Exploring the Design Space of Analogue-Digital Hybrid Boardgames Using a Player-Centric Approach

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“Keep playing games. Make time to play games with your friends and family, because it’s surprisingly heartbreaking to wipe a thin layer of dust off a game you love, before you put it back on the shelf because the real world is calling you.”

- Wil Wheaton

Abstract

This thesis contributes to the growing literature of boardgames research through an exploration of analogue, and analogue-digital hybrid, boardgame play. Despite increasing interest and research into analogue games, there is still a considerable gap in the understanding of boardgame players and their experiences of play. Research presented throughout this thesis first provides an understanding of boardgame immersion—a trait of player experience which could potentially benefit from technology—both detailing the experience itself, and factors which contribute to it. Second, there is a narrower focus on a sensory element—a soundtrack—found in many hybrid boardgames, and its positive effects to boardgame play. And finally, a taxonomy for future analogue-digital hybrid boardgame design and research is constructed from a study of how boardgame players envision their ideal hybrid boardgaming experiences. All of these studies explore, and widen, the design space of fully analogue, but especially hybrid, boardgames through providing a deeper understanding of facets of player experience which could potentially benefit from the inclusion of technology in a boardgame.

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Working from home for most of my PhD, the one person who has seen me at my best and my worst

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Declaration

I declare that this thesis was composed by myself, that the work contained herein is my own except where explicitly stated otherwise in the text, and that this work has not been submitted for any other degree or processional qualification except as specified. Parts of this thesis have been published previously in the following conference papers:

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Chapter 1

Introduction

1.1 Motivation and Research Questions

This thesis is an investigation of the analogue-digital hybrid design space, explored through various facets of boardgame player experience. Boardgaming is a popular hobby, and there is increasing interest in the characteristics of analogue games (Woods, 2012; Booth, 2016; Sousa and Bernardo, 2019; Arnaudo, 2018), alongside their players (Rogerson et al., 2016, 2017a,b; Rogerson, 2018; Kosa and Spronck, 2019, 2022). Similarly, the augmentation of analogue games with technology is increasingly prevalent, both in commercial examples (Burrell-Saward et al., 2022; Cicurel, 2018; Buckenham and Fleetwood, 2016; Valens, 2016) and as a concern of researchers (Rogerson et al., 2021b,a; Kosa and Spronck, 2018b; Jensen et al., 2020; Kankainen and Paavilainen, 2019). Whilst substantial research has been conducted to understand facets of video game player experience (Brown and Cairns, 2004; Cairns and Cox, 2008; Cairns et al., 2014; Denisova et al., 2016; Bopp et al., 2016; Birk et al., 2016; Allison et al., 2015), there is still a limited understanding of boardgame players' experiences during boardgame play; how various factors affect these experiences; and, how boardgame players envision their own ideal experiences, especially in analogue-digital hybrid play.

Whilst boardgames are inherently games, and therefore share some core characteristics with video games and other playable experiences, they have their own distinctive features. Similarly to video games, boardgames often feature complex game-worlds and narrative elements as well. When compared to video games, however, these features are delivered through material components, static artwork and text. Whilst in some cases technology—often through a digital app—is utilised to aid world-building and narrative, these examples are still in the minority. Boardgames, on the whole, enable tangible interaction

with material components, and are played in a double shared space of a physical environment and an in-game environment, most often with others in the same room. Video games, on the other hand, provide continuous multi-sensory stimuli through moving image and audio, often as a solitary experience (at least in the physical space). The variety in shared and differing affordances imply potentially unique aspects of the resulting boardgame player experience, when compared to video game play.

The main motivation behind the research presented in this thesis was to address these gaps through gaining a better understanding of the experiences of boardgame players in analogue, and analogue-digital hybrid, play.

I ask and investigate the following three research questions through this thesis:

- Do boardgame players experience immersion—a substantial aspect of video game player experience—and if they do, how does it differ from video game play?
- How does the inclusion of a soundtrack—a common feature of both video game experiences and hybrid analogue-digital boardgames—affect the experience of boardgame play?
- And, how do boardgame players envision future analogue-digital hybrid boardgames, without the constraints of the current known capabilities of technology?

I answer these questions through three research studies—conducted with boardgame players and adapting both qualitative and quantitative methods—presented in Chapters 3, 4 and 5.

1.2 Document Structure and Contributions to Boardgames Research

Chapter 2 provides context in which this thesis resides by a review of relevant boardgames research literature to-date, an overview of various theories of immersion in other media, and a closer look into analogue games with a technology component, both in research and in a commercial setting.

In Chapter 3, I contribute an overview of boardgame players' subjective experiences of immersion, alongside player-described conditions which both facilitate the immersive experience, or hinder it, presented through a Spectrum of Immersive Experiences and a Matrix of Conditions of Immersion. This research "sets the scene"—so to speak—for the following two, more technology focused studies, by first focusing on a more generalised trait of player experience, such as immersion.

In Chapter 4, I present empirical evidence that a soundtrack enhances the experience of boardgame play significantly, when compared to the experience of playing without. Additionally, I contribute the term

and definition of *thematicness*, as a potential measure to discuss and assess the thematic capabilities of a boardgame. Both of these findings could potentially be useful when exploring the additional sensory capabilities technology can bring to boardgame play.

In Chapter 5, I contribute a Taxonomy of Analogue-Digital Hybrid Boardgame Design, through the analysis of participatory design research I conducted with boardgame players. The taxonomy details how boardgame players envision interacting with boardgame components as connected devices or components which can trigger technology; what effects players envision these interactions trigger; and, what happens between interactions and effects as an intermediary processing step. The taxonomy's potential usefulness lies in an understanding of players' ideas of analogue-digital interactions and the desired effects these interactions enable, potentially prompting and aiding future designs of hybrid boardgames.

Finally, Chapter 6 concludes the thesis by discussing how the research studies detailed in preceding chapters—and the ideas and theories generated from them—relate to each other and the wider context of boardgames research.

1.3 Methodology Overview

One overarching focus of this thesis was to gain a better understanding of boardgame players' experiences. Therefore, all three studies presented in further chapters had a qualitative component. On the surface, the qualitative analysis approaches may seem similar—or even interchangeable—with one another. However, each of the three qualitative approaches selected had strengths, which made them more suitable for their respective purposes when compared to each other or other methods.

For instance, the investigation of the concept of immersion in boardgame play started with the open question of what immersion was in boardgame play. The main goal was to construct new theories, or theoretical frameworks, from players' lived experiences and to understand why certain factors have influenced these experiences. Therefore, a *Constructivist Grounded Theory (GT)* approach, as defined by Charmaz (2014), seemed most fitting for the purpose. This version of GT is an interpretative and systematic approach that allows for constructing robust theories and frameworks that are grounded in data—hence the name.

There are a number of different versions of GT—each slightly different—first credited to authors Glaser and Strauss (1967), who outlined the method in their 1967 book, *The Discovery of Grounded Theory: Strategies for Qualitative Research*. One dominant difference between Glaser & Strauss' original and

Charmaz's adaptation is the role of the researcher. In the original approach, theories are "found" in data. Charmaz, on the other hand, advocates for a more proactive role of constructing theories through interpretation and through the researcher's knowledge of the domain that is being researched. Another distinction of the constructivist approach is its relationship with context. As opposed to other forms of GT, including the original, existing research and theories are taken into account to a greater extent. Still, research starts without a hypothesis and without extensive reliance on pre-existing literature. In other words, it is less to prove a pre-existing theory and more to construct a new one.

These concepts fitted well with the boardgame immersion study since there were no pre-existing works that defined boardgame immersion, at least not from an experiential standpoint. There were, however, many studies concerned with video game immersion. The knowledge of these studies was not used to form a hypothesis. They, however, provided an important wider context in which the constructed theories could be later situated. Additionally, Grounded Theory was already used in video game player experience research with much success. One of the most influential—and most cited—video game immersion papers, *A grounded investigation of game immersion* by Brown and Cairns (2004), used GT with great success, demonstrating that the method was highly suitable for player experience research.

A standout feature of all GT methods is simultaneously analysing data whilst also collecting further data. Early, open coding and close interpretation of people's lived experiences informs further data collection, or *theoretical sampling*, until the researcher reaches *saturation*—meaning that no new concepts can be extracted from additional sources—after which data collection ends. After reaching saturation, the researcher moves onto a more *focused* coding phase, with the purpose of "grouping" the looser, open codes into tighter, overarching categories.

Another factor that lent itself to this method was the abundance of found data on specialist boardgaming forums. Players were actively engaging in online discussions of the topic, which produced more than enough material for multiple rounds of theoretical sampling. Grounded Theory is one of the most rigorous—and, as a result, time- and resource-consuming—qualitative approaches. As securing new participants continuously was not a concern due to readily available data streams, there were no resource constraints that needed to be taken into account.

If the immersion study was the open exploration of a phenomenon, the second study—examining the effects of a soundtrack on boardgame play—adopted a more zoomed-in approach. It started with the hypothesis that a soundtrack would positively affect boardgame player experience and therefore required different methodologies. Having a hypothesis, alongside clear variables, made this inquiry more suited for

quantitative approaches. Still, the emphasis was not just to quantify whether the presence of a soundtrack made a difference to the experience, but also to understand how the resulting experience was perceived by players. Since the qualitative component in this study was complementary to the quantitative (for which a standardised player experience survey was selected, detailed more in Chapter 4), the additional complexity GT afforded was not required here. Therefore, *Reflexive Thematic Analysis (RTA)*, as defined by Braun and Clarke (2021), was selected as the most suitable approach for a number of reasons.

As with Grounded Theory, there are many various strains of Thematic Analysis (TA) used by researchers across disciplines. RTA is distinguished from other forms of TA in that it does not have a code book and that themes do not emerge but are identified through analysis and the researcher's preceding knowledge and experience with the subject matter. This aspect of RTA is similar to constructing theories in GT. However, in contrast to the *inductive* GT approach in the immersion study, a *deductive* approach to TA was followed, which better suited the study as the hypotheses and the results of the quantitative analysis influenced the approach of engaging with interview data. The goal was to gain deeper insight into the "how" questions, complementing the "what" questions of the quantitative part of the study. As the quantitative results immediately highlighted the areas of concern during the experiment, the follow-up semi-structured interview questions were adapted to highlight these areas during the data collection process.

As participants experienced the different conditions of the study in a controlled experiment, GT was not suitable, as the crucial step of *theoretical sampling* would not have been possible. RTA has many of the benefits of GT, such as a detailed, interpretative coding process, alongside a final pass of refining themes. It is, however, less resource-dependent without the theoretical sampling phase and less systematic when compared to GT overall, making it more approachable as a complementary method within mixed-methods research.

For the third—and final—study, neither GT nor RTA was revisited as the qualitative method. As with the immersion study, only a qualitative analysis approach was needed. This was because it moved away from the condition-based, hypothesis-defined nature of the second study. The focus, as with immersion, was on open exploration. However, as opposed to constructing a theory based on a phenomenon, the goal was to extract and categorise information. *Content Analysis (CA)*, therefore, lent itself to this inquiry well.

Not surprisingly, there are many versions of CA as well. According to Krippendorff (2004), the first methodological overview of Content Analysis was credited to Berelson's *Content Analysis in Commu-*

nications Research, published in 1952. The method was largely quantitative at the beginning, used in journalism and political sciences. Going forward, the emergence of data-processing and word-processing software enabled the large-scale analyses of textual data. At the same time, more qualitative-focused approaches surfaced, most notably in the social sciences. One difference between these approaches is the role of the analyser. Qualitative approaches extract information from texts manually, requiring close examination of text-based material. For the third study, the qualitative CA approach outlined by Mayring (2022) was followed. Most qualitative CA methods—Mayring's included—differ from Grounded Theory and Thematic Analysis by requiring a "strictly rule-based" and theory-rooted approach.

Another notable difference is CA's requirement for inter-coder agreement. This means that a second coder is required to analyse all—or a portion of—the data set. Similarly to GT, it is a systematic approach. Where it largely differs, however, is that the material analysed needs to be "embedded" in its context. Units for analysis also need to be determined beforehand, and the researcher starts analysis with pre-determined theories. Qualitative CA can be inductive or deductive. A deductive approach, in this case, means that predetermined theories assist category formation. An inductive approach—similarly to constructivist GA—forms categories by extracting them from the textual material. The approach used in the third study was what is called "inductive category formation". However, when compared to the GA approach in the immersion study, there is less emphasis on interpretation. This was well-suited for the third study, since the overall goal was the creation of a taxonomy. The categories were already present in the textual data collected by players. First, the initial categories needed to be extracted. Then, categories that had similarities were grouped together into larger, more overarching categories. The difference between this approach and the other two methods was that smaller categories still formed part of the resulting taxonomy. As opposed to final themes, such as with Thematic Analysis, here the hierarchy between various smaller categories, alongside various larger categories, formed the resulting report.

In summary, Grounded Theory was used to interpret players' experiences and construct theories of immersion from them. Thematic Analysis was used to understand more subtle differences between how players experienced three conditions. And finally, Content Analysis was used to categorise the various potential functions of technology within boardgame play and as a means to illustrate the relationships between these categories.

1.4 Ethics Statement

All research presented in this thesis adhered to ethics guidelines set by Goldsmiths, University of London, and went through the formal ethics approval process. Approval was granted by the Department of Computing for the study in Chapter 3 in March, 2019; for the study in Chapter 4 in January, 2021; and for the study in Chapter 5 in June, 2022. Furthermore, all participants received detailed information regarding their participation, were notified that their participation is voluntary, and that they have the right to withdraw and have their data excluded from analysis. All participants signed an informed consent form as a requirement for participation, and all research data was anonymised and stored in encrypted folders on a Goldsmiths, University of London provided OneDrive, alongside personal computing hardware during analysis.

This thesis is mainly concerned with the experience of boardgame players during play. Therefore, concepts popular in video games research—such as immersion—are explored in relation to boardgaming. Researching the concept of immersion brings with itself a number of important ethical considerations. According to Slater et al. (2020), *super-realistic* virtual environments could impose persuasion and deception on participants. However, these concerns are strongly linked with immersive technologies—such as Virtual Reality—where the user's sensory input feed is exchanged for a virtual one. Boardgames, in their current form, do not have these sensory capabilities, nor can they produce the amount of realism VR can. Immersion happens at a more cognitive level of boardgaming, where users remain in the real world and continue experiencing sensory input from the real world.

Whilst the current state of technologies sometimes accompanying boardgaming experiences do not have the necessary realism and/or isolation capabilities to create suggestible states for players, it is possible that this may change in the future. Therefore, it is important to consider users' well-being—both physical and mental—when thinking about future hybrid designs. While it was not considered likely that concepts and findings of this thesis could be used to create designs that imposed physical or mental harm, future work should maintain an aim to avoid this possibility.

Finally, accessibility was also considered when designing the studies presented in this work. The term *accessibility*, in this case, refers to design considerations taken into account in ensuring that a product—in this case, a game—can be used, and enjoyed by, all users regardless of physical and/or mental abilities or disabilities. I believe that any research and/or design with accessibility considerations, should be done with participants with accessibility needs. Regrettably, this thesis had neither scope, nor the necessary

expertise to approach the topic. However, I urge boardgame designers—and future research that may be conducted based on this thesis—to explore how the ideas presented here could be made more accessible to all users.

Chapter 2

Background

This chapter provides contextual background in which boardgame player experience can be situated. It is divided into four sections. First, boardgames are defined for the purpose of this thesis, including alternative terminology used to describe the same medium.

Next, an overview of the current state of boardgames research is provided, helping position this thesis and its contributions within a wider academic context.

Moving forward, there is an exploration of the concept of immersion, a shared phenomenon experienced across media and games. As immersion is a highly debated concept—with many conflicting definitions—the purpose of this section is to navigate through these definitions while exploring its relationship to player experience. Further, this section helps situate the research study presented in Chapter 3 within a wider context of immersion research.

Finally, we investigate the relationship between analogue and digital, through exploring analogue-digital hybrid boardgames. This section will include an overview of what hybrid boardgames are, how players feel about the inclusion of technology in analogue experiences, and why boardgames are not just suitable, but could also potentially benefit from, embedded technology. This is through an exploration of the characteristics of these games, alongside their differences and similarities to digital games, in their sensory and narrative capabilities.

2.1 Defining Boardgames

Boardgames—also known as board games, tabletop games or analogue games—refer to a centuries-old form of play, with none of their respective names truly describing what they are. Some examples of these

games have no board (Roudy and Sautter, 2017), are not played on a tabletop (Gerding and McCoy, 2013) or are not fully analogue due to incorporated technology (Cicurel, 2018; Kotry, 2014; Valens, 2016).

Elias et al. (2012) states that while many different approaches exist in defining what a game is, whatever is commonly accepted as a game by its players is a game, regardless of definitions. Similarly, regardless of whether an analogue game is truly analogue or whether it has a game board, enthusiasts and publishers agree whether a title is a boardgame or not. This is reflected in titles earning a place on BoardGameGeek (2019a), an entirely user-run boardgame database, respected and used equally by players and industry (Timmel, 2019).

Going forward, any game that has been classified either by its publisher or its players as a board, tabletop or analogue game will be considered as such. However, for a more general understanding, some of the most common features of these games are: being sold packaged in a box (or similar physical packaging), featuring physical components—such as cards, dice or other game-pieces—and are most commonly played by one or more people in a shared environment.

2.2 An Overview of Analogue Games Research

The interest in researching boardgames is cross-disciplinary, ranging from anthropology to as far as artificial intelligence. Many researchers are concerned with the ancient origins of boardgames discovered through archaeological digs (Sebbane, 2001; Whittaker, 2005), their development and role in society through the course of history (Parlett, 2018; Bell, 1979), and most recently, investigating controversies such as representations of colonialism (Sedelmeier and Baum, 2022; Borit et al., 2018) as a common theme across popular titles, aiming to "raise awareness about how these games (mis)represent colonial realities and relations." (Borit et al., 2018, 1).

There is often a divide between *classical*—such as Chess or Go—and *modern* boardgames, where the transition into the latter, according to Schreiber (2011), is often associated with the release of *The Settlers of Catan* (Teuber, 1995). Figure 2.1 illustrates a typical modern boardgame, which are defined by Sousa and Bernardo (2019) as:

> *"...commercial products, created in the last five decades, with an identifiable author or authors, with original mechanics design and theme, with high quality components, created for a specific public. We can consider MBG to be the same as Hobby board games..."* (Sousa and Bernardo, 2019, 77)

Figure 2.1: *Spirit Island—designed by R. Eric Reuss and published by Greater Than Games—is a great representative of a modern boardgame. Picture provided by, and used with permission of, More Games Please.*

Both classical and modern boardgames are used in video games and artificial intelligence (AI) research, where AI systems are often tested in their ability to solve historically difficult classical games (Silver et al., 2016; Browne et al., 2012). According to Chaslot et al. (2008), modern boardgames are also gaining popularity in AI research due to their characteristics of increased randomness or variation in player powers, amongst others. Most recently, an AI research group dedicated to the analytics of modern tabletop games was formed, with the aims of AI agents capable of handling and adapting to the complexities of modern boardgames, such as co-operation or hidden information (Gaina et al., 2020; Balla et al., 2023). Their framework—*TAG*—can utilise algorithms such as Reinforcement Learning to test games, as well as AI agents, with 20 modern tabletop games already in its database—including notable titles such as *Pandemic* or *Terraforming Mars*—providing new avenues for research, more human-like opponents in digital adaptations of physical games, and aiding in the testing and balancing of new tabletop game designs. Whilst these works offer great advancements in the capabilities of AI, and in widening the understanding of boardgames as systems, they offer little in terms of understanding the experiential side of boardgaming. Understandably, players, and the rich culture of boardgaming as a hobby, are not the focus of attention. Boardgames themselves are seen more as a tool—or, a problem to be solved—as opposed to the facilitator of experience.

Outside of AI research, there is a growing number of dedicated publications related to boardgaming, in various contexts.One notable example of a dedicated boardgame publication is *Analogue Game Studies*, a curated journal concerned with all games that have substantial analogue components, which is currently in its tenth volume (Trammel et al., 2023). This is an extensive publication which entertains many facets of boardgaming as a hobby. Hovewer, articles are more conceptual think-pieces, and there is a notable absence of user studies detailing player experience. The publication—while curated by expert authors—is also not currently peer reviewed.

There are also a number of games research interest groups, such as the *Manchester Game Centre* (2023), which recently published the anthology *Material Game Studies: A Philosophy of Analogue Play* (Germaine and Wake, 2022). As the name suggests, however, this publication is also a collection of conceptual works as opposed to empirical user studies. *Board Game Academics* (BGA, 2023) is an annual, peer reviewed journal dedicated to publishing tabletop games research in the context of its connection to society, and held their first annual conference in 2023. Another annual conference dedicated to analogue games is the *Board Game Studies Colloquium (BGS)*—currently in its 26th year as of 2023 (BGS, BGS)—with its own annual journal publication, the *Board Game Studies Journal*, with 16 volumes to date (Silva, 2023). These examples showcase that boardgames had been an interest in academic circles for quite some time. However, it highlights an important gap within dedicated boardgaming publications: boardgame players and their experiences.

Boardgames research has also seen a number of important book releases in recent years. While Woods (2012)'s *Eurogames* could be considered the first substantial scholarly work on modern boardgames, Engelstein and Shalev (2019)'s *Building Blocks of Tabletop Game Design* is the first encyclopedic volume dedicated to all the different mechanics that can be found in modern boardgames. Complementary to this largely game systems-focused work is Marco Arnaudo (2018)'s *Storytelling in the Modern Board Game: Narrative Trends from the Late 1960s to Today*, using narratological methods in the analysis of tabletop games. *Rerolling Boardgames: Essays on Themes, Systems, Experiences and Ideologies*, explores "the many different approaches emerging around the critical challenges that boardgaming represents" (Douglas and Hargadon, 2000, abstract), whilst Paul Booth has published two influential books to date. His works explore boardgames through a paratextual lens (Booth, 2016), establishing tabletop games as media entities on their own right, and provide a foundation and context for future analogue games research (Booth, 2021). The common theme within these publications is that they all largely focus on boardgames as artefacts or systems, or as part of culture. Whilst there are clear considerations of player

experience, these considerations largely relate to the perspective of game design, as opposed to how they are experienced by players themselves.

In contrast, notable publication venues that are not boardgames-specific—such as CHI (Conference on Human Factors in Computing Systems); CHI Play (a games-only arm of CHI); FDG (Foundation of Digital Games); and Games and Culture—all increasingly publish research that fosters a growing body of works focusing on boardgame player experience. Some of the most notable output (Rogerson et al., 2016, 2017a; Rogerson, 2018; Rogerson et al., 2017b, 2021a,b, 2022; Kosa and Spronck, 2018b, 2019, 2022; Sousa and Bernardo, 2019; Sousa et al., 2021; Martinho and Sousa, 2023) from these venues are publications that showcase similarities in methodologies and rigour on par with video games player experience research, and more generally, HCI research as a whole.

This current rising interest in boardgames in academia correlates with their commercial success. In 2018, successfully funded tabletop games gained 165 million US dollars on Kickstarter, surpassing digital games by more than ten times in funding (Hall, 2019). According to Rogerson (2018), the driving force of boardgaming are adult "hobbyists," who enjoy the social and material aspects of analogue games alongside the variety of available titles and the challenge they provide. Investigating the communities surrounding board gaming, she concludes that BoardGameGeek—a website which surpassed three million registered users in 2022 (Alden, 2022)—is comparable to the likes of *Goodreads*, being the centre of the hobby as a database and social hub (Rogerson et al., 2017a). Rogerson further states that:

> *"...being a BoardGameGeek is not simply about playing games; in accruing gaming capital, users engage with a specific set of digital practices that support and enable material acts of play, and that invite users to co-create emic information about games and the gaming hobby."* (Rogerson et al., 2017a, 3)

Partially as a result of engaging in these surrounding practices, there is increasingly a distinction between "casual" and "hobbyist" boardgamers when referring to players. Arnaudo (2017), for example, defines a hobby boardgamer as *"a person who considers playing board games as a hobby of major importance in their life"*, and a hobby boardgame as *" the type of game that hobby board gamers mainly play and enjoy"*. Rogerson et al. (2016, 2017a) also draw a distinction between casual and "serious" gamers, where the latter is considered the equivalent of a hobby boardgamer. The ability to draw such a distinction between players highlights how "seriously" one can take this form of gaming. Hobby boardgamers are increasingly the focus of Player Experience research as well. For example, Kosa and Spronck (2018a)

examined multiple facets of players' motivations in various areas of boardgaming. First, they have created and tested a *Tabletop Gaming Motivation Questionnaire* based on existing models from video game literature, with modifications to cater to the unique characteristics of tabletop games when compared to video games. Whilst not all dimensions of player motivation were reliably validated during this study, further analysis and work by Kosa and Spronck (2019) resulted in an improved version, named the *Tabletop Gaming Motivations Inventory*, which is a significant contribution to understanding boardgame players better. They found that:

> *"...players may choose to play tabletop games because they like to escape real life issues, they like the look and feel of the game, they can form/continue relationships, they find the tabletop playing activity exciting, and they think tabletop gaming provides them with an environment in which they can be free to explore without external controlling."* (Kosa and Spronck, 2019, 65)

Furthermore, two additional factors—*Customisation* and *Socializing*—were also important motivating factors for players in playing tabletop games. These findings correlate with work by Rogerson et al. (2016). The authors found that being able to customise the components of analogue games to their liking was an important factor for players. Customisation was part of a facet of boardgaming the authors define as *Materiality*, which is to do with all material aspects of tabletop games, concluding that

> *"Players value and protect game components as objects, and seek to "pimp" or customise games by collecting or making improved or additional game components such as counters, playing pieces or victory point tokens as well as by adding items which contribute thematic detail. Further, they enjoy the boxes or materials in which the games are stored, and customise these principally to protect pieces or streamline setup of the game but also for purely aesthetic reasons."* (Rogerson et al., 2016, 3959)

In addition to why and how boardgamers play, researchers examined players' motivations for purchasing certain games (Kosa and Spronck, 2022), their changing playing habits when parenting (Rogerson and Gibbs, 2016), and even reasons behind their superiority compared to AI agents when playing the game *Hanabi* (Sidji et al., 2023). Whilst this overview of tabletop games research is most probably incomplete, the purpose of this section was to illustrate the many varying facets of interest in boardgames and their players.

It is evident that there is interest, and a growing breadth of quality research publications, when it comes to analogue gaming. However, there is clear scope in furthering the understanding of player experience, especially when it comes to how boardgame players interact with various aspects of analogue games.

2.3 Immersion

Immersion—as a research area—is a sub-field within Player Experience research, surrounded by ambiguity due to inconsistencies regarding its definition. Munday (2007), for example, considers immersion as a phenomenon aiding mind-state while Phillips (2014) as a trait aiding the realisation of the game world. Immersion—as a shared language between academia, players and industry—could serve as a useful metric when evaluating the effects of technology on the player experience of boardgames. However, due to the breadth of available ideas in existing literature, it is important to understand which of these could be applied to analogue games, if any. For this reason, the purpose of this section is to serve as a review of immersion research, examining its various definitions across domains and evaluating these definitions in the context of analogue games and their players. The scope of this chapter, therefore, is not to survey everything that has been written on immersion, but rather, to gain an overview and understanding of the most relevant ideas.

2.3.1 Immersion as Metaphor

The metaphor of "being immersed" derives from physics and the act of submergence into a liquid. This analogy was famously used by Murray (2017), first in 1997, who later defined immersion into a virtual world as "the sensation of being surrounded by a completely other reality, as different as water is from air, that takes over all of our attention, our whole perceptual apparatus" (124). Murray—both in the original 1997 edition and the updated 2017 edition of *Hamlet on the Holodeck*—argues that immersion is not merely a sensory experience but an act of imagination.

Immersion research before and after Murray was (and is still) divided in the interpretation of the act of submergence. A review paper by Nilsson et al. (2016) argued that immersion research can be categorised into four groups: immersion as a "Property of the System", which is concerned with immersion as a trait of technology; immersion as a "Perceptual Response", which is concerned with immersion as a cognitive act of perceiving such technological systems; immersion as a "Response to Narratives", where immersion is attributed to an unfolding narrative and the story-world; and immersion as a "Response to Challenge",

where immersion is the overcoming of challenge with skills and intellect.

Nilsson's categorisations are useful in understanding differing definitions of the same term across a variety of academic disciplines. However, the most relevant takeaway in the context of this thesis is the distinction between *immersion as a sensory response to technology*—where a system needs to fulfil various requirements in order to be considered *immersive*—and *immersion as a response to psychological stimuli*, where the technology is less relevant and where the player's mind is stimulated, as opposed to their senses. On the surface, immersion as a psychological experience could be considered more relevant to boardgaming. However, games such as *Chronicles of Crime* Cicurel (2018) can be used with optional Virtual Reality (VR) glasses. Even though immersive technologies, such as VR, are not common in analogue games, it is unknown whether they will rise in popularity in the future.

2.3.2 Immersion as a Sensory Response

In foundational immersion research, immersion is not the goal but rather the means, to achieve another facet of player experience: *presence*. Amongst the first to define these terms were authors Slater and Wilbur (1997), where presence refers to the subjective feeling of being in a virtual environment (VE) as opposed to a real one, while immersion is the objective property of the virtual environment the user is placed within. Witmer and Singer (1998) identified immersion as a direct prerequisite to presence, where immersion is defined as a psychological response to a "continuous stream of stimuli and experiences". The level of immersion depends on the virtual environment (VE), where the VE has to surround the user in such ways that the user is essentially removed from the "real world". Therefore, Witmer and Singer's immersion does not solely depend on a "coherent set of stimuli" but also how these are presented to the user. According to the authors, games which do not surround the player fully—such as arcade games—are excluded from immersion, however, they can still enable involvement. The authors further disclose their disagreement with Slater et al. (1996) and his view that "immersion is an objective description of VE technology" (Witmer and Singer, 1998, 227), since the player has to subjectively feel included within the virtual environment in order to be immersed.

What connects both of these works is the emphasis on presence as the main trait of player experience, immersion almost falling to the sidelines. Both Witmer and Singer (1998) and Slater (1999), for example, formulated their own set of standards in measuring presence, generating a discourse based on their disagreements surrounding the technicalities of how the concepts are best defined.

Many examples of immersion research that followed in the footsteps of these foundational works

started dividing immersion into various categories where immersion as a sensory response to stimuli is still present, however, it is a type of immersion, rather than the sole version of immersion. Ermi and Mäyrä (2005), for example, define sensory-type immersion as one of three dimensions of immersion, which overlap and are all part of the overall game experience. Sensory immersion is still dependent on audio-visual stimuli, however, the requirements have changed since Witmer and Singer (1998): immersion is now possible when playing games that have no head-mounted displays as "large screens close to [the] player's face and powerful sounds easily overpower the sensory information coming from the real world" (Ermi and Mäyrä, 2005, 7). McMahan (2003) associates sensory immersion with a first person point of view enabled by many games "mov[ing] away from 2-D level design [...] to 3-D design" (67).

McMahan warns, however, that immersion as a term became diluted and often used interchangeably with other terms such as presence or engagement. She differentiates between diegetic and non-diegetic levels of immersion, where diegetic is immersion into the story world while non-diegetic is "the player's love of the game and the strategy that goes into it" (68). McMahan's immersion—while a move away from the emphasis on sensory stimuli—still requires what is presented within the virtual environment to match the player's expectations.

Another example is Ryan et al. (2006)'s influential work in translating *self-determination theory* to video game player experience. In contrast to earlier works by Witmer and Singer, the authors identify presence as a contributing factor to immersion. The quality of the system—the audio-visual qualities of the game and what it is played on—is what invokes presence, and in turn, presence invokes immersion, which is defined as a deep sense of *engagement*.

It is apparent that immersion, as a term, was convoluted from the start, and the more publications were concerned with the concept, the more disarrayed it became. In addition, many of the above examples (Witmer and Singer, 1998; Slater et al., 1996; Slater, 1999; McMahan, 2003) were about evaluating systems—including video games as systems—as opposed to relying on player sentiment. The exceptions to this is work by Ermi and Mäyrä (2005), which incorporated user studies as a foundation to their categorisation, and work by Ryan et al. (2006), in which the resulting framework was validated by user studies as well. Another noticeable trend is that many of the later works (Ryan et al., 2006; Ermi and Mäyrä, 2005; McMahan, 2003) frequently associate immersion with engagement, in addition to presence. Engagement, as a concept, is the bridge towards later player experience works more concerned with the subjective experience of the user, as opposed to the objective evaluation of the system.

2.3.3 Immersion as a Cognitive State

Ermi and Mäyrä (2005) state that the second dimension of immersion is based on the synergy between challenge provided by the game and the skills of the player. These skills can be twofold: either dexterity-based or cognition-based, however, they often overlap due to the requirements of digital games. This concept bears similar characteristics to Csikszentmihalyi (2008)'s *flow*, which is defined as "a sense that one's skills are adequate to cope with the challenges at hand, in a goal-directed, rule-bound action system that provides clear clues as to how well one is performing" (71). Flow, according to Csikszentmihalyi, requires an activity in order to happen. When it does, it provides a "sense of discovery, a creative feeling of transporting the person into a new reality" (74). This other reality is not fictional, but rather, a state of high focus that obstructs the surrounding reality. Based on these definitions, it is apparent that flow has similarities with how some researchers define immersion.

Looking back at Ryan et al. (2006), there are some clear similarities between the "Player Experience Need Satisfaction (PENS) model and the concept of flow. Here, the main goal is engagement, which is achieved when a player's experience fulfils a sense of *competence* and mastery in the game; a sense of *autonomy* in their choices and navigating through the game; and a sense of *relatedness* to in-game characters or surrounding communities of players. Presence and immersion are two additional cognitive states, where presence happens as a result of both sensory and cognitive involvement with various aspects of the game and its world, and immersion happens as a result of presence. Flow, on the other hand, is a much older concept when compared to PENS and one that is applied to any activity, in a much broader sense when compared to video games. In flow, the overall goal is to remain so highly focused on an activity, that the person is completely absorbed by it. Flow has similar requirements to PENS, such as the balance between skill and challenge, a sense of control over the activity itself, or intrinsic motivation—meaning that the activity is carried out by the person's own accord. Another connection between PENS and flow is that both describe a sense of losing track of time by the deep engagement with the activity. For PENS, this type of deep engagement is associated with immersion. In flow, immersion is not explicitly part of it. However, the way flow is described, it is clear that deep engagement on the cognitive level is its overall goal.

The sense of deep cognitive absorption is described in various ways through immersion literature. Brown and Cairns (2004), for example, define immersion as a gradual scale of involvement—where the steps are "engagement", "engrossment" and "total immersion"—each requiring the previous in order to happen. Engagement begins with the willingness to start and keep playing the game while engrossment

is becoming “further involved with the game [while] the gamers’ emotions are directly affected by the game” (3). Total immersion is when players are most involved, and is equivalent with presence: “being cut off from reality and detachment to such an extent that the game was all that mattered” (3). While Brown and Cairns recognise the shared characteristics between flow and immersion, they conclude that the two still can be distinguished due to total immersion having a “fleeting nature” (4) as opposed to the longer lasting effects of flow.

According to Douglas and Hargadon (2000), engagement, immersion and flow are treated as separate concepts. Yet, it is difficult to assess what the authors’ definition of each is, due to terms sometimes being used interchangeably: “Genre fiction lends itself to immersion, encouraging us to form hypotheses, guess about motivations, project a series of likely conclusions. These processes stand as a kind of low-level, mostly unconscious engagement with the text and schema it invokes, confined entirely inside the framework of the text’s schema” (156). It seems, however, that immersion is the more passive while engagement is the more active of the two, while they both become a perquisite to flow. McMahan (2003) also identifies engagement as a type of immersion, similarly to Brown and Cairns. Characteristically, however, it is more similar to Ermi and Mäyrä’s challenge-based immersion, and it involves a goal-oriented take on focus and attention, incorporating strategic thinking.

Arsenault (2005)—building on the previously mentioned research by Ermi and Mäyrä and Brown and Cairns—is proposing changes to challenge-based immersion through considering challenge in a more passive-participatory way, stating that there are “many ways to experience a form of challenge in traditional, non-participatory media” (2). Arsenault’s immersion is a form of absorption, which—similarly to flow—does not require a fictional setting, but can happen when the participant is “absorbed” in anything from a painting to cinema, and it “occurs when one accepts that a system (of rules, laws, etc.) governing a mediated object replaces the system governing a similar facet of unmediated reality” (4).

It is apparent from the literature reviewed in this section that the more immersion is researched, the less clear its meaning becomes. While many of these papers describe very similar ideas, there is also great inconsistency in the practicalities of what can, and what cannot, be considered immersion. There is also no coherence across the literature regarding degrees of immersion—for instance, it is unclear whether what Brown and Cairns (2004) describe as *total immersion* is, in any way, experienced by players themselves as more immersed than other forms of immersion; nor there is agreement between the relationship of immersion and the many other cognitive states, such as flow, engagement, involvement and presence. The key takeaway, however, is that immersion, as a form of cognition, can be sum-

marised as a type of mental absorption connected to psychological challenge—both active and passive participatory—through how well these can be overcome with skills and strategic thinking.

2.3.4 Immersion as a Response To World-Building

According to Murray (2017), “a stirring narrative in any medium can be experienced as a virtual reality” (123). This is due to the human mind’s ability to isolate itself from reality when engaging with fiction. Murray identifies digital media as a medium enabling participation in these “fantasies”, comparing immersion to “learning to swim” (125). Murray’s idea of being transported into another world differs from flow, for example, in a way that this “other world” is fictional, where entering “the enchanted world as our actual selves” threatens to break the illusion and therefore prevent immersion (127).

Douglas and Hargadon (2000) identify immersion as the experience of “being completely absorbed within the ebb and flow of a familiar narrative schema” (154). Schemas act as cognitive templates for understanding and engaging with fiction and narrative and immersion does not require participation in itself. However, agency through engagement is what enables “the ability to effect the course of the narrative” (158). While it is apparent from this text that world building, first and foremost, can happen cognitively as part of imagination, it is unclear whether the authors think agency has an effect on immersion itself. Immersion is seen more as a feature of engagement, however, where immersion ends and engagement begins is difficult to envision as there is a lack of clearly described relationship and hierarchy between the two concepts.

In contrast, McMahan (2003) identifies psychological immersion as “the user’s mental absorption in the [virtual] world” (77), which is a clearly defined perquisite to presence. Ermi and Mäyrä (2005) call this imaginative immersion, however, its conditions are more detailed when compared to McMahan. Players are still “absorbed with the stories and the world” (8), however, emotional involvement and the player’s own imagination also become features of this dimension. Arsenault (2005) argues that immersion into fiction is possible without the use of imagination and proposes to rename Ermi and Mäyrä’s imaginative immersion to fictional immersion.

Ryan (2001) suggests that the concept of immersion precedes virtual reality technology with an example of Charlotte Bronte inviting her readers into the fiction world. Ryan analyses the concept of the “textual world”, emphasising coherence as a requirement for any text to form a world. Furthermore, according to Ryan, the reader takes active participation in the creation of the fictional world:

> "The idea of textual world presupposes that the reader constructs in imagination a set of language-independent objects, using as a guide the textual declarations, but building this always incomplete image into a more vivid representation through the import of information provided by internalized cognitive models, inferential mechanisms, real-life experience, and cultural knowledge, including knowledge derived from other texts" (Ryan, 2001, 91).

In Ryan's narrative immersion, imagination is treated as a form of participation where the reader becomes a "co-author", filling in the blanks of the imaginary world. Ryan differentiates between sensory and narrative immersion as "hot" or "cold", where "a hot medium facilitates immersion through the richness of its sensory offerings, while a cold medium opens its world only after the user has made a significant intellectual and imaginative investment" (348). Narrative immersion can be divided into three sub-categories—spatial, emotional and temporal—all three requiring intense focus from the participant. Spatial immersion—similarly to what other researchers define as presence—is a "response to setting", while temporal immersion is "the response to plot" and emotional immersion is "the response to character" (121).

Researchers in this chapter seem to agree that narrative immersion is a form of entering into or being transported to a fictional world. Where they start to diverge from one another is the question of participation. In some cases, participation is a form of agency—where the participant can actively change the surrounding world—while in other cases, it is connected to imagination in the sense of co-authorship. Where narrative immersion differs from sensory immersion is that the fictional world is imaginary—as there is either no sensory information presented or what is presented is incomplete—while how narrative immersion differs from cognitive immersion is that it requires a world to be entered, as opposed to reaching a different mental state.

There are, however, similarities across all domains of immersion research in the form of the user's absorption and involvement in the activity, world, or emotion they experience as a result of what they are presented with. In that sense, whilst many of the works presented in this—and preceding—sections seem to contradict each other, it appears that all ideas have a common core in the form of an experience that needs to be completely absorbing. Whether this absorption is a result of technology (or the virtual world), challenge and cognitive concentration, or imagination and emotional reaction, seem more as facilitators—or the means—of a resulting experience. When thinking about Murray (2017)'s original metaphor from the first edition of Hamlet on the Holodeck in 1997, there can be a parallel between the idea of submergence and the idea of absorption. Both terms, overall, suggest an experience that fully envelopes the person

experiencing it.

2.3.5 Measuring Immersion

It is apparent from previous sections that immersion is considered either an objective phenomenon or a subjective experience. To date, there had been a few notable tools developed to assess immersion, alongside its adjacent concepts—such as engagement, presence or flow—in various dimensions. For example, the earlier mentioned presence questionnaire by Witmer and Singer (1998) uses a set of 7-point Likert scales to determine participants' sense of presence in the virtual environment, which was later heavily criticised by Slater (1999). Ryan et al. (2006) has also developed a questionnaire to assess participants' need satisfaction, where immersion is one of the various dimensions which contribute to a player's overall engagement in a video game. Jackson and Marsh (1996)'s Flow State Scale (FSS) is a 37-item assessment tool based on Csikszentmihalyi's flow concept, while Brockmyer et al. (2009)'s GEQ—or Game Engagement Questionnaire—assesses players' absorption, flow, presence and immersion, which all amount to engagement.

The way these various measuring tools are developed is similar to the many discrepancies surrounding immersion—and its relationship to other concepts, such as engagement or presence. While these tools all measure various dimensions of experience, these dimensions appear in differing hierarchies. For example, presence is the target experience measured by Witmer and Singer (1998)'s questionnaire, whereas presence is one dimension amongst others that contribute to engagement (Ryan, 2001; Brockmyer et al., 2009). Immersion can be both the requirement for presence (Witmer and Singer, 1998; Slater and Wilbur, 1997), and evoked by it (Ryan et al., 2006). Similarly, flow can be the overall goal (Jackson and Marsh, 1996), or as one of four domains that achieve engagement (Brockmyer et al., 2009). It is clear that one of the biggest confusions of navigating these concepts—especially for newer researchers—is the lack of clarity of how these concepts fit together. At times, they seem interchangeable. At other times, there is a clear hierarchy. However, this hierarchy can differ from paper to paper, from research to research. As a result, these questionnaires feel simultaneously convoluted and incomplete at the same time.

The most complete, dedicated immersion questionnaire, however, was developed by Jennett et al. (2008). The Immersive Experience Questionnaire (IEQ) is largely based on preceding work by Brown and Cairns (2004), alongside research into adjacent concepts, such as flow and engagement—amongst others. The IEQ assesses a set of domains, such as cognitive and emotional involvement (or absorption),

challenge and control (based on flow) and real-world dissociation (mainly found in presence research). What sets the IEQ apart is that in addition to assessing each individual domain, it also asks players to give a single rating of their subjective, perceived level of immersion. Whilst most assessment tools calculate an objective assessment based on subjectively rated individual components, Jennett et al. (2008) takes into account players own assessment of their levels of immersion, in addition to the objectively calculated score of the various domains. This inclusion of the self-assessed rating is an important step towards acknowledging players' awareness of their own experience.

On the other hand, a potential shortcoming of the IEQ's immersion score is that immersion might be defined differently by players themselves. Therefore, it is uncertain whether they all think of the same thing when they rate their own experience. Additionally, while the IEQ is based on Brown and Cairns (2004)'s immersion model, there is a slight inconsistency between the two works in how they describe the relationship between various dimensions they present. For instance, Brown and Cairns (2004)'s conceptual model has a clearly defined scale between engagement, engrossment, and total immersion, where it is suggested that total immersion is considered being immersed to a greater extent when compared to engagement and engrossment. Additionally, it appears that both engagement and engrossment contribute to total immersion. This incremental concept of immersiveness is seemingly absent from Jennett et al. (2008), where the various domains seem more equal in their hierarchy.

2.3.6 Challenging the Concept of Immersion

It is apparent from the previous sections that there is no clear agreement on what immersion is. In some cases, it is defined as a response to sensory stimuli (Witmer and Singer, 1998), while in others as a degree of involvement (Brown and Cairns, 2004), a type of engagement (McMahan, 2003) or a sense of presence (Brown and Cairns, 2004). Most of the authors reviewed seem to agree that it is a form of mental absorption. Most authors also agree that immersion is a pleasurable experience (Douglas and Hargadon, 2000; Ermi and Mäyrä, 2005; Ryan, 2001). In some cases, it is defined as one specific occurrence (Witmer and Singer, 1998), while in other cases, it can be divided into a series of occurrences (Brown and Waterhouse-Watson, 2014; Ermi and Mayra, 2007; McMahan, 2003; Ryan, 2001). If immersion is divided, these divisions usually interact either as dimensions (Ermi and Mäyrä, 2005) or as steps towards a more complete experience (Brown and Cairns, 2004). The ambiguity of how immersion is best defined further complicates how engagement, involvement or presence should be defined, and whether these terms are synonymous with immersion. Flow is also seen as immersion in some cases, or in some ways

connected to immersion.

These ambiguities have not remained unnoticed by researchers. Salen and Zimmerman (2003), for example, dedicate a section in their book to the “immersive fallacy”, which is “the idea that the pleasure of a media experience lies in its ability to sensually transport the participant to an illusory, simulated reality” (450). The fallacy originates from a contradiction: the ongoing bias towards newer technologies creating better player experiences, and at the same time, the desire for these technologies to be unnoticeable during gameplay. Salen and Zimmerman suggest that feeling “engaged and engrossed [while] play[ing]” is often mistaken as immersion as “play seems to take on its own ‘reality’ ” (451). There is no transportation due to the “double consciousness” of gameplay: the player retaining consciousness in both the real world and the game-world through being aware of the “artificiality” of the experience. Salen and Zimmerman warn that as a result of believing in the immersive fallacy, game designers can be prevented from creating meaningful experiences to players.

Calleja (2011) warns that the extensiveness of immersion research creates more confusion than clarification. He sees validity in the various existing theories and definitions while also emphasising that whenever new research is conducted, researchers need to be upfront about how they define immersion and draw their conclusions with that definition in mind. Furthermore, he proposes that immersion research should be specific to domain, as different domains retain different properties that might determine the type of immersion achievable. Calleja’s own solution is to move away from the confusion of immersion, replacing it with the term “incorporation”, which acts as a “double metaphor: incorporating (in the sense of assimilation or internalization) the environment while reincorporating (in the sense of corporeal embodiment) the player through the avatar in that environment” (255). Incorporation is a result of six player experience frames—tactical involvement, performative involvement, affective involvement, shared involvement, narrative involvement and spatial involvement—all being present to various degrees during the experience, creating an “intensification in focus where players cease to view the virtual environment as separate from their immediate surroundings and start interacting with it in an instinctive way. This state of deep involvement results in a shortening or disappearance of distance between player and game environment” (254).

Calleja, alongside Salen and Zimmerman set out to clear confusions surrounding immersion as a concept, proposing to move away from it and towards other aspects of player experience. However, while both recognise immersion to be discussed by players and industry, they do not talk about the importance of immersion to these demographics. Furthermore, Calleja refers to Ermi and Mäyrä (2005)’s

approach of interviewing children as problematic due to children representing the general public, stating that “the general populace will usually not be aware of the theoretical connotations of the term and will thus give a more generic perspective on it. This is a problem when the term is then used in the field in a more colloquial sense that clashes with the more academically technical one” (31–32). This raises the question whether casual players—who are neither researchers nor seasoned “gamers”—are excluded from immersion due to not knowing specific terminology.

Calleja (2011) gives a generous amount of example comments in his work. However, upon reading these comments, it can be seen that players themselves often give unintended definitions of their own immersion. One quoted participant, for example, says that the sensation of movement within a game “creates a certain flow on the game [which is] important for keeping [their] attention in the game...” (243). This participant continues to state that this level of attention—which they identify as a sense of flow—is what helps them stay immersed in the game. However, the player’s comments are not used in the work by the author to define immersion, but rather as a supporting comment for “performative involvement”, which is a frame related to “avatar and game piece control” in Calleja’s model. This raises the question whether player defined immersion is considered less validated by the author and whether players can only be immersed in an experience when the experience matches academic terminology.

Lastly, since there were many examples in this chapter’s reviewed research where the authors identified immersion as a type of enjoyment, it is perhaps worth considering that it could be connected to other emotions. Birk et al. (2015) critique the assumption that “flow, immersion, or engagement should result in increased pleasure” stating that “this strong focus on the positive side of player experience...neglects the darker side of play that can also result in engaging and transformative experiences” (799). Mekler et al. (2016) explore the complexities of emotions experienced during gameplay, arguing that “the positively-biased perspective on desirable emotions in games misses out on opportunities that the interplay between positive and negative emotions offers” (367). While immersion—and other aspects of the player experience—are widely studied, both Mekler et al. and Birk et al. raise important questions regarding the understanding of how players themselves think about their own experiences.

2.4 Boardgames and Technology

The idea of augmenting analogue games with technology has also been gaining interest amongst researchers since the early 2000s. Mandryk and Maranan (2002) were among the first researchers to use

the term *hybrid* to describe analogue games with a digital component. One of the aims of this research was to bring together boardgames' capability of face-to-face interaction with elements of digital enhancements seen only in video games. This work, however, largely focused on prototyping and did not include any user studies—though the authors mention testing their concept with players in their future research section. Similarly, Iwata et al. (2010) presented a prototype that augmented the classic boardgame *Go*. The authors' aim was to provide guidelines for augmenting classic games with digital components whilst also preserving the spatial elements boardgames have. The focus of this research, similarly to Mandryk and Maranan's, was also the prototype itself, and no players were involved to assess the effects of the augmentation on player experience.

The main focus of these earlier works was largely to further technological advancements as opposed to gaining a better understanding of player experience. The experience of play itself is considered to a certain degree; however, it remains largely conceptual. These earlier works, however, began establishing boardgames as a topic of interest at more prestigeous publication venues, such as the *Conference on Human Factors in Computing Systems*, alongside sparking further discussions in the analogue-digital hybrid research space.

As interest grew further in hybrid boardgames, the definition of the term also became more diverse. Rogerson et al. (2021b), for instance, define hybrid boardgames as "boardgames in which play is enacted through both physical components and a 'smart' digital element" (1). The term is often used to describe boardgames played on digital, interactive surfaces (Mandryk and Maranan, 2002; Mora et al., 2016), whilst Kankainen and Paavilainen (2019) define them as "combining new technological affordances to previous forms of activities" (2). Kosa and Spronck (2018b) refer to boardgames with technology as "augmented", whilst Mora et al. (2016) use both hybrid and augmented interchangeably. Smit et al. (2019) calls the analogue-digital hybrid research area an opportunity to explore "how digital environments can add value to tactile, physical, or material experiences" (2).

Regardless of precise definition, the important conclusion from these works is that there is an interest in investigating the design space at the intersection of analogue and digital, even if many of the prototypes created for research purposes are very different from their commercial counterparts. Many of the analogue-hybrid prototypes are also created with the goal of bringing boardgaming experiences closer to video games. However, a few notable studies began focusing on analogue games' unique features, and began asking questions about how to use technology to enhance these already existing characteristics further.

For example, Mora et al. (2016) propose “computer-augmented game pieces on conventional surfaces” (1) as an alternative to interactive surfaces. This proposition serves the purpose of bringing the focus of interactivity back to game pieces, as opposed to digital surfaces, utilising the mobility and manipulability of components. The authors state that:

> *“Game pieces can influence the state of a game not only when they sit on the interactive surface, but also when they are manipulated over and around it, without requiring an external infrastructure for sensing. In this way, the board is mainly used to stage the game and establish context for the use of the pieces, as in traditional board games.”* (Mora et al., 2016, 7)

Another prototype is Jensen et al. (2020)’s “Hybrid Settlers”, an augmented version of *Settlers of Catan*. The authors utilise *electrochromic ink*—a type of material able to “change [its] optical properties through chemical oxidation or reduction when an electric current is applied to [it]” (3)—to create tiles which can display information dynamically. One of the advantages of this technology is its low cost and relative ease of implementation. However, one disadvantage is losing the graphical elements of the original tiles. Smit et al. (2019) envision the role of technology in boardgames as an opportunity to introduce novel game mechanics. The authors propose what they call an “immersed character”, where miniatures in any existing boardgame could be equipped with a camera able to lives-tream a feed from the perspective of the in-game character onto a Virtual Reality display players would wear.

These two prototypes move away from electronic surfaces, and instead, look at novel ways to utilise already existing game components—even if examples similar to these hybrid or augmented game ideas are yet to be seen in commercially available boardgame titles, with some exceptions. For example, *Teburu* (Xplored, 2023a) is an upcoming hybrid gaming system, featuring technology built into all of its components. Its materials aim to have the look and feel of analogue games, whilst harnessing unique features provided by mostly hidden technology. There is a layer of sensors underneath its interchangeable cardboard surface, its miniatures and dice are equipped with RFID, magnets and other wireless technologies, and there is full communication and tracking between game-board and components. There are currently three custom prototype games designed for the system. According to Teburu’s website, the system “seamlessly integrates the physical and digital worlds, keeping players focused on the board and its components while the system takes care of the game rules, enemy behaviour, and storytelling events.” Still, players will need to own the system, just like a video game console, and purchase additional games

if and when they are developed for the system. Whilst the future success of the product is yet to be known—alongside players' reception to it—its Kickstarter campaign successfully raised EUR 311,497 by 1174 backers (Xplored, 2023b).

Despite clear interest in the integration of new technologies into analogue games by designers, publishers and researchers, the reception from fan communities is divided. In a survey by Booth (2019b), 364 participants welcomed the inclusion of apps in games while 201 expressed their dislike and 240 remained neutral. This could be summarised as one third of boardgame players having a positive attitude towards technology. Kosa and Spronck (2018b) examined the different reasons for players' liking or disliking "augmented tabletop games" in a qualitative content analysis. They found that the most common aversion was the fear of "obsolescence/incompatibility of technology" closely followed by the undesired "presence of electronics/screens" during board gaming. The most common attraction of technology was enhanced "enjoyement/experience/fun" with most commenters in this category agreeing that technology did not threaten the "traditional industry." These studies show that while the dislike towards integrated technology is not overpowering, it is certainly a factor for a large segment of the tabletop community when purchasing games and might result in players avoiding titles as a result. While both studies mainly focused on games and discussions centred around the integration of apps (Kosa and Spronck, 2018b; Booth, 2019b), it remains unclear whether players would welcome technologies which did not require them to interact with digital devices or screens and could work autonomously of the players.

Still, there are undeniable advantages and roles technology can fulfil within an analogue game. Rogerson et al. (2021b)'s *Hybrid Digital Boardgame Model*, for example, collects 41 functions across 8 domains technology can fulfil in hybrid boardgames, many of which offload some of the tedious tasks—such as "housekeeping" and calculations—players would traditionally need to do themselves otherwise. However, the domain "Storytelling" details how technology can aid narrative and thematic elements of boardgames, providing additional sensory stimuli. According to the authors:

> *"Participants noted that these tools are often used to increase the user's sense of immersion and tension and their engagement with the game. Sounds may be used to provide thematic background music and sound effects or to provide explicit, character-acted content (St Noire), or the app may 'listen' to sounds created by the players (Unlock!). Video provides a sense of place and immersion, for example through the 3D glasses available with Chronicles of Crime."*
> (Rogerson et al., 2021b, 7)

The Hybrid Digital Boardgame Model is a useful categorisation not just for classifying existing commercially available titles based on technology's function within them, but also a reference which can be utilised by future researchers and designers in understanding these functions better.

An important new direction of the hybrid boardgames research presented in this section is the larger focus on player experience. For example, Mora et al. (2016) included user studies to test their prototype, while both Rogerson et al. (2021b) and Kosa and Spronck (2018b) examined players' sentiment toward hyrbidity. This larger focus on players furthers the understanding of what these games are like to play, not just to create, and how players feel about them. Taking into account the relationship between technology and boardgamers is an important step when considering how future advancements in technology could enhance player experience in boardgame play.

2.4.1 Commercial Examples of Boardgames with Technology

Infusing digital—such as electronic or computerised—elements into analogue games is not a new concept. Amongst the first was *Stop Thief* (Doyle, 1979), which used an electronic device named the "crime scanner" that was capable of giving aural cues to players. These cues were used in the game's main mechanic—deduction—in order to help locate the thief's location based on its sound (BoardGameGeek, 2019b). Other examples from this era were *Dark Tower* (Burten et al., 1981)—accommodating a miniature computer built into its main tower-feature serving as an interactive Game Master—and *Fireball Island* (Kennedy and Lund, 1986), a game with a similar premise but featuring a marble-emitting volcano instead of the interactive tower. While these games were only a few examples of many—created in an era after the invention of the microprocessor (Edwards, 2013)—they have achieved a "cult" status since. Another form of early hybrids were Interactive VCR Games. According to Booth (2016), these aimed to be the answer to video games and other home entertainment products gaining popularity in the 80s. The first iteration of the genre was the *Clue VCR Mystery Game* (Buffman et al., 1985), with many to follow. The games used current technologies of their time—first VHS tapes and then DVD discs—to offer interactivity and audio-visual storytelling through recorded footage.

Today, designers of analogue games have a diverse variety of digital tools to chose from. Some of these are optional to players—such as digital app timers—while others are fused with game mechanics in a way that they are impossible to play without. *Alchemists* (Kotry, 2014), for example, was amongst the first modern boardgames to include an app, which is used to scan ingredient cards when creating potions. While the app is central to the game, it is optional to use. One player can replace the app and know all

hidden information of the game—resulting in this player not being able to otherwise participate—while there is also a web version of the app itself (Czech Games Edition, 2019). Many publishers now release helper apps with their games, which are freely available and are optional to gameplay. *Renegade Game Studio's* companion app (Dire Wolf Digital, 2015) provides select titles—such as real-time bomb diffusing game *Fuse* (Klenko, 2015) or popular deck builder *Clank!* (Dennen, 2016)—with enhancements such as a fully narrated timer, step-by-step instructions for various parts of the games, or making "bookkeeping" and score-keeping easier for players. The app also accommodates thematic music and sound effects for each of the games, which are optional to use (Dire Wolf Digital, 2015).

There are games, however, which were designed with integrated technology as a central mechanic and therefore cannot be played without the app. The second edition of *Mansion of Madness* (Valens, 2016), for example, uses the app to generate how the game-space is created, alongside all events and scenarios of a given game session. The app is also responsible for a thematic atmosphere, with music, sound effects, narrated elements, visuals and animation. Enhancing immersion is one aspiration of these titles, as reported by the designers of *First Martians: Adventures on the Red Planet* (Trzewiczek, 2017). Two notable examples from recent years are *Detective: A Modern Crime Board Game* (Rymer et al., 2018) and *Chronicles of Crime* (Cicurel, 2018). Detective is advertised as "a fully co-operative, immersive, detective experience", where players take the role of investigators trying to solve a series of connected cases. Detective prompts players to think of the game as a "detective simulator"—an experience that takes a whole night per game to play—as opposed to a regular board game. Another innovative feature of the game is the use of a dedicated website, built specifically for the game, which acts as a police database players need to use to match evidence or look into files of witnesses and suspects they "encounter". Players also get realistic physical components—such as case files—in the game box, turning the player's surroundings and everyday objects into the game-world (Rymer et al., 2018). Chronicles of Crime has similar goals which they achieve with different methods. Instead of physical case files, they use a dedicated app where location cards, evidence cards and non-player character cards all feature a QR code that needs to be scanned in order to progress the story. When players scan a location card, they have the ability to look through a room in Virtual Reality (VR), passing the device from player to player and look for clues (Cicurel, 2018). These games both bring a new approach to creating alternate realities, however, with a key difference: while Chronicles is aiming to transport the player into the game-world, Detective brings the game-world into the real world.

There are only a few games which go beyond "just" apps when utilising technology. Trivia game *When*

Figure 2.2: *Return to Dark Tower. Image used with permission of co-designer Tim Burrell-Saward.*

in Rome (Buckenham and Fleetwood, 2018), for example, uses connected smart speaker Amazon Alexa as a "game host", asking players trivia questions and playing back authentic sound-clips for the various travel locations. Another example is *Beasts of Balance* (Buckenham and Fleetwood, 2016), where there is synergy between the in-app gameworld and the physical pieces of animals. By stacking these animal components to a tower, new types of beasts are created in the app-world, where these creatures continue to live and can be collected as well. Publisher *Restoration Games* recently resurrected both Dark Tower and Fireball Island. In the new, redesigned version of Dark Tower—*Return to Dark Tower* (Burrell-Saward et al., 2022)—many of the game's interactions, such as the combat system or in-game events—are now carried out through an app. However, the game still features—and centres around—the iconic 3D tower component, which now benefits from two-way communication and interaction between the tower and the companion app. Players can "drop" skulls into the physical tower itself, which in turn, triggers events in the app. An image of Return to Dark Tower can be seen in Figure 2.2.

Similarly, *Beyond Humanity: Colonies'* is another hybrid boardgame which utilises RFID technology built into the components of the game, which interact with a wireless game-board (Salamonowicz and Suski, 2022). The novelty of the technology here is that interaction happens through the boardgame components, instead of through an app. Whilst the app is still there, it removes the need for players to

take their focus away from the game and its physical comonents entirely. A statement from the designers explains the innovation as follows:

> *"As board game enthusiasts, our team believes that an app should never take the player's attention away from the board. As engineers and designers, we fought to change the way software is used and can be a part of an exciting tabletop experience. During the game, the app serves as a self-operating data slate that enhances the classic and traditional board game experience. It displays the status of the colony and its citizens and does not require any interaction asides from clicking "next" at the end of turn. Instead, the game gathers information about your actions on its own! Thanks to the CPU built into the central piece of the game, the app recognizes when the new buildings are connected to it and it can recognize smart cards with the RFID technology built into modules."*

Examples such as Beasts of Balance, Return to Dark Tower and Beyond Humanity demonstrate novel possibilities towards utilising the potential of analogue pieces as connected devices. Whilst the examples presented in this section are far from exhaustive, they are representative of ways in which technology is currently implemented into analogue games.

2.4.2 How Boardgames could Benefit from Adaptive Technologies

This section compares the differences and similarities of boardgames to other media in order to understand why boardgames are not just suitable, but can also benefit from, the addition of adaptive technologies. The previous section has show how technology is currently most commonly used in boardgames. However, when compared to video games, boardgames provide unique characteristics and challenges when it comes to technologies which could automatically trace, and in turn, react to changes in its game states.

Boardgames have Dynamic States

Dynamic states in boardgames are a result of different game features revolving around uncertain elements. While uncertainty can be associated with randomness, according to Engelstein and Shalev (2019), even games—such as *Chess*—with minimal or no randomness carry elements of uncertainty as a result of not being able to predict our opponent's moves. Engelstein and Shalev identifies two types of

randomness in boardgames, based on whether randomness happens before or after the player's decision making. *Input randomness* is defined as what "players respond to" (207) while *output randomness* is "forcing players to make a high-stakes decision" (207) with an unknown outcome.

Even though the latter results in a more tense player experience, both create changes in the state of the game, creating possible points in the game to which technology could react to. When compared to the structure of a film—where the final media product is an unchangeable entity, predetermined by writing and the ideas of the director (Kirkpatrick, 1983)—the outcome of a single boardgame session is a result of a variety of factors. The most basic outcome of a game, according to Elias et al. (2012), can be that one of the players becomes the winner of the game. Winning can be a result of skill—such as in games like *Go*—or luck, as in drawing the highest card. However, the outcomes of a game can include many unpredictable elements, such as the overall length of a game, and can have an effect on the pacing of the game based on the behaviour of players at different stages of the game: "play can become different in character toward the end because the players will take crazy chances...desperate to win" (84).

According to Engelstein and Shalev (2019), uncertainty—whether it is a result of a card draw or a dice roll or another gameplay element—can also bring with itself power given to players to alleviate the random element. These manifest in the players' ability to manipulating certain aspects–such as decks, cards or dice—of the game, which can increase player agency. However, this added power to players brings with itself another random element: the player. From the perspective of adaptive technology, the unpredictability of how players mitigate randomness, and how they react to in-game events, create a new set of game states.

Dynamic States are Traceable

Adaptive technology requires changing states to which it responds. In video games—as determined by Collins (2008)—music "triggers", for example, can be coded into the game itself. At a first glance, boardgames could seem to fall short in their trace-ability due to their materiality. However, while this materiality—according to Rogerson et al. (2016)—is one of their main forces in attracting players, playing pieces can also contain information regarding the game's state.

Pandemic (Leacock, 2008), for example, is a game where players co-operate to prevent a world-wide epidemic. The game has mechanism of moving through a deck of cards. These cards represent cities on a map and players can use it either for movement, or, to exchange sets of the same colour to find a cure for one of the diseases in the game. This deck also contains a number of *Epidemic* cards, which—whenever

drawn—increase the threat levels within the game, effectively changing the game state. Other game pieces in Pandemic which reflect the current state of a game are coloured cubes players are required to place into different cities. The number of cubes in a city reflect how much danger that location is in.

There are examples of game designers utilising game components to manipulate and track game state changes with the aid of technology. In *Chronicles of Crime* Cicurel (2018), components feature a QR code which needs to be scanned with a mobile app. These components include location boards, evidence cards and suspect cards, and scanning these would reveal more information about a certain object, person or location through the progression of the game. These components allow the designers to reuse them in subsequent games as the revealed information upon scanning a component can be changed in the software. Another example is *Alchemists* (Kotry, 2014), where an app is used again to scan cards containing ingredients to create potions. The app determines which combination of ingredients are the correct ones for a given game, allowing for greater replayability.

In these examples, however, both the technology used to read components, and the components which reveal information, are specifically designed with the games themselves. None of the apps, for example, could be used to read the cards of *Pandemic*—or any other game. Furthermore, both apps require players to manually scan components, as opposed to working autonomously.

Another potential way to extract information regarding the state of an analogue game is through its players. Padovani et al. (2017) successfully used machine listening to gain information regarding the progression of tabeltop role-playing games (TRPGs). While boardgames and TRPGs share some similarities, there are a number of notable differences. For instance, while the social interaction in TRPGs revolves around the progression of a shared narrative and the impersonating of in-game characters (Cover, 2010), the social aspect in board gaming can be unrelated to the game played, or—according to Rogerson et al. (2016)—even take over an evening making the actual board gaming fade into the background. Interaction in boardgames can be entirely—or partially—non-verbal. In *Mysterium* (Nevskiy and Sidorenko, 2015), one of the players assumes the role of a ghost who can only communicate through distributing cards with abstract images. In other games, such as *Dead of Winter* (Gilmour and Vega, 2014), one of the players could potentially be a traitor and therefore needs to hide information from other players. These communication limits—as Engelstein and Shalev (2019) defines them—can range from not revealing player cards to having to withhold information from other players in order to “make the game more difficult” (228). While these aspects could potentially make it more difficult to apply machine listening to boardgames when compared to TRPGs, there are other possible ways to effectively track players.

Rogerson et al. (2017a), for example, found eye-tracking to be a potential way of gathering information regarding boardgame play. In the study, participants were playing boardgames in groups while one participant wore a portable eye-tracking device. From this preliminary study, the authors found that eye-gaze data can reflect different game-states through the eyes of a player. Rapid gaze-movement between various areas of the board, game pieces and opponents revealed "active engagement with the game, involving planning, analysing and understanding the game state and other players' motivations" (522).

While game designers already utilise game components to gather information regarding different game states, this is currently done with the main goal of extending replayability. However, further research could identify other ways in which game components could be used for data gathering, in a less game-dependent manner. Furthermore, there are examples of successfully tracking players, however, not all methods are suitable for all games—as illustrated in the comparison of TRPGs and boardgames. While some of these methods are preliminary—such as eye tracking—they show great potential for further research in understanding players themselves and how they reflect game state changes. Future research could also explore other physiological methods—such as heart rate monitoring—as potential measures.

Reinforcing Thematic Ties

The top 100 list of BoardGameGeek (2019a) reveals a plethora of different themes from farming (Rosenberg, 2007) through the zombie apocalypse (Gilmour and Vega, 2014) to attracting birds (Hargrave, 2019). Many of these themes, however, are commonly found in other media, such as film, TV or video games. Amongst games with typical fantasy (Dennen, 2016) or science-fiction (Fryxelius, 2016) tropes are also licensed games, which Booth (2015) calls paratextual games.

According to Booth, paratextual boardgames are games which are part of an existing franchise in another medium—such as film or literature—providing an interactive entry into this universe fans are already familiar with (similarly to licensed video games). While paratextual games are often criticised as lacking in interesting gameplay, Booth argues that this over-generalisation is dismissive of cult-media based games which gain added complexity through their relationship with the original media product. *Battlestar Galactica: The boardgame* (Konieczka, 2008), for example, is a licensed boardgame currently ranked within the BoardGameGeek (2019a) top 100. While it is not necessary for players to be familiar with the original work on which the boardgame is based to enjoy the game, Booth emphasises that when players do so, these games have the ability to "expand, deepen, and augment the narrative world through

individual player associations" (71).

Other than thematic ties, according to Elias et al. (2012), boardgames also share many of their characteristics with digital games. However, while video games typically benefit from additional sensory elements—such as music—aiding the realisation of their game world, boardgames rarely have their own soundtrack. Fans of the *Star Wars* movie franchise, for example, have access to both video game and boardgame versions set in the same universe. However, while the video game *Star Wars Battlefront II* (Williams and Dyer, 2017) features adaptive music composed specifically to the game by Gordy Haab, none of the boardgame adaptations—such as *Star Wars: Imperial Assault* (Kemppainen et al., 2014) have music, unless players choose to listen to the soundtrack of the movies. When asked about the adaptive music of *Battlefront II*, Haab notes that "if you're in a multiplayer match and suddenly the battle becomes more intense, the adaptive system would slowly mute the current version playing, and fade into the more intense version, and so on. So it is interactive – but what you're hearing is always a complete, single recording of the entire orchestra playing together" (para. 4).

Uncertain elements in boardgames often bear thematic significance—for example, in *Betrayal at House on the Hill* (Glassco et al., 2004), players explore a haunted house by placing tiles representing different parts of the house. Many of these tiles force players to draw "event cards", containing unexpected events which players need to resolve through rolling dice. As per Engelstein and Shalev (2019), these situations contain both *input* and *output* randomness. Players can make a decision whether to step on a tile where they know they will need to draw a card. However, they cannot predict how the events of the card will unfold. These events have consequences—such as losing life or gaining items—however, the cards contain highly thematic text.

An example event card would have the effect of the player unexpectedly gaining an item while the following thematic text would provide context for that effect: "There is an old mirror in this room. Your frightened reflection moves on its own. You realize it is you from another time. Your reflection writes on the mirror: *THIS WILL HELP* Then it hands you an item through the mirror" (Glassco et al., 2004, Image in the Mirror). This thematic flavour added to uncertainty could make boardgames benefit from dynamic, sensory elements which could strengthening the theme. As a comparison to *Battlefront II*'s game state changing from an uneventful match into an intense battle, *Betrayal*'s state change is the calmness of exploration turning into a "spooky" event. The difference is that *Battlefront II* has music which accommodates this change.

Potential to Aid Narrative

Narrative has an important role in both film and video games. When it comes to boardgames—perhaps thinking of titles such as *Monopoly* (Darrow and Magie, 1933)—narrative seems like a far fetched idea. According to Arnaudo (2018), however, analogue games are a medium in which narrative and storytelling have increasing importance. From his book *Storytelling in the Modern boardgame*, it appears that stories emerge as a result of a combination of "strong theme, dynamic interaction of rules, and players' input" (17). Arnaudo compares experiencing boardgame narrative similar to experiencing narrative in film or literature while his exploration of fantasy worlds comes to the conclusion that boardgames are a medium enabling fans of fantasy literature to step into these storyworlds. Thinking back to the example of thematic uncertain events in *Betrayal*, a string of these events combined with how players interpret these events, could result in an unfolding narrative. Arnaudo himself refers to *Betrayal* as an "experience game" due to players' enjoyment of the theme, unfolding narrative and characters, as opposed to the mechanics.

While it is emphasised that—when compared to film or video games—players have a significant role in how (and whether) narrative successfully emerges, Booth (2019a) notes that the book would have benefited from a more detailed exploration of players themselves. Still, both Booth and Wake (2018) agree that—being the only publication on narrative in boardgames—the book is an important addition to the growing scholarly account of tabletop gaming. The most important takeaway is that boardgames, as a medium, can account for different types of narrative while also remaining immobile objects without players interacting with them. Stories can be deliberately written and experienced through campaigns, for example, while they can also be a result of players' ability to build their own narrative, especially when the game's theme and mechanics form a synergy which allows them to do so.

According to Elias et al. (2012), "powerful visual and audio presentations possible in a computer game make presenting story very enticing" (219). While boardgames usually have neither, the inclusion of technology in certain titles uses visual and aural cues to aid narrative. The 2nd edition of *Mansion of Madness* (Valens, 2016)—as mentioned in the previous section—comes with a fully integrated app which features elements similar to the cut scenes of video games, alongside sound effects, music and voice acting in parts of the game. The earlier mentioned *Chronicles of Crime* (Cicurel, 2018) enables players to see crime scenes in Virtual Reality while the app also supplies background music.

Potential to Enhance Immersion

Arnaudo (2018) refers to many narrative driven boardgames to have "immersive properties." boardgames share certain characteristics with video games, however, they are mostly neglected from immersion research. While the effects of sensory elements to video game immersion are explored in the literature, it is more ambiguous whether they could enhance boardgame immersion without knowing whether boardgames can be immersive. This section showcases existing research regarding boardgame immersion, however, its extensiveness is far from video game immersion research.

One notable example is Wake (2019)'s recent publication in the Analogue Game Studies journal. The piece is a theoretical exploration of what boardgame immersion could be, when the special characteristics of the medium—such as materiality—are taken into account. Wake's writing is an update on a previous publication (Wake, 2017), however, the core concept is largely unchanged. Wake differentiates between "puzzle-based" and "imaginative" immersion, where the former is assumed to be more likely to occur when playing boardgames. Wake's argument that follows is an attempt to take "the properties of the large number of highly-thematic games in which players are invited to identify with (and perhaps as) the characters within the storyworld" (7) into account, making a case for imaginative immersion in the boardgame context. Wake uses Salen and Zimmerman (2003)'s double consciousness to build upon, referring to a double space—where play takes place "both on and around the table" (Wake, 2019, pp. 12). Through close inspection of three popular thematic boardgame titles, Wake concludes that the materiality of boardgames—which could be seen as what prevents imaginative immersion because of a lack of fidelity—achieves the exact opposite, defining immersion as follows:

> "To be immersed in these analog storyworlds, is, then, to occupy two spaces simultaneously, and at points it becomes difficult to distinguish between the "inside" and "outside" the game and the meta game. Thus immersion in boardgames should be understood not in terms of the transportation of the player to the world of the game (through an identification with the token-avatar) but in a broader sense in which the game world extends beyond the game and into a zone that is proximal with that of the player's actual world, creating both friction and design opportunities." (Wake, 2019, pp. 34)

Wake's theoretical exploration of boardgame immersion is an important step towards the understanding of boardgames as a medium in a contemporary context, and a move towards an understanding of how players interact with them. The ideas outlined in the article could, however, be taken further with ad-

ditional participant studies, which could challenge or verify the concepts outlined by the author regarding the effects of “double space” to player immersion.

Arnaudo (2017), while exploring flow theory in the context of boardgames, defined flow as “the almost hypnotic sense of immersion” (1). Arnaudo’s exploration is experiential, originating from the concept of flow “perfectly captur[ing] a state [he] has experienced countless times” (8). His approach is more practical when compared to Wake, posting a question to the forums of BoardGameGeek to seek input from players themselves. Arnaudo distinguishes between casual and hobby boardgamers, where the latter is a “self-select group that immerses itself in self-selected activities” (14). Other than gamers themselves, Arnaudo identifies hobbyst games to be a requirement of flow, due to higher complexity when compared to casual games, alongside the notion that boardgames are highly modifiable: whenever players are unsatisfied with the complexity of a game, they are able to tailor certain aspects of these games more freely when compared to video games. Arnaudo defines thematic games—games with strong thematic ties—as deeply immersive into a “parallel reality, in turn increasing the sense of psychological separation from ordinary life” (36). This separation creates the required commitment to the activity which is required for achieving a flow state, however, other aspects of board gaming—such as social interaction—can have flow-preventing effects.

Arnaudo concludes that “not all pleasure that can be derived from hobby boardgames has to come from flow”(63), however, flow is amongst the factors which attract players. From his writing, it is yet again difficult to distinguish between flow and immersion, where immersion is occasionally used interchangeably with flow, and other times, as a prerequisite to it. The bias towards pleasurable experiences is present, however, the acknowledgement that players do not exclusively choose to participate in board gaming to experience flow (or immersion) is a welcomed one: it is an indication that neither flow nor immersion are the penultimate experience, but rather, possible experiences amongst many.

Wake (2019), in his closing remarks, states that more research is needed regarding the augmentation of analogue games, bringing new possibilities—such as “aural elements”—to tabletop games. One such attempt is Rapp and Fischbach (2018)’s study of the effects of augmentation through building a custom app that replaces some of the components of *Eldritch Horror* (Konieczka and Valens, 2013), a popular thematic boardgame set in H. P. Lovecraft’s universe. The authors’ goal was to measure whether augmentation would result in greater levels of immersion, where immersion is defined as being incorporated within the game-world. This definition is based on Cheng et al. (2015)’s study explores the relationship between learning and gaming, using immersion as a measure. Immersion, according to Cheng et al., is

also used as a tool in predicting flow, therefore immersion—once again—becomes a prerequisite to flow. Game elements replaced by Rapp and Fischbach's app include replacing story cards with voice recordings, for example, or automated calculation of dice-results to decrease the cognitive load of players. Other than the addition of sound, the player environment is also augmented with the use of controllable lights.

Controlling player environment is an idea which correlates with both Wake's idea of the "double space" and Rogerson et al. (2016)'s findings when researching the materiality of boardgames. Rogerson et al. found that alongside game pieces, the environment in which games are played is of great importance to hobby boardgamers, where both game components and the environment are tailored by players to suit their needs and to enhance their own experience. Rapp et al.'s study of augmentation could be an important step in understanding how these factors manipulate immersion, however, his findings are non-conclusive due to "bugs" in the app hindering the experience.

From this section it is apparent how little research has been conducted regarding boardgame immersion to date. Existing examples are either theoretical (Wake, 2019) or incomplete (Rapp and Fischbach, 2018), or use immersion interchangeably with other player experience traits, such as flow (Arnaudo, 2017). More coherent studies are needed based on the ideas presented, in a more player-centric and practical manner. It is not surprising that there is no current research regarding the effects of technology and other sensory elements to boardgame immersion, however, it is crucial to first understand whether immersion is a trait of boardgame experiences, and if it is , how it can best be defined before using it as a measure to understand the effects of augmentation.

Chapter 3

How Boardgame Players Experience Immersion

3.1 Study Aims

The aim of this research was to understand whether boardgames—as a medium—have immersive capabilities, and how, if at all, boardgame players experience immersion as a result. As detailed in Chapter 2, there are many definitions of immersion in other media, whether it be a result of sensory stimuli, or a cognitive experience of an activity, or the result of a narrative experience. Boardgames have, to some extent, many similarities with other media. They are capable of telling stories and have dynamic gameplay, as evidenced in 2.4.2. And, in many cases, technology is used to augment boardgames to increase their immersive capabilities with expanded narrative and additional sensory stimuli. However, without a shared understanding of what it means to be immersed in a boardgame experience, it also becomes difficult to know whether or not technology would elevate the experience in any way. Further, preceding works in boardgame player experience largely focused on other facets of the experience, and those which were concerned with immersion, were largely theoretical.

Therefore, the main goal of this study was to understand boardgame immersion within the context of player experience, through analysing player data. As a resulting, this Chapter contributes the following in the understanding of boardgame immersion:

- A spectrum of the varying immersive *experiences* of boardgame players, based on how players describe them

- A matrix of underlying *conditions* required by players to achieve these immersive experiences
- And, an exploration of the relationship between conditions and experiences, contributing to the theory that boardgame immersion is a result of these conditions being met by an experience

3.2 Methodology

3.2.1 Forum Data

Data was collected from pre-existing discussions on online boardgame forums. The first data set was retrieved from a pre-existing discussion thread on a boardgames related subreddit. Reddit is a social media site that allows users to discuss media or questions in the form of comment chains. A subreddit is an area for users who are interested in a particular topic. Here we chose a discussion in r/boardgames where respondents answered the user-posted prompt *"What is the most immersive game you have ever played?"* Reddit (2017a). In total there were 320 replies to the question, which were gathered into the data set. 220 of these replies were removed from the data set for the following reasons: they either did not provide data on why the game was considered immersive—for instance if the comment simply noted the name of the game and nothing else—or were reactions to another comment, steering from the original discussion. In total, the remaining replies contributed 100 sampled sources. It is assumed that the majority of comments are from unique users, however, due to many users remaining anonymous—without a unique username—it is impossible to tell.

The second data set was theoretically sampled during the coding of the first data set, and consisted of an additional 110 comments retrieved from another reddit discussion thread—with the prompted question of *"What is the most immersive game you've played? What game really makes you feel like you are in that world?"* Reddit (2017b)—alongside 13 comments from BoardGameGeek, with the prompted question of *"What boardgames do you find to be the most immersive? And why?"* BoardGameGeek (2017).

For greater interpretability, original quotes from the forums are included in this Chapter. Following the guidance from BPS Ethics Guidelines for Internet-Mediated research Krotoski and Oates (2017), we see that forum data is in the public domain and believe our use of this data does not contravene users' expectations, and no damaging effect is anticipated from the ability to link a quote to its original forum post.

3.2.2 Interviews

The forum posts were collected from discussions that were initiated by users on the sites and not by researchers. Furthermore, the discussions were one to three years old, and as a result were no longer active. For these reasons, there was no ability to discuss the users' responses to the questions regarding boardgames immersion. Therefore, a third data set—an interview study—was planned to allow researchers to investigate in more depth how boardgames players experienced immersion. Five participants were recruited for the interview study: two British, two American and one Mexican-American, all between the age of 20–50. Four participants were sampled through Twitter based on their regular engagement in boardgames discussions through various social media platforms and one was recruited through an open call sent to board gaming groups by email. Three participants identified as men and two as women. Interviews were semi-structured and started with asking players what their most immersive boardgames experience was, replicating the original question from the forum discussions. While follow-up questions depended on the direction of each individual discussion, all participants were asked to give their own definition of immersion, whether they have had an experience when something broke or prevented immersion, if they have done anything in the past to enhance immersion and whether immersion was important to them.

3.2.3 Grounded Theory

We employed a standard approach to Grounded Theory following Charmaz (2013). Initial codes emerged from terms frequently used by players themselves in the forum comments—such as *game mechanics, art, story* or *game pieces*—which led to a more focused, theoretical sampling of the second data set and design of interview questions. Simultaneously, the initial codes were refined and grouped into more comprehensive categories, which—after further refinement—became the final categories used in the Results and Discussion sections of this Chapter. As per Charmaz, data collection, analysis and revisiting of data formed a continuous circle of discussions between three researchers [1] (as opposed to a linear approach), resulting in constantly refining our theories through the process.

[1] Note that the work in this chapter was published as a CHI 2020 paper, coauthored by Sarah Wiseman, Paul Cairns, and Rebecca Fiebrink. Paul Cairns contributed by providing feedback on the grounded theory analysis, research which I first designed and undertook as a student in his class. Sarah Wiseman and Rebecca Fiebrink were both my PhD supervisors at the time (Sarah Wiseman has since left academia) and therefore had closer involvement in the paper writing and revision, as well as providing guidance and feedback on my research. Sarah Wiseman in particular contributed some key ideas around the Immersion Spectrum and Conditions Matrix to the work that is written up here in Sections 3.3 and 3.4, and she contributed some writing to the CHI paper sections corresponding to Sections 3.3 and 3.4 here. Nevertheless, the bulk of the work (including idea for the study, grounded theory analysis, and interview design and execution) and the paper writing was done by me.

3.3 Results

Through analysis, it became apparent that players talked about two different aspects when discussing what boardgame immersion was for them. Some players, for example, elaborated on the exact features of the game—and the surrounding experience—contributed to their immersion. These players did not appear concerned with the definition of immersion itself, only with the factors which affect it. Other players, however, chose to share a game that they found immersive and described how it felt to become immersed in it. Rather than focusing on aspects which contributed to their immersion, these players described and explored what the term 'immersion' meant to them in a boardgame. Therefore, our analysis produced two interconnected theories. First, we can describe *Conditions of Immersion*: factors which are required by players for immersion to happen, such as specific traits of games, or required behaviours of players themselves. Second, we have *Experiences of Immersion*, which are the qualities of the immersive experience itself, as described by players.

3.3.1 Conditions of Immersion

Conditions of immersion are the factors that players require to be present in order to achieve immersion. Conditions reported by players included features of the games themselves and additionally aspects of gameplay outside of the game, for instance the actions of other players. We distinguish these two types of condition as *In-Game* and *Out-of-Game* conditions respectively.

We also noted that players discussed positive and negative conditions for immersion. Both In-Game and Out-of-Game can be positive and negative, positive meaning that the conditions of immersion are met, while negative conditions are those which actively remove (or prevent) a player from immersion.

In-Game Conditions

In-Game conditions describe innate properties of the game that were intentionally included by game designers. This could describe, for instance, the mechanics or artwork of the game. Other players described how the tactile nature of the game helps their immersion, *"I think I need something tactile to feel really immersed. To that end, Eclipse is the one that pops out to me."*. Whereas for another player, the narrative of a game is a key component in feeling immersed, *"The storytelling in Above and Below and Near and Far makes for a superb immersive experience."*.

Where some players discussed specific aspects of particular games, other players considered certain

general conditions being indicative of whether they would find a game immersive. For instance, this player explained *"When the theme and mechanics come together in a way where they become inseparable, that's where I tend to find the most immersion"*. Here we see that some players feel they are able to predict their own immersion based on generalised conditions. This differs from the previous accounts of players who were able to name conditions relating to specific games.

Whilst some players felt that in-game design decisions helped their sense of immersion, others noted that poor design decisions could hinder their ability to feel immersed in a game, for instance this player's account of in-game combat mechanics: *"Star Wars: Rebellion - Knocked down slightly because the combat takes you out of the immersion a bit. Matching up colours and icons is certainly not the ideal way to resolve conflict."*. Another player reported how certain game design decisions removed their sense of immersion to such an extent that moments which should be emotionally charged were reduced to a simple edit to how the game would play: *"[Dead of Winter's scavenging mechanic is] always just a deck of cards and chance. And unless one of the few interesting crossroads cards comes up, I've never been able to get attachment to a character so that their death is anything more than 1 fewer action die."*

It was found that the same in-game feature in a given game can have either positive or negative effects on immersion, depending on the player. One example is the narrative elements of *Above and Below* Laukat (2015). One respondent found the narrative immersive while another player felt that the lack of resolution to story elements prevented their immersion: *"Yeah this...made the story aspects of Above & Below feel hollow to me. You have a moderately interesting little story and situation, and then you... get some small, completely arbitrary bonus because... reasons. It didn't feel very rewarding and it also felt a bit of a jarring conclusion to the situation."*.

Out-of-Game Conditions

Out-Of-Game conditions describe factors affecting gameplay which are beyond the control of the game designer. This often refers to the actions of the other players at the table. When players sit down to play a game, they have the option of adhering to rules, ignoring rules, and even adding to them. In addition, players can choose to add layers of role playing to a game which may affect its immersiveness. These aspects, which are not strictly required to play and enjoy the game, are not within the control of the game designer who may have clear intents for how the game should be played but cannot ultimately enforce them.

For some players, immersion was increased by their external knowledge of the game's historical or

fictional setting: *"Battlestar Galatica. That was probably the most immersed and invested into a game. After watching the show then playing the game, just dealing with crisis after crisis each turn was like the show and we were really getting into our roles."*.

To increase immersion, some players reported that they adapt their physical environment to better match the game theme, often with music *"When I played with my friends I popped on the Last of us soundtrack. It was perfect!"* or even clothing and beverages *"Oh Merchants and Marauders is fabulously immersive! We've even dressed as seafarers/pirates to play, with a bit of spiced rum on the side and sea shanties playing in the background."*

One recurring Out-Of-Game condition that increased immersion which was reported by players was role-playing. For instance *"Flash Point: Fire Rescue is amazing for this. We name every firefighter and role-play the entire game."*. When all players are in agreement about adding a layer of role-play to the game it creates a more immersive experience for the player. In some games where lore and role-play are already a key component, it is still possible for players to expand upon the given narrative to increase immersion: *"[M]y buddy and I really had fun reading all the story paragraphs on cards (in different accents and voices) and crafting hypothetical situations around these characters that would explain why situations took place as they did. [...] the way we played, it really heightened the experience tremendously, and made it so much more fun. Even if we lost horribly." (Discussing Eldritch Horror).*

This account highlights how the Out-Of-Game decisions made by players were often made in order to enhance and strengthen an In-Game decision made by the designer. In the previous instance, the player took the narrative provided by the game and chose to expand upon the stories and to add characterisation in the form of voices. One player felt that making these Out-Of-Game decisions was something of a player "responsibility": *"I think for any game it takes effort on the players' part to really solidify the theme. In my experience Dead of Winter has been really thematic but my group generally tries to thoroughly narrate the actions taken and events occurring in order to establish continuity with the game's premise."*

As with In-Game conditions, it is possible for Out-Of-Game decisions to break immersion or prevent it from occurring. For instance when there is disagreement about how the game is best played: *" Sherlock Holmes with everyone being a bit silly and role-playing the era is brilliant but with people being too clinical and almost metagaming it's a bit dull."*

Whereas this player reports that other players taking the game too seriously (and thus ignoring intentional design decisions) negatively affects their immersion, others reported the opposite effect. When another player is not paying enough attention to the game and not engaging with the rules or mechanic,

players reported losing immersion: *"No game will ever be able to fully occupy my attention if another player is taking a phone call, while another is checking out another game at another table, and yet another is already talking about what to play next."*

While flavour text and story paragraphs are conscious In-Game decisions of the game designer, the Out-of-Game decisions are the responsiblity of the players and can thus choose to ignore careful narrative set up by the designer. Immersion can be hindered for the rest of the group when one or more players ignore flavour text, as this player reported: *"I played this with the wrong group, who were just ignoring all the flavor text and powering through. It was a terrible experience, it felt like there was a really cool game under there."* while another player further emphasised the role of players themselves in bringing boardgames into life: *"You, as a player, are a part of the theme. If you strip the game from it's theme, cards will be only cards and cubes will be only cubes. I have a friend that does this in everything. Example from Alchemists: "Ok, so I do a red plus and sell it in the thingy", "NO, you concoct a healing potion and sell it to the barbarian on the market". "* Discrepancies between players about which aspects of the game to engage with and which to discard are a frequent cause of breaking immersion.

3.3.2 The Immersive Experience

When players chose to explain their sense of immersion—or the feeling they interpreted as immersion—we noted a variety of reported experiences. Here we describe in detail the reports of immersion found within our data sets.

Engrossment

For some players, immersion means being absorbed in gameplay. The emphasis is on the player's role as a "problem solver", where the outcome of the game is largely or solely due to the player's actions. Setting has no effect upon immersion in this instance, only the "problem" or "challenge" is important: *I don't find myself immersed in theme very often, but there are several games that immerse me in the gameplay to the point where I don't notice the passage of time."*. Whilst it was common for players to note these experiences involved losing track of time, players also associate immersion with stressful and intense experiences: *"Go. It's so intense, it's like I melt into the abstract board. After a tight game I'm usually shaking from adrenaline and vow never to play it again. It's a very stressful game for me."*

Contextual Engrossment

The feeling of engrossment was enhanced for some players by including or appreciating the context in which the game was being played. Whilst the theming alone did not facilitate immersion, it enhanced the players' sense of challenge-related immersion: *"Whenever I play, instead of removing soldiers from the board every time they are killed, I'll leave them in the hex where they di[e]d so that after a battle is over [...] we can see where the most carnage took place. It kind of helps you realize how much went into you accomplishing the mission which really adds to the immersion." [Discussing Tide of Iron]*.

Players are aware of a defined world that surrounds gameplay, but they do not necessarily feel part of this fictional world. Whilst the focus remains on the challenges of the game alongside players' abilities to overcome them, the context affects how the level of challenge is interpreted.

Embodiment

For players who found that both the challenge of the game and the theming or context to be equally important for immersion, their sense of immersion reflected a state of embodiment: *"The way [the] campaign is designed makes you feel that you're really a tiny rebel against imperial forces, advancing rebellion one small step at a time. Secondly, it is very very tactical" [Discussing Imperial Assault]*.

This is a distinct sensation from Contextual Engrossment, where players feel like they are an *external* force on the game world. For players reporting a sense of Embodiment as immersion, their presence within the game world was key. They reported feeling that they were navigating the problem solving aspect of the game whilst inhabiting a role within that fictional world—for instance making decisions *as a character* rather than as a player: *"Alchemists - It so perfectly mimics academics with all in its glory, that I get into a mindset of an aspiring alchemist every single time. A blast among my academic friends."*

Contextual Submergence

Some players placed the world as most important to immersion, and perceived the problem solving aspects of game play to be secondary (but still necessary for immersion). In this sense, one could consider this state of immersion to be the opposite of Contextual Engrossment. For these players, the setting is what allows them to achieve immersion primarily: *"You don't necessarily get the feeling of actually doing the things but more like a feeling of being in there (does that even make sense?)" [Discussing T.I.M.E. Stories]*

For players who experience Contextual Submergence immersion, whilst they may be making decisions within the game, immersion is not broken if they feel like they don't have influence over the gameplay entirely. They are happy to experience the world more passively and still feel a sense of immersion in the game.

Submergence

Submergence describes players for whom immersion is being fully incorporated into the narrative, setting and unfolding events of a game. For these players, having control over events in the game or solving problems to win is not an important component of immersion, for instance this player discussing the immersion of watching, not playing: *"Star Trek Ascendancy feels like you are watching the meta world and politics of Star Trek.".*

As this feeling of immersion does not rely at all upon in-game decision making, a person being immersed this way might not even have to play the game, but rather, be a spectator of others playing: *"The game I wanted to say I've never played, I've only watched. And that game [is] Spartacus! That game was the most immersive game I have witnessed. I felt like I was actually watching a group of Dominus scheme, betting, and sending there gladiators/slaves into the arena. As a spectator it felt like I was in the arena stands watching blood spilling and devious schemes being hatched!".*

Summary

Through analysis of players' reports of immersion, it was possible to determine that all players were not discussing the same experience. For some, a sense of losing time was deemed immersion whilst for others a feeling of being in the game world was the definition of immersion. The *Experience* of immersion is therefore distinct between players.

We have chosen to note these differing definitions here through categorisation. We wish to highlight however that we do not believe these categories to be distinct, but rather are way-points along a continuous line of descriptions of immersion, similar to what is seen in Ermi and Mayra (2007). The categories act as illustrative examples of how the two extremes of view with regards to player-reported immersion are not entirely separate and easily distinguished.

3.3.3 Awareness of Immersion

Whilst these theories are a result of our analysis, it is clear from the data that certain players are also aware of the ambiguity of the term "immersion" in boardgames. Players stated *"'Immersion' is an interesting thing, and also very nebulously defined"*, or *"There are two sorts of immersives[sic] here – immersed in the theme/subject matter, and immersed in the gameplay"*. Where some players were aware of the possible different definitions, others felt that they themselves had the sole correct interpretation of the word, going as far as to call out other players' definitions: *"I think you're taking the metaphor of immersion too literally. When people talk about being immersed they don't mean they literally thought they were part of the game's universe"*, or even questioning other players' experiences: *"I think you are holding the term immersion to a higher standard than others in this thread. From my viewpoint, you sound like you do get immersed in games"*. This indicates that hobbyist boardgame players are not just aware of immersion as a concept, but are eager to query and question its use and meaning.

3.3.4 Issues with Immersion

Whilst the majority of respondents experienced immersion in some way or form, there were a few players who did not feel boardgames as a medium was capable of facilitating immersion for them. One player, for example, attributed this to *"board games [not] really [having] enough sensory input or narrative depth that I'd ever call them immersive. It's always still bits on boards with dice and cards."* While the same player still experienced getting *"deep into a strategy or deep into the social interactions at the table"*, their Conditions of immersion—"sensory input" and "narrative depth"—were not met by the experience. Whilst boardgames provided the In-Game attributes of "strategy" and Out-of-Game attributes of "social interactions", the player does not consider these to be their Conditions for immersion. This illustrates how Conditions differ from player to player, enabling immersion for one player while denying it from another.

Another player considered game components to be in the way of Embodiment: *"making me feel like a mage? By counting numbers and fid[d]ly bits? Not really...If I wanted immersive, I would read a book"*, implying that their reason for playing boardgames is not necessarily for immersion. It is possible for immersion not to happen even when players engage in Out-of-Game practices such as role-playing: *"I like being silly and imaginative, yes, but I have never felt like I'm "in" the world of the game. I love a game with good theme and I can do spooky voices or over the top pronouncements of betrayal, but it isn't immersion for me. [...] I've just never had a gaming experience where I have felt like I was in the*

game instead of playing the game". This comment implies that players can have Conditions of Immersion which are never met by any game experience, creating a constant barrier to immersion for these players.

Lastly, there are players who consider boardgames to have the ability to facilitate immersion, but believe that immersion cannot compensate for an otherwise bad gaming experience: *"I'd say probably Arkham horror. But that's also a perfect example of why theme and immersion are irrelevant. It's a terrible game, and while you may feel immersed in the world, the lack of gameplay means it's permanently consigned to the shelf"*. Whilst for some players a driving factor of playing boardgames is the ability to become immersed, a sense of immersion cannot save a game if the player does not enjoy the base mechanics.

3.4 Discussion

3.4.1 Conditions and Experience of Immersion in Boardgames

Our results indicated that players describe either their conditions for immersion to occur, or the immersive experience itself. We suggest that the Conditions of Immersion are best illustrated as a Matrix, as seen in Figure 3.1, while the Experience of Immersion itself is best illustrated as a Spectrum, as seen on Figure 3.2.

We use a matrix to describe conditions for immersion (Figure 3.1), as there are two major factors which define the conditions: whether they are positive or negative and whether they come from within the game or are something additional brought to the game by players. Boardgames are played in two spaces simultaneously—on the table with game components, and in the real world, where factors such as other players, one's outside interests, and other elements come into play. Throughout our research, we noted that comments regarding immersion conditions concerned either decisions that the game makers had made (In-Game on the matrix) or actions taken by the players themselves (Out-of-Game on the matrix). We also note that both of these aspects were described in positive and negative terms by players. From this, we determined that the reported conditions for immersion could fit within this two dimensional space. Whilst we feel that all of the comments collected in this study that relate to the conditions of immersion can be placed within the matrix, here (Figure 3.1) we present example quotes which could be assigned to each of the four quadrants.

Furthermore, we believe that both axes are continuous, and that it is possible for a condition to have a strong or weak positive impact on immersion. Similarly, we believe that whilst some features clearly

come from within the game (the mechanics of gameplay, the quality of game pieces etc) and some from outside (players choosing to give characters names, putting on music etc), other features are closer to being a combination of both. Take for instance, the player who reported extending the narrative of some in-game characters. The game designer worked to create these three-dimensional characters (In-Game condition) whilst the player chose to add to these stories (Out-Of-Game). In this way, this act was a combined effort from player and game. Since Out-of-Game practices are voluntary, deliberate alterations of how the game plays—including rule modifications to better suit the players—are practices, we suggest, that present a level of control over the immersion of the game. Boardgames, due to their inability to reinforce certain boundaries when compared to video games, may result in a new type of player "customisation" of immersion.

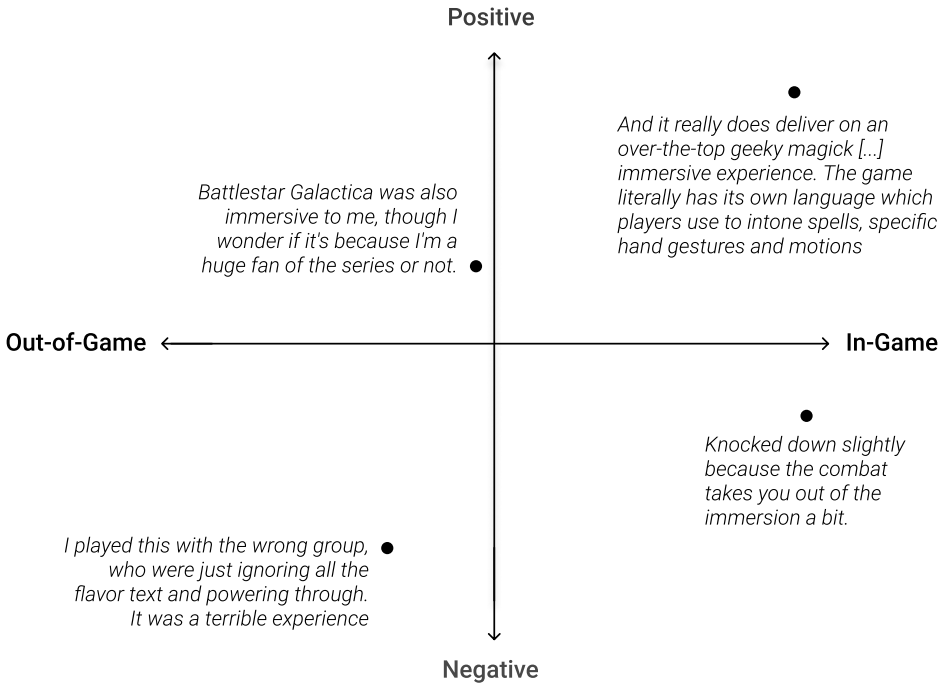

Figure 3.1: *Immersion Conditions: Matrix of conditions required by players to feel a sense of immersion in game, or conditions that lead to a loss of immersion. In-Game Conditions describe those designed by the game maker whilst Out-Of-Game Conditions describe those brought to the game by the player. An exemplar quote is presented for each quadrant.*

Immersive Experiences fell along a spectrum, from engrossment in the challenge of the game, to submergence within the game world. However, we note some way-points between these two extremes, and—based on our analysis—we suggest that immersion for players is comprised of some blend between these two. This spectrum does not comment on the *amount* of immersion but rather the *composition* of immersion. Figure 3.2 shows a range of immersive experiences and their relative composition of both Challenge and Game World. Challenge relates to how important it is to have influence over the game's

outcomes in the form of decision making. For players who experience immersion as engrossment, this is entirely composed of challenge. Game World relates to all aspects of the fictional world created within the game. This was so strong for some players that all they needed was the narrative to become submerged in the game. They did not even require the ability to make any meaningful changes within the game as they were content to simply watch the game being played, thus requiring no Challenge at all.

Importantly, players also reported a blend between the two game aspects, such as immersion resulting largely from a sense of being in the game world, but also being helped by the presence of challenging gameplay (Contextual Submergence in Figure 3.2). Others reported becoming immersed in the complex manoeuvres required in the game and found the game theme to be a nice additional touch (Contextual Engrossment in Figure 3.2). Others still reported that a perfect blend between challenge and gameplay helped them reach an immersed state (Embodiment in Figure 3.2). We do not suggest here that absolute percentages can be ascribed to the players studied in this research, but rather, we aim to highlight that immersion could be achieved by many different combinations of Challenge and Game World.

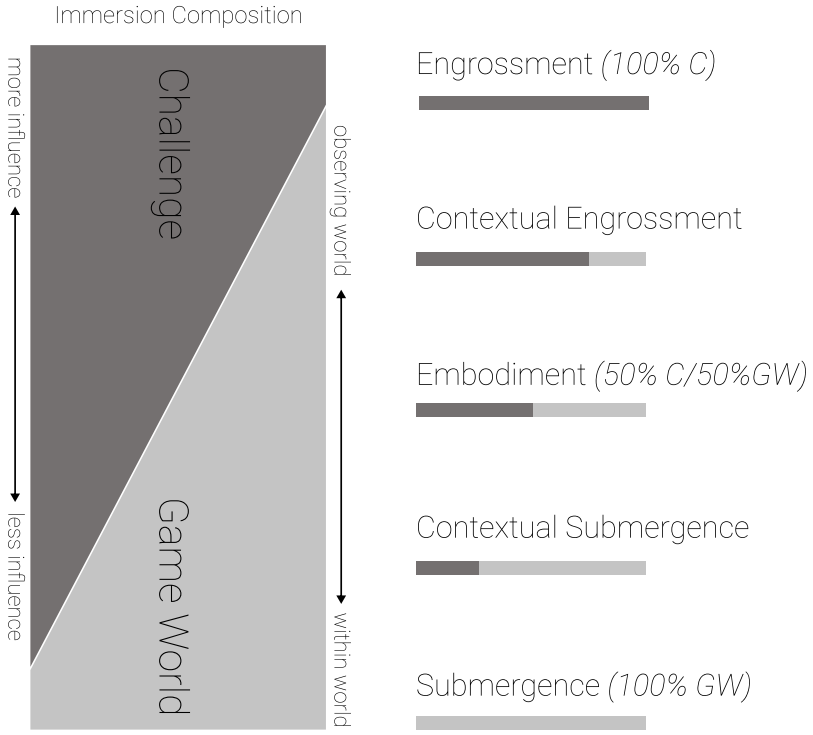

Figure 3.2: *Immersion Experience: Spectrum to show the possible composition of immersive experiences described by boardgames players.*

We did not find evidence to suggest that immersive experiences are static for each player. That is, we believe that it is possible for the same player to occupy a number of different places on the spectrum; for example, the same player could find immersion within Engrossment in one game while in another game,

immersion could look more like Embodiment. This was alluded to by one player who reported two games as being *"deeply immersive in different ways" [Discussing Terra Mystica and Werewolf]*.

Through data analysis, we suggest that the relationship between the Conditions Matrix and the Experience Spectrum is causal: when a player's condition(s) for immersion is met by a game, they experience a form of immersion. This experience exists at some point on the Immersion Experience spectrum. While the majority of respondents either described a condition or the nature of the experience, there were examples where a player would nominate both the condition and then provide a description of the resulting experience. One player, for example, describes the Condition to be a certain level of complexity, while the Experience as "being focused": *"[the game should] be so complex that my mind has to be focused on the game at all times"*. Another player finds *"Warhammer Quest: The Silver Tower"* to have a *"very strong narrative"*, which in turn results in the experience feeling *"like I was an adventurer with my comrades going through a creepy dungeon."*. In this case, the Condition is "strong narrative" while the resulting Experience is the Embodiment of an adventurer.

As noted previously, it may be possible for different sets of conditions to lead to different experiences of immersion for players. Therefore it is not a player who occupies a point on the immersive experience spectrum but a combination of player *and game*. For instance, one player may feel immersed playing chess because their required conditions for immersion are that they feel highly challenged and that there are immense amounts of choices available to them. In this instance, the player experiences Engrossment. However they may also have immersion conditions of needing beautiful artwork and well-made pieces. These conditions may be met by another game and in this instance the player may experience Embodiment. Here you see the player's position on the immersion experience spectrum alters based on the game they play, and therefore, which immersion conditions are met.

3.4.2 Boardgame Immersion and Video Game Immersion Theories

Game properties described by players in In-Game Conditions often correlate with game characteristics found in video game immersion research. While the sensory representation of boardgames largely differs from video games in their lack of moving image and audio—with the exception of boardgames with implemented technology or companion apps—it can be argued that players who describe art, game components and theme as their condition for an immersive boardgame experience are detailing something similar to what Witmer and Singer (1998) call a "continuous stream of stimuli". While stimulus provided by boardgames arguably do not fully surround the player—as identified by Witmer and Singer as a require-

ment of immersion—we argue that players themselves can provide the "missing piece" either through imagination or through Out-of-Game practices, such as adding music to the game session or otherwise modifying the game environment. Furthermore, these Out-of-Game practices happen whenever the players themselves require them. It is possible for a given game to have met the conditions of immersion as it is for one player (or player group), while at the same time to require Out-of-Game modifications to meet the conditions of another. This suggests that the self-described conditions of immersion differ from player to player, and that players themselves are able to identify whether these conditions have been met or not.

Additionally, similarly to Cairns et al. (2014), we suggest that a lack of high visual fidelity of game assets does not prevent players from experiencing immersion whilst playing boardgames. The aesthetic qualities of game pieces and art are important—and are conditions of immersion to some—however, what is important to players is that art and components are fitting to the theme of the game and that they are done to high artistic standards.

In video games immersion literature, immersion through sensory elements of video games is often considered as a type of immersion in itself (Witmer and Singer, 1998; McMahan, 2003; Ermi and Mayra, 2007). However, we argue that—at least for boardgames—sensory elements can be contributing factors in achieving immersion, rather than a type of immersion. This distinction highlights that for some players sensory elements of the board game lead to immersion, but for others they do not. These elements are not immersion but rather, are potentially immersive.

Some In-Game Conditions relate to features of boardgames which provide cognitive challenge to players, such as requiring the game to have strategic depth. Challenge has been recognised as a form of video game immersion (Nilsson et al., 2016; Ermi and Mayra, 2007; Brown and Cairns, 2004), and we believe the experience to be similar for boardgame players. However, we once more distinguish between a requirement of challenge provided by the game as a Condition to immersion, while the feeling of being challenged as the Experience itself. Based on our findings, many players' experiences could be defined as engagement as opposed to immersion. However, as found by Denisova et al. (2016), these terminologies overlap when defined by video game players also. We therefore accept engagement as a form of immersion.

World-building and narrative were important to players both in terms of the Conditions needed to achieve immersion, and for the reported Experience of immersion. This finding echoes similar results from the video games literature, which highlights the important of world-building for some immersive

video game experiences (Murray, 2017; Ermi and Mayra, 2007; McMahan, 2003; Arsenault, 2005).

Our analysis highlights that whilst a game designer can attempt to craft a game world for players to inhabit, the players are still required to acknowledge this in order for the game world to exist. Players who ignore flavour text are perceived to be denying other players of the ability to immerse themselves in the world. Through use of text prompts, game art and mechanics, players create a virtual world in their heads, without needing intense visual stimuli. This is not a unique finding; when considering text-based narrative, Ryan (2001) discusses the ability for readers to create their own virtual world in their head from the text alone.

This is, however, a difference from video games where world building is presented as a coherent whole through moving image and audio. We argue that boardgames present more flexibility in the interpretation of the game world, similarly to other text-based media, as suggested by Ryan et al. Ryan (2001). Furthermore, this customisation is not just reflected in world building, but how rules are enforced during game-play, alongside players' ability to introduce Out-of-Game practices. This flexibility of boardgames suggests that boardgames allow for a more "customisable" form of immersion, when compared to video game immersion. Video games, on the other hand, present a more homogeneous experience through enforcing the rules and supplying audio-visual stimuli that are specifically designed for the game itself. Whilst boardgame players can add their own music, for example, it is often "borrowed" from a different domain.

This contradicts the conclusions that Abeele et al. (2020) suggest when considering video game design choices. The authors propose that game designers have control over aspects of the game which are then entirely responsible for the player experience through *functional consequences* which lead to *emotional consequences*. Whilst it seems possible that this is also the case within boardgames, the analysis in this paper additionally highlights that the existence of immersion is a joint effort between game designer and player, and that regardless of the game designer's choices and decisions, ultimately the player has control over whether those decisions are realised during game play. Further research could determine whether there is a similar, directly causal relationship between Conditions of Immersion and Experiences of Immersion in our work, but importantly the Conditions will include decisions made by both designers and players.

Lastly, whilst our data contained a few examples of hybrid boardgaming experiences, we could not assess from this data set whether these games have more capacity for immersiveness when compared to boardgames which are fully analogue. Considering the various roles technology can fulfil within a

boardgame (Rogerson et al., 2021b), it is possible that it could become an additional tool to help fulfil players' Conditions for immersion in a variety of ways. For example, a companion app or website can provide additional sensory stimuli or additional ways to deliver narrative—aiding in the realisation of the game-world—which could help fulfil Conditions for Engrossment and Submergence-type immersive experiences. Or, technology could bring with itself novel gameplay mechanics, which could in turn help players achieve Engrossment. However, above all, technology could become an additional tool in boardgame designers' arsenal in their efforts to facilitate experiences which could meet players' various criteria for immersion.

3.4.3 Implications for Designers and Players

After Dourish Dourish (2006), we are wary to see Grounded Theory used purely to deliver implications for design. However, this work suggests that boardgame designers and players might take the following into consideration when thinking about immersion:

- Players can have agency in shaping their experience of immersion as well as the immersion of fellow players. This recognition may lead them, for instance, to consciously choose to act in ways that ensure that immersion is not broken for any of the players.
- Narrative and theme are often identified as primary drivers for immersion; however, we identified other factors (such as time pressure) that designers might consider in order to facilitate different types of immersion.
- Designers might increase immersion by mitigating unwanted player behaviour. One example is players ignoring flavour text, which could be addressed with the inclusion of voice-over, for example.
- Players, as well as designers, should consider that immersion is not experienced the same way by all players. Therefore, a game that is immersive to one player might not be to another.
- Focus and concentration on the game seems to be an important factor across the variety of experiences. Therefore, players—when striving to achieve immersion—should limit distractions during game sessions, whilst designers could consider mitigating the amount of time players need to wait between turns, for instance.
- Whilst it is useful to consider immersion when playing or designing boardgames, it is apparent that it is not the sole reason why players enjoy boardgaming as a hobby.

- Designers could examine Out-of-Game practices that players are choosing to bring to games and consider whether incorporating elements of these practices into new games in a more formal way could increase immersion for other future players. For instance, more game designers may like to consider a game soundtrack.

3.4.4 Limitations and Scope of Contributions

The small sample sizes of the forum data and the interviews prevent us from using these data alone to formulate a fully applicable, general theory of boardgame immersion. Rather, they have informed an initial understanding of how players experience immersion, in order to identify relevant factors and facets of experience. We have sought to produce useful descriptions of previously unknown phenomena as a basis for further research, alongside demonstrating that players may think about immersion on a wider spectrum than expected.

Whilst hobbyist boardgame players are arguably more vocal about their play experiences (and it is likely hobbyist boardgamers who we have sampled in the forums), these players may not be representative of the wider boardgame community as a whole. Casual gamers may be more likely to be excluded from these data sets due to not necessarily engaging in the surrounding practices of board gaming the same way as hobbyist gamers do, resulting in a possible over-sampling of hobbyist players. We therefore suggest these theories on boardgame immersion are preliminary and need validating across a wider variety of gamers. Further, we lack information regarding forum users' backgrounds (e.g., gender, age, and racial representation), so we may have sampling biases in our collection.

Lastly, since one set of data were collected from a prompt question that asked specifically about "what makes you feel like you're in the world", we assume this could be leading people to discuss immersion on the submergence end of the spectrum. However, we don't comment in this paper about the number of participants who report immersion at either end of the spectrum and so feel this does not impact our data analysis overall.

3.4.5 Future Research

This research highlights that immersion is important to boardgamers and that there are distinct definitions for what the experience entails. Whilst completing the analysis we were aware of gaps within our understanding of boardgame immersion that our theory currently does not explain.

We explored boardgame immersion from two angles: as a collection of factors which facilitate immersion, together with different ways it manifests for players. However it may be possible that there is a third metric regarding the amount of immersion experienced. We could not extract this information from our current data sets, however, through more targeted data collection (such as player interviews) a more complete picture of the boardgame immersion could be drawn.

Whilst conducting our data analysis we noted that some players made a clear distinction between the concepts of immersion and fun. Whilst many players conflated the two to a certain extent, some players highlighted how separate the two concepts were. One player explained that regardless of how immersive a game is, if it is not fun then immersion alone cannot save it. Conversely another player discussed that strong immersion in a game can overcome negative emotions felt from losing a game. Future research in this area might explore how interrelated immersion and "fun" are within boardgames.

A final pertinent area for immersion research is the blurring of analogue and digital games. Whilst we have highlighted the differences between the features of boardgames and video games—such as the materiality of boardgames or their lack of visual realism—we have not considered digital editions of otherwise analogue games. An increasing number of analogue games are being translated into a digital form (Nintendo, 2020; Funforge Digital, 2017; Asmodee Digital, 2015; DIGIDICED, 2019, 2017). While these adaptations aim to implement the mechanics to mimic the analogue version as much as possible, they often feature animations and a soundtrack, which are not present in the original. The question about whether these games are considered more as a video game experience or more as a boardgame experience could be asked, alongside comparative studies of whether immersion is experienced differently from their analogue original.

3.5 Conclusion

In this Chapter, we illustrate how immersion is an important aspect of the boardgame experience for many hobbyist players. Just as in video game literature, the term "immersion" has many different definitions for players. Here we have collected and analysed players' discussions and interviews to present a Matrix of Conditions of Immersion, as well as a Spectrum of Immersive Experiences. We show that whilst boardgames and video games have distinct interactive experiences, the two seem to elicit similar feelings of immersion according to some definitions of video game immersion. We also highlight boardgame experiences' capability for customisation; an advantage in giving players more control in shaping their own

immersive experiences through the flexibility in rule enforcement, and material nature, of boardgames.

Chapter 4

The Effects of a Soundtrack in a Boardgame

4.1 Experiment Aims

The purpose of this study was to examine the effects of a soundtrack to player experience in a boardgame—more specifically, a soundtrack which was purposefully created for the game as additional sensory stimuli. As I discussed in Chapter 2, companion apps are increasingly featured in modern boardgames, and many of the commercially available examples include optional (Klenko, 2017) or integrated (Valens, 2016) soundtracks. Simple, pre-recorded soundtracks can be a technically straightforward addition to certain styles of boardgame, and one can imagine the design of more complex approaches where a digital soundtrack could dynamically respond to player actions or game state, as in video games.

Most commonly in current boardgames with soundtracks, there is little to no correlation between gameplay and the background audio—such as the Deluxe edition of *Tokaido* by Bauza (2015)—and both the playtime of these games, alongside the events during gameplay, are too unpredictable due to randomness and game mechanics. However, there are boardgames which—defined as Fully Real-Time Games by Engelstein and Shalev (2019)—feature a fixed game length between 10-20 minutes, and players always have exactly the same amount of time to solve the puzzles of the game. The ending is indicated either by specific conditions met, or by a timer running out. These games are usually quite frantic in nature and simple in gameplay, as players do not take turns, but carry out their actions simultaneously. Notable real-time games are *Escape: The Curse of the Temple* by Østby (2012), or *Magic Maze* by Lapp (2017).

Whilst not all real-time games include audio, games Engelstein and Shalev (2019) call Elapsed Real Time Games—like Escape: The Curse of the Temple—sometimes have a fully composed soundtrack timer which lasts exactly the same length as the game itself. The audio track often carries information regarding how much time the players have left, and thematic sound effects or bits of narrative within the audio are not uncommon. Because gameplay is short, and there are not many game-state changes, the soundtrack remains in greater synchronicity with the actions of the game. Whilst Engelstein et al. contribute elevated tension to the timer mechanic in these games, we wanted to know whether the soundtrack could increase the levels of tension when compared to playing the game without a soundtrack.

Although no research to our knowledge has examined the effects of music on boardgames, there is substantial research on the effects of music in video games. Klimmt et al. (2019), for example, found that music had a positive effect on the enjoyment of players in a fantasy video game, and increased players' feelings of fear in a horror game. Phillips (2014) states that music can aid certain mind-states for players, which she defines as "being in the zone"—a state similar to Csikszentmihalyi (2008)'s flow state: a state of unbroken concentration. Munday (2007) attributes music to causing cognitive immersion, where cognitive immersion is considered a function of the brain, aiding players blocking out distracting sounds while also helping players focus their attention to stimuli provided by the game itself.

Another role music can have in video games is strengthening the game-world and narrative elements of games. Phillips (2014) states that different genres of games have different musical requirements. The exploration of a rich and detailed game-world is a feature of most "role-playing" or "adventure" games, for example, where the role of music is to aid the realisation of the fictional world, making its characters and culture believable. Similarly, Whalen (2004) suggests that in order for both the game-world or its characters to become believable, they need distinguished theme music attributed to different locations and characters within the game. Munday (2007) also considers music inseparable from the game-world, where music and other sounds—such as dialogue, sound effects and even silence—together with all other sensory information such as visual or tactile elements, merge to form the game-world itself. Collins (2008) argues that music reinforces the motivations of characters, while also helping the player navigate within the narrative and signalling changes in the story. Continuity is not only important in the overall flow of the game, but in the flow of its narrative. Both Collins and Munday state that music can connect the story elements, similarly to how it connects locations or phases of action and inaction. Music can, furthermore, become feedback to players during gameplay. For example, players can recognise where they are by listening to music associated with a location, whilst also being prompted by music towards

important goals, objects or characters (Collins, 2008), or differentiate between a “safe state” and “danger state” in the game (Whalen, 2004), or further aid the game’s flow by setting the pace of a given game (Phillips, 2014).

Lastly, building upon our research into boardgame immersion detailed in Chapter 3, tension, theme and narrative were all contributing factors to immersion to some players. Whilst this study is not explicitly interested in immersion, we wanted to know whether a soundtrack could affect players’ experiences of theme and narrative, similarly to how these are affected by a soundtrack in video games. Whilst music is definitely not the only sensory element technology could potentially strengthen, it is one that is both utilised by players to help their own immersion (as evidenced in Chapter 3), and a tool designers already utilise as part of digital apps and timers included in many commercially available boardgames.

4.2 Methods

4.2.1 Participants

Participants were sampled from hobbyist boardgame players—defined by Rogerson (2018) as players who participate in the surrounding practices of board gaming, including the collecting, organising and discussing of games—alongside players who identify as more casual players who co-resided with the hobbyist player. Due to the ongoing COVID-19 pandemic, the experiment had to be conducted fully remotely and included materials which needed to be delivered to participants, which influenced how participants were sampled both in a geographical sense and in terms of their gaming experiences. In the end, 14 participants were recruited on the basis of the following criteria:

- Groups of two people living at the same address, available to participate together.
- At least one, or both participants in the same group identify as a hobbyist boardgame player.
- Players need to own a computer with a web-camera and microphone, and are able to play videos on their computer, alongside using video-conferencing software.
- Players should have not played the selected boardgame before.

Participants were asked to fill out a pre-survey (see Appendix A)—which enquired whether they identified board gaming as a hobby, whether they aimed to play boardgames frequently, whether they have

collected boardgames and whether they have participated in online discussions regarding board gaming. Based on these questions, we identified 9 participants as hobbyist players, and 5 participants as more casual players. The mean age of participants was 30.15 (STD 10.02), and 5 participants were female identifying, whilst 9 male identifying. All participants received a sealed copy of the game by courier service before the start of the experiment, which they have kept afterwards.

4.2.2 Materials and Conditions

For this experiment, the boardgame *Fuse* by Kane Klenko (2015) had been selected due to the following properties:

- A game which is real-time—where players all play at the same time, without taking turns—to eliminate waiting time before turns.
- A game which has a fixed length despite the outcomes of gameplay, so that there is greater correlation between the soundtrack and gameplay.
- A game which has a short play time, allowing for multiple play sessions, reducing the risk of fatigue for participants.
- A game which has an official, optional soundtrack app, ensuring that the music and sound effects are aligned with the game's theme.

Furthermore, *Fuse* is a co-operative game—where players work together against the game—and there are no notable differences in gameplay depending on player count. Whilst there is no in-game narrative, the game has a setting of a space ship, where players impersonate members of a bomb-defusal squad, attempting to defuse a set number of bombs in exactly ten minutes. Game components include cards—which represent the bombs—and dice, which players need to place on the cards in order to solve the spatial and mathematical puzzles presented on them.

Whilst ordinarily the game's soundtrack would be defined as all audio included in the app—which is music, sound effects and voice-narrated time-announcements—in this experiment we do not consider the voice-narration as part of the soundtrack. Whilst the main purpose is understanding the effects of the combination of music and sound effects to player experience, we acknowledge the possibility that these effects could be a result of the time-announcements. Therefore, we define *soundtrack* as the combination of music and sound effects only, and we define *time announcements* as the voice-narration only. We also

acknowledge that isolating the soundtrack from the time-announcements would have been most ideal, however, this was not possible due to the app not having the option to disable either. Therefore, the voice-narration with time-announcements was re-created by the researchers. These are reflected in the experiment's three conditions—**C, B** and **A**—which each include the following:

Condition C	**Condition B**	**Condition A**
Soundtrack	No Soundtrack	No Soundtrack
Time Announcements	Time Announcements	No Time Announcements

Based on the three conditions, the following three corresponding timers were used in the experiments:

- Timer (C): A timer which has the soundtrack—thematic music and sound effects—as well as the narrated time-announcements.
- Timer (B): A timer which does not have the soundtrack, however, has time-announcements.
- Timer (A): The fully silent timer which neither has the soundtrack, nor time-announcements, with only a beep indicating the game's end.

Furthermore, the *Fuse* companion app features a visual timer, where minor visual effects are used, alongside showing the remaining time the players have through the game. After the ten minutes have passed, an animation of an explosion is shown. There are no further video effects in the companion app. The visuals were included with all three timers.

4.2.3 Hypotheses

The experiment had the main hypothesis of "A Soundtrack Enhances Player Experience of boardgames", with three sub-hypotheses:

- A soundtrack makes gameplay more enjoyable
- A soundtrack increases tension during gameplay
- A soundtrack strengthens theme

Whereas the null-hypothesis was that 'a soundtrack has no effect on any of those factors'. However, due to the possibility of any effects being the result of time-announcements, we added the additional hypothesis of "Time-Announcements Enhance Player Experience of boardgames", with the sub-hypotheses of:

- Time-announcements make gameplay more enjoyable
- Time-announcements increase tension during gameplay
- Time-announcements strengthen theme

4.2.4 Procedure

In groups of two players each, participants were asked to play the game three times—once with each timer (A, B and C)—in a randomised order to minimise the learning effect, and were asked to fill out a tailored version of the Intrinsic Motivation Inventory (IMI) as defined by Ryan et al. (1983), after each play-through. The IMI is a standardised survey consisting of a variety of sub-scales measured with a 7 point Likert scale. These sub-scales relate to different aspects of evaluating participants' subjective experiences of an activity. It is flexible in that the researcher can choose which sub-scales to include in the final questionnaire, however, all questions within a category have to be used in the final survey. Furthermore, the wording of these questions can be tailored to better reflect the activity. The IMI has a total of seven sub-scales to choose from, including sub-scales for both *Enjoyment* and *Tension*, which were the only sub-scales used in this study.

We have also created an additional four questions to determine *Thematicness*—a term that we use in this study to reflect the extent to which the boardgame experience felt thematic to players—using the same format of a 7 point Likert scale, mixed into the questions of the IMI. However, as there are no standardised measures, or even a definition of theme in a boardgame, we have used our immersion research outlined in Chapter 3 to formulate these questions. In our immersion study, we have introduced an Immersion Spectrum, on which players' various immersive experiences fall based on the ratio of required Challenge to Game World in order for them to become immersed. Game World can be defined as the thematic context of the boardgame experience, and it contributes to:

- *Embodiment*: where players felt they were navigating the problem solving aspect of the game whilst inhabiting a role within that fictional world.
- *Contextual Submergence*: where players' immersion is a result of inhabiting the setting of the game itself (but not necessarily the role or the problem solving).
- *Narrative Submergence*: where players described immersive experiences as a result of the narrative.

Whilst we are not explicitly interested in immersion in this study, players described a well-formulated game world—or theme—as an often contributing factor to immersion in the forms of characters, context and storytelling. Therefore, we believe that the extent to which these aspects are evoked during game-play reflect upon the thematicness of the experience. All questions—for both IMI sub-scales, alongside questions of *thematicness* can be seen in Figure 4.1. (See Appendix B for tables of frequencies of the survey answers).

After-Experience Survey Questions	
	IMI Sub-scale for "Enjoyment"
Q1	I enjoyed playing this game very much
Q2	This game was fun to play
Q3	I thought this game was boring
Q4	The game did not hold my attention at all
Q5	I would describe this game as very interesting
Q6	I thought this game was quite enjoyable
Q7	While I was playing the game, I was thinking about how much I enjoyed it
	IMI Sub-scale for "Tension"
Q8	I did not feel nervous at all while playing this game
Q9	I felt very tense while playing this game
Q10	I was very relaxed in playing the game
Q11	I was anxious while playing the game
Q12	I felt pressured while playing the game
	Custom Questions for "Thematicness"
Q13	I felt like I was on a space ship during the game
Q14	I felt like I was defusing bombs during gameplay
Q15	I felt like I was a real Bomb Defusal Technician during the game
Q16	I felt that the survival of the ship's crew depended on me.

Figure 4.1: *IMI and Thematicness Survey Questions*

Finally, after a ten minute break to let participants rest and to look through their survey answers, participants were asked to engage in a short interview to reflect on their experiences. Both players were interviewed simultaneously, starting with the less experienced player to minimise the hobbyist player possibly influencing the casual player. When both players considered themselves hobbyist, interview order was decided randomly.

The first two questions were pre-determined and always the same for each participant:

- Which timer would you choose to play with and why?
- Could you describe each timer with three words (or more)?

After these, more specific questions followed based on participants' answers on the surveys. These most often related to the thematic items on the survey, however, it differed on a case by case basis. Lastly, participants were asked if they had anything more to add.

4.2.5 Data Analysis

Surveys

To test the hypothesis of the effects of a soundtrack to player experience, we used a within-subject design with the independent variable *Presence of Soundtrack*, with the dependent variables of *Enjoyment*, *Tension* and *Theme*. Similarly, to test the hypothesis of the effects of time-announcements to player experience, we used a within-subject design with the independent variable *Presence of Soundtrack*, with the dependent variables of *Enjoyment*, *Tension* and *Theme*.

First, we determined the IMI sub-scale scores for each condition—A, B and C—by calculating their averages. For the sub-scale *Enjoyment*, the average of questions 1-7 was used. For the sub-scale *Tension*, the average of questions 8-12 was used. Finally, questions for *Thematicness* were not from a standardised questionnaire, and therefore were used individually in analysis.

To test the effects of a soundtrack to *Enjoyment*, we conducted a one-way repeated measures ANOVA test, comparing the IMI Enjoyment sub-scale scores of the conditions B and C, where C contained the soundtrack, and B did not. Similarly, to test the effects of a soundtrack to *Tension*, another one-way repeated measures ANOVA test was conducted, comparing the IMI Tension sub-scale scores of the conditions B and C. To test the effects of a soundtrack to *Thematicness*, we used the non-parametric Wilcoxon Signed Ranks test comparing the individual score of each survey item from 13 to 16 for conditions B and C.

To test the effects of time-announcements to *Enjoyment*, we conducted a one-way repeated measures ANOVA test, comparing the IMI Enjoyment sub-scale scores of the conditions A and B, where B contained the time-announcements, and A did not. Similarly, to test the effects of time-announcements to *Tension*, another one-way repeated measures ANOVA test was conducted, comparing the IMI Tension sub-scale

scores of the conditions A and B. To test the effects of time-announcements to *Thematicness*, we used the non-parametric Wilcoxon Signed Ranks test comparing the individual score of each survey item from 13 to 16 for conditions A and B.

Interviews

A Reflexive Thematic Analysis (RTA) was conducted on the semi-structured interviews, following guidelines by Braun and Clarke (2021). Whilst Thematic Analysis (TA) is often regarded as one method, there are some notable differences between the various approaches used by researchers. RTA, for example, does not have a code book, whilst themes do not emerge but are identified through analysis and the researcher's preceding knowledge and experience with the subject matter.

As mentioned previously in Section 1.3, the RTA method was chosen as complementary to the statistical analysis of the three conditions. RTA was selected over Grounded Theory—the method used in Chapter 3—for a number of reasons. First, there was no scope to perform some of the more resource-heavy requirements of GT, such as theoretical sampling or multiple passes of coding, as there was no access to additional participants after the experiments ended. In contrast to GT, RTA also has the advantage of being more flexible and light-weight by being less focused on being grounded in theoretical frameworks, and more on step-by-step analysis. Therefore, as opposed to initial coding and focused coding in GT, the procedure of RTA started with data familiarisation, through first transcribing, then reading interviews multiple times. During this step, initial impressions were collected in notebooks within MaxQDA.

RTA also has the advantage of the choice between an *inductive* and *deductive* approach. An inductive approach—similarly to Grounded Theory—is more explorative, with a focus of uncovering new ideas or insights. In contrast, a deductive approach takes into account pre-existing theories or a pre-defined research question. A deductive approach, in this case, was more suitable, as the hypotheses and the results of the quantitative analysis both influenced how we engaged with the interview data, with the goal of gaining insight into further depths of the effects of a soundtrack to boardgame player experience.

Analysis was further influenced by the findings of the Immersion research outlined in Chapter 3. Whilst the goal here was not to measure, or even to assess, participants' immersion, we still wanted to explore how the presence of a soundtrack might influence aspects we have associated with immersion—especially *submergence-type* immersion. We were interested in how players describe these experiences and whether they were similar to those in the immersion study. Therefore, these areas of interest, along-

side the results of the quantitative analyses, were guiding the complete coding step of RTA. Complete coding refers to coding every instance within the dataset that relates to the research questions. In this case, there were 214 initial codes, both on the semantic level—as participants were asked to use descriptors for each timer—and the latent level through the researcher's own interpretation. The smallest coding units consisted of only a few words to a sentence.

Codes were then refined and reformed into clusters based on meaning and content—especially the semantic codes, since participants used many descriptors with similar meaning—before all codes were examined to find relevant patterns. Themes we initially identified were then refined and reviewed until the final selected themes reflected the data analysed and the research questions we asked.

Themes are, at their core, patterns identified within the dataset that were most relevant to the research questions. In this case, the way players described the different timers—and the effects they have experienced on their gameplay as a result—formed the bulk of the themes outlined in the Results section. These themes had to describe how the timers made players feel during gameplay and had to have relevance in altering the experience either positively or negatively. The purpose of the themes was to correlate with the findings of the quantitative analysis and to have a more well-rounded understanding of *why* a certain aspect was rated as such by the players on the surveys.

4.3 Results

4.3.1 Effects of the Soundtrack

The repeated measures ANOVA tests for the effects of a soundtrack on both *Enjoyment* and *Tension* determined statistically significant results in favour of condition C, as can be seen in Figure 4.2.

	Mean	**Std.Dev.**	N	*F(1, 13)*	*p*	$\eta^2_{partial}$
Enjoyment						
C (with soundtrack)	40	5.936	14	*5.55*	*0.035*	*0.299*
B (without soundtrack)	36.57	6.136	14			
Tension						
C (with soundtrack)	23.86	4.555	14	8.53	0.012	0.396
B (without soundtrack)	20.86	5.433	14			

Figure 4.2: *Results of the Effects of a Soundtrack on Enjoyment and Tension*

Therefore, based on these results, we reject the null hypothesis that a soundtrack has no effect on player experience, and conclude that a soundtrack enhances enjoyment and tension in a boardgame.

The Wilcoxon Signed-Ranks test performed for each question to test the effects of the soundtrack on *Themeaticness* resulted in statistically significant results in favour of the soundtrack in questions 13, 14 and 16, with no significant difference between conditions for question 15. A summary of the results can be seen in Figure 4.3.

	Mean Rank	*Z*	*p*
Q13			
C (with soundtrack)	3.5	*-2.2*	*0.026*
B (without soundtrack)	0		
Q14			
C (with soundtrack)	4.33	*-2.05*	*0.04*
B (without soundtrack)	2		
Q15			
C (with soundtrack)	4.07	*-1.54*	*0.124*
B (without soundtrack)	7.5		
Q16			
C (with soundtrack)	2.5	*-2*	*0.046*
B (without soundtrack)	0		

Figure 4.3: *Results of the Effects of a Soundtrack on Thematicness*

We also conclude that a soundtrack increases feeling like being on a spaceship, feeling like defusing bombs and feeling responsible for the survival of the crew to some extent, however, does not affect feeling like a Bomb Defusal Technician.

4.3.2 Effects of Time-Announcements

The repeated measures ANOVA tests did not have statistically significant results for the effects of the time-announcements on either *Enjoyment* or *Tension*, as can be seen in Figure 4.4.

	Mean	Std.Dev.	N	*F(1, 13)*	*p*	$\eta^2_{partial}$
Enjoyment						
B (with time-announcements)	40	5.936	14	*0.18*	*0.678*	*0.014*
A (without time-announcements)	36.57	6.136	14			
Tension						
B (with time-announcements)	20.86	5.433	14	0.248	0.627	0.019
A (without time-announcements)	20.36	6.404	14			

Figure 4.4: *Results of the Effects of Time-announcements on Enjoyment and Tension*

Therefore, we also reject the alternate hypothesis of time-announcements having an effect on *Enjoyment* and *Tension*, and conclude the null hypothesis to be true.

The Wilcoxon Signed-Ranks test performed for each question to test the effects of the time-announcements

on *Themeaticness* resulted in statistically significant results in favour of the time-announcements in questions 16, with no significant difference between conditions for questions 13, 14 and 15. The results can be seen in Figure 4.5.

	Mean Rank	*Z*	*p*
Q13			
B (with time-announcements)	3.25	*-1.511*	*0.131*
A (without time-announcement	2		
Q14			
B (with time-announcements)	3.33	*-0.707*	*0.48*
A (without time-announcement	2.5		
Q15			
B (with time-announcements)	3.14	*-1.414*	*0.157*
A (without time-announcement	2.5		
Q16			
B (with time-announcements)	3	*-2.121*	*0.034*
A (without time-announcement	0		

Figure 4.5: *Results of the Effects of Time-announcements on Thematicness*

Therefore, we conclude that the time-announcements had no significant effects regarding feeling like on a spaceship, feeling like defusing bombs, or feeling like a Bomb Defusal Technician. However, time announcements had a positive effect on feeling responsible for the survival of the crew. More extensive materials of the analysts can be found in the supplementary materials submitted with this thesis.

4.3.3 Interviews

Through our analysis detailed in 4.2.5, we identified four themes regarding how playing with each timer affected player experience. In the first theme, we discuss the different effects timers had on players themselves—how they acted and felt during gameplay. In the second theme, we discuss that whilst music and sound effects create atmosphere, atmosphere and *thematicness* are not the same. In the third theme, we illustrate how participants experience elevated tension with music and sound effects, however, tension is not always regarded as enjoyable. Finally, in the fourth theme, we investigate the wider contextual factors which can contradict the role of the timer, or influence the choice of timer, in the overall player experience. In the following, all names of participants had been changed to preserve anonymity. These names were chosen at random, however, pseudonyms of participants in the same household start with the same letter.

The Exciting, the Useful and the Empty

All three timers affected participants differently, through the way they played the game, to how they felt during gameplay. Players had an activated experience with timer C, filled with urgency to act: *"I was, like definitely much more like tense and keen to kind of do things and just...I did"* (Adam), helping them keep their focus on the game's events: *"the last one, I was probably like, the most attentive for it...like I was aware of the time passing because the noises were keeping me like focused on it"* (Aida), and *"I think you were more kind of in the zone and more kind of tense in the situation with the music"* (Damien). This activeness and heightened attention reflected in the descriptions they used for timer C, such as *"C, I would describe as more kind of intense and impactful and suspenseful. Like definitely the experience of playing while that was far more engaged and activated."* (Adam). Active and focused gameplay also resulted in excitement: *"C, I thought was really exciting because [of] the music and it just kind of gets you in the zone"* (Daisy), and some players associated these with the game's bomb defusal theme: *"because the game is like stress, right? Like, defusing a bomb and like the numbers...and it should, it should be a rushed thing. So it was more enjoyable"*. There was a synergy between the actions and the mind states and emotions participants associated with these actions, such as *"the one with the sound was kind of the most intense"* (Brian), and *"it felt a lot more dramatic, what was happening"* (Damien). Grandiose words, such as "impactful" and "suspenseful" and "dramatic" highlighted an experience in line with the game's theme on a functional and emotional level: participants' rushing and activated play-style concordant with the imagined rushing and activated state of bomb defusal, as well as the excitement, suspense and drama of the gameplay concordant with the imagined heights of emotional states during bomb defusal. Still, for some players, the intensity of timer C could become overwhelming *"so the first one with the music was maybe a bit too much..like, I think [over time] I imagine it would become annoying"* (Callie), which could result in them choosing a different timer for consecutive plays. Still, even when C could hinder concentration, some would still prefer the experience it created: *"Silence [A]… perhaps we concentrated better, but it was less enjoyable"* (Blanca).

Whilst for most participants, playing with timer B lacked the excitement and heightened emotions of C—and was missing the rush and urgency of it—it provided a functional, controlled experience where most participants found it a useful addition: *"B was more like, I'd say more useful, because...I had more awareness of how much time I had left without having to check*. It seemed that B "got the job done", without much flair, but with purpose: *"B, it's just the right amount of reminder and kind of making the game feel…making [me] feel more into the game. It felt like that was the purpose of what I was doing,*

it was for defusing the bombs" (Callum), and with efficiency: *"B I think was the most…the most efficient one in a way, you just get the information you need every now and then"* (Elinor). Whilst emotions such as excitement were exchanged for descriptors such as comfort *"I felt most comfortable with [B]"* (Callie), some participants still felt that B helped them remain concentrated on the game without the extra distractions of the music: *"so B again, I'd say that one was more focused…clarity"* (Callum), and provided some levels of tension for some: *"B...slight tension"* (Gordon). A few players found B to be distracting, however, it was for the opposite reason for why some players found C distracting. Here, it was the lack of excitement (as opposed to too much excitement in C): *"B - I thought was a little bit annoying. And C, I thought was really exciting because of the music and it just kind of gets you in the zone…Whereas I thought yeah, distracting, I'd say for B"* (Daisy). This lack of excitement resulted in one player not paying attention to the time-announcements even: *"I wasn't really paying attention to what the voice was saying, it just was a voice in the background. So that was a little distracting. And after a very short amount of time, I just phased it out, because it's not supplying me with any useful information apart from the time every now and again"* (Damien), whilst another player found the voice *"very sterile and clinical - it's just this voice"* (Eliot).

Finally, timer A created an experience in complete contrast with C, where players felt *"a bit more leisure"* (Blanca), describing it as *"A [being] the complete opposite [of C]. Like it was extremely kind of laissez-faire, very, like lazy and disengaged"* (Adam). Players became less activated: *"I think the one without the sound, Blanca was telling me to like…it's on time, she said a few times, because I was kind of a bit more lazy"* (Brian) and often had to make an effort to keep up with the time without the time-announcements: *"I think the silence was a bit annoying because I couldn't see the timer, so at least [with the] other [timers] I had some idea of where we are"* (Callie), as well as *"the silent one, that was the one where I needed to sort of give extra attention to the timer"* (Elinor) and *"I think also on the functional level...But in the one without any sound you just don't know like you…need to look at the screen to know your time"* (Brian). Most participants described their experience as something missing, such as *"...and the third one just...absent? Like, there was just nothing. You know what I mean? Yeah….So it was missing something"* (Daisy), one participant even describing it as *"kind of empty and soulless"* (Eliot).

Atmospheric, but not (necessarily) Thematic

Timer C was often described as "atmospheric", which provided an extra experiential layer to the gameplay: *"C, atmospheric and more of an experience, I would say for C. So it kind of made it more than just the*

game...even if it wasn't, like, a lot more...it was more than just the game" (Eliot). Atmosphere had a presence or an absence, depending on the timer: *"...as soon as we start [another version without the music]...it's not as good without the music. But after the music, then you see like, it's a huge difference in terms of the atmosphere at the table, I think."* (Damien), and *" So C, the first one we did..it just gave it that atmosphere, which I think was quite obvious where it wasn't there as well"* (Finley).

Whilst atmosphere was seen as a positive addition to the overall experience, players could clearly distinguish between atmospheric and thematic. The two concepts were not interchangeable for most players, and for the experience to become thematic, players often had other requirements, such as better or more complex narrative: *"Yeah, I think it might be me finding it quite hard to get into the theme because there's just not…there's not that much of a story around"* (Callie), or more visual and spatial representations through the game's components: *"[the game] perhaps could be expanded to like having a board and all the bombs were in different locations of the ship and things like that...something that makes you feel like you're more on a ship, even if it's just like a quite simple board that the cards are made upon"* (Gordon).

Many of the players mentioned remaining aware of the game's components, even with the presence of atmosphere: *"with the music, the music really just added atmosphere. I mean, it never really felt like [more] than you're rolling dice"* (Daisy), and the awareness of game components sometimes prevented them from feeling like they inhabited the game world: *"I've really enjoyed this game, it's really good. But for me, it is dice drafting and placement. And the theme wasn't absolutely predominant for me. And I also look at mechanics and compare them a bit to previous experiences as in like, 'Oh, yeah, that's [like Sagrada]', so I'm not on the spaceship"* (Elinor), as well as *"It's difficult to say like you're on a spaceship. Yeah. I'm rolling some dice. I don't think I'm on a spaceship"* (Damien).

Some participants compared their experiences to video games: *"I think just the noises in general at least, like a teeny tiny bit kind of like brought me into the world of the game [but] I almost expected there to be like a video or something. Like, you know, how like video games have cut-scenes. [They] set you up for like the next thing...I almost expected that...like characters, or something being like, 'Oh, no, the alien'"* (Aida).

When asked further about how a video would have related to the experience being more thematic, she added that *"I think it would have enhanced it"* (Aida). Similarly, another participant mentioned that the existing visual-timer of the game was helpful: *"I don't know perhaps it was the music. We had like quite a lot of like, the...the video was playing a part. I think for me, at least"* (Blanca) but still did not make

the experience thematic: *“in terms of the theme, I don’t know. I do enjoy the sound generally, I’m that kind of person that always puts sounds on, but not in terms of like ’I’m on a ship, yeah, this is the theme’ ”* (Blanca).

Tense, but not (always) Fun

Whilst most participants described their experience with timer C as tense, how they regarded tension varied between participants. Some seen it as a contributing factor to a better experience *“if you don’t have the tension, and the time, the game doesn’t really work”* (Blanca), as well as *“[C], it kind of gave a bit more tension to the game that was maybe missing certainly in A when it was completely silent, and then in B as well”* (Elinor). Others, however, seen it as added stress, and would choose another timer if they played the game again: *“So there’s a fine balance to it. And I think that B hit that nail on the head, I felt like for C, when there was quite a lot of pressure with the added explosions in the background or the metronome, it was more difficult to focus on what I was actually doing and I was missing things, which might have been a bit more obvious to me if there was [a] lack of that atmospheric background”* (Callum).

For some participants, this was a decision between doing better in the game, versus an atmospheric experience: *“But I’m just debating...[between B and C]...to make it better at the game, I choose B because it gives you the time, but then it doesn’t kind of distract you [by] adding extra pressure. But I also enjoyed the little bit of extra atmosphere that the music gives you”* (Eliot).

Others regarded tension in C as unrealistic, due to how the music and sound effects were used within that timer: *“the music did create an artificial sense of pressure. I think partly though it was because it was being a bit more cinematic and a bit more bombastic that it was easier to laugh off”* (Adam) and in some cases, tension caused by timer C could affect a participant indirectly through how the other player acted: *“It kept my attention like, on the fact that we were in a rush more [as opposed to] just having a clock going [which] doesn’t really get me to like rush and it definitely made him flip out. So yeah, like he was like rushing way more with the third one [C] which was stressing me out”* (Aida).

It’s not the Timer, it’s Me

Some aspects of player experience were influenced by factors independent from the timers, such as the first play-through providing novelty which might “wear off” later: *“Oh, so because I think it was fresh in my mind. So I think it was…the first time I play a game, I tend to enjoy it the most”* (Eliot). Furthermore, consecutive plays made the game less and less interesting, independent from the timer they played with:

"the first one was a challenge, because we weren't as used to it, and probably was a bit harder and more interesting atmosphere as well... I think it was a factor that we got better and better as we went along" (Elinor). How well participants felt they were doing in the game also influenced their enjoyment and perceived pressure, regardless of which timer they played with: *"To me, the reason for that was actually I wouldn't say it was to do with the backing. I think it was because the last game we played, I felt that we were doing really badly. So because I thought 'okay, I'm pretty sure we've got no chance of getting to the end of this', I felt less pressurised"* (Eliot).

Other than novelty, players' personal preferences influenced their choice of timer, even if they agreed that one was more experiential than the other: *"I think probably B was the one version of the game that you could approach as a fairly abstract puzzle, and I like being able to kind of take a bit of a step back and solve things. So I think from that perspective, I probably found it more interesting, [even though] soundtrack C was a more complete experience"* (Adam). Similarly, another player would choose a timer based on their personal preferences, despite how enjoyable that experience was: *"I have like a bit of preference against games with apps. But I really enjoyed the ones that I eventually play with apps. I don't know why...like, the sound doesn't feel like a good enough reason [to choose timer C], but I enjoyed [the game] more with it…I don't know. Stupid…it's really stupid"* (Brian).

Thematicness in games also came with preconceptions by players, based on their preferences and overall preceding experiences with theme in boardgames: *"these sort of games have a tacked on theme, which never works for me [though] I have problems with themes in in heavier games [as well]"* (Brian) and not all players would want the game to become more thematic, or boardgames to be more thematic in general: *"I don't want there to be videos. I don't want there to be like extra layers of narrative. I think that would make me like the game a lot less. boardgames with narratives are silly. That's basically my position. You don't need a boardgame to have a narrative - it's dumb"* (Adam).

4.4 Discussion

The results of this study confirmed the sub-hypotheses that a soundtrack affects both *Enjoyment* and *Tension* in a boardgame, whilst did not confirm the sub-hypotheses that time-announcements are making the boardgame more enjoyable or more tense. The Reflexive Thematic Analysis provided further insight into how players regarded both the soundtrack and the time-announcements. With the soundtrack, participants painted the picture of an experience with urgency, involvement and movie-like excitement. In

contrast, the time-announcements were regarded as purposeful and useful in most cases, but lacked the excitement of playing with the soundtrack. Fuse's bomb defusal theme is synonymous with tension, however, how much players welcome tension differed between participants. For some, it was essential to the experience, whilst others would rather focus on gameplay and regarded the extra pressure as a distraction. In either case, most agreed that the soundtrack contributed to more tension, and players who disliked the extra pressure found playing with only the time-announcements as a good compromise between experience and gameplay progress.

Thematicness, however, was more difficult to assess based on the results of this study. The statistical analyses resulted in significant differences in favour of the soundtrack for three of the four questions, however, through the qualitative analysis we discovered that music and sound effects are not enough for most players to compensate for other factors when it comes to theme, such as the game not having a well-realised game-world, sufficient narrative progression and more thorough visual representation in its components. Boardgames with included technology are more and more common, as we discussed in 2.4. However, we also discussed how players are not always welcoming towards the inclusion of technology. Some of the participants in this study did express a slight aversion towards apps in boardgames, and some did not want their games to be atmospheric or thematic. But most players did welcome atmosphere, and had suggestions for how to make the experience more thematic. This suggests that these are aspects of the analogue/digital hybrid which are worth further exploring, in ways which focus on the synergy between soundtrack, visuals and narrative to achieve a more thematic experience—similar to what already works in video games.

4.4.1 Limitations

This study examined changes to boardgame players' experiences as a result of a musical soundtrack in one boardgame, which had a musical soundtrack developed by the publisher to align with theme and timings of the game. This prevents the generalisation that effects would be the same with any boardgame or soundtrack, however, it serves as an initial step in understanding possible effects of augmentations of boardgames through technology. We are aware that the small sample size further limits the generalisation of our findings, and prevents analysis of differences in experiences between casual and hobbyist players, or between players who regularly play boardgames with soundtracks and those who do not. We also did not test for the differences in player experience that might arise as a result of the quality of the soundtrack, and we did not test how music independent from the game (i.e., not composed specifically for the game)

might affect player experience, as we were specifically interested here in the effects of audio which was originally intended to be used with the game. Furthermore, we anticipate that the effect of soundtrack on player experience might be different in games that are significantly more or less thematic than *Fuse*.

4.4.2 Design Implications

This work provides evidence that adding a soundtrack to a boardgame can yield positive benefits. Designers and publishers might wish to make more use of audio—either as optional content or as an integral part of gameplay—as another tool when designing for a desired player experience. Furthermore, when the goal of designers is to create highly thematic experiences, they might use audio together with strong narrative and visual elements to strengthen thematic ties with the game world.

4.4.3 Future Work

Evidence suggests that theme and thematicness are facets of the boardgame playing experience that players are aware of and can discuss in detail. Whilst its importance varies between players, it is a phenomenon worth further investigating and defining in future research. For example, future work investigating players' definitions of thematicness could help both boardgames researchers and designers better understand what the building blocks of thematic experiences are. Furthermore, our findings suggest that there is a distinction between the concepts of thematicness and atmosphere, however, further investigation could determine what the exact differences are, what is the hierarchy between the two concepts, and where players draw the line between an atmospheric and a thematic experience.

Based on our findings, we suggest that casual boardgame players—whilst less engaged in surrounding practices of the boardgaming hobby—are articulate about their experiences and are willing to participate in studies just as hobbyist players do. As many boardgames are specifically targeting casual players, we suggest that sampling participants from this group could widen the understanding of how people engage with boardgames, helping both designers and researchers engage with a more diverse view of board gaming in general.

As boardgames share many characteristics as a result of them combining different mechanics, there are certain factors which could alter how adding a soundtrack would affect player experience. For example, further research could investigate whether interactive audio—audio which is synchronised to game state—or music which thematically differs from the game's theme affects player experience differently from our findings.

Furthermore, other sensory elements—such as moving image—which are also often featured in hybrid analogue-digital boardgames, could also benefit from research examining its effects when compared to boardgame play without these sensory elements, gaining further knowledge into the potential benefits of technology on analogue play.

4.5 Conclusion

This chapter explored the effects of a soundtrack to player experience in a boardgame, with the main contributions that music and sound can enhance enjoyment and tension in a boardgame. Furthermore, it explored a soundtrack's role in making the boardgame experience more thematic, however, we found that it contributed to another phenomenon described by players as "atmosphere", concluding that music and sound alone are not enough to increase thematicness without other elements of an analogue game—such as art, components and narrative—conveying the thematic setting sufficiently.

Chapter 5

How Boardgame Players Imagine Interacting with Technology

5.1 Study Goals

The aim of this research was to collect information about how boardgame players envision interacting with technology in future analogue-digital hybrid games, and to organise this information into a taxonomy that can be used as a reference and a valuable resource by boardgame designers and researchers. In product design, discovery research (Rosala, 2020) is often utilised to understand a problem space before committing to a design and building a product, and understanding users and their needs is a key step in the process, as they are the main beneficiaries of the resulting product. Thinking of boardgame players as end-users, and analogue-digital hybrid boardgames as products, the goal of discovery here was to understand players' desires in:

- How they imagine interacting with hybrid boardgames, ignoring the believed and real constraints of current technologies
- And, what outcomes players imagine the technology could enable and foster in these experiences?

Looking at the current state of hybrid boardgames—as defined by Rogerson et al. (2021b)—most of them utilise phones or tablet devices, where the "triggering" of technology elements come from interacting with screens, such as phones or tablets. However, materiality and the analogue nature of games are important factors to players (Rogerson et al., 2016) and screens are not always appreciated as an addition to the analogue experience (Kosa and Spronck, 2018a).

Therefore, this work is meant to inspire new, alternative avenues in boardgame design on a conceptual level, based on players' own depictions of future boardgaming experiences with a technology component. It aims to explore the design space of hybrid digital-analogue games through a user-centric lens; explore the potential of regular boardgame pieces as connected input-devices; consider technology's potential in enabling these alternative interactions; and, consider the potential effects these interactions can create on player experience.

5.2 Methodology

5.2.1 Participants

Participants were sampled through open calls in specialist boardgaming interest groups on social media sites. All respondents filled a pre-screening survey for suitability (see Appendix C), determining their habits and experience playing board games. A total of 31 hobbyist boardgamers were selected—as defined by Rogerson (2018)—with 17 identifying as male, 14 as female and 1 as non-binary. The majority, 23 players, were residing in the UK, with 4 from the US, 1 from Mexico, 1 from Thailand, 1 from Ireland and 1 from the Czech-Republic respectively. The median age of participants was 34. Most participants also have previously played boardgames with a technology element.

Additional criteria for participation was access to a computer with a web-camera, speakers and microphone, alongside pen and paper.

5.2.2 Participatory Approach

Participatory approaches to design and research have been gaining popularity in the last 30 years or so, with a significant increase in number of publications in the last decade (Hansen et al., 2019). We took a participatory approach where the end-user's point of view formed the main concern of enquiry, as defined by Halskov and Hansen (2014), with the goal to generate new knowledge about how users envision interacting with new technologies in a setting where they can shape the future outcomes of their own experiences.

The resulting design concepts by participants are secondary in importance to the categorisation that grew out of them through analysis, serving as means, rather than the end results of the research.

To collect design ideas from participants, we utilised a rapid idea-generation method called *Crazy 8s*. The method was popularised by Knapp et al. (2016) as part of the Design Sprint system—a 5 day

process aimed at solving design problems quickly in product development—and is now recognised as part of Google (2023)'s Design Sprint Toolkit. The goal is to create 8 individual design ideas in 8 minutes, spending 1 minute on each before moving onto the next. The one minute limitation is used to prevent overthinking, and getting "stuck" with the first idea. Instead, it encourages considering refinements or alternatives by starting a new design each minute.

We chose Crazy 8s as we needed an ideation method that is:

- Accessible to non-designers, as most players have no experience designing boardgames.
- Fast, therefore it minimises overthinking (or the surfacing of the "inner critique").
- Capable of generating multiple ideas within a short time.

The Crazy 8s method fulfilled all three requirements due to its simple rules, and its potential to result in 8 ideas per participant in under 10 minutes.

5.2.3 Workshops

Whilst Crazy 8s is an individual activity, we organised participants into small groups of maximum 5 members each to conduct workshops more efficiently. Groups were formed based on availability and location, with time-zone differences being accounted for. All workshops were conducted remotely through a Teams call. Participants supplied their own paper and pen, and worked individually in their own homes. In the end, there were a total of 10 remote workshops.

Participants were briefed about the goals and process of the workshop, asking them to think about board games with technology components, but to imagine capabilities beyond what is currently thought possible, and beyond the exclusive use of screens. They were also asked to think of interacting with regular board game components in such ways that they could trigger technology, which in turn could invoke *thematicness*—a term introduced in the previous chapter and is defined as: *"The degree to which the game-world feels realised to the player"*. This definition was explained to participants as well, to ensure a common understanding.

Afterwards, the following instructions were given:

- Fold a paper sheet into 8 rectangles
- Draw 8 designs in 8 minutes

For each idea (1 minute):

- Choose a board game piece
- Think of a way of interacting with it
- Which then triggers something in the game
- Which makes the game more thematic

Participants were shown a compilation of common boardgame components, such as various dice, cards, meeples, tokens, miniatures and so on, for inspiration. They were told, however, that they can use any piece they have seen, or not seen, in any boardgame before, to their preference.

Once the challenge has started, a dynamic 8 minute timer was shown on screen at all times, showing each minute separately. There was a sound indicating the end of each minute, and participants were verbally reminded to start a new design. There was a reminder of the instructions on screen as well. After all 8 minutes of the challenge ended, participants were asked to scan a QR code which took them to a survey, where they were asked to write a brief explanation of all their designs. They were also asked to upload their sketches to a shared Dropbox folder by scanning another QR code. All original scans from participants can be found in the supplementary materials submitted with this thesis.

Finally, there was a brief discussion, where participants were asked to share some of their favourite designs, and to choose designs from other participants they liked the most.

In the end, we have collected a total of 242 individual design ideas from participants (not all participants had a full set of 8 designs).

5.2.4 Analysis

We followed an inductive category formation approach—a form of qualitative content analysis—as defined by Mayring (2022). The goal of this method is to directly extract and develop categories from textual materials, taking into account the context in which the material resides within. Similarly to other qualitative analysis methods, such as grounded theory, it utilises a systemic procedure where data is coded line-by-line, forming initial categories which are then revisited and revised iteratively until the final categories are agreed upon.

When compared to other, similar methods, qualitative content analysis has two additional requirements: selection criteria and degree of abstraction for relevant text segments need to be predetermined

explicitly; and, an intercoder agreement needs to be carried out on either the full, or a percentage of, the dataset to achieve greater objectivity.

For the context of the analysis, the following criteria were predefined:

- Extract and categorise all game components mentioned by participants, i.e.: *what* players are interacting with
- Extract and categorise all interactions mentioned by participants, i.e.: *how* players interact with the components
- Extract and categorise the effects caused by the technology, i.e.: *what* effects were triggered by the interaction

Open coding was conducted systematically on each individual design idea. The first stage of coding extracted a boardgame component, as named by the participant; an interaction or action happening to that component; a technology mentioned, or implied by the description used by the participant; the effects the interaction would cause through the technology; and any thematic implications. Even though each individual design contained a full idea, and therefore these artefacts could be seen as self-contained designs by themselves, analysis was conducted with categorisation in mind: in that sense, designs were seen as a collection of individual elements—rather than as a whole—and the way these individual elements were later grouped, formed the basis of the resulting taxonomy.

Categories were formed through the entire coding process, following the direction from *micro*—the smallest units named by participants themselves—towards *macro*, where units formed increasingly broad groups based on shared characteristics, such as their function or broader purpose.

Once all categories were finalised, a partial intercoder agreement was carried out on a randomised, 25% portion of the full dataset, due to the extensiveness of the material. The second coder was another PhD student—with substantial experience with content analysis through their own research—who received both the material, together with all content-analytical rules, including category definitions. This is to ensure an understanding of the context of the material. Results from both coders were compared and discussed, and disagreement was counted on all codes where the second coding was accepted as better. Cohen's Kappa was calculated with a final agreement score of 0.8.

In addition to presenting a list of the final categories with code frequencies, as recommended by Mayring (2022), a taxonomy was formed through establishing a hierarchical relationship between these categories. Sample analysis data can be found in the supplementary materials submitted with this thesis.

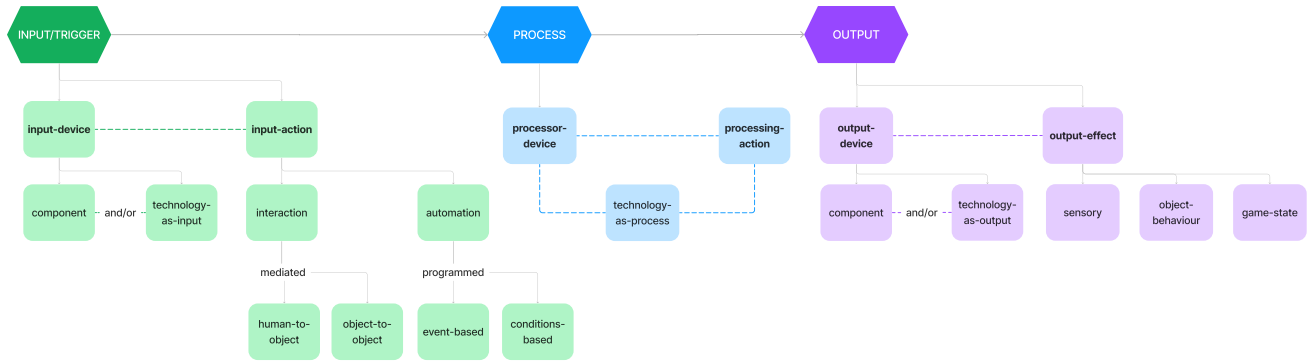

Figure 5.1: *The Taxonomy of Analogue-Digital Hybrid Board Games.*

5.3 Results

The qualitative content analysis detailed in the previous section resulted in 4 separate lists of categories, collecting: groups of boardgame components; groups of interactions and triggers between players and objects; various technologies and functions of technologies; and groups of effects which happen as a result.

All categories on these lists grouped items by similar characteristics. These lists then formed the basis of the resulting taxonomy presented here. The taxonomy was created by examining the relationships and hierarchies between these categories. To best illustrate how categories relate and function together in the taxonomy, I borrow terminology from the field of *Internet of Things (IoT)*, which is concerned with transforming "real-world objects into intelligent virtual objects" (Ramaswamy and Tripathi, 2015, pp. 164). IoT is as much conceptual as it is practical, where every object has the potential to connect and communicate with any other object through a shared network (Ramaswamy and Tripathi, 2015).

Situating the taxonomy in the context of IoT, therefore, allows us to examine boardgame objects through their potential for "connectedness". To illustrate the relationships and hierarchies between categories in the taxonomy, we can imagine following the journey of a signal—the element which fuses analogue with digital—through standard data-processing principles. It starts with an *Input*: the first point of contact which creates the signal itself; followed by a *Process*: a digital "brain" which decides what the signal is for; and finally, it all comes together in an *Output*: an event that occurs and that is the final destination of the signal. Technology is part of every category, but has a different form or function in each. It is the enabler of the signal's journey. Technology can stand and function on its own, or in combination with, the analogue parts of a boardgame. Figure 5.1 illustrates the full taxonomy.

5.3.1 Input (trigger)

Inputs are “triggers”, so to speak, which send a signal towards processing. Inputs exist in two forms: as *input-devices*—objects and technologies in the physical space—and as *input-actions*, the forces which set things in motion. Input-actions and input-devices are interconnected in a way that one needs the other for the trigger to happen. Input-actions can be further divided into *interaction* and *automation*, whilst input-devices into *components* and *technology-as-input*.

Interaction (input-action)

Interaction happens as a result of deliberate human mediation. A player carries out an action which sets off a trigger. Interaction can be further categorised into *human-to-object* interaction, where the trigger is the result of the player interacting with the object specifically, and *object-to-object interaction*, where the trigger is a result of two or more objects interacting with each other. In the latter, there is still human mediation, however, the trigger only happens when the specific objects come into contact. In that sense—whilst there is some overlap—the difference between the two is what the point of contact is at the moment the trigger is activated. The following two examples from participant ideas further illustrate this difference:

> *“Each player has a card with various information, including their hitpoints/health. When they are damaged, the player taps on the card, and the life points reduce automatically, along with a ‘negative’ sound to denote losing health.” (p17, idea 3/8)*

In the example above, *touch*—or tapping on a card—is the human-to-object interaction, which sends a signal of the “player losing health” into a processor, which in turn outputs two effects: a thematic sound, and a change in the player’s stats. In contrast:

> *“Cards with screens, I’m thinking Kindle-like. These could be blank but reveal information depending on where they are placed on the game board. Could be used in a detective type game, where the card only reveals the information you need if placed in the right place.” (p16, idea 5/8)*

In this second example, the trigger is when the card is placed onto a specific space. It requires the card and the game board—two objects—to come into contact with each other, forming the object-to-object interaction. When they do, the signal is sent forward to a processor, and in turn, information is revealed as an output.

Table 5.1: *Examples of Human-to-Object Interaction*

Human-to-Object Interaction		
Interaction	**Examples**	**Code Frequency**
Move	The trigger is the movement itself, not the destination of the object.	25
Touch	Touching, pressing, tapping, squeezing or otherwise coming into contact with an object.	12
Roll	Rolling dice (specifically).	12
Manipulate	Flipping, flicking, opening, closing, spinning or otherwise handling an object.	7
Voice	Speaking, singing, or otherwise making sound that becomes a trigger.	5

Table 5.2: *Examples of Object-to-Object Interaction*

Object-to-Object Interaction		
Interaction	**Examples**	**Code Frequency**
Placement	Area or proximity is the trigger.	47
Contact	Pieces stacked, attach, interlock, hit other component, etc.	15
Scan	Using an object to scan another object e.g., a phone to scan a card.	11

When looking at examples of object-to-object interaction, “placement” and “contact” are both similar in the sense that two objects come into contact with each other to form the trigger. However, there is a distinction to be made in the requirement of a specific area in which the object is placed, for it to become a “placement”. Tables 5.1 and 5.2 collect more examples of both human-to-object, and object-to-object interactions.

Automation (input-action)

Automation, in contrast, does not have conscious mediation from the player. It is a pre-programmed action which happens seemingly on its own, through the unfolding of gameplay. Automation can be *event-based*, where changes in the game-state or narrative cause the trigger; or, *conditions-based*, where preset conditions need to be met for the trigger to happen.

> *“Pieces that respond to the passage of time The longer you don’t interact with them, the more they change/decay. 4x / civ-type strategy games - roads, buildings that break down when you don’t interact with them.” (p20, idea 6/8)*

This first example is conditions-based automation, where a certain amount of time needs to pass,

Table 5.3: *Examples of Event-Based Automation*

Event-Based Automation		
Event	**Examples**	**Code Frequency**
Game Event	Game-state changes, in-game actions, in-game outcomes.	10
Narrative Change	Changes based on story events/progression.	5
Randomness/Chance	Chance-based events.	4
Game Progression	Events happening as the game progresses.	3

Table 5.4: *Examples of Conditions-Based Automation*

Conditions-Based Automation		
Condition	**Examples**	**Code Frequency**
Requirement Fulfilled	Certain score, certain resources, etc.	9
Set Time	Timer ends, passage of time.	8
Card/Dice Result	Results of rolls and draws specifically.	6
Completion	Completing routes, sets, buildings, etc.	5

which triggers the effects of "decay". Time is measured by a processor, and as conditions are met, sends information to the output.

> *"Meeples that can fall over when something bad happens to them in the game. You pull the wrong card and suddenly a third of all meeples on the board topple. That could be quite dramatic." (p9, idea 5/8)*

This second example is event-based: a chance-event of pulling "the wrong card" is the trigger. The processor is recognising the card drawn, and in turn, creates an output: the effect of meeples falling over. Whilst there is an overlap here by players pulling the cards themselves, however, the information is hidden from them, and they are not directly causing the events happening.

> *"Thinking of Catan: when the dice are rolled and you have buildings on the correct resource, your buildings light up to remind you to pick up your resource. I am terrible of keeping track of when I should pick up resources." (p15, idea 1/8)*

This third example is conditions-based as well, requiring the player to possess certain resources and pieces. When the condition of owning them is met, a trigger automatically happens, in turn outputting lights. The role of technology in automation is enabling these triggers to happen on their own, through pre-programming. Tables 5.3 and 5.4 collect further examples of both event-based and conditions-based automation.

Components (input-device)

Boardgame components are analogue objects which become input-devices by fusing with, or interacting with technology. They can house technology within them, which creates the illusion of only interacting with the component, not the technology. Or, remain fully analogue, and still contribute to the trigger through contacting other objects that have—or are—technology. When thinking about components, any given part (or parts) of a boardgame can become input-devices. These components can be custom—representing the thematic setting of the game—or standard, such as common dice and cards or generic cubes and tokens. Looking at examples from participant ideas can illustrate this further:

> *"Voice activated character standees that can refuse to move. If you give them the wrong order, a magnet in the board locks them in place." (p1, idea 3/8)*

This idea implies that ordinary player pieces are fused with a technology element which can interact with another object: the game board, which also has a technology element. When voice commands are recognised by a processor, the effect of "locked in place" is triggered.

> *"Cards which can feel the pulse rate of the player holding them, and which change their appearance. The cards represent police that become more suspicious if your pulse is elevated." (p1, idea 7/8)*

In this second example, game cards contain two forms of technology: one which can sense the pulse of the player, and another which creates a change in the card's appearance as a result.

> *"Dice which, when rolled in particular combinations, causes some specific reaction on the board (could be that the board spaces move around, doors open, walls rise, water pours in, etc). The reaction could be close to the player pieces or not." (p8, idea 1/8)*

This final example implies either the dice having a form of technology which can send signals, or the play area (such as game board) being able to recognise the results of rolls. Once a processor receives these results, an effect happens.

All of the above examples show how players imagine interacting with seemingly regular boardgame pieces. What enables these interactions to trigger effects beyond what would normally happen in analogue games, however, is the technology: whether it currently exists, or whether it is imagined, analogue objects can become *connected, intelligent components* through technology whilst retaining their analogue look and feel. Examples of boardgame components mentioned by participants can be seen in Table 5.5.

Table 5.5: *Examples of Boardgame Components*

Boardgame Components		
Components	**Examples**	**Code Frequencies**
Game pieces	Such as meeples, tokens, resources or thematic pieces.	96
Play area	Components on which play happens, such as game boards, modular boards, tiles etc.	75
Cards	Any type of cards from standard to custom.	46
Dice	Any type of dice, from six sided through rpg to thematic	26
Player pieces	Game pieces that represent the player, such as miniatures, standees, pawns etc.	22

Technology (input-device)

Technology can be embedded into components and remain hidden, or, retain their form and be seen as they are. When technology is an input-device, it is usually a form of sensor which can send a signal forward to the processor. Sensors, as the name suggests, *sense and detect* through interaction and automation, as detailed in previous sections. They can detect touch, for example, or the place of an object. They can be as simple as using a phone—a device which has multiple sensors—which could read QR codes through a camera, or scan boardgame pieces or parts of a gameboard. They can be, however, a lot more intricate when imagining how they could be built into boardgame pieces themselves.

> *"MEEPLES WITH VR CAMERAS in [them] to enable seeing [the] board from their point-of-view." (p30, idea 7/8)*

In this example, the sensor—a camera—is built into meeples, sending a signal to VR headsets players would be wearing. Whilst there is no clearly defined trigger moment, there is continuous processing of the video feed, and continuous effect of players seeing gameplay as the meeples would "see".

> *"Pressure sensitive board, mimicking detecting - the more a player pushes down on a particular spot, the further you get ripples appearing on the board, showing locations of things buried under it." (p1, idea 5/8)*

In this second example, the game board has built-in pressure sensing—a form of touch sensor that is able to detect force—and ripple effects happen the more force is applied.

> *"A game that includes a motion sensor and reacts to motion. People need to gesture in front of each other." (p29, idea 1/8)*

Table 5.6: *Examples of Input Technology*

Examples of Input Technology		
Sensors	**Examples**	**Code Frequencies**
Location Detection	Proximity, orientation, etc. Sensors which recognise the place of objects.	31
Detection	Umbrella term for unspecified detection.	23
Identification	Sensors which can recognise things, e.g. RFID, NFC, barcodes, camera etc	18
Touch	Contact with objects, e.g. pressure, button, etc.	9
Motion	Detects object or player movement.	6
Wearable Device	Smart watch, fitness band, etc. Can sense players, such as HR.	5
Temperature	Senses the temperature of objects.	3

This third example has an interesting human-to-object interaction, where player-movement is the trigger, as opposed to moving a boardgame component. The sensor—a motion sensor—is either built into an object, or is part of the game in some other way. This sensor then sends the signal to a processor. The resulting effect here is unnamed.

Sensing technology can create intelligent boardgame components which can send information to a processor through either interacting with players directly, or with other components. Whilst there are existing objects—such as smartphones—which are already used in existing boardgames, examining the possibility of utilising sensing technology built directly into components themselves and remain hidden, could potentially harness the benefits of technology whilst keeping the analogue interaction in focus. Examples of sensors can be seen in Table 5.6.

5.3.2 Process

Process is the intermediary step where the signal is received from the input. It is a type of technology which has two parts: *processor-device*, a form of hardware which is capable of running scripts, and *processing-action*, the script itself which runs on the hardware. The role of the processor-processing duo is to take in the signal as information from the trigger, analyse that information, make decisions about it, and send it forward to an output. This is, arguably, where most participant examples become somewhat vague. Nonetheless, highlighting the importance of this step should aid analogue-digital hybrid boardgame designers and researchers in understanding the potential avenues future designs can take.

> *"Dice for games where when they land they record the number onto your attached app which goes right to the dm so you can't cheat (with any bonuses you've attached to character sheet*

etc), and the side it's landed on will glow until another roll is made. So if you drop a dice under a chair etc you'd know what it was too. Sound effect on d20 for a 1/20 roll." (p3, idea 4/8)

In this first example, there is an obvious processing method: an app on a phone, which can understand the results of dice rolls. It then sends the signal forward, and outputs sound effects on certain rolls. There is, however, another form of processing here: dice "knowing" when they have been rolled. This implies either information between the dice and the same app, or, some form of processing built into dice themselves. There is a second output here as well, sides lighting up until they are re-rolled.

"A game where you need to teach a little robot to move to a goal. The robot uses a reinforcement learning algorithm and the user can help it learn better by providing obstacles or certain prompts. It's a coop quick physical tamagotchi-style game." (p29, idea 6/8)

Once again, the processing is named in this example: a reinforcement learning algorithm, which is a form of machine learning. Input is created through "obstacles or prompts", which determine how the algorithm—and the robot—learn.

"Moving one game piece automatically moves another - like the pieces are connected through the board. The idea is that the players are connected telepathically." (p8, idea 4/8)

This third example, however, does not specify how processing happens. It implies a connection between two game pieces and the game board. Movement is the human-to-object interaction which is the trigger here. However, it is unknown where the signal is sent by this trigger. There could be, for example, a micro-computer built into the game board. Or, there could be an external device which receives the signal. This device then sends the signal to the second boardgame piece, and the output is the automatic movement of this piece.

Whilst how processing is carried out might be difficult to imagine without significant knowledge of the current workings and possibilities of technology, these examples nonetheless illustrate how players envision the future capabilities of analogue-digital hybrids. Table 5.7 provides further examples of process technology.

Table 5.7: *Examples of Process Technology*

Examples of Process Technology		
Technology	**Examples**	**Code Frequencies**
Processing	Connection & Intelligence, e.g. AI or ML algorithm, remote access server, etc	52
Processor	Mobile device, computer (microcontroller, chip), breadboard, etc.	20

5.3.3 Output

We can think of outputs as the outcome of the initial trigger input. It is the end destination of the signal that was created by the trigger, and it has two parts: an *output-device*—a technology device or a boardgame component—and an *output-effect*, which is the effect presented through technology, or which "happens" to the component. This outputted effect is why the whole interaction happens in the first place, and it is an event which utilises the strengths of technology compared to analogue alone.

An output-effect can be *sensory*: engaging the senses of players; it can be *object-behaviour*, where boardgame pieces "do something" on their own; and it can be a *game-state change*, where the outcomes of the game are altered. Furthermore, effects can contribute to a game's thematicness through providing atmospheric elements or through representing in-game events in the 3D space. They can also aid gameplay, or present novel game mechanics.

Sensory (output-effect)

Sensory effects can help convey a setting of a boardgame through strengthening its thematic elements by adding "more" of what is already there. For example, a boardgame set in a zombie apocalypse would already have art and components representative of the theme. Utilising audio, however, can provide an additional layer to elevate the game's perceived thematicness:

> *"Sound effects on boards to add music of theme elements like zombie noises if you're near a hoard." (p3, idea 7/8)*

Thinking back to the Immersion Spectrum in Chapter 3, a thematic setting plays an important role in immersion, especially for Embodiment and Contextual Submergence/Submergence. Examining the above example in more detail, reinforcing theme with sensory elements could potentially aid how realised the setting is perceived by players. For Contextual Submergence and Submergence, the more realised—or "fleshed out" the setting is, the more it helps players feel this type of immersion. For Embodiment,

immersion is the result of the sense of carrying out an action appropriate for the setting, from *within* that setting. In the above example, players hearing zombie hordes *when their in-game representation is near them*, reinforces the connection between the action and the setting, potentially aiding the feeling of acting from within the setting.

Whilst for any form of immersion to happen for a particular player, the conditions of immersion for them need to be met by the experience itself, the addition of sensory stimuli through technology has the potential to help players get there. Thinking back to Chapter 3 again, one of the reasons why some players never experienced any form of immersion was boardgames not having enough sensory stimuli. Designers can take into account the strengths of technology in providing sufficient sensory stimuli when creating analogue-hybrid experiences with submergence-type immersion as a goal. Additionally, audio is not the only sense which can be targeted when conveying a setting:

> *"Pawns that change temperature as you move them around the board into different climates." (p1, idea 1/8)*

In the example above, themes of climates are reinforced through feeling the temperatures associated with those climates, through touch. In the example below, scent is utilised similarly, by reinforcing a setting through scents associated with a location:

> *"Scent producing meeples which provide a scent appropriate to the board location. Jungle/mine/sea scents etc." (p15, idea 4/8)*

And finally, sensory effects are not just for strengthening a theme. They can also be used as novel game mechanics.

> *"In a secret identity game (Werewolf, Mafia etc.), players are each given a player token at the start of the game, before they know which players have which roles. And then, as they all hold their tokens and look around at one another, one or more players' tokens silently vibrate in their hands, letting them know that they're the ones who need to betray the group. This is fun, because it'll involve a moment where everyone is trying to maintain a straight face, while reading the expressions of their friends for clues." (p9, idea 1/8)*

In the above example, a popular party game type—a hidden identity game—could use haptics in place of cards for players to find out their identities. This would be a spin on typical existing mechanics,

Table 5.8: *List of Sensory Effects*

Sensory Effects		
Effect	**Examples**	**Code Frequency**
Audio	Thematic music, sound effects, reactive audio, directional sound, etc.	74
Visuals	Projection, light, colour, steam, fog, moving image	29
Touch	Haptics, temperature	8
Olfactory	Scent	4

and could further enhance the core of these games, which is to deceive opponents. Similarly, in a spin on deduction games, visual effects could be utilised in a "hot-and-cold" manner to guide players when searching for a location:

> *"Game board with holes in a detect the hidden intruder game. Pieces moved by the players are detected by the board which also tracks the movement of the hidden thingy (e.g. Whitechapel). The board can then illuminate with a range of colour lights (green/amber/red) depending on how close they get." (p21, idea 8/8)*

When designing with a sensory output effect in mind, thinking about the following questions might help designers:

- How might we use technology to create a sensory effect which reinforces the game's thematic setting?
- How could we use a sensory effect as part of gameplay?
- How can we create a gameplay mechanic using the sensory effect itself?

Table 5.8 collects more examples of sensory-effects.

Component-behaviour (output-effect)

Whilst boardgame components are often input-devices, they can also become part of an output effect through behaviour. Behaviour is triggered the same way as sensory effects, and can manifest in a variety of ways. These behaviours can simulate thematic evens in the 3D, physical space—the space in which play happens—through "acting out" actions on the board. The way technology contributes to this effect is that behaviours are autonomous in the sense that even if they happen as a result of a player-induced trigger, the behaviour is carried out on its own, seemingly by itself.

Table 5.9: *List of Object Behaviour Effects*

Object Behaviour Effects		
Effect	**Examples**	**Code Frequency**
Change Properties	Transform or change appearance, change size, change temperature, image/txt appears on object, change colour	38
Animate	Automatic movement (whole piece or parts), objects released, objects open (doors, etc), pieces auto-distribute, objects fall, object shakes, etc.	33
Lock-in-place	Objects automatically locked/prevented from movement	5

"Game pawns that change shape and weight over the course of the game with time, mimicking ageing. As they get bigger and heavier it is harder for them to move, and they move more slowly." (p1, idea 6/8)

Transformation is a form of behaviour in which the properties of game components change in some way. In the above example, the thematic event of "ageing" is physically represented through the transformation of the pawn. The trigger here is passage of time through automation, and processing is tracking the time and outputting the component change. Even though it might be difficult to imagine this example as a real boardgame, it illustrates how this player envisions technology's future capabilities to create novel experiences.

"A dexterity/stacking game based on articulated figurines. Depending on their configuration, such as which creatures they are next to or have affinities with, different figurines can activate their limbs and animate, changing the game state." (p2, idea 2/8)

In this second example, object-to-object interaction through proximity detecting is the trigger, and the outputted object behaviour is pieces animating. There are various ways in which objects can animate in a boardgame, such as through automatic movement of pieces, objects being released, or pieces falling over. These behaviours could represent dramatic, thematic events, such as in this next example:

"Car/ship pieces pulled or pushed apart via magnets to simulate explosions." (p6, idea 7/8)

Object behaviours overlap with visual sensory experiences as they are inherently perceived visually by players. However, the distinction here is the involvement of physical objects to a greater extent.

Table 5.10: *List of Game State Change Effects*

Game State Change Effects		
Effect	**Examples**	**Code Frequency**
Status Change	Automatic calculations, send-, receive-, record-, track-, exchange information, hidden information, narrative change, clues revealed, give instructions etc.	77

Sensory visual effects can happen independent from boardgame pieces, such as projections or effects delivered through screens. Object behaviour always involves a boardgame component, and the piece will either "act on its own", or go through a transformation. Still, there are instances where we can classify an effect as both object behaviour and sensory visual effect: for example, if a meeple changes colour, it would be considered both. Table 5.9 provides more examples of object-behaviour.

Game-state-change (output-effect)

Output effects can influence the course of the game through handling game-state changing information. These game-state changes can advance gameplay, narrative, player scores and other statuses within the game. Game-state changes happen in all boardgames, with or without technology. Technology can be utilised, however, to automatically record, store, calculate and track in-game events and statuses. After the game-state is altered, this new status then needs to be signalled to players. As such, game-state change effects are followed by sensory or component behaviours:

> *"Each player has little "unit" pieces of their colour. To capture an opponents piece, one of your units jumps on top of the opponent's piece. At this point, the opponent's piece changes colour to your colour to show it is now owned by you now." (p17, idea 2/8)*

In this above example, the trigger is object-to-object interaction when two pieces come into contact (the "jump" is possibly manual), and the game-state change effect is that an opponent's piece has a new status: "captured". There is a visual sensory effect here signalling the status change when the opponent's piece changes colour.

> *"Spaceship miniatures battle games could be made more interesting if instead of resolving combat through open dice rolls you instead point your camera at the target ship, and by recognising the ships profile the probability of hit/miss is calculated and the outcome determined automatically, including the possibility of critical hits and the consequences they have on gameplay."*

Table 5.11: *Examples of Output Technology*

Examples of Output Devices		
Device	**Examples**	**Code Frequencies**
Screen	LCD, mobile device, computer, built-in (such as built into cards).	12
Speakers	Connected speakers.	5
Wearable	Glasses, headphones, etc.	5
AR	Augmented Reality projection.	4

(p24, idea 5/8)

Here, the trigger is scanning spaceship miniatures with a smartphone camera to find out their battle stats. These stats then go through processing in the process step, and the resulting status change—whether it is a critical hit or not—is determined and displayed to players. Without displaying the status change on an output-device, the results of the battle would be lost on players.

> *"In a narrative-based detective game, a meeple piece is placed onto a location card, and a spoken story of that location is played. Or the meeple is placed onto a person, and a spoken version of a conversation with them is played." (p17, idea 8/8)*

In this final example, storytelling is aided by technology. The trigger is object placement, and upon placement, the game-state effect is advancing the narrative. This narrative status-change is delivered through a sensory effect: dialogue through audio. Even though game-state change effects require the presence of another output-effect, or output-device, to become "visible" to players, these effects still utilise technology through relying on triggers and processing. The resulting status changes are more technology-adjacent in the sense that they happen because of, and by the use of, technology—as opposed to being technology themselves—but they form an important part in the overall analogue-hybrid player experience. Examples of game-state-change effects can be seen in Table 5.10.

Output-Device

An output-device is technology, or an object, which can enable the effects previously outlined. For example, sensory-effects such as audio, would need speakers—an output-device—to be audible. Similarly, visuals would need some form of projector, either a screen, or augmented reality (AR), etc. Similarly, boardgame components become output-devices when object behaviour effects happen to them. Examples of output-devices can be seen in Table 5.11.

5.4 The Analogue-Digital Hybrid Board Game Ideation Deck

Complementary to the taxonomy, I have designed a card deck aimed at non-academic audiences, as an alternative way to present the information detailed in the previous section. The reasoning behind these cards were examples such as: *Generominos* by Compton et al. (2017), which is an ideation deck to aid in the design and analysis of new controller systems; Rogerson et al. (2022)'s SMeFT deck for aiding the design of hybrid boardgames for "distanced" play; and, a review paper by Roy and Warren (2019) into card-based design tools. Roy and Warren analysed 155 card decks which can be used for design ideation, concluding that due to their unique characteristics and engaging nature, cards have certain advantages over other, similar tools when it comes to aiding design. According to the authors, user feedback also indicates that designers enjoy using them, and find them useful. However, they can be prone to being confusing, or presenting too much or too little information. Furthermore, when compared to other methods to generate ideas, groups using cards did not produce better quality ideas than groups who did not. However, both Rogerson et al. (2022)'s and Compton et al. (2017)'s validation of the decks had positive findings in their helpfulness for design and enjoyment for use, alongside several other validation and review studies for card-based design tools (Lucero and Arrasvuori, 2010; Golembewski and Selby, 2010; Halskov and Dalsgård, 2006; Alves and Roque, 2011; Wölfel and Merritt, 2013) evidence the benefits these decks provide in the ideation process.

The purpose of the Hybrid Board Game Ideation Deck is not to be better, or in any way more effective, than other design and brainstorming methods. Instead, it was created to be used together with the taxonomy, or as a reminder of the ideas within the taxonomy, in a more visual and distilled way. It consists of 35 cards ordered into 4 groups, following mostly the same structure as the taxonomy, with a few notable differences. First, cards are organised into Interaction, Components, Technology and Effects, as opposed to Input, Process and Output. This is to make it simpler compared to the taxonomy. As a result, Automation is contained within the Interaction card group. Furthermore, technology here has its own group—as opposed to the taxonomy where it is divided by its function—however, sensors are collected as a separate, "golden" card, similar to a Joker card in a standard playing card deck. At the bottom of every Technology card, and the Sensor card, a circle at the bottom left, centre or right corner of the card indicates whether the technology can be used as an input, process or an output. Technologies that fall into more than one of these categories have all indicative circles, with corresponding colour coding. An example of a card from each group can be seen in Figures 5.3 and 5.2 respectively. The full

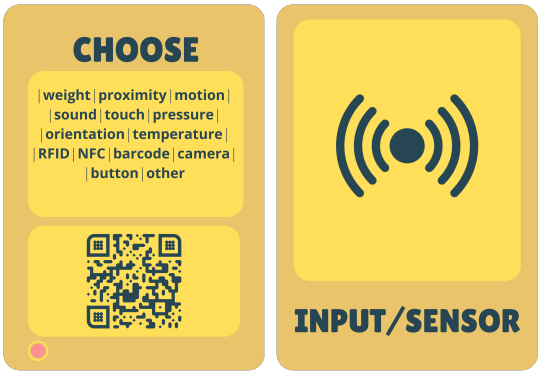

Figure 5.2: *The Sensors Ideation Card, with a pink circle in the bottom-left corner indicating its "input" status.*

deck can be found within the supplementary materials submitted with this thesis.

5.5 Discussion

The results of this study confirmed that players envision novel interactions with hybrid analogue-digital boardgames that go beyond the use of digital screens. The taxonomy presented in this chapter is useful in illustrating the current and future potential of technology at every aspect of a hybrid boardgame, from interaction to the resulting effects. Whilst many of the examples in players' design ideas seem impossible until further technological advancements, the taxonomy provides theoretical exploration of the design space, from a perspective which favours player experience. As we discussed in 2.4, players' feelings towards technology are mixed, with one of the leading reasons for dislike being the presence of screens. Whilst there is evidence of the importance of analogue pieces in the enjoyment of boardgaming as a hobby (Rogerson et al., 2016), technology has clear roles and benefits within analogue games as well (Rogerson et al., 2021b,a). Future analogue-hybrid boardgame designs could potentially utilise existing boardgame pieces as input devices—with interactions players already do and enjoy—and harness the benefits technology can provide, whilst making technology less "visible" to players.

One of these benefits include the potential of aiding thematicness, a concept which we introduced in Chapter 4, and contributing to certain types of immersion—such as Embodiment, Contextual Submergence and Submergence—as we detailed in Chapter 3. As with many aspects of player experience, both thematicness and Submergence-type immersion happen when the experience matches a player's expectations of the experience. Still, technology has the potential to facilitate these experiences through reinforcing a game's thematic setting. As we know from Chpater 4, this thematic setting already has to

be strong though art, components and narrative in the analogue parts of the game, however, technology could provide additional sensory input which—to some players—have been missing from purely analogue experiences for them to be immersive. Sensory Effects have a clear advantage here, however, it would be interesting to see how Component Behaviour could be utilised in future boardgame designs to enhance the immersive/thematic capabilities of boardgames.

Additionally, technology's potential to follow and to change the status of game-state, and in its abilities to carry out automation of certain player tasks—such as calculations or score keeping—align with the roles and functions determined by Rogerson et al. (2021b) and further evidence that technology is seen as useful in aiding gameplay.

Finally, whilst the taxonomy presented here has some clear distinctions between categories, these categories are not exclusive. Nothing stops designers from combining all three Output Effects—sensory, object-behaviour and game-state-change—for example, in the same analogue-digital hybrid boardgame. The purpose of this taxonomy—alongside the ideation card deck—is to be used, either as inspiration, or as information in future boardgames design and boardgames research, through understanding how players envision technology implemented into analogue experiences.

5.6 Limitations

The main limitation of this research is that the usefulness of the resulting taxonomy, alongside the complementary ideation deck, are not tested with boardgame designers. Whilst the main focus of this thesis is boardgame players and their experiences, designers could potentially benefit from many of the findings presented here. However, without knowing how designers would use this information, or the tools created out of the information, it cannot be known whether they will find value in them.

Future research could test and validate the findings, alongside the ideation deck, in workshop-based research studies of using these tools for design ideation. Further, prolonged usefulness could be determined by more longitudinal studies, such as a diary study, where designers could spend longer times with these tools to assess how they would fit into their overall design practice.

Additionally, the majority of participants are hobbyist boardgame players who have played a hybrid boardgame before. This knowledge of current practices for technology implementation could potentially create a bias for these participants. Further, the results of this study cannot be generalised towards the wider population, as more casual players and non-boardgamers could potentially have different priorities

and ideas towards future hybrid boardgames.

Finally, participants' feelings towards hybrids were not assessed. We assume that participants had no strong feelings against technology inclusion in this study. However, we do not know whether any of the future ideas presented would potentially "fix" already existing problems towards technology inclusion presented in other research, as detailed in 2.4.

5.7 Conclusion

This chapter investigated how boardgame players imagine alternative ways of interacting with technology in analogue-digital hybrid boardgames. The resulting taxonomy categorises the possible ways in which technology can be utilised to trigger, process and output various effects, taking into account potential advancements in technology's capabilities in the future. The main contribution of the taxonomy is to expand the design space for novel hybrid boardgame experiences—at present and in the future—and for designers and researchers to use as inspiration, and as a reference, in their future works when considering hybrid boardgames from a player interaction-centric perspective.

Figure 5.3: *Example Ideation Cards for Interaction, Components, Technology and Effects. Circles in the middle, and bottom-right coner on the Technology card indicate that it is both a Process and an Output.*

Chapter 6

Discussion

This thesis aimed to explore the design space of analogue-digital hybrid boardgames through a better understanding of the various facets of boardgame play which are, or could be, enhanced by the presence of technology. First, through a qualitative analysis, boadrgame players' subjective experiences of immersion were examined. It was important to first understand whether analogue games have the capacity to be immersive, and if they do, how immersion manifests in the player experience, to determine whether technology could enhance experiences of immersion further.

When considering the many possible definitions of immersive experiences in the literature outlined in 2.3, I propose a distinction between "objective" and "subjective" immersive experiences. In that sense, we could consider a player to be objectively immersed whenever their experience meets criteria outlined for a given academic definition of immersion. However, a player is subjectively immersed when the experience meets their own, personal definition of immersion. This distinction could be helpful in navigating the now extensive field of immersion studies, and could potentially aid discussing these experiences further.

Similarly to previous findings in video games research (Brown and Cairns, 2004; Ermi and Mayra, 2007; Jennett, 2010), we suggest that boardgame immersion is, first and foremost, a cognitive experience. One important distinction between video game immersion literature and the study presented in Chapter 3 is a focus on not just the immersive experience, but the conditions which need to be met for players, in order to feel immersed. These conditions are the criteria a player has for their subjective immersive experience to happen. From this perspective, technology could potentially aid in fulfilling certain player criteria for "immersiveness".

For example, some players require a boardgame to have certain sensory stimuli to be immersive. As technology has the capacity to provide additional sensory elements, it could objectively make a

boardgame more immersive as a result. Whether the experience would also be subjectively more immersive, would depend on the player. Similarly, technology can be helpful in delivering narrative and storytelling elements, and could potentially expand upon the capabilities of boardgame narrative delivered through cards or game-books. Technology can, for example, deliver recorded voice-acting, or interactive narrative which reacts to in-game events—such as in Return to Dark Tower. All of these capacities of expanding the game-world through enhancing the sensory and narrative capacity of analogue games have the potential to aid immersion types such as Embodiment, Contextual Submergence and Submergence.

However, when considering the many functions technology can fulfil in a hybrid boardgame—as detailed by Rogerson et al. (2021b)—technology might directly or indirectly contribute to experiences of Engrossment and Contextual Engrossment as well. For example, one of the domains defined by Rogerson et al.—*Informing*—is concerned with technology's ability to handle many aspects of information flow in a boardgame. This ability, alongside domains such as *Housekeeping* or *Remembering*, where technology "takes care" of some of the more tedious or complex tasks of boardgaming, could help players become engrossed by aiding players' own capacity to focus on elements of gameplay which require concentration. Similarly, *Timing*—the domain concerned with elements such as timers and timed gameplay—can create pressure, a condition of Engrossment to some players, or even Submergence-type experiences through a "rich range of uses of timing functions, including the delivery of scripted or random content and orchestration of the game" (Rogerson et al., 2021b, 6).

Whilst the first study looked at boardgame player experience more broadly, in Chapter 4, we took a more narrow focus by examining the effects of a soundtrack on boardgame play. The choice of focusing on audio was twofold, from the perspectives of immersion and technology inclusion. First, some players reported voluntarily choosing to use music to enhance their own immersive experiences. Second, there are currently many examples of boardgames with apps which include audio as a sensory element. Since there is an overlap in this sensory domain between certain types of subjective player immersion, and the inclusion of audio in boardgame companion apps, it seemed like a fitting area to further understand the potential of technology in enhancing player experience.

As stated in Chapter 4, we refrained from explicitly assessing the soundtrack's effects on boardgame immersion due to the various subjective definitions players offered in Chapter 3. However, we have constructed our own, objective measure in the form of a questionnaire, with the questions based on descriptions of Submergence-type immersive experiences. The results of this research contributed two important findings regarding boardgame player experience, and technology.

First, we introduced a new concept—thematicness—defined as the degree to which the game-world feels realised to the player. Thematicness and Submergence-type immersive experiences have some overlaps. The importance of theme and the game-world, and the extent to which this game-world materialises through thematic representations in art, components and narrative, are important to both. However, thematicness could potentially act as a measure in assessing a boardgame's capacity of Submergence-type immersiveness. For example, a player could have the condition of a certain degree of thematicness to achieve Submergence. Again, these factors would still be subjectively judged by the player, however, defining these aspects of boardgame play might aid a shared terminology for further discussion of player experience.

Second, we found that when using the complementary app-timer of *Fuse* with all of its sensory elements—including its visuals, voice-narration and music/sound effects—the resulting player experience was significantly higher when compared to just the visual timer, or the visual timer combined with voice. Further, both the visual timer and the voice narration have a function-first role within the game, by informing players of the time they have left before the game ends (and the ship explodes, thematically speaking). Even though they feature additional thematic elements, such as the look of the timer resembling the timer of a bomb, the soundtrack—combining music and sound effects—is there to enhance the thematic and narrative context. These findings cannot confirm whether the official app/soundtrack have more advantages compared to, for example, user-selected music. However, it confirms that additional sensory elements do positively affect player experience.

Thinking of thematicness, together with the benefits of sensory stimuli, and Rogerson et al. (2021b)'s findings of technology's role in the *Storytelling* domain—where technology can be used to enhance thematic elements through "sound, video, animation and other mechanisms afforded by the digital medium"(6)—we can consider further potential benefits in exploring the idea of implementing sensing technology into boardgame components. Some of the examples mentioned in 2.4, such as Beyond Humanity and the Teburu console, are already expanding the design space in a commercially available setting. However, the question of whether hybrid boardgames which are completely exempt from the presence of screens are possible, remains unanswered. Further, it is also unknown how this would affect player experience. Would players welcome—and even prefer—such hybrids when compared to hybrid boardgames with apps and screens? Considering research supporting players' enjoyment of materiality and the interaction with these material components (Rogerson et al., 2016), together with findings of some opposition towards the presence of screens in boardgaming (Kosa and Spronck, 2018b; Booth, 2019b), might sug-

gest a preference towards such hybrids. However, even without a screen, the issues outlined by (Kosa and Spronck, 2018b), such as obsolesce of technology, would remain present.

Many of the above questions and theories have prompted the third study of this thesis, and especially, a desire to understand how players envision the future of hybrid boardgames. We wanted players to freely imagine the possibilities of technology augmentation, without the constraints of being influenced by what limitations they believe technology currently has. The participatory design approach chosen for data collection was to place the end-user (the boardgame player) at the forefront of discovery and ideation. As apparent from our findings, many players still used apps and screens in their example designs. It remains unanswered whether this is because of preference, or as a result of choosing technology they already know and have seen examples of. This study also did not expand knowledge towards players' feelings about technology inclusion.

The main contributions, instead, come from a collection and classification of technology's potential from initial player interaction through the final effects technology enables. The resulting taxonomy details potential ways to interact with boardgame components as connected technology; or as material components which can interact with technology themselves. It provides an overview of various possible ways in which technology could process information it receives from an input (or inputs); and finally, it collects various effects which players envision would be beneficial in a hybrid boardgame. Some items outlined in the taxonomy—such as effects relating to information handling, randomisation, or the input automation—overlap with many of the domains in Rogerson et al. (2021b)'s work. This is to be expected as both works study the same domain, and boardgame players' understanding of existing boardgames (hybrid or fully analogue) is also a contributing factor. However, I believe the two works serve a different purpose, and are complementary to each other when expanding the overall understanding of hybrid boardgame design. Whilst Rogerson et al. (2021b)'s Hybrid Digital Boardgame Model "represents the current state of the art of [hybrid] games, describing the use of hybrid digital elements in commercial boardgames as well as those designed for research settings" (10), the taxonomy outlined in 5.3 provides a model of potential interactions for future hybrid boardgame design, regardless of whether these ideas can currently be implemented due to the constraints of technology. It aims to spark inspiration in design thinking and design research towards yet unseen examples of hybrid analogue-digital boardgames and from the perspective of intended player interaction and player experience.

Chapter 7

Conclusion

This thesis outlined the investigation of three, interconnecting research questions, relating to the relationship between boardgame player experience and technology.

In Chapter 3, the question of *"Do boardgame players experience immersion, and if they do, how does it differ from video game play?"* is answered through a qualitative analysis of boardgame players' self-reported immersive experiences. The resulting contribution to the field of boardgames research is a *spectrum of immersive experiences*, alongside a *matrix of factors* that invoke these experiences. This work is the first foray into the experiential understanding of boardgame immersion, rooting boardgames within the wider context of games studies through outlining their similarities to video game immersion, whilst also distinguishing boardgame player experience through highlighting the unique characteristics that set boardgaming apart from other forms of player experience.

The findings of this study demonstrate players' ability to articulate their needs, which need to be fulfilled in order to subjectively become immersed in a boardgame. These needs can either be specifics of the boardgame itself, the surrounding gameplay, or a combination of the two. Immersive experiences are illustrated as points on a spectrum, depending on players' requirements for the experience to be immersive. Experiences range from only requiring gameplay for immersion to experiences only requiring an unfolding story, where placement on the spectrum depends on how much of each gameplay and story a player requires to be immersed.

This study did not, however, provide a definition of immersion. Neither did it measure the amount of immersion players have experienced. Both of these limitations were outside the scope of the study and its research question and would have required different data collection methods.There is opportunity for future research studies to develop specific measures to assess boardgame immersion. As with video

games, the spectrum and matrix outlined in Chapter 3 could be used to develop dedicated immersion questionnaires. As this study mainly focused on subjective immersive experiences, there is also scope to define boardgame immersion more objectively. For instance, building a questionnaire that can determine where a player's experience falls on the spectrum could be used both as a tool to objectively categorise immersion and as a self-assessment tool for players themselves to gain a better understanding of their own experiences.

In Chapter 4, the research question of *"How does the inclusion of a soundtrack affect the experience of boardgame play?"* was answered through the results of a mixed-methods experiment. This study investigated the effects of a single factor on boardgaming experience by comparing how the experience differs with and without a soundtrack. Audio was chosen for a number of reasons. First, it is often supplied by publishers as an add-on to existing games. Second, in the absence of an official soundtrack, it is often substituted by the players themselves. Finally, audio was one of the factors contributing to some players' immersive experiences. The primary finding of this study was that a soundtrack has positive effects on player experience. However, it has also been demonstrated that a soundtrack, in itself, is not enough to make a boardgame *thematic*. The results of the qualitative analysis of players' sentiment contributed to the concept of *thematicness*—the extent to which a boardgame is considered thematic—and highlighted that, similarly to immersion, players have their own requirements for the boardgame and the surrounding experience itself in order to be considered thematic.

This study also had a number of limitations. First, it had a fairly narrow focus on a single factor as opposed to various factors that could alter player experience. Similarly, it focused on a single boardgame and a soundtrack that was written for this specific boardgame. Future research could widen both the number of boardgames examined and the number of factors—such as added visuals or voluntary role-play—to player experience. Additionally, while thematicness was defined, the results of this study did not provide any means to measure the extent of thematicness. Similarly to the immersion study, there is opportunity for future research to extend and categorise the various aspects of boardgames and boardgame play that can contribute to thematicness and to develop a robust way to measure its extent. Further, there could be future opportunities to investigate the links between the concepts of immersion and thematicness and the ways in which they potentially influence each other.

Finally, the study outlined in Chapter 5 answered the research question of *"How do boardgame players envision future analogue-digital hybrid boardgames without the constraints of the current known capabilities of technology?"* through utilising participatory design research methodologies. Building on the

understanding of various aspects of player experience gained from the first two studies, the aim here was to expand on those ideas through a more practical approach. As a result, this research focused on what experiences players envisioned as opposed to experiences they already had. The resulting taxonomy contributes both an expanded theoretical understanding of how technology could fit into analogue gaming long-term and more practical considerations for future analogue-digital hybrid boardgame designs. This study also prompted more reflection on the ways data and concepts are presented to wider audiences. To make these concepts more approachable to non-academic demographics, findings were both presented as text, and as ideation cards that could be used in real-world design contexts.

One limitation of this study was that it only focused on perspectives of players. Future research could widen this perspective by validating the usability of the taxonomy—and the ideation deck—by designers. Another useful perspective would be expanding the understanding of boadrgames' capacity for implemented technology. This could be through participatory research not just with boardgame designers, but also with practitioners of "physical computing"—a discipline focusing on the capabilities and use of micro-controllers and sensors for the purpose of building tangible, technology-enabled objects.

The taxonomy, together with the theories outlined in Chapters 3 and 4, overall contribute to the expansion of the understanding of player experience in boardgame play—with or without implemented technology—and into the factors which contribute to these experiences, either positively or negatively. Utilising information regarding players and their current, and future, experiences could prompt future research and design based on these theories, and be an aid in player-centric approaches in both boardgames research and boardgame design. Additionally, the taxonomy and companion ideation card deck detailed in Chapter 5 could not just serve as design guidelines for hybrid boardgames, but could serve as a potential tool to analyse both current and future hybrid games and experiences.

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Appendices

Appendix A

Pre-Study Survey for Chapter 4

The survey will take approximately 5 minutes to complete. It is important that both participants fill out this survey. Please decide beforehand who is going to be Participant 1 and Participant 2, and fill relevant sections accordingly.

A.0.1 Prerequisites of Participation

1. Are there two adults living at your address willing to participate in this study?

This study requires two people to play the board game together. Due to the remote nature of the study and the possibility of another lockdown, it is required that the two participants share the same address.

- Yes
- No

2. Are you both planning to be staying in the UK between now and March, 2021?

As materials need to be shipped to your address and then sent back to the researchers, it is important that you will be at a UK address to receive the package. Once the specific date of your participation is agreed upon, this time window will be reduced and more specific.

- Yes, we both will be in the UK
- No, one or both of us will be leaving the UK

3. Can you receive deliveries or have the ability to collect packages in case of a missed delivery?

A package containing a copy of Fuse will be sent to you with DPD Next Day courier service, so all you have to do is be at home at the time of delivery. We will agree on a suitable day for you to receive the package. Furthermore, DPD will give you a one hour time window on the day of shipping.

- Yes, I am able to receive packages at my address
- Yes, I am able to collect parcels in case of a missed delivery
- No, I am not able to receive packages at my address
- No, I am not able to collect parcels in case of a missed delivery

4. Have either of you played Fuse, the board game before?

- Yes
- No

5. Are there two smartphones in your household running either Android 4.4 (phones released after 2013) or later, or iOS 8.2 (phones released after 2015) or later with the ability to install apps?

- Yes
- No

6. Do you have access to a laptop/desktop with a webcam, microphone and speakers?

The experiment will be conducted through video conferencing software (Zoom). It is important that participants and the researcher can see and hear each other as instructions will be given through the study. The experiment will also be recorded for reference, please refer to the information sheet and consent form for more information.

- Yes, we have a computer with a webcam and microphone
- No, we do not have a computer with a webcam and microphone

A.0.2 Participant Demographic Information

7. What is your name?

8. What is your gender?

Please state the gender you self-describe as, or leave blank if you prefer not to say.

9. What is your age?

10. What is your email address?

Your email address will be used to send you survey questions during the study

A.0.3 Boardgaming Experience

11. Which of the following best describes you?

- I strive to play boardgames frequently and I consider it as a hobby
- I collect boardgames
- I work in the boardgames industry
- I participate in online and in-person boardgame discussions
- I sometimes play boardgames but I don't consider it as a hobby *(please specify your reason of playing in "other")*
- other

Appendix B

Survey Response Frequencies for Each Condition for Chapter 4

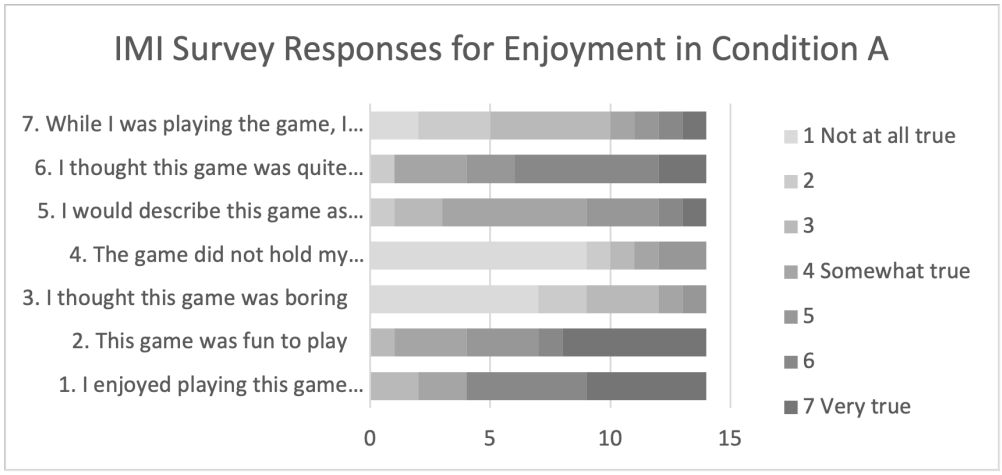

Figure B.1: *IMI Response Frequencies for Enyoyment in Condition A*

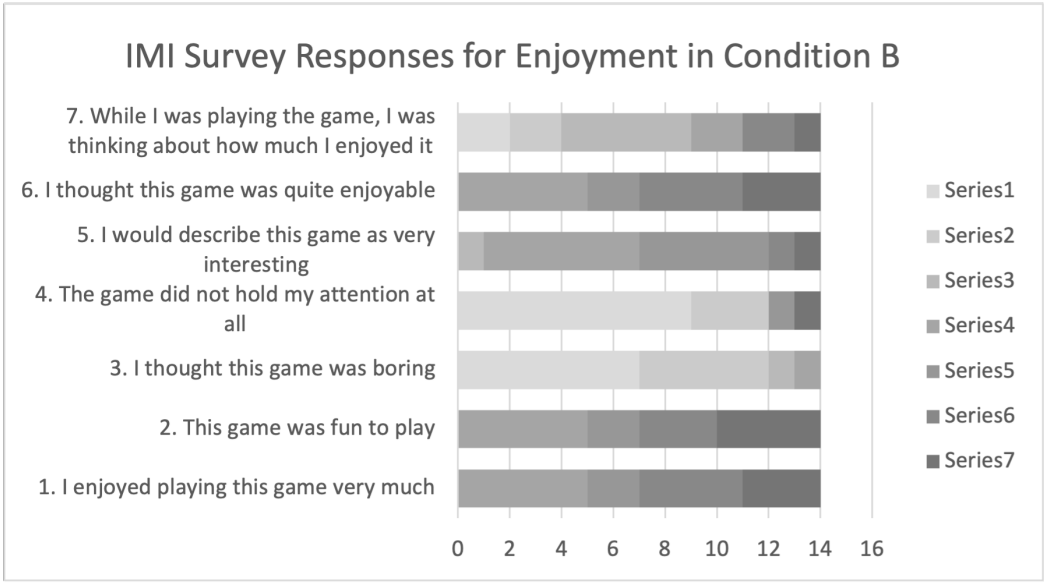

Figure B.2: *IMI Response Frequencies for Enyoyment in Condition B*

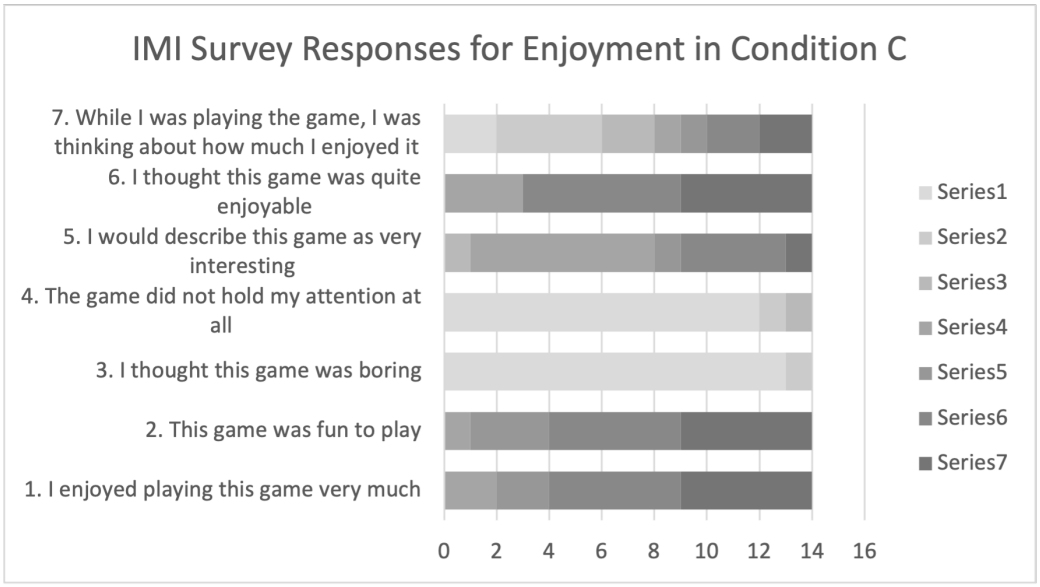

Figure B.3: *IMI Response Frequencies for Enyoyment in Condition C*

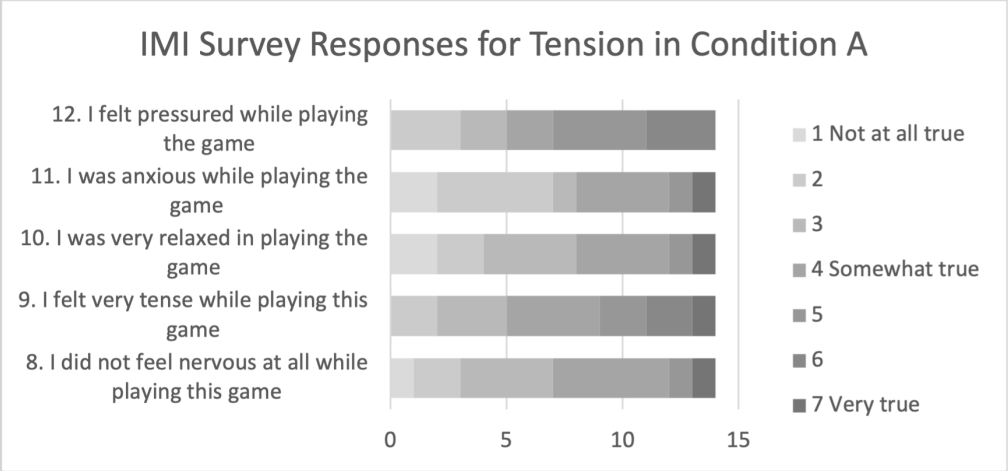

Figure B.4: *IMI Response Frequencies for Tension in Condition A*

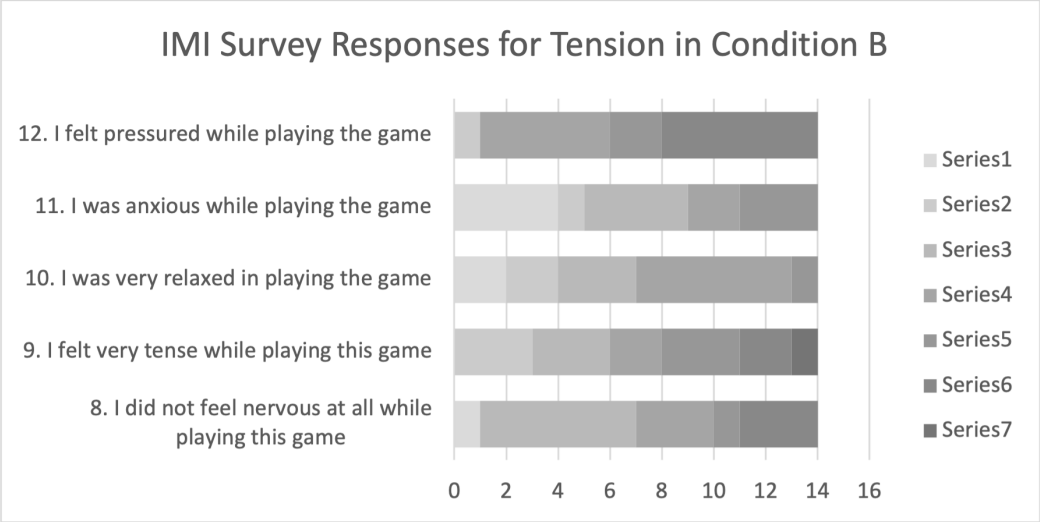

Figure B.5: *IMI Response Frequencies for Tension in Condition B*

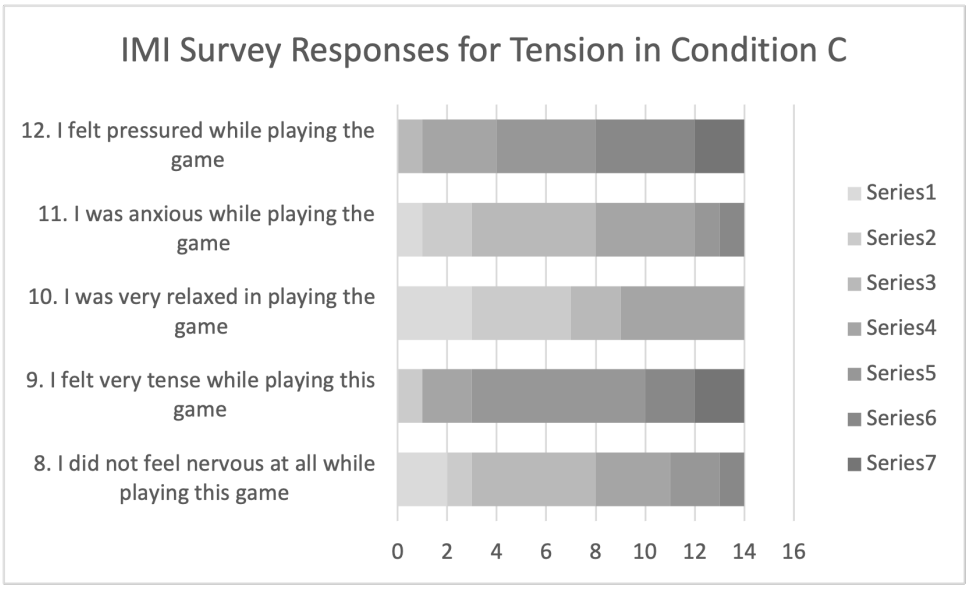

Figure B.6: *IMI Response Frequencies for Tension in Condition C*

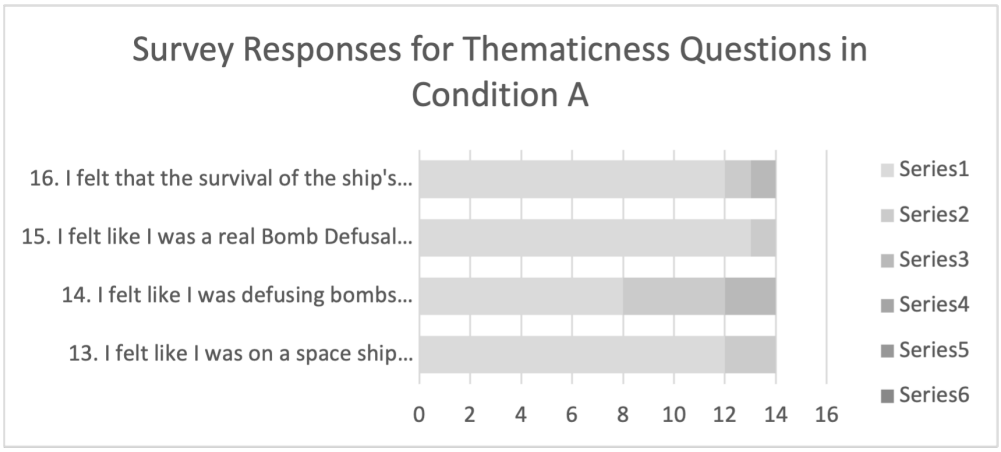

Figure B.7: *Thematicness Response Frequencies in Condition A*

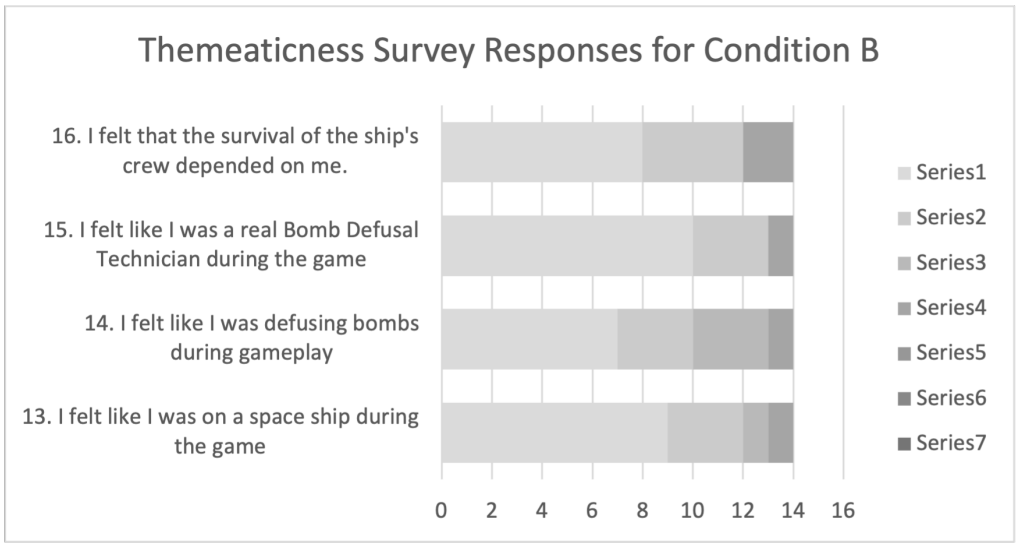

Figure B.8: *Thematicness Response Frequencies in Condition B*

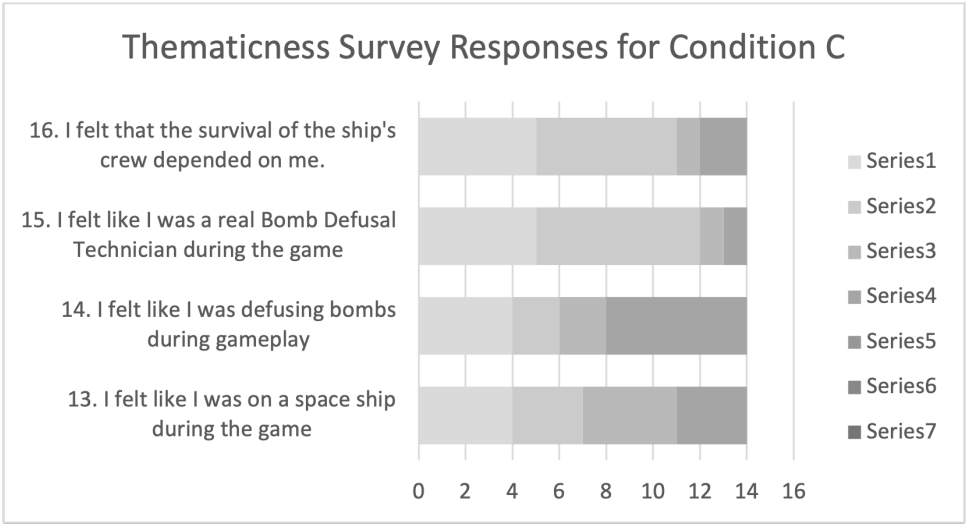

Figure B.9: *Thematicness Response Frequencies in Condition C*

Appendix C

Pre-Study Survey for Chapter 5

Your are being invited to participate in a study about board games and technology, which will be held remotely in an agreed time. The study takes approximately an hour and you will be asked to do a short, creative brainstorming exercise, and participate in a discussion afterwards. You do not need any special skills or equipment to participate, other than a sheet of paper and a computer with a microphone and web camera. You will be participating together alongside other board gamers. All participants will receive a voucher worth £20 (or equivalent in your currency) a few weeks after the study. The survey will take approximately 4 minutes to complete.

C.0.1 Prerequisites of Participation

1. Do you have access to a laptop/desktop with a webcam, microphone and speakers/headphones?

The experiment will be conducted through video conferencing software (Microsoft Teams). It is important that participants and the researcher can see and hear each other as instructions will be given through the study. The experiment will also be recorded for reference, please refer to the information sheet and consent form for more information.

- Yes, we have a computer with a webcam and microphone
- No, we do not have a computer with a webcam and microphone

2. Do you have access to A4 paper?

During the experiment, A4 paper will be used to do an exercise, which you need to supply for yourself. (You won't need to print anything)

- Yes, I have access to paper
- No, I don't have access to paper

3. What is your email address?

Your email address will be used for sending you further information about the study, alongside joining instructions and study-specific communication. We might also send you follow-up questions after the study.

C.0.2 Participant Demographic Information

We are asking for demographic and board gaming habit information to make sure we get participants from a wide variety of backgrounds. However, questions relating to gender and ethnicity can be left blank if you do not wish to answer them.

4. What is your age?

Enter your answer

5. What is your country of residence?

Enter your answer

6. How would you describe your ethnicity?

You can leave this question blank if you prefer not to say. Enter your answer

7. What is your gender?

Please state the gender you self-describe as, or leave blank if you prefer not to say. Enter your answer

C.0.3 Boardgaming Experience

8. Which of the following best describes you?

Please select all that is true:

- I strive to play boardgames frequently and I consider it as a hobby
- I collect boardgames
- I work in the boardgames industry
- I participate in online and in-person boardgame discussions
- I sometimes play boardgames but I don't consider it as a hobby *(please specify your reason of playing in "other")*
- I have played board games with a technology component before
- other

C.0.4 Scheduling

Here are the currently available dates for participation. All times are given in BST (British Sum- mer Time), please refer to this time zone converter to convert to your own time zone: ht- tps://greenwichmeantime.com/time-gadgets/time-zone-converter/ If none of the following times and dates work for you, please select "none of these work for me" and we will be in touch whenever new dates and times are released.

10 Your Availability

Please select ALL times when you would be available to participate in the study. You will be randomly assigned to a group of 3-5 board game players based on this, and the exact time, together with joining instructions, will be emailed to you.

- July 8th, Friday, BST 11:00 (11am)
- July 8th, Friday, BST 19:00 (7pm)
- July 9th, Saturday, BST 11:00 (11am)
- July 9th, Saturday, BST 19:00 (7pm)
- July 10th, Sunday, BST 11:00 (11am)
- July 10th, Sunday, BST 19:00 (7pm)
- None of these work for me