depth as a limiting factor for evaluation

During the evaluation, it was brought up by a couple of participants after it was explained what we were evaluating, that the complexity of the gameplay was too simple for it to feel confusing. If there were more mechanics or elements, they believe that they would feel a bigger difference between the scenarios.

### Animations as a mediating object to convey causality

All participants stated that they found the animations helpful when perceiving the causality throughout gameplay. The participants all agree that animations act as a good means of feedback to what is going on while also conveying specifics of interactions such as targeting and affirmation of the gameplay timeline in an understandable manner.

### 4.2.5.3 Interesting but not directly related results

#### **The interplay between upfront information and affirmative feedback**

All participants thought that there is a relation between how much upfront information and how much information from animations the player receives. It was argued that more available upfront information may lower the requirement for extensive affirmative feedback such as animations. One argument for this is that it allows reallocation of the cognitive load stemming from viewing and interpreting animations following a certain playback pace to instead be exerted during the player's planning phase. Another argument made by Participant 1 and 4 is that the more information one has beforehand, the easier it is to envision the consequences of your and your enemies' intended actions. Furthermore, Participant 4 states that at least one of the two information sources are required to ensure some degree of understandability.

Participant 6 believes that more upfront information makes it easier to understand what is about to happen but that too many visual informational artifacts may clutter the UI and in turn increase extraneous cognitive load and feel overloaded.

Participant 1 argued that animations in conjunction with upfront informations such as enemy intentions can be used as a substitute for post-action information such as Scrolling Combat Text(SCT) and Combat Logs (FOTNOT OM DET INTE NÄMNS TIDIGARE).

Participants thought that there is a tradeoff between upfront information and affirmative feedback. When you are new to a game you require more informational content to understand both core gameplay and nuanced interactions. Once you have gotten acquainted with these aspects one plays more intuitively and requires less upfront information. It is also argued that the more intricate gameplay mechanics, the more information is required to ensure understandability in decision making.

#### **Importance of upfront information**

The participants had different ideas regarding the upfront information provided to them in the POC. Many argued that it was a very helpful mechanic when calculating their correct actions, while others argued that with so few mechanics present in the POC, it did not play as big of a role.

#### **Missing implementations expected by the participants**

Participant 6 thought that it may be viable to implement a highly informational tutorial in order to keep information more subtle once gameplay commences.

Participant 3 would prefer if there was some type of post-action affirmation such as SCT. The participant also expected more information in the game, such as hoverable status effects that would display stats such as: type of effect, damage amount and turn amount. Furthermore, participant 3 mentions the lack of sound effects and that its absence has a negative impact on understandability.

All of these features and implementations that were missing, according to the

participants, had already been discussed during the implementation phase of the project and was deemed out of scope.



# 5

## Discussion

### 5.1 Insights from qualitative evaluation of POC

#### 5.1.1 Animation playback styles and understandability

Based on the results of the evaluations there are indications that a sequential playback of animations, as in scenario 1, may lead to gameplay that is both understandable and easily read. Each action the player takes plays its related animations in focus without sharing playback time with other animations. This could be perceived as a reassuring means of feedback to the player that conveys the causality of interactions. On the other hand, sequential playback of animations resulted in a slower pacing of the gameplay. In the eyes of an expert user that plays faster, it may be perceived as static, cumbersome, and ultimately break enjoyment or immersion.

Scenario 3 seemed to enable faster overall pacing of the gameplay and in the case of an expert user seemed more fluid and responsive. On the other hand, it appeared to be more difficult to understand interactions between units during playback of animations. For example the knight could be attacked by a skeleton while attacking the other skeleton, resulting in the skeleton striking thin air since the knight is moving. Additionally, a unit can be attacked by multiple enemies within approximately the same timeframe, which caused confusion about which unit did what and when. These interactions seemed to increase extraneous cognitive load on the player as there were more entities to keep track of at a certain time.

In scenario 2, the animation playback system is parallel while respecting causality in the sense that the order in which animations are played is considered. If multiple units are involved in an interaction, it displays the full effects of as in the sequential playback version. If there are no actor dependencies, the system allows for full parallel playback. The implementation of this animation playback system aimed to act as a compromise between scenario 1 and 3. The participants all had perceived the scenario differently. Several participants thought that there was no difference in understandability between scenario 1 and 2. Other participants thought that the same could be said between scenario 2 and 3. Most participants felt that there was a gulf in understandability between scenario 1 and 3. Conclusively, it could be argued that scenario 2 cumulatively represents a compromise in regards to understandability and the perceived pacing, fluidity and responsiveness of the gameplay. It is inconclusive if this compromise is balanced to the point of where it would be deemed superior in

comparison to the other scenarios. This holds especially true considering the sample size of the evaluation and the limited context in which the system is implemented. Despite this, it could prove fruitful to investigate further while considering design revisions.

### **5.1.2 The POC in relation to the mental model of other games**

The results showed that the participants all found the input system and core mechanics of the POC to be similar to other games they already had experience within. Our intention was to eliminate, or at least reduce, this as a source of error for the rest of the results. By doing so, we can argue that the fluidity, smoothness and understandability - factors of the POC mainly stems from other sources (such as animation playback style).

### **5.1.3 Animation playback style and perceived gameplay pace**

The overall results when looking at which animation playback style felt the slowest, it was clear that it was the sequential playback. Further, it was the general perception that the third scenario had the fastest gameplay pace. However, a factor which could be skewing these results is the overall speed of the animations.

All of the different scenarios had the same values for the speed of the animations, including movement speed, attack speed, etc. This has, in our case, led to scenario 1 being perceived as "slow", while getting an increased rating when looking at understandability. An extreme example of these could be seen when including participants with monitors with a refresh rate of 60 Hertz (Hz), since every animation in the game played at roughly 50% of the original speed. However, something that was not explored was the effect of increasing the animations' speed, instead of altering the animation playback style. Perhaps it would be enough to increase the animation speed and not the animation playback style. Would it result in a faster perceived game play pace, while maintaining a higher level of understandability? Would it still feel slow? Or would it start to lose understandability just like the second and third scenario?

## **5.2 Project's relevance to Box Dragon**

In this section, we present insights relevant to one of the stakeholders of the project, Box Dragon. The arguments for the insights builds on a combination of the results of the qualitative study and its subsequent analysis.

The results of the study conducted in this project indicates that parallel playback of animations may have an impact on the player's perception of gameplay pacing and fluidity. This highlights the importance of what Box Dragon is currently pursuing in their project. Furthermore, all participants of the study agreed that animations play an important roll in strategic turn-based games, as these support immersion, satisfaction, enjoyment and general appeal. There are indications from

participants that preserving full animation playback of actions lead to higher player satisfaction and immersion. Although some participants pointed out that more upfront information might lessen the importance of animations.

The results also indicate that players with more experience within these types of games seem to plan their entire turns out before performing any actions. This led to a very crucial scenario of needing a faster animation playback style, while maintaining causality, as it led to the player performing their actions as fast as they could. Following this, there are indications that there exists a "sweet spot", where animation playback speed, in conjunction with a suitable animation playback system, enables a higher paced gameplay while preserving the player's understanding of causality and general understandability of the gameplay. Furthermore, we suggest that a suitable animation playback system would be somewhere in between sequential and fully parallel.

One thing that became obvious throughout our study, is that player experience impacts how they interact with the system, and what they expect. For example, there seemed to be a mismatch between the player and the system when the player plays at a slower pace, but the enemy plays very fast. Subsequently, one can say that the user's needs and requirements regarding animation playback and gameplay pace changes judging the longitudinal PX. Following this, there seems to be a gap in the market in regards to a dynamic system of animation playback. Box Dragons seeks to achieve a system that should be viable for all types of players, no matter the experience. Another way of describing the potential solution could be to create a system that assesses and adjust animation playback according to the current proficiency and speed of the player.

In the end, our research question covers the topic of how the player's understanding is affected by different animation playback styles, and our research indicates that there are pros and cons to which you use. These results are directly applicable to Box Dragon as they suggest that the work Box Dragon are putting in to their animation playback style will affect how the player perceives their game.

## 5.3 Evaluation of the Study

### 5.3.1 Importance of pilot study

The aim of the pilot study was to test multiple aspects of the drafted qualitative study. Although the study proved to mostly acquire relevant feedback and insights considering the research area, it also displayed a necessity of revising and expanding the SSI questions further. Additionally, the feedback given during the pilot study highlighted potential flaws of the study design such as learnability bias, gameplay aspects that limits parallel playback, and overall resolution of the POC. The pilot study also acted as a means to perform final playtestings of the POC, which led to a few final revisions to the implementation before conducting the qualitative study. Conclusively, the pilot study proved to be an efficient tool to evaluate the study design and to highlight favorable revisions to its content.

### 5.3.2 Learnability bias of participants

As the results showed, all of the participants played faster and faster as they progressed through the study, following that they were getting familiar with the system and gameplay. This was often also present in their answers as the participants themselves all reasoned about their own 'learning curve' within the POC. This factor was present when reviewing the participants answers relative to the order in which they played the three different scenarios as there was frequently a bias towards the final scenario played being the most clear and fluid. This is something we had to think about when finalizing and analyzing our answers, and is one of the main reasons as to why we had the different participants get a different order of the scenarios.

### 5.3.3 Limiting knowledge about the study

As an introduction to the study, each participant was given information regarding our project and some instructions about what they were being asked to do. While giving this information, we intentionally stayed away from mentioning what specific factors we were evaluating, to not influence the participant's answers or how they approached the gameplay. The benefits of this was that the results we were getting were uncontaminated in regards to what we were evaluating, as a direct result of hiding information from our participant. Although it could be argued that we were leading the participants on, we believe that we were clear about what the study was about as a whole, and that it was a necessary compromise to exclude information about what specific factors were of interest, while trying to keep the participant in the loop.

### 5.3.4 The effect of the questionnaire

After each scenario, the participants were asked to fill out a questionnaire to rate PX statements of each scenario on a Likert scales. Since this study was qualitative, as opposed to quantitative, these questionnaires were mainly used in conjunction with the semi-structured interview when analyzing the results. The questionnaires mainly gave us indications of what the participant preferred when evaluating the different factors, but did not enable us to draw conclusions independently.

After playing the initial scenario, participants were unaware of what the questionnaire was going to be about specifically as we presented it to them. However, since the questionnaires were the same after each scenario, while playing the following scenarios the participant could keep these questions in mind while playing. This, we believe, led to some bias in what the participant was looking for when playing the rest of the scenarios. If we were to conduct this study again, we would have wanted to introduce the questions in the questionnaire before the participants played any scenario.

### 5.3.5 Enabling participants to become expert users

When designing the study, we wanted our participants to mimic an expert user within our system since the expert user is the most likely to have a need for a faster

gameplay pace. To achieve this, we intentionally selected participants who were considered well versed within genres or games similar to what we had implemented. Further, we created a dummy scenario for them to play before the actual scenarios to incorporate the participants into our game as fast as possible without contaminating the results of the study. This led to the participants having familiarized themselves with the foundation of our POC, meaning that they could play cards, target enemies, and move units. It also made the participant aware of what they could expect gameplay-wise. We could see from the results that this indeed had an impact on the overall experience level of the participants when playing the actual scenarios, but did not familiarize them enough so that their experience with the three scenarios were unaffected by their experience level. To achieve this, we believe that one would need to have the participants play scenarios similar to ours, without changing animation playback style, for a longer duration to truly get familiar with the game. This, however, could lead to a bias for that specific animation playback style that they are exposed to and was also out of scope for this project. Another approach could be to let the participant play all scenarios in a specific order but in several sequential iterations. This would most likely require more of the participant's time and multiple iterations of the questionnaire for each scenario. This approach was dismissed due to the time constraints of the project.

## 5.4 Mimicking Box Dragon's implementation

Box Dragon's system is complex with several thousand lines of code to accommodate many different scenarios for all kinds of actors. In our system, the most important events in the graphs are the PlayCard-events as well as the chaining of events that happens after a card has been played. The difficult part consists of the modeling of the graph, the walkers as well as the implementation of the Actor Dependencies. The Actor Dependencies are the relations between nodes in the graph that halts the playback of a walker in case the Unit of the node (the actor) is busy in another node that has not yet completed.

To create a controlled environment where we could perform our evaluation, we had to create a scaled down version of Box Dragon's implementation. The main reason for not simply using the existing system was that it was simply too complex and involved in a bigger context, meaning it would have been extremely difficult to extract key features into something we could use. Further, we have no experience in the programming language that it is built in, nor any insight into the bigger picture in which this system is a part of. This then led to us instead creating our own, scaled down version, to be able to highlight the key features of Box Dragon's implementation, which were relevant to our research question. While drawing inspiration from the existing system, we had to constantly evaluate whether a feature of the system was necessary for us to implement within the scope and context of our research question. By doing so, the resulting system that was implemented was, as stated, a scaled down version of the original.

## 5.5 Designing for a system that promotes fluidity in playback of animations

When implementing the event-graph and walker - systems, we came to some realizations about where the difficulties lie. For instance, in Box Dragons implementation, they have little to no control over the pathfinding of the units. So, when a unit moves from point A to point B in the world, they can not immediately guarantee the amount of time that will take. This prevents them from blending this action with the next action, instead they have to explicitly wait for the pathfinding to complete.

Another realization we had was that the timing of when an action has been comprehended by the player is delicate. Box Dragon has addressed this problem by allowing their visual artists add a flag to an animation which indicates that the brunt of the animation is complete. As an example: an attack animation where a unit would hit a target with a sword would have its flag placed somewhere around the time when the sword actually hits the target. The contrary would be to have the flag placed at the end of the animation, when the sword has returned to its initial position.

When designing the data structure that represents our events, it quickly became clear that there was no strict definition of exactly what an entry in the data structure looks like. A node in the graph, our data structure of choice, does not necessarily map to a single event in the scene. An example of this would be when the wizard throws a fireball. To throw the fireball, there would be an `AttackNode` added to the graph which would tell the wizard to perform its fireball animation and shoot a fireball towards the target. However, the same node would have to be responsible for handling the fireball impact, otherwise there will be a timing issue. If the impact of the fireball in itself adds an additional node to the graph which tells the fireball to explode and the unit to take damage, there could be a delay or some actor-dependency that prevents the node from being traversed immediately. The result would be a fireball that hits an enemy, and an explosion that would appear in a later stage. Instead, we came up with a hybrid-solution where nodes contain the collection of events that are directly related to each other, such as the previous example. This type of flexibility was possible since we opted for an approach where we mimic Box Dragon's system, as opposed to copying it directly. The two systems remain the same on an abstract level, where concepts, rules and constraints are the same, but differ in the implementation. This is something that we have had to bear in mind when connecting our findings back to Box Dragon, but we believe that our systems share enough of a core model for the insights from our results to apply to their system as well.

## 5.6 Utilizing Mixamo

One of the key factors for the POC was that the aesthetics should be consistent and follow mental models that players can recognise from other games. Mixamo as a tool provides the developer with animations that are easily implemented onto existing character models. Despite this, there are pitfalls when using the service.

Firstly, Mixamo can only provide animations to models which are modeled similar to humanoids, which can limit the creativity in character modelling. Furthermore, there is no guarantee that a model you create can use the library even if it appears to resemble human anatomy. Secondly, the library of animations in the application is quite extensive, yet there is no guarantee that it hosts the specific animation style that you desire. Thirdly, there is a risk of creating a high contrast between characters when utilizing Mixamo animations in conjunction with animations developed from scratch. This is partially due to the set resolution and style of the Mixamo animations. Another reason for unwanted contrast follows the prior notions which highlights the boundaries innate to Mixamo.

Within the scope and boundaries of this project, these detriments were experienced as negligible. One of the reasons for this are the downloaded humanoid assets from Unity's Assetstore, which were compatible with Mixamo. Subsequently, all animations utilized have a consistent aesthetic and were only modified slightly to account for accessories and weapons added to the models.

## **5.7 Future work**

This section covers the topics that we found interesting but ultimately were outside the scope of this project. The topics all cover points of interest that could potentially be researched further.

### **5.7.1 Variations and dynamics of affirmative feedback**

In this project we specifically looked at playback styles and how they affected the player. It does not take into consideration the length or speed of animations, nor does it take into consideration the amount of upfront information presented to the player. We hypothesised that although all of these matters have their respective effects, it is likely that they affect each other as well. We believe that if you change one factor, the impact that other factors have may change as well, and that they are correlated. All of these factors are valid to look into, as we believe that they affected the results of the study, since several of the participants mention these factors specifically without us prompting it.

### **5.7.2 Dynamic system inputs to enable interaction combinations**

A common phenomenon in games such as Slay the Spire, Box Dragons ongoing game development project and the POC created during this project, is the possibility to perform multiple interactions, such as playing cards, in close succession. The animation playback style affect the way these interactions play out visually. Another game genre that relies heavily on the phenomenon is the fighter genre. Games like Street Fighter, the Tekken series and Super Smash Bros, all enable the player to give multiple inputs within a certain time frame, which are then registered by the system and combined into a single consequence. The technique could potentially be utilized

for turn-based card games in which playing cards represents button inputs and the time frame may be based on for example the current visual update or a calculated window of time that takes character movement and interactions timings into consideration. This could result in a faster pace of gameplay in sequential playback while maintaining a higher visual clarity and understandability of causality. For example, casting two attack cards, that are connected to the same unit, consecutively, could perhaps cancel the final nodes of the first attack, and ignore the first nodes of the second attack, thus linking them together in a combo.

### **5.7.3 The interplay between upfront information and affirmative feedback**

During the semi-structured interviews of the user studies, discussions regarding the importance of upfront information occurred. An indication that was discovered was that there might be a trade-off between the amount of upfront information a user is presented with, and the amount of affirmative feedback that is required for a user to fully understand what is happening. The hypotheses that arose from this was that if you could move the cognitive load from the action phase (when animations start to play), to the planning phase (the number-crunching and decision making that occurs before any cards are played), then there would be a lesser need for affirmative feedback during the action phase.

# 6

## Conclusion

In this master thesis project, we created an environment to perform user tests, in the form of a proof-of-concept application. The application was developed using Unity and featured three different scenarios, each utilizing a different animation playback style. Once the application had been created, a pilot test was conducted and any final tweaks and alterations to the application and user study was addressed. Following this, the user study was performed on six participants, and the results were compiled using affinity diagrams into a list of insights gained from the tests.

In this project, we aimed to answer the question “How does asynchronously playing animations affect the player’s perception and understanding of causality in a strategic turn-based game?”. The results from the study indicates causation between different animation playback styles and the understandability of the game state. However, the results also showed that there was a preference in speed over understandability from most of the participants. Finally, some future research has been suggested, highlighting some interesting findings in the correlation between upfront information and affirmative feedback, the effects of a dynamic input system to allow for combination of interactions, and a look into how placement of affirmative feedback affects the perceived pacing of a game. Conclusively, although the choice of animation playback style seem to have effect on the player’s perception and understanding of causality in a strategic turn-based game, the understandability and PX factors native to animations seem to expand beyond the system that they are played by.



# References

- Adams, W. C. (2015). Conducting semi-structured interviews. In *Handbook of practical program evaluation* (p. 492-505). John Wiley & Sons, Ltd. Retrieved from <https://onlinelibrary.wiley.com/doi/abs/10.1002/9781119171386.ch19> doi: <https://doi.org/10.1002/9781119171386.ch19>
- AgileBusiness. (n.d.). *Chapter 10: Moscow prioritisation*. Retrieved from <https://www.agilebusiness.org/dsdm-project-framework/moscow-prioririsation.html>
- Amalarethinam, G., Director, M., & Mary, G. (2011, 04). A new dag based dynamic task scheduling algorithm (dytas) for multiprocessor systems. *International Journal of Computer Applications*, 19, 975-8887.
- Andersen, E., Liu, Y.-E., Snider, R., Szeto, R., & Popović, Z. (2011). Placing a value on aesthetics in online casual games. In *Proceedings of the sigchi conference on human factors in computing systems* (p. 1275–1278). New York, NY, USA: Association for Computing Machinery. Retrieved from <https://doi.org/10.1145/1978942.1979131> doi: 10.1145/1978942.1979131
- ApolloMalo14. (2021, Mar). *Animations taking too long is a big problem* [Reddit Post]. Retrieved from [www.reddit.com/r/hearthstone/comments/lv6ndx/animations\\_taking\\_too\\_long\\_is\\_a\\_big\\_problem/](http://www.reddit.com/r/hearthstone/comments/lv6ndx/animations_taking_too_long_is_a_big_problem/)
- Banyte, J., & Gadeikiene, A. (2015). The effect of consumer motivation to play games on video game-playing engagement. *Procedia Economics and Finance*, 26, 505-514. Retrieved from <https://www.sciencedirect.com/science/article/pii/S2212567115008801> (4th World Conference on Business, Economics and Management (WCBEM-2015)) doi: [https://doi.org/10.1016/S2212-5671\(15\)00880-1](https://doi.org/10.1016/S2212-5671(15)00880-1)
- Beck, K., Beedle, M., Bennekum, A. v., Cockburn, A., Cunningham, W., Fowler, M., ... et al. (2001). *Manifesto for agile software development*. Retrieved from <http://agilemanifesto.org/>
- Bernhaupt, R. (Ed.). (2015). *Game user experience evaluation*. Springer International Publishing. Retrieved from <https://doi.org/10.1007/978-3-319-15985-0> doi: 10.1007/978-3-319-15985-0
- Bruce, H., & Martin, B. (2019). *Universal methods of design: 125 ways to research complex problems, develop innovative ideas, and design effective solutions* (expanded and revised, 25 additional design methods ed.). Beverly, MA: Rockport.
- DataFlair, T. (2021, Aug). *Scheduling algorithms in operating system*. DataFlair. Retrieved from <https://data-flair.training/blogs/>

- scheduling-algorithms-in-operating-system/
- Eladhari, M. P., & Ollila, E. M. I. (2012, Jun). Design for research results: Experimental prototyping and play testing. *Simulation & Gaming*, 43(3), 391–412. Retrieved from <http://journals.sagepub.com/doi/10.1177/1046878111434255> doi: 10.1177/1046878111434255
- El-Rewini, H., Ali, H., & Lewis, T. (1995). Task scheduling in multiprocessing systems. *Computer*, 28(12), 27-37. doi: 10.1109/2.476197
- Entertainment, B. (2014, Mar). *Hearthstone official game site*. Blizzard Entertainment. Retrieved from <https://hearthstone.blizzard.com/en-us>
- Gerling, K. M., Klauser, M., & Niesenhaus, J. (2011). Measuring the impact of game controllers on player experience in fps games. In *Proceedings of the 15th international academic mindtrek conference: Envisioning future media environments* (p. 83–86). New York, NY, USA: Association for Computing Machinery. Retrieved from <https://doi.org/10.1145/2181037.2181052> doi: 10.1145/2181037.2181052
- Heroes of might and magic iii*. (2023, Jan). Wikimedia Foundation. Retrieved from [https://en.wikipedia.org/wiki/Heroes\\_of\\_Might\\_and\\_Magic\\_III](https://en.wikipedia.org/wiki/Heroes_of_Might_and_Magic_III)
- Heroes of might and magic® 3: Complete*. (n.d.). Retrieved from [https://www.gog.com/en/game/heroes\\_of\\_might\\_and\\_magic\\_3\\_complete\\_edition](https://www.gog.com/en/game/heroes_of_might_and_magic_3_complete_edition)
- Hicks, K., Gerling, K., Dickinson, P., & Vanden Abeele, V. (2019). Juicy game design: Understanding the impact of visual embellishments on player experience. In *Proceedings of the annual symposium on computer-human interaction in play* (p. 185–197). New York, NY, USA: Association for Computing Machinery. Retrieved from <https://doi.org/10.1145/3311350.3347171> doi: 10.1145/3311350.3347171
- ISO. (2019, Jul). *Iso 9241-210:2010 ergonomics of human-system interaction — part 210: Human-centred design for interactive systems*. the International Organization for Standardization. Retrieved from <https://www.iso.org/standard/52075.html>
- Jordan, P. W. (2002). *An introduction to usability* (1st ed.). Taylor & Francis.
- LavapotionAB. (2022, May). *Songs of conquest*. Coffee Stain Publishing. Retrieved from <https://www.sonsofconquest.com/>
- Michel, R. (2007). Design research now: essays and selected projects. In (p. 87). Basel, Switzerland Boston: Birkhäuser.
- Nakamura, J., & Csikszentmihalyi, M. (2001). The concept of flow. In C. Snyder & S. Lopez (Eds.), *Handbook of positive psychology* (p. 89-105). Oxford University Press. Retrieved from <https://books.google.se/books?id=2Cr5rP8j0nsC>
- Nielsen, J. (2000, Mar). *Why you only need to test with 5 users*. Retrieved from <https://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/>
- Nielsen, J. (2012, Jan). *Usability 101: Introduction to usability*. Retrieved from <https://www.nngroup.com/articles/usability-101-introduction-to-usability/>
- Nielsen, J. (2020, Nov). *10 usability heuristics for user interface design*. Retrieved from <https://www.nngroup.com/articles/ten-usability-heuristics/>
- Nielsen, J., & Norman, D. (n.d.). *The definition of user experience*

- (*ux*). Retrieved from <https://www.nngroup.com/articles/definition-user-experience/>
- of ActivePlayer, A. (2022, Jul). *Hearthstone live player count and statistics*. Retrieved from <https://activeplayer.io/hearthstone/>
- Omara, F. A., & Arafa, M. M. (2009). Genetic algorithms for task scheduling problem. In A. Abraham, A.-E. Hassanien, P. Siarry, & A. Engelbrecht (Eds.), *Foundations of computational intelligence volume 3: Global optimization* (pp. 479–507). Berlin, Heidelberg: Springer Berlin Heidelberg. Retrieved from [https://doi.org/10.1007/978-3-642-01085-9\\_16](https://doi.org/10.1007/978-3-642-01085-9_16) doi: 10.1007/978-3-642-01085-9\_16
- Schlüter, A., Waldkirch, M., Burmeister-Lamp, K., & Auernhammer, J. (2021). No second chance for a first impression: the role of aesthetics in early access video games. *International Journal of Innovation Management*, 25(10), 2140002.
- Slay the spire*. (2023, Jan). Wikimedia Foundation. Retrieved from [https://en.wikipedia.org/wiki/Slay\\_the\\_Spire](https://en.wikipedia.org/wiki/Slay_the_Spire)
- Slay the spire on steam*. (n.d.). Retrieved from [https://store.steampowered.com/app/646570/Slay\\_the\\_Spire/](https://store.steampowered.com/app/646570/Slay_the_Spire/)
- Stappers, P., & Giaccardi, E. (2017). Research through design. In M. Soegaard & R. Friis-Dam (Eds.), *The encyclopedia of human-computer interaction* (2nd ed., pp. 1–94). The Interaction Design Foundation.
- SteamDB. (2023, May). *Heroes of might and magic iii - hd edition 2023*. Retrieved from <https://steamdb.info/app/297000/charts/>
- Sánchez, J. L. G., Vela, F. L. G., Simarro, F. M., & Padilla-Zea, N. (2012). Playability: analysing user experience in video games. *Behaviour & Information Technology*, 31(10), 1033-1054. Retrieved from <https://doi.org/10.1080/0144929X.2012.710648> doi: 10.1080/0144929X.2012.710648
- Thulasiraman, K., & S., S. M. N. (1992). *Graphs: Theory and algorithms*. Wiley.
- Wildemuth, B. M. (2017). *Applications of social research methods to questions in information and library science* (Second edition ed.). Santa Barbara, California: Libraries Unlimited.



# A

## Stakeholder interview - Kevin Chang, Box Dragon

An annotated interview with Co-founder and Game Director Kevin about their intended audience and general vision of the game.

# Stakeholder Interview – Annotated

Kevin Chang

## Box dragon's vision of Next Humanity

To better understand the goals, mindset, and intended player base of Box Dragon's game development project, a semi-structured interview was held with Co-founder and Game Director Kevin Chang. Found below are excerpts from the interview in which questions are denominated by Q and answers by A. Only questions and answers from the interview that were deemed relevant to the project are accounted for, as the setting for the interview would be considered casual.

The opening questions of the interview aimed to develop an understanding of what Box Dragon's vision of gameplay and PX in their project is and what it ultimately means for the player. Initially, questions were open-ended and sought to open the dialogue as well as to highlight topics of importance. These topics were then pursued in more nuanced follow-up questions to in more detail comprehend the effects Box Dragon wished to invoke in the player.

Q: How would you describe the game you are currently developing and which game genre would Box Dragon classify it as?

A: *"The game is a roguelite strategy deckbuilder. The player takes the role of the commander of the last castle-city of humanity, fighting scrappy battles and scavenging for resources to survive the post-apocalypse."*

Q: In broad strokes, how would you describe Box Dragon's, and/or your, vision of the game you are currently developing? (In terms of PX and gameplay)

A: *"We had a vision for a strategy game that was both turn-based and crunchy, inviting the player to play it differently every time. But we also did not want to compromise between fluidity of the player experience and the strategic nature. We noticed that these types of games in this space don't really have a focus in the UX."*

The importance of how gameplay fluidity ties to PX is highlighted by Kevin. It is made clear that this is a key aspect in Box Dragon's project. It should permeate the player's experience within the game. Kevin argues that gameplay fluidity and PX factors often are overlooked, require compromising, or down prioritized by similar titles within their genre. Consequently, Box Dragon seeks to develop a game with high replayability that does not limit the fluidity and PX while maintaining a heavily strategic turn-based gameplay. (Ties to: RtD, Immersion and Flow, Design after Demand/Market driven design?)

A: *"...everyone understands cards as a medium. Cards represent options and choices in games; once you have cards you already know what to do with them. It is a clear framework for how to engage with the games."*

From a standpoint of creating a game title that offers playability and accessible gameplay, it is made clear that cards as a communicative and operative entity within games ties to the mental model of the players. The player is expected to be familiar with how cards are read, what type of information is expected to be found on them and how they are operated. (Find source if mental models help players get more immersed? Or perhaps if more automated mechanical processes help immerse the player into the gameplay?)

Q: Is fluidity central to the game itself?

A: *"We wanted to show that in a strategy game we have this fluidity and are a bit more inviting to the PX. You can play your cards as fast as possible, and the game will simply keep up. Or just sit back and enjoy and watch things play out one by one. We don't want the mechanics of the play to interrupt the player's experience."*

As a player evolves mechanically throughout playing a game, it is not uncommon that limitations of the gameplay's pace prohibit the player from playing at their maximum capacity regarding speed. Multiple examples of this are raised in chapter XX which also discusses the compromising solutions implemented to account for the phenomenon. Box Dragon's project aims to develop a novel implementation technique that maintains core gameplay and PX attributes while allowing the player to play at whatever pace they are comfortable with. (Also RtD once again, could probably be a section after both questions above where it is discussed)

The following excerpts from the interview intended to answer what audience Box Dragon's game fundamentally envision catering to. The information gathered will be used as a template for desired characteristics of participants of the empirical study of this project.

Q: Which players is the game intended for? Who do you seek to reach?

A: *"This game is primarily intended for already invested players in roguelike or deck builders."*

A: *"We hope we are a good successor to Slay the Spire and its ilk. Our very core demographic: If you played roguelike indie games before, or if you enjoy strategy games of any sort, this will be enjoyable. It will feel familiar yet new."*

Q: What age group do you intend to reach?

A: *"...slightly aging gamers 25-40. Players who might be short on time but still want a compelling experience."*

A: *"In many ways, this is a love letter to strategy enthusiasts of the early 2000's, the Magic: The Gathering enjoyers, Civilization players, that era."*

The main insights drawn from the answers are that players should have some interest in roguelikes or deck builders and appreciate a strategic game environment. The player should be able to quickly immerse themselves into a session of playing without strict rules regarding session length and progression. Conclusively, Kevin imagines the core demographic to be players who have experience with roguelike indie games and find themselves in the age of about 25-40 years old.

Q: Which PX-aspects of the game do Box Dragon consider the most important?

A: *"I would say that the users that will resonate most with: mastery and exploration, trial and error. The kinds of players that love to see how you want to combo and break the game. Infinite potential, early days of a meta. Learning new little tricks, even after 50 hours. Most players should be able to see the 'blue sky' potential."*

A: *"Theory crafting is a great way to put it. If players are still engaged with the game even when they're not playing, we've succeeded."*

Q: What about depth and playability?

A: *"The game will certainly have a lot of depth and be highly replayable due to its nature. I do wonder if moving it to a strategic shell will make it harder for players to find out where you went wrong. It is important for the player to be able to analyze it without a huge understanding of the game."*

Kevin depicts that Box Dragon's game seeks to accommodate for replayability through a system that encourages trial and error on the road to mastery of the game. The player should be motivated to craft theories on how the game can be played by realizing potential within the game through curious exploration of mechanics and synergies.

Following that the game strives to create a holistic strategic environment where exploration is encouraged, there is always something new the player should be able to learn. It should be clear what that potential is and means of how it could be achieved. Kevin also highlights the importance of player understandability and how the game should give sufficient feedback on where mistakes were made.

Q: In UI design, one often refers to the product posture being either transient: which roughly translates to plug and play over shorter periods of time. or sovereign: A system with rich input and visual feedback with a "time and experience equals improved skill and efficiency" where the user is expected to sit for longer sessions.

- a) Would you describe the vision of the game being more of transient or sovereign nature?
- b) TL;DR of Transient: "Plug & play" "Quick & easy fun"
- c) TL;DR of sovereign: "Develop skill and enjoyment over extensive period of time"

A: *"We want players to be able to break out of the session at convenient times, but in general you are supposed to be lost in the experience."*

A: *"...Get lost in the flow state where you need to see what happens next."*

Although the game is supposed to immerse and intrigue the player throughout the gameplay, Kevin mentions that they created designated timings in-game that encourages the player to review whether they would like to pause their experience or not. The main sentiment of the answers is the importance of enabling the player to enter flow-state.



# B

## Test plan

The test plan used for the user studies.

# Test Plan

## Content

<b>Purpose of study (research hypothesis/questions)</b>	<b>1</b>
<b>Participant profile</b>	<b>2</b>
<b>Compensation plan</b>	<b>2</b>
<b>Methodology</b>	<b>2</b>
<b>Material &amp; Apparatus</b>	<b>4</b>
<b>Structure &amp; Timeline</b>	<b>6</b>
<b>Analysis</b>	<b>6</b>

### 1) Purpose of study (research hypothesis/questions)

The purpose of this study is to evaluate the effect different implementations of animation playback in a strategic deck builder game environment have on the player's understanding of causality within the game, contribution to immersion, perceived gameplay fluidity and sense of user control.

I.

### 2) Participant profile

ADD SECTION ABOUT US TAKING BOX DRAGON'S PROJECT AND INTERVIEW INTO CONSIDERATION

<b>Inclusion criterias</b>	<b>Exclusion criterias</b>
Familiar with games in the genre of strategy, roguelikes, and deck builders.	Participant properties that are deemed to heavily affect proficiency in the POC. Such as visual impairment, movement restrictions and cognitive limitations.
Interest in strategy, roguelikes, or deck builder games.	Participant is directly involved with the project Box Dragon is pursuing.

Age 20-40.	
Own and operate a PC.	
Proficient reading comprehension in the English language.	

### 3) Compensation plan

- o Upon completion of the study, all participants will be compensated with an early access key to Box Dragon's game.

### 4) Methodology

#### Study Design:

- o Qualitative study
- o Playtesting
- o Repeated measures design
- o Survey
- o Semi-structured interview

Estimated number of participants: 6

#### Conditions:

1. Calm, indoor environment
2. Low ambient sound

## Study brief

### Presentation of the study

“ ”

*Since January I and Adam/Marcus have been working on our master's thesis in cooperation with Gothenburg based game studio Box Dragon. The project revolves around the player's experience in games within the genre of strategic roguelike deck builders, and especially addresses the user's sense of control and how visual cues impact understanding of the game state.*

*In this study, you will be asked to play through four game scenarios we have created throughout this spring. After each scenario, you will answer a questionnaire about your experience with the game. After all scenarios have*

*been played through, we have prepared an interview about the experience as a whole. Before we start, we want to clarify that you, the player, are by no means assessed or judged based on your proficiency or progress in the game. We are solely evaluating our prototype.*

“””

## 5) Material & Apparatus

- o Project brief
- o Interview script
- o Questionnaires
- o Computer
- o POC
- o Video meeting software

## 6) Structure & Timeline

Preparation required before the study starts:

- o Consent form
- o Control questions

Approximated study duration per participant: 60 minutes

### Timeline of the study:

<i>Phase</i>	<i>What's happening</i>	<i>Material/Staff</i>
Prep	Participants are informed about the research conducted throughout the project. They are then presented with information about the study. The participants are asked control questions to assess whether they are fitting participants of the study and to what degree they fulfill the criterias. Finally the participants are asked to sign a consent form.	Project brief Study brief Control questions Consent form
Setup	The participants are asked to download and open the POC. They should also share their screen allowing the moderator to observe actions taken.	PC Discord or Zoom POC application
Familiarizing with the system	The participants are presented with a dummy scenario where they can get familiar with the mechanics of the POC and	POC application

	how the system operates. This also acts as a means to immerse the participant into gameplay.	
Interview	The participants are asked interview questions about their experience with the dummy scenario.	Interview question protocol
Playtesting Scenario A	The participants are asked to play through the respective scenarios <b>X</b> times.	POC application
Playtesting Scenario B		
Playtesting Scenario C		
Survey	The participants are presented with a survey after each scenario to evaluate their experience with each respective scenario.	Survey
Interview	The participants are asked open-ended questions about their experience with the scenarios.	Interview question protocol
Wrap up	Compensation and goodbyes.	Compensation

## 7) Analysis

Method of analysis:

- Affinity diagramming



# C

## Interview template

The template used during the semi-structured interviews.

# Interview Template

## Dummy scenario questions

1. Was the input system of the game understandable? (What actions you are able to do and what effect they have)
2. Were there any playable cards that were confusing or that need clarification? (Show all playable cards)

## Interview questions (Post-playtesting)

1. Which version of the game was easiest to understand during gameplay?
  - a. Why?
  - b. Would it make a difference with swapped order?
2. Which version of the game did you find most fluid during gameplay?
  - a. Why?
3. Which version of the game did you find the fastest during gameplay?
  - a. Why?
4. Which version of the game did you find the most responsive during gameplay?
  - a. Why?
5. Which of the three versions of the game did you prefer?
  - a. Why?

6. Do you think the animations have positive effects on understanding what is going on throughout gameplay?
  - a. Why?

**DESCRIBE OUT PROJECT AND WHAT THE DIFFERENCE IS BETWEEN THE VERSIONS HERE.**

7. Would you have played any of the versions differently now that you have played through all scenarios and been given an explanation of their differences?
8. Would you have rated them differently in the forms?
9. Do you think more upfront information leads to lesser need of confirmatory feedback?\*
10. Did animations help you get immersed?
  - a. Why/Why not?



# D

## Image board

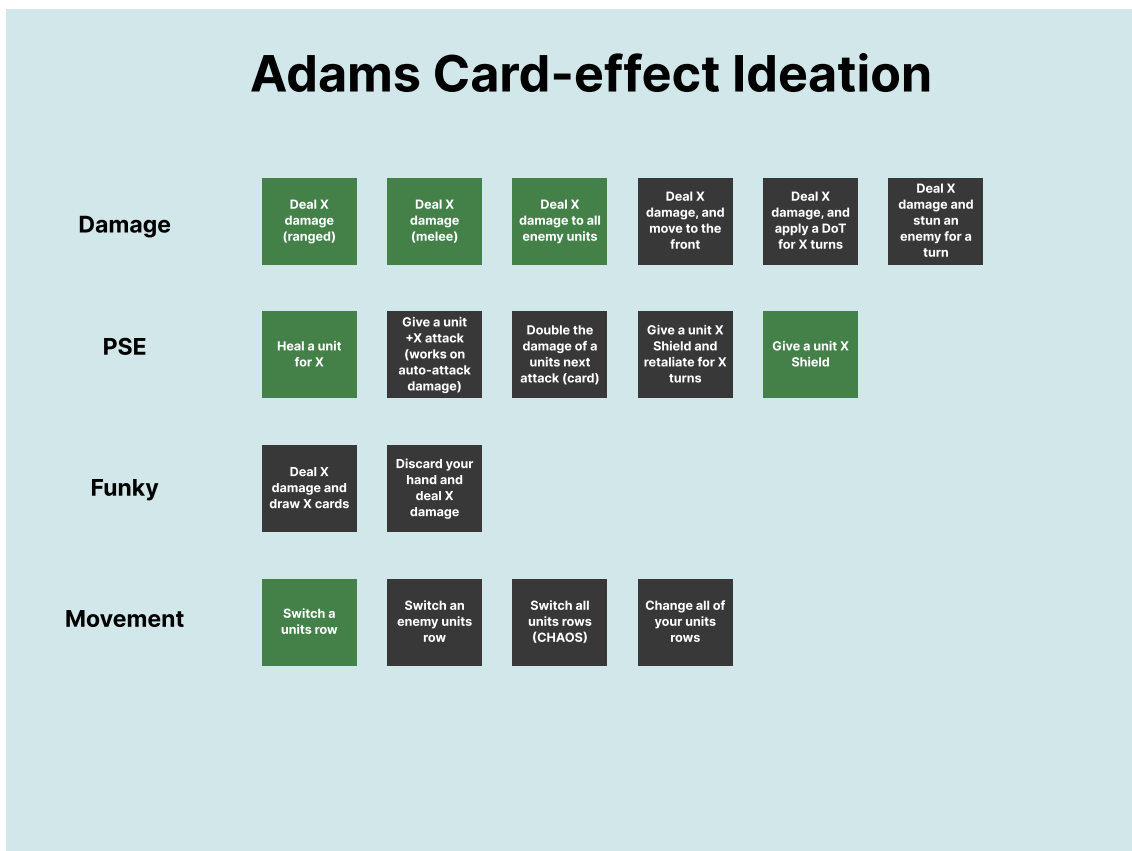
The resulting image boards from the ideation phase.



# E

## Card-effect ideation

The process of generating card-effects, created in Figma.



# E. Card-effect ideation

## Marcus Card-effect Ideation

Sidenotes  
Cards needs categories  
ergo Status effect, attack  
and so on.

<b>PSE</b>	Recover X HP each turn	Recover X HP	Gain X Strength	[Cleanse] Remove all NSE	Gain X Max HP	[Oiga Cleanse] Remove all NSE If it removes an NSE, gain X Strength/AP Draw Card	Retaliation Return X damage when attacked
<b>NSE</b>	Poison Deal X damage each turn	Constraint Next intended action is delayed/cancelled					
<b>Damage</b>	Deal X damage Y times	Deal X damage, if in melee range, deal X*Y damage	If ranged: Recover X HP if melee range: Deal X damage	Switch row If melee (after switch) deal X damage			
<b>Shield</b>	Deal Y damage Gain X Shield next turn						
<b>Cards and AP</b>							Loss X AP Draw Y Cards

## Approved Card Concepts

Heal a unit for X HP each turn for Y turns	Deal X damage Y times to an enemy	Poison / burn (Up to aesthetics) Deal X damage to an enemy each turn, for Y turns	Deal X damage to an enemy, and move to the front row	Deal X damage to an enemy, choose a card to discard
Deal X damage (ranged) to an enemy	Deal X damage (melee) to an enemy	Double the damage of a unit's next attack	Deal X damage and stun an enemy for a turn	
Heal a unit for X	Switch a unit's row	Deal X damage to an enemy, if in melee range, damaged dealt is doubled	Retaliation Return X damage when attacked for Y turns	
Deal X damage to all enemy units	Give a unit X Shield	Spend X AP Draw Y Cards	Deal Y damage to an enemy Gain X Shield	

# F

## UI graphics

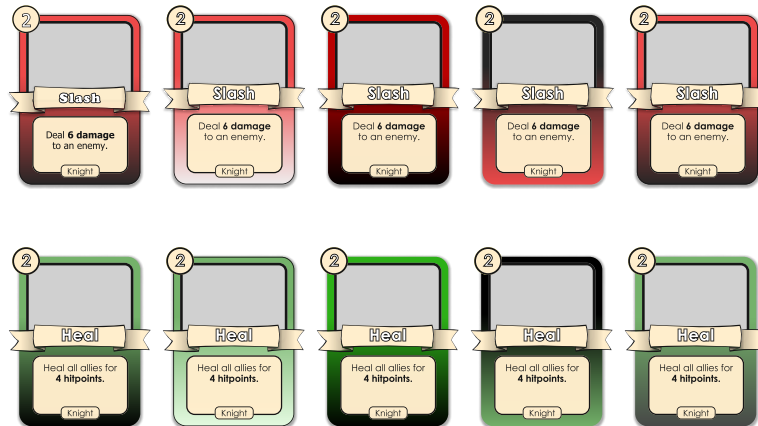
The design inspiration and iterations of card graphics can be seen below.

### Cards



### Card Templates

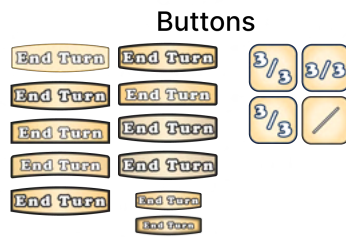
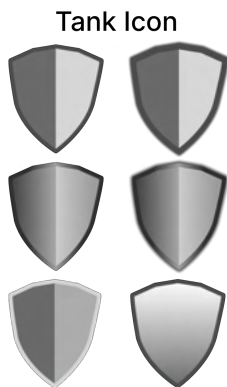
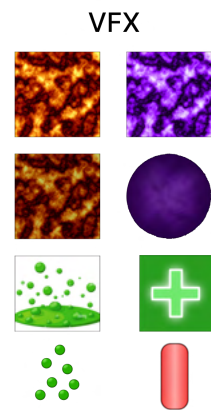
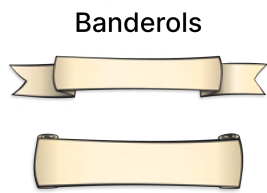
**Fonts**  
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Design iterations



## UI elements - Miscellaneous

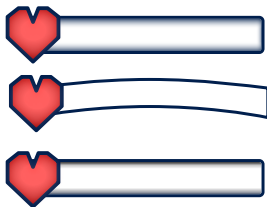


### View Draw Pile



## UI elements - Units

Health Bars



Status Effect Icons



Intents



# G

## Game description and rules

# Descriptive brief for evaluation

## Presentation of study

“”””

*Since January I and Adam/Marcus have been working on our master's thesis in cooperation with Gothenburg based game studio Box Dragon. The project revolves around the player's experience in games within the genre of strategic roguelike deck builders, and especially addresses the user's sense of control and how visual cues impact understanding of the game state.*

*In this study, you will be asked to play through four game scenarios we have created throughout this spring. After each scenario, you will answer a questionnaire about your experience with the game. After all scenarios have been played through, we have prepared an interview about the experience as a whole. Before we start, we want to clarify that you, the player, are by no means assessed or judged based on your proficiency or progress in the game. We are solely evaluating our prototype.*

“”””

## Explanation before dummy scenario

In this training dummy scenario you will get the chance to get acquainted with the system inputs and the general idea of the game. You will get to play the knight unit, one of three playable characters within our game.

**You can go ahead and click on “Training” to proceed.**

We will now explain most of the essential parts of the game.

The game is a turn-based strategy game in the context of a 3 versus 3 scenario, although it is only a 1v1 scenario for the dummy fight. Each turn, you may play cards to perform actions:

- Attack one or more enemies
- Inflict negative status effects on enemies
- Apply positive status effects on one or more allies
- Move one of your characters

### **The design of the cards tells you**

- Cost
- Effect (Descriptive text and what colors signify)
- Designated character (User)

## **Action Points**

To play cards, you need to invest Action Points as seen in the bottom right. Each turn you will have 4 Action Points to spend.

## **Status Effect List**

Above the health bar of your unit, you can see if there are any active status effects on your character. These may be positive or negative, and are described through icons relating to their effect.

## **Rows in the battlefield**

There are two rows units can move between.

The front row acts as a “tank-row”. Regular attacks may only hit units that stand in the front row, protecting units in the back row. Area of Effect, A.K.A. multi-target attacks, may bypass this and hit all enemies/allies.

## **Mechanics / Miscellaneous**

- Each turn you will draw 5 new cards.
- Cards that are not played will be discarded into the discard pile on the right. The decks shuffle.
- The draw pile on the left can be clicked to view cards that may be drawn during the next turn.
- Whenever you want to end your turn you may click the button to the right.
- You may play cards as fast as you want, and end your turn at any point. As soon as the input has been given, the game will respect your actions even if you play fast. With this said, we encourage you to play at whatever pace you are comfortable with.

## **Explanation before real scenarios**

We will now head on with the first scenario. You will now be faced with three enemies but also have three characters to your disposal.

All rules from the Target Dummy Scenario apply to the gameplay. Additionally, you can see the intended actions of your enemies during your turn. This can be seen above their health bar. Intentions display what type of attack the enemies are going to perform and how much damage they will inflict.

Should you have any questions throughout the gameplay, let us know and we will answer to the best of our ability.

We once again encourage you to play at whatever pace you are comfortable with, and may remind you that we are NOT evaluating you, but rather the game.



# H

## Questionnaire results

Results below are extracted from the form participants would fill in after each playthrough of a scenario.

### H.1 Scenario 1

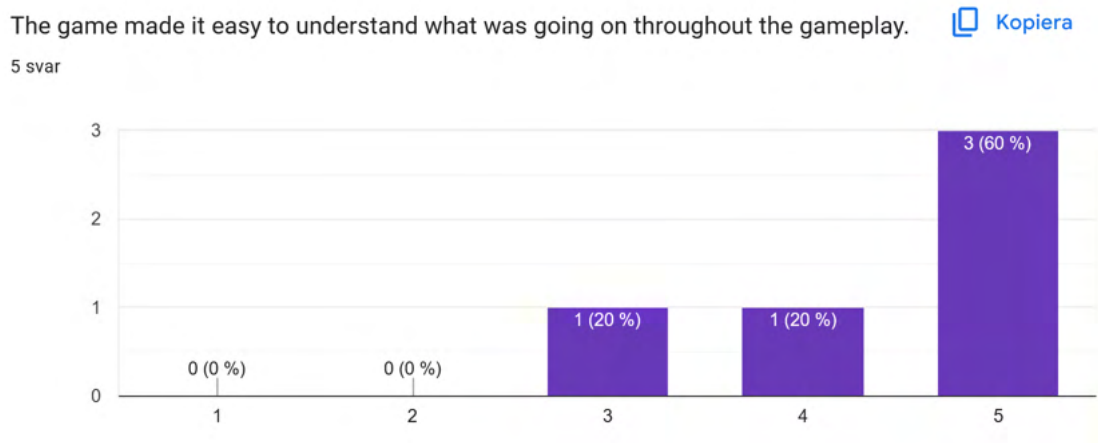


Figure H.1: Perceived understandability.

### H.2 Scenario 2

### H.3 Scenario 3

## H. Questionnaire results

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Visual updates within the game felt responsive.



5 svar

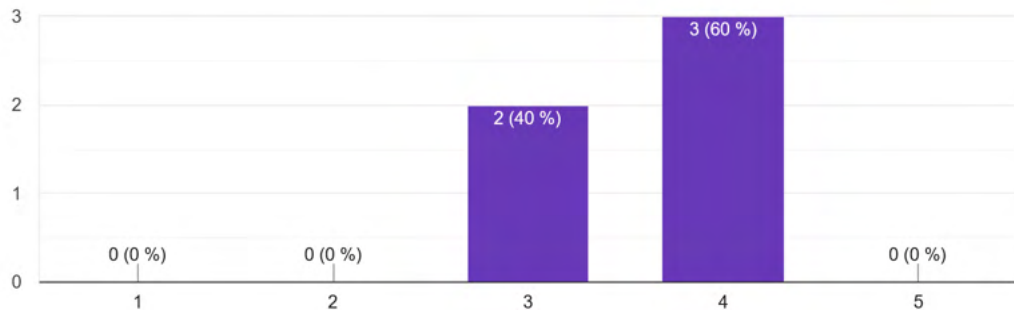


Figure H.2: Perceived gameplay responsiveness.

The gameplay felt fluid and smooth.



5 svar

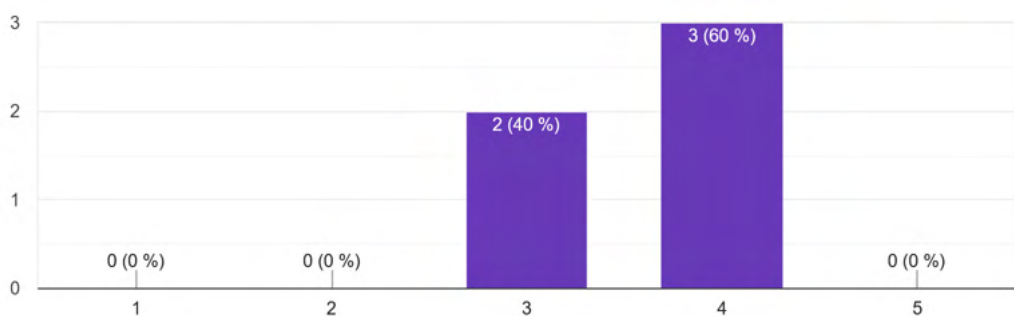


Figure H.3: Perceived gameplay fluidity and smoothness.

The game allowed me to play at any pace I would like.



5 svar

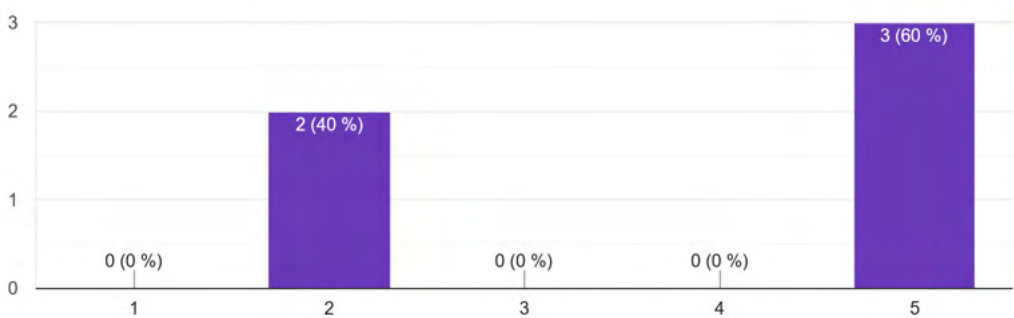


Figure H.4: Perceived gameplay pacing and sense of user control.

The game did what I told it to instantly.



5 svar

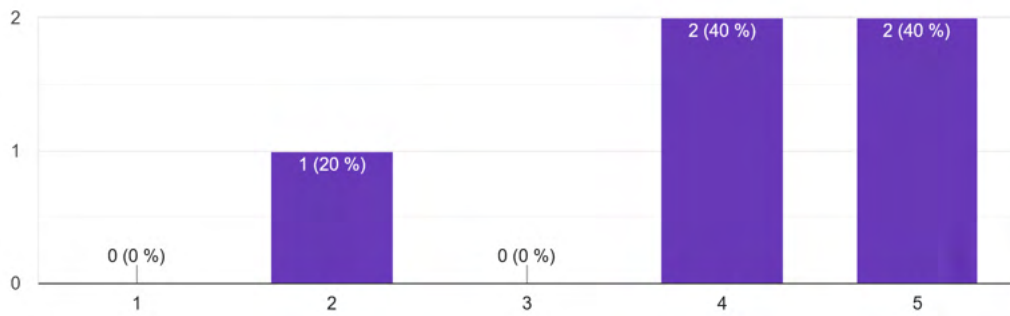


Figure H.5: Responsiveness and user control.

Participant	Understandability	Responsive visuals	Fluidity and smoothness	Perceived Pace	User Control
Participant 1	5	4	4	5	4
Participant 2	5	4	3	2	2
Participant 3	3	3	3	5	5
Participant 4	5	4	4	5	4
Participant 5	4	3	4	2	5

Figure H.6: Results in detail for scenario 1.

The game made it easy to understand what was going on throughout the gameplay.



5 svar

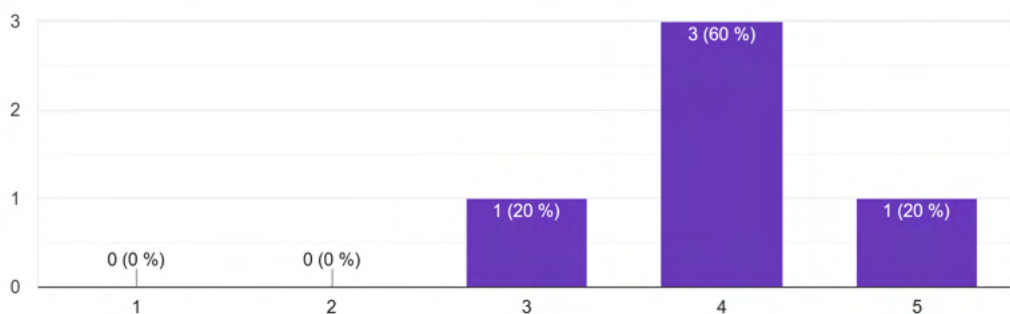


Figure H.7: Perceived understandability.

## H. Questionnaire results

Visual updates within the game felt responsive.

Kopiera

5 svar

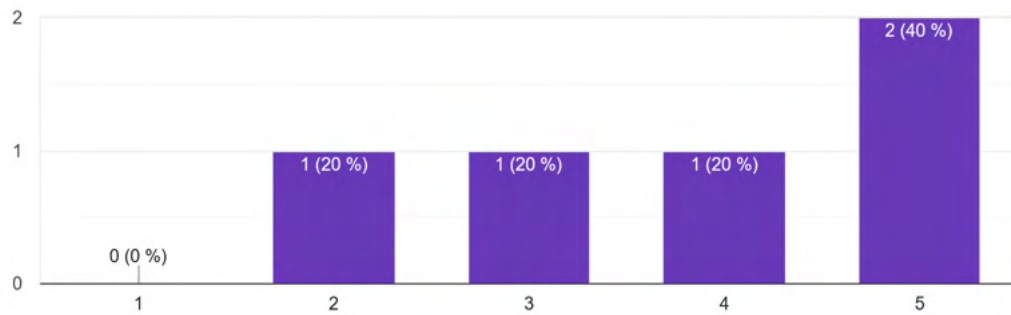


Figure H.8: Perceived gameplay responsiveness.

The gameplay felt fluid and smooth.

Kopiera

5 svar

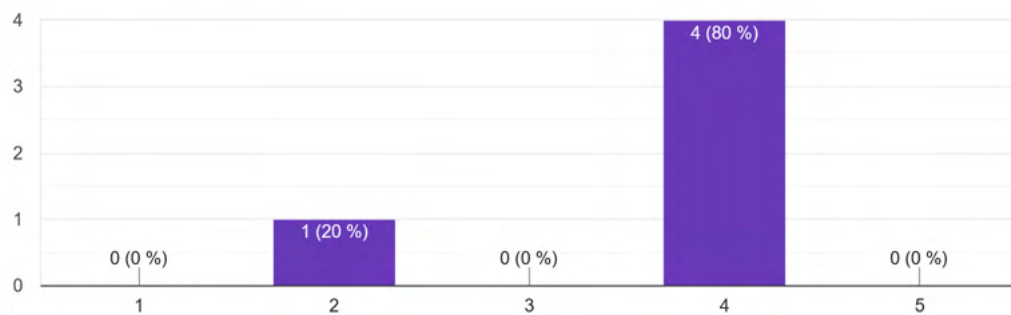


Figure H.9: Perceived gameplay fluidity and smoothness.

The game allowed me to play at any pace I would like.

Kopiera

5 svar

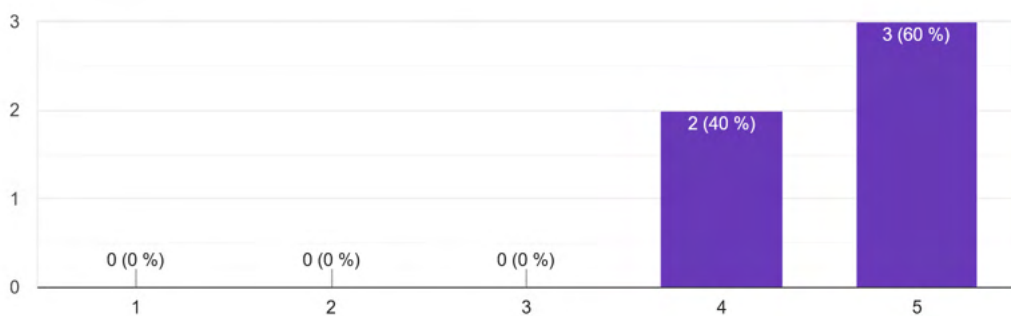


Figure H.10: Perceived gameplay pacing and sense of user control.

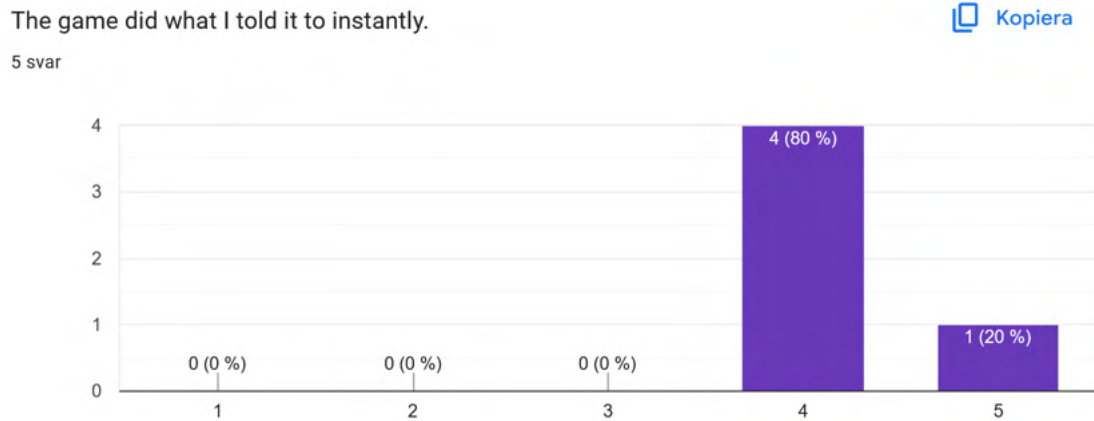


Figure H.11: Responsiveness and user control.

Participant	Understandability	Responsive visuals	Fluidity and smoothness	Perceived Pace	User Control
Participant 1	4	5	4	5	4
Participant 2	5	5	4	4	4
Participant 3	4	3	2	5	5
Participant 4	4	4	4	5	4
Participant 5	3	2	4	4	4

Figure H.12: Results in detail for scenario 1.

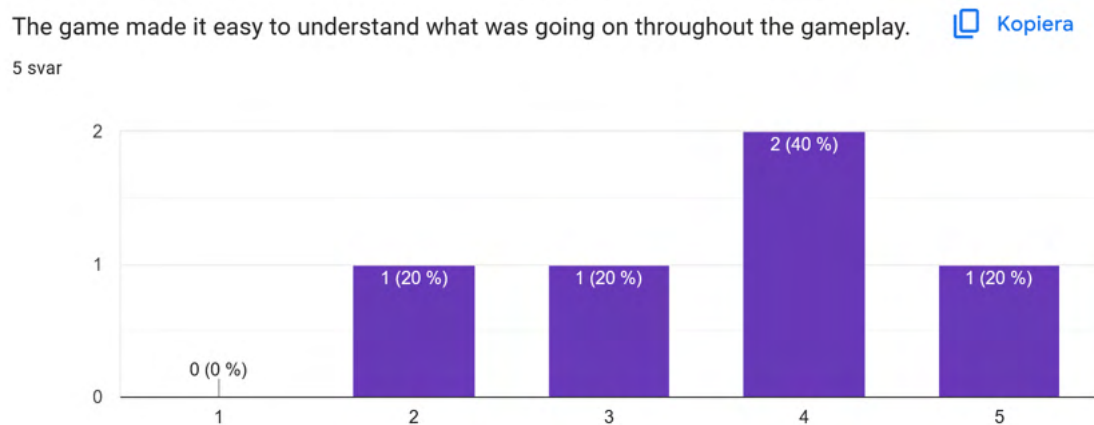


Figure H.13: Perceived understandability.

## H. Questionnaire results

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Visual updates within the game felt responsive.



5 svar

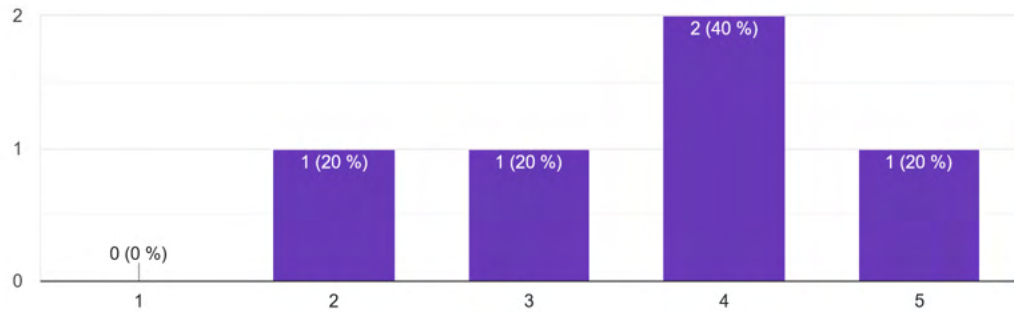


Figure H.14: Perceived gameplay responsiveness.

The gameplay felt fluid and smooth.



5 svar

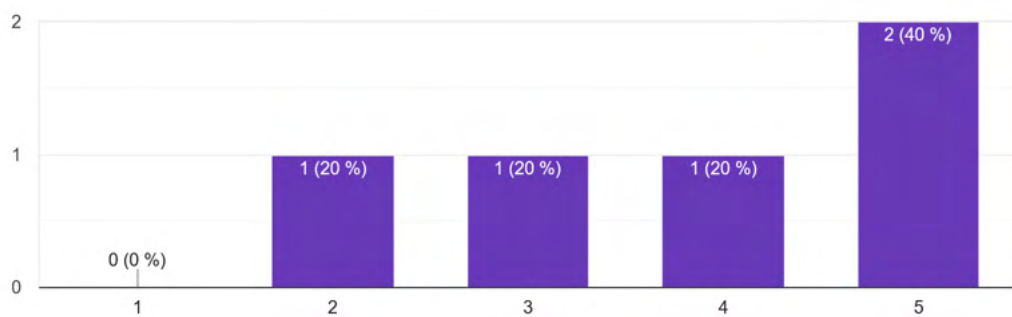


Figure H.15: Perceived gameplay fluidity and smoothness.

The game allowed me to play at any pace I would like.



5 svar

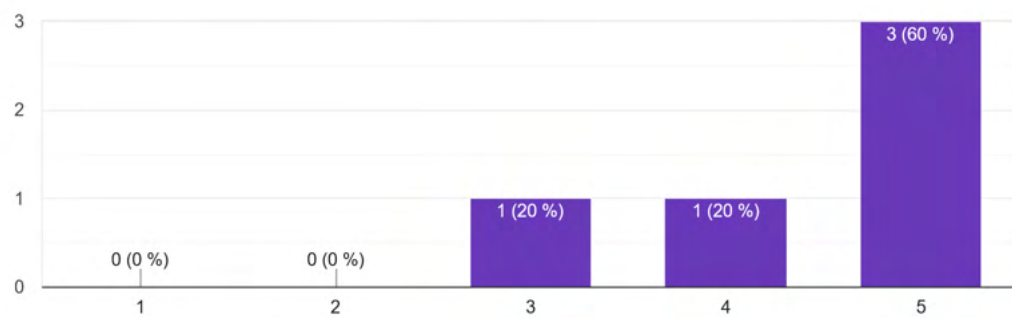


Figure H.16: Perceived gameplay pacing and sense of user control.

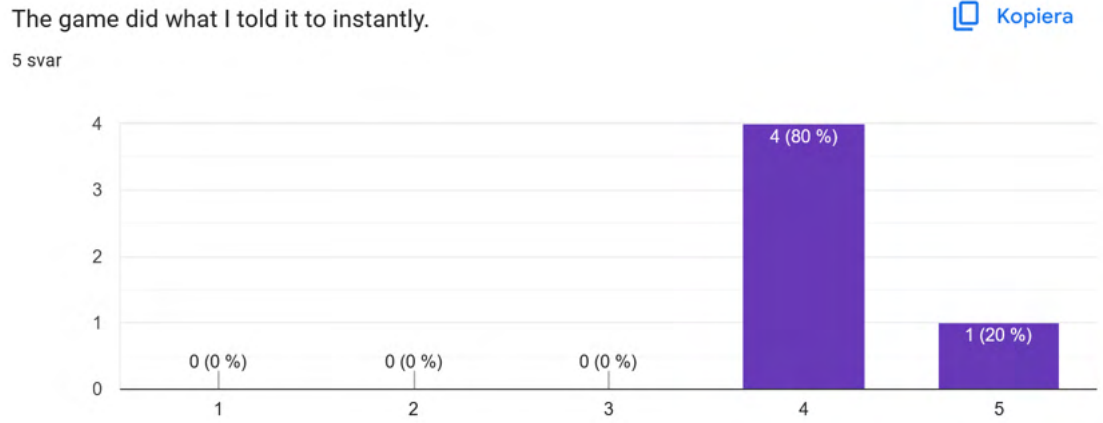


Figure H.17: Responsiveness and user control.

Participant	Understandability	Responsive visuals	Fluidity and smoothness	Perceived Pace	User Control
Participant 1	4	4	4	5	4
Participant 2	4	5	5	4	4
Participant 3	3	3	2	5	4
Participant 4	5	4	5	5	5
Participant 5	2	2	3	3	4

Figure H.18: Results in detail for scenario 1.



# I

## Affinity diagrams

The responses, insights and notions given by each participant was compiled into an affinity diagram. These can be viewed in full in this chapter.

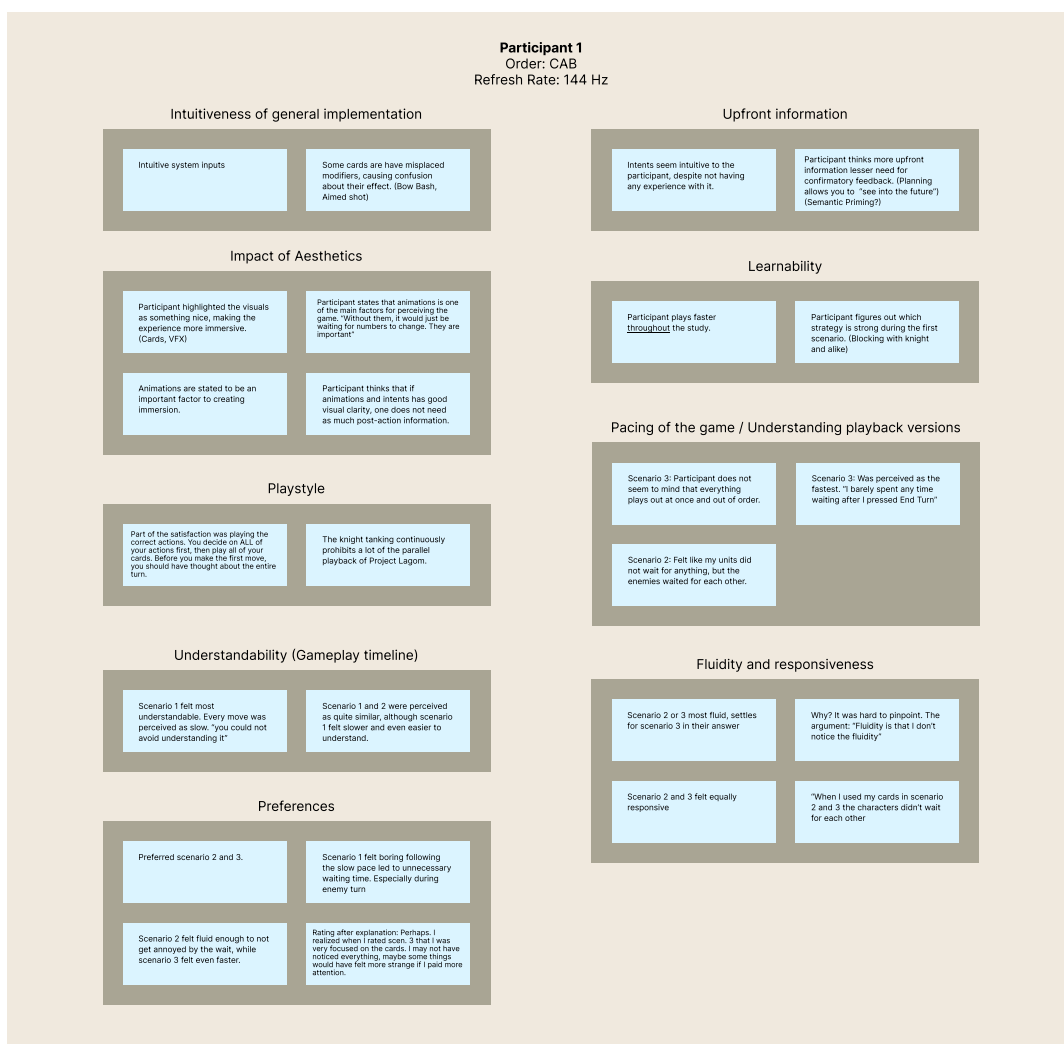


Figure I.1: Affinity diagram of participant 1.

# I. Affinity diagrams

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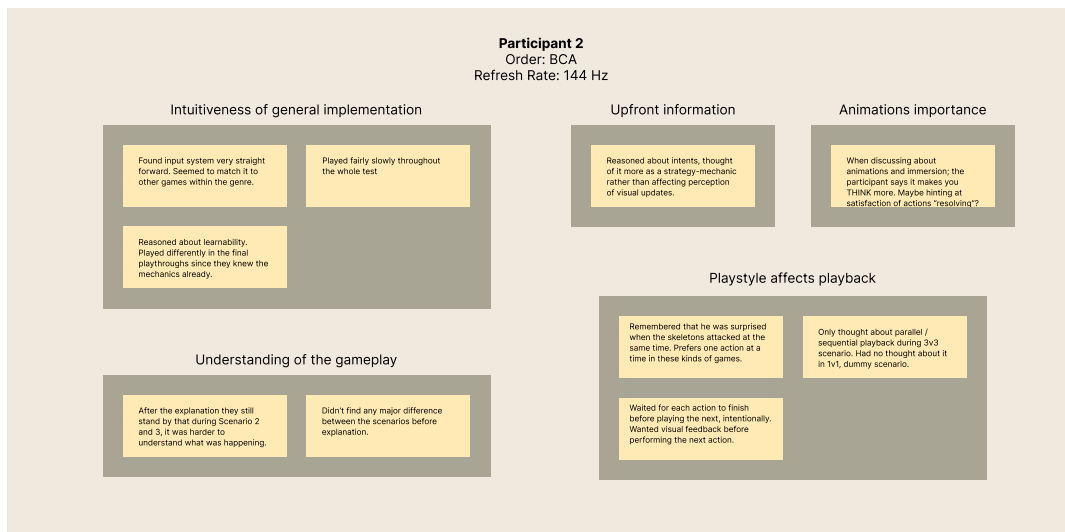


Figure I.2: Affinity diagram of participant 2.

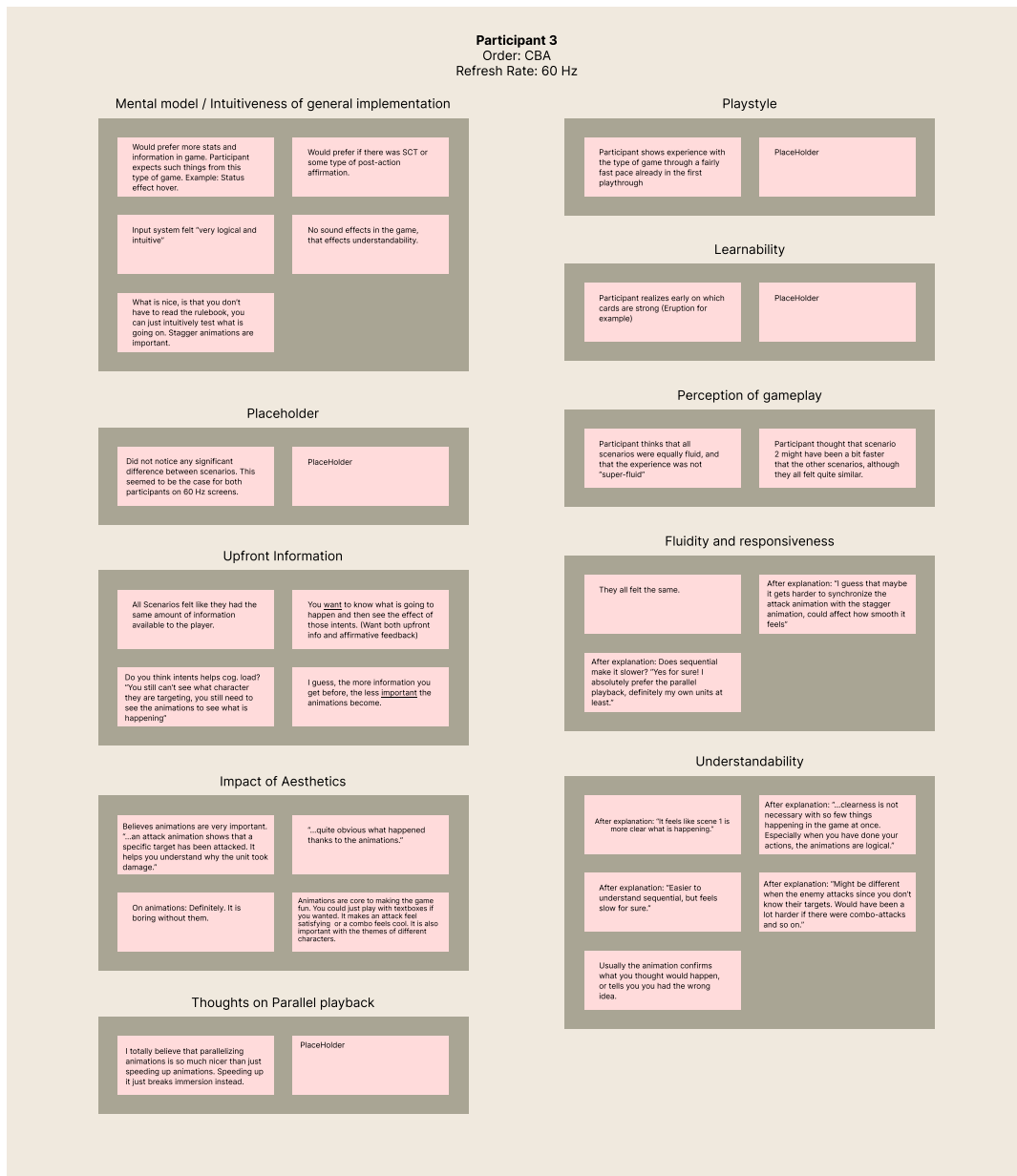


Figure I.3: Affinity diagram of participant 3.

# I. Affinity diagrams

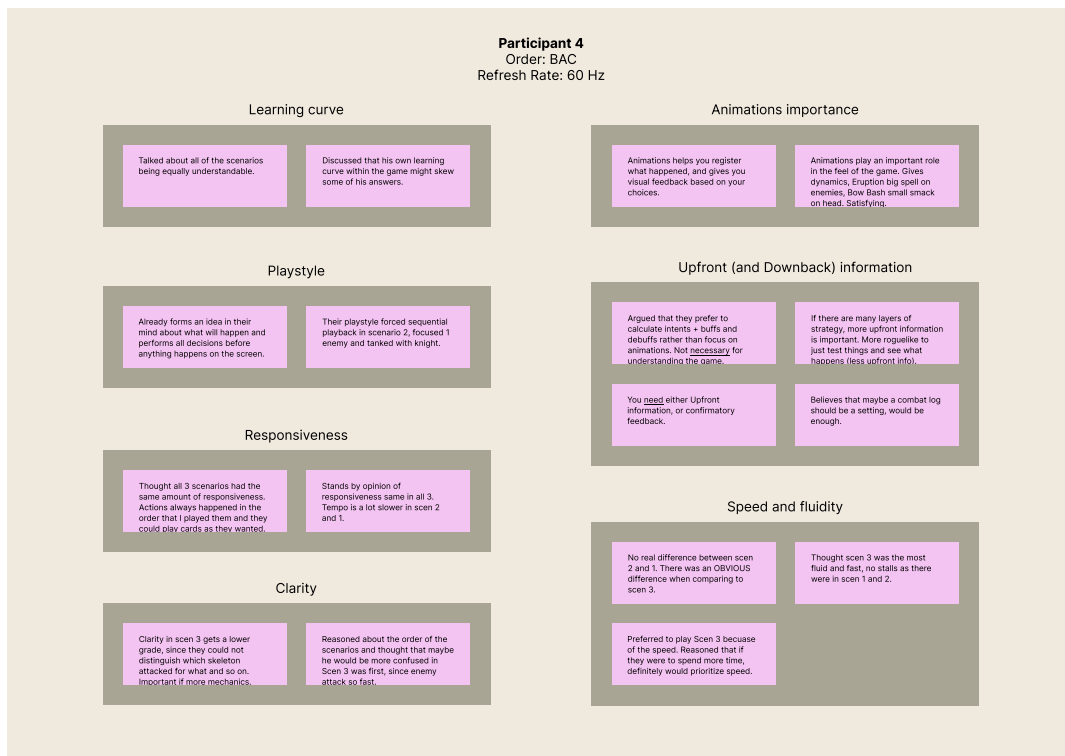


Figure I.4: Affinity diagram of participant 4.

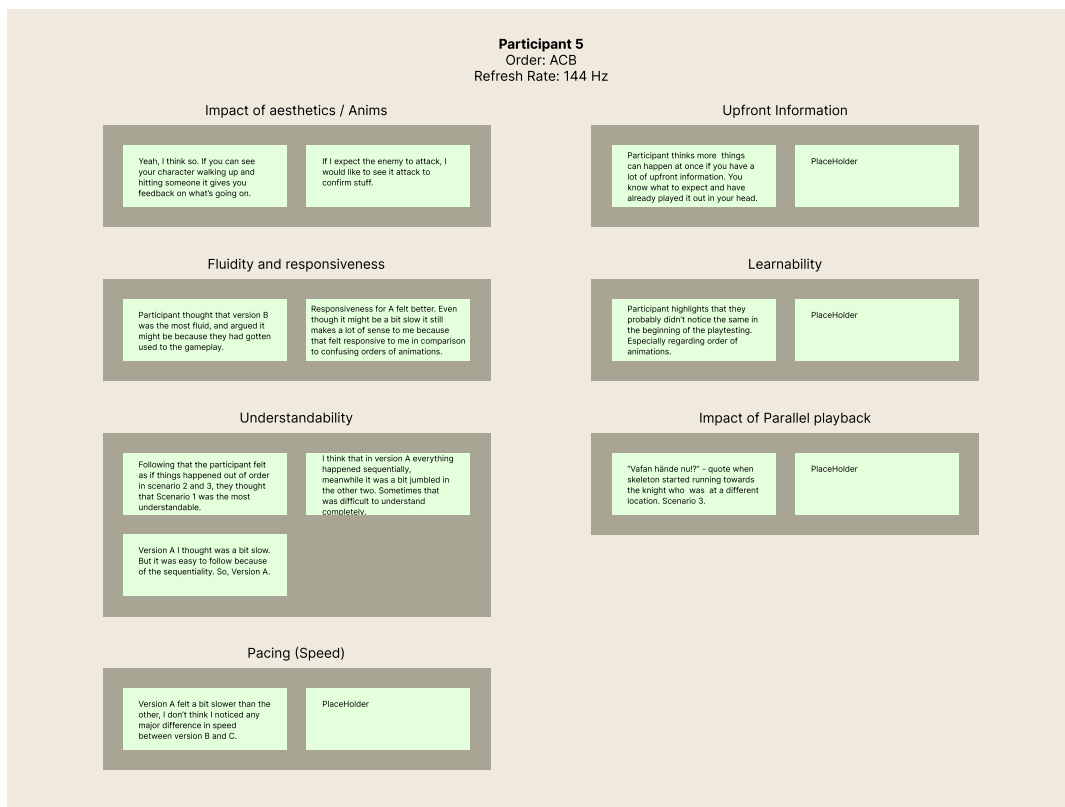


Figure I.5: Affinity diagram of participant 5.

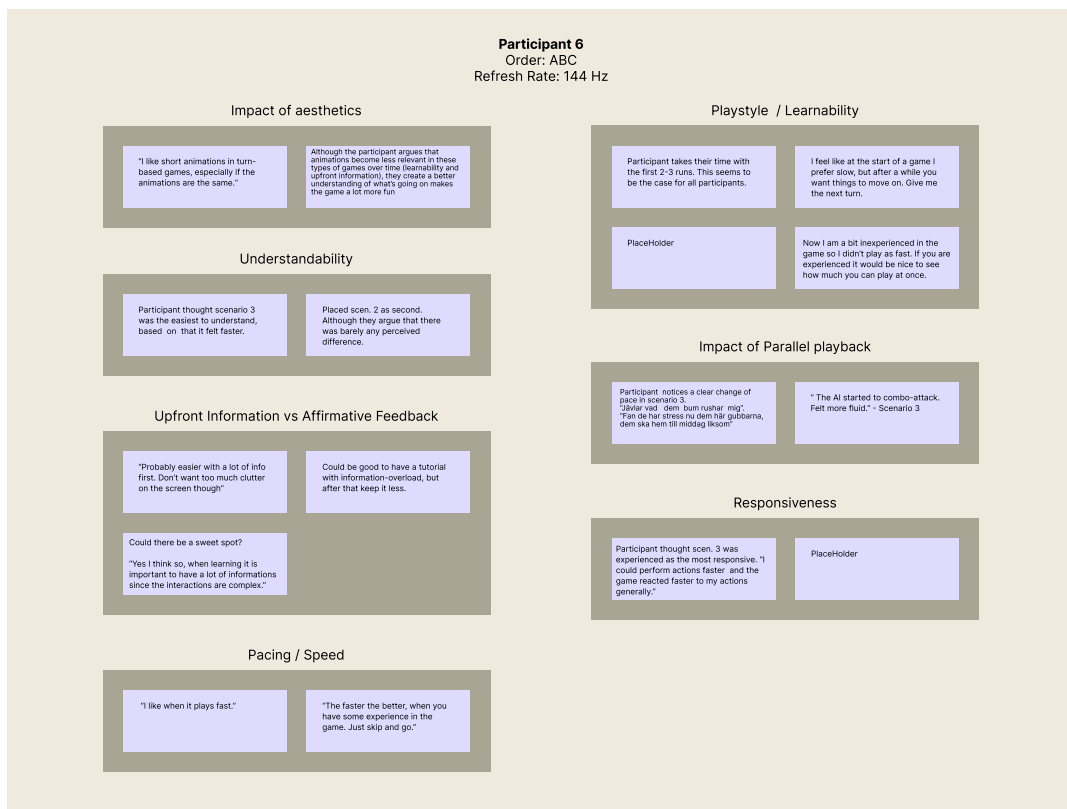


Figure I.6: Affinity diagram of participant 6.



# J

## Control question form

All participants of the study was asked to fill in a number of control questions to affirm that they are suitable participants according to inclusion and exclusion criteria. The template of the form is found below.

# Questions for the participant

After you have been briefed about the study and what this project is about, you will get asked to fill in some answers to a few introductory questions. These questions are found in this form.

The form also includes a consent form for participation in the study. More information about what you can expect is found on the next page.

\* Anger obligatorisk fråga

## Consent form

I understand that my responses will be available through a publicly published thesis report. I understand that the consent form will be kept separate from the data records to ensure confidentiality. I understand that I may choose not to participate or withdraw at any time during the study. Furthermore I understand that responses I give are anonymous.

I understand that upon completion, I will be given a full explanation of the study. If I am uncomfortable with any part of this study, I may contact any of the researchers from the group, Adam Rohdell and Marcus Neidert.

I understand that I am participating in a study of my own free will.

## Consent to participate

I acknowledge that I am at least eighteen years old and that I understand my rights as a research participant as outlined above. I acknowledge that my participation is fully voluntary.

1. \*

*Markera endast en oval.*

I consent to participate in the study

I do NOT consent to participate in the study

2. Today's date \*

---

*Exempel: 7 januari, 2019*

3. Email:

Your email is stored for us to send compensation for your participation.

---

4. What is your age? \*

*Markera endast en oval.*

< 20 years

20-25 years

26-30 years

31-35 years

> 36 years

## Participant Questions

In this section, you will find a number of questions about your history with and interest in games that relate to our project.

5. Are you familiar with the genre of strategic roguelike or deck builder games? \*

*Markera endast en oval.*

Unfamiliar

1

2

3

4

5

Well-versed

6. Do you have interest in the genres mentioned? \*

*Markera endast en oval.*

Uninterested

---

1

---

2

---

3

---

4

---

5

Very interested

---

7. Below are a number of game titles within the genre of strategy, roguelike and deck builder. Which, if any, of these have you played? \*

If you have played other titles that might be relevant please write them in the last input field.



Markera alla som gäller.

- Slay the Spire
- Heroes of Might and Magic
- Hearthstone
- Civilization
- Monster Train
- I have no experience with games within the genre
- Övrigt: \_\_\_\_\_