Using Companion Applications as Rules Teaching Tools To Make Hobby Board Games More Approachable

Author: Linsey Rimmer

Student Number: D1526794

Degree: MSc Computing

Supervisor: Dr Daniel J. Finnegan

School of Computer Science and Informatics, Cardiff University

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1. Abstract

‘Hobby’ board games have been growing in popularity over the past twenty years. However, such games feature unique and complex mechanics that can represent a barrier of entry to welcoming new players, restricting the capability of the genre to continue its growth. ‘Bloodborne: The Board Game’ is one of these more complex hobby board games which could benefit from more understanding as to how technology can aid the welcoming of new players into the activity. While studies into companion applications to date have focussed on design models for companion applications in relation to existing hobby board gamers and experienced fans, there has been limited study into the ways that companion applications can be targeted towards new players and used as specifically rules teaching tools. Therefore, a web-based companion application has been developed for the hobby board game ‘Bloodborne: The Board Game’ to aid with reducing game complexity and helping to teach game rules. To evaluate the effectiveness of the proposed companion application, usability evaluations were performed to gather qualitative data regarding the experience of first-time users. Findings from analysis of the data showed that there should be a segregation of features between those designed for new players and those implemented for experienced players, with the automation of housekeeping tasks only adding to the complexity for new players, rather than reducing it. Furthermore, rules teaching methods have potential within step-by-step companion application tutorials, although these should be executed within a sandbox environment. In response to the findings, the conclusion presents the ‘Model for Companion Application Features According to Experience Level’, which can be used to aid in the design and development of companion applications for new players.

2. Acknowledgements

I would like to thank my supervisor, Dr Daniel J. Finnegan, for his advice and guidance throughout this project, and my family for their support throughout the masters course.

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As a result, the code and content used within this project is not available for public use outside of this research project.

All code and technical hosting features that display the copy were created by Linsey Rimmer as part of the ‘Bloodborne: The Board Game Companion Application’ dissertation project. All written content that forms the body of this dissertation essay was written by Linsey Rimmer.

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5. Introduction

Board gaming has seen significant growth in the past twenty years, especially in the area of the more complex 'hobby' board games (Samarasinghe et al. 2021). However, this research discusses the barriers to entry that exist which make such hobby board games less approachable to potential new players.

Board games are an important medium as they have the potential to educate and increase creativity, regardless of whether the board game itself is creative (Mercier and Lubart 2021; Pollok et al. 2021). Educational board games are able to increase player's knowledge and benefit players through behavioural and habitual changes (Gauthier et al. 2019), such as by encouraging healthy eating (Viggiano et al. 2015), or practicing online safety (Wilhelmsson et al. 2021). Furthermore, support for 'family based leisure' with nostalgic elements, such as board games as a medium, can be viewed as an 'incubator' for people's satisfaction and well-being, especially during and since lockdown (Gammon and Ramshaw 2021). From such observation, it can be seen that board gaming represents an important medium in society that must be encouraged in its growth, and as such, research must find ways to remove the existing barriers to entry.

Within the well-known concept of board games, there are several different genres that appeal to different users. Woods (Woods 2012) defined these as: 'traditional games', such as chess; 'mass-market games', such as those like Monopoly which sell large quantities yearly; and 'hobby games', which are more niche and targeted towards hobby gamers. 'Bloodborne: The Board Game' is a hobby board game inspired by the FromSoft published video game 'Bloodborne'. It is a story-based game played across a series of individual game sessions, each called a 'Chapter', and takes advantage of game mechanics including 'Turn Order: Pass Order', 'Deck Construction', 'Hand Management', and 'Variable Player Powers' (BoardGameGeek. [no date]). 'Bloodborne: The Board Game' has a complexity rating of 2.98/5, with 75.6% of voters considering the game to be a medium or harder complexity (BoardGameGeek. [no date]). For contrast, mass market games such as Monopoly or Yahtzee have much lower complexity ratings, being 1.63/5 and 1.18/5 respectively (BoardGameGeek.[no date]). 'Bloodborne: The Board Game' represents a board game of higher than usual complexity, but still close to some popular but more complex games such as Catan, which has a complexity rating of 2.31/5 (BoardGameGeek.[no date]). Therefore, the game represents a title that is still low enough in complexity to welcome new,

inexperienced players into the hobby, yet complex enough to require tools to help make the game more appealing and approachable.

'Bloodborne: The Board Game' can be considered a hobby game because, as a KickStarter funded game, its content is both not traditional nor designed for the mass market. However, 'Bloodborne: The Board Game' represents a recent trend towards the blurring of boundaries between digital video games and analogue games. As it is an interpretation of its video game namesake 'Bloodborne', it benefits from much of the game's public appeal being drawn from its predecessor, relieving it of the responsibility of advertising its own mechanics as a way of drawing players in (Werning 2018). The drawback of this is that new players may not necessarily have any awareness of the complex game mechanics involved before sitting down to play, and may not expect such complexity. However, as a result of crossing this boundary between the digital and physical, 'Bloodborne: The Board Game' exists in a rare position of having two groups of potential fans: hobbyist gamers who traditionally collect and follow 'hobby games' of this genre, and potentially casual gamers who are fans of the video game first and foremost, but who may consider attempting to access the new hobby of board gaming through being a fan of the brand.

In response to the need to make board games such as 'Bloodborne: The Board Game' more approachable to new audiences, this dissertation project explores how complexity makes rules learning difficult, and thus makes games less approachable. In response to such a problem, this project develops a rule teaching board game companion application to act as a tool for new users to learn 'Bloodborne: The Board Game'.

The initial chapters of the dissertation will discuss the project aim and objectives, followed by exploring the problem background and a review of currently available academic literature, with a focus on learning and e-learning methodologies, and audience responses to companion applications. This dissertation will then discuss the possible approaches to take to the project, and then explore the application of the approach, split between the approach to software development and then the approach to the usability evaluations. Details of software development include the development of a user persona and functional requirements, with the final resulting web-based companion application evaluated through a series of usability evaluations. Following the discussion of how these usability evaluations were performed, the results will be reported, and then discussed and analysed to inform conclusions. Finally, the conclusion will present the 'Model for Companion Application Features According to

Experience Level', a tool that game designers and companion application developers can consider when establishing functional requirements. Finally, a reflection on learning will consider the success of the project and evaluate alternative practices which could have improved the experience.

6. Aim and Objectives

The aim of this project is to develop a companion application for 'Bloodborne: The Board Game' that aids players with rules learning and housekeeping within 'hobby' board games, thus making such games more approachable and therefore more popular within mass markets. This aim has been developed in response to the observation that more research is required into the ways that companion applications can benefit board game play experience (Liu et al. 2021; Wilhelmsson et al. 2021), particularly how applications can aid rules learning (Rogerson et al. 2021), in order to invite more players into the genre.

In order to achieve this aim, the following research objectives have been identified:

1. Establish if interactive technology can be used to increase player's access to and ability to comprehend game rules
2. Discover how AI cloud technologies can be integrated into the board game experience to support player's understanding of game rules
3. Determine if automation can be used to reduce complexity in hobby board games

This project intends to deliver a proof of concept prototype companion application for 'Bloodborne: The Board Game'. The main use for this companion application is for individuals or groups of new players to learn the game rules without any prior background knowledge or experience with hobby board games. User feedback will be gathered as part of usability evaluations of this prototype. From analysis of this data, this project intends to contribute a refined model of possible and recommended design choices and features within companion applications, with the rules teaching elements being the priority focus. Such a model will contribute to the wider board gaming community, particularly for board game designers and publishers, by offering critical advice for the design of future board games, board game companion applications, and hybrid or augmented board games. Designing future games with rules learning in mind will help to expand the community by making it easier for potential new players to access and understand 'hobby' board games.

7. Problem Description and Background

This research has identified that the complexity and time demands of modern 'hobby' board games present a barrier of entry that make it difficult to expand the genre's audience. This is therefore a problem as it puts board game publishers in a position where they struggle to continuously expand their potential audience.

Hobbyist gamers are characterised by an enthusiasm for the culture and community of board gaming, with this enthusiasm indicated through their large collection of different games rather than attachment to a single title (Woods 2012). In this way, these 'buffs' differ from a 'casual' board gamer. The latter may only consume board games as a form of 'entertainment and sensory stimulation', without the inclination to commit additional time and monetary resources outside of performing the activity itself (Stebbins 2012). However, the two groups of casual gamers and hobbyist gamers do not exist in isolation – instead, a group of mostly-casual gamers may have within them one or two 'super fans' who 'pursue information on releases, make purchasing decisions and […] determine the games that more casual hobbyists play' (Woods 2012). In this sense, the expansion of the hobby game genre is reliant on those representatives who encourage the growth of the fandom and act as the entry point for new gamers in overcoming game complexity through offering explanation of mechanics. The complexities of modern hobby games require time and attention to develop understanding and strategy (Arnaudo 2017), and as an individual welcoming new and casual players, the 'super fan' can represent the 'more knowledgeable other', helping those with no experience learn and understand the mechanisms of a game past what their ability may allow were they attempting to do so alone (Vygotskiĭ 1978). Without such guidance, new players may find it difficult to grasp hobby board games because of the demands required of their commitment and skill that casual gamers may be unwilling to give (Juul 2010). These demands may "put off" new players, discouraging them from investing further in the hobby, making it difficult for the genre to expand as casual players instead choose to stay with their casual games or, in the case of 'Bloodborne', the video game.

Arnaudo observed that "modern hobby games are often much more complex than casual games" (Arnaudo 2017), with there having been an "exponential growth" in the number of board games published since the year 2000, many of them reflecting new and complex mechanics rarely seen previously (Samarasinghe et al. 2021). 'Bloodborne: The

Board Game' can be identified as one of these new and more complex board games, with mechanics such as 'Hand Management' and 'Turn Order: Pass Order' being prevalent in the title's gameplay. The complexity of such a game is therefore indicated in elements such as 'Turn Order: Pass Order' being identified as the fourth most complex feature out of 182 possible options, although 'Hand Management' is featured in the lower 50% of complex features (Samarasinghe et al. 2021). The turn order mechanic within 'Bloodborne: The Board Game' is complex because there is no set structure or order within rounds – instead, the players have the freedom to decide who goes when according to the best strategy they themselves can develop. Such a feature is a core mechanic of the gameplay, as it challenges players to strategise. However, its presence also leads to a problem in gameplay: players can easily lose track of turn order and therefore miss their turn. This can be fatal in such a game where part of the challenge is achieving difficult goals against a tight time restriction. Contrastingly, 'Hand Management' is not considered as complex a feature (Samarasinghe et al. 2021). The turn management mechanic could therefore benefit from a feature within a companion application to reduce the problem of mishandling turn order, while card management represents a feature that "isn't broken, so don't fix it".

It is important to note that complexity within board games is far from a bad thing. In fact, their complexity is observed to be one of the very reasons why such board games are immersive and therefore appealing (Farkas et al. 2020). However, Arnaudo went on to observe that a board game's complexity also demanded more time and energy to memorize and implement (Arnaudo 2017). Such demands on time present a further barrier of entry for both existing and potential new players. Even for hobbyists, changing life phases, such as a new career or children, can impact the amount of spare time available to the player, and therefore the amount of time they can spend on playing games (Woods 2012; Rogerson and Gibbs 2018). If we are now facing a scenario where even the hobbyist gamers – those who would commit more time or money than they apparently have available to them (Stebbins 2012) – are unable to find the time or opportunity to play, how can we expect to attract new individuals into this realm of more complex games that are outside of the 'mass market' options (Woods 2012)? As a 'serious leisure' activity followed by hobbyists, usually such serious leisure requires a higher time commitment than casual or project-based leisure (Stebbins 2012). Sociological research has found that throughout society there is an ever more prevailing feeling of 'time poverty', that is, individuals do not perceive themselves to have the spare time available to them to do what they want to do because other

responsibilities and demands on time prevail (Rudd 2019; Giurge et al. 2020). This has already been seen to effect video gaming with the rise of casual games in response to the changing demands on time of different generations (Juul 2010), and by a similar logic non-casual board games have similar time barriers in place. Therefore, solutions need to be found to ensure 'time poor' individuals who may find joy and enrichment from the board gaming hobby are given appropriate entry points to abolish, or at least lessen the effects of, such time restraints. While Rogerson and Gibbs go on to suggest possible solutions for finding opportunities for play, such as changing the time or location assigned to play within, or going entirely digital (Rogerson and Gibbs 2018), all of these solutions continue to carry inherent flaws that do not fix the player's experience of time poverty. Changing location, such as by going to a board game café, has additional strain on travel time, cost, or the inconvenience of transporting the game itself. Going entirely digital loses the elements of materiality that are so important to board gaming culture (Rogerson et al. 2016) – although Rogerson and Gibbs do admit this (Rogerson and Gibbs 2018). A solution may therefore lie in a hybrid digital proposition in the form of a board game companion application, wherein the material draw is maintained but the excessive complexities of set up, time cost, and inconvenience are tempered.

This background leads to the identified problem of this research, which is that there are barriers of entry for new players wishing to approach 'hobby' board games that make it difficult for the genre to expand. This problem can be separated into two primary elements. First, there is a complexity and an excess to the game components, namely game pieces, that lead to an excess of time and space required to set up and play – time that many adult players simply do not have to spare. Meanwhile, the very nature of hobby games as complex makes it difficult to welcome new players into the fold without a guiding hand to teach and explain new rules. This research project intends to attempt to solve both these problems through the creation of a board game companion application that reduces the excessive reliance on components, and reduces the barriers to entry represented by game complexity by having the companion application act as this 'more knowledgeable other' (Vygotsky, 1978).

The aforementioned research objectives outlined in the Aim and Objectives section have been developed in order to overcome these identified barriers. In achieving the project's research objectives and the identified aim of the project, this paper will contribute to filling the wider gaps in board game research that have been identified by previously published work. These gaps include helping to understand how increasingly sophisticated game

elements – such as companion applications – can be used to benefit the game experience (Liu et al. 2021; Wilhelmsson et al. 2021), with a particular focus on hybrid gaming's impact on user's learning of the rules for new players (Rogerson et al. 2021). To this researcher's knowledge, no paper as yet has studied how companion applications can specifically be applied to help with rules learning and reference. To date, most related research in board gaming – a field that has been shown limited, 'sparse' and 'sporadic' attention (Samarasinghe et al. 2021; Wilhelmsson et al. 2021) – has focussed on building generalised models of applications for companion applications without reviewing the potential benefits of specific features. Furthermore, by applying this study to 'Bloodborne: The Board Game', this research may therefore take advantage of a unique context; 'Bloodborne' is a well-known, popular video game, demonstrated by its sustained player numbers even as late as 2021 (PC Gamer 2021), increasing the likelihood and opportunity for finding potential new players to take part in a usability study as part of this research.

8. Literature Review

In order to adequately contextualise this research within its wider subject field, this literature review will cover several angles in order to inform the design of the final companion application. First, a clarification of terms will be provided in order to justify the application of several different pieces of research to this project. As the main body of the literature review, this research will explore e-learning tools, teaching methodologies, video game tutorial methodologies, player's motivation to take part in board games, and finally the existing design principles for companion applications that have been developed so far.

8.1 Clarification of Terms

While the field of companion application research has been relatively limited to date, there are various topics of research that can be applied to this area. Research seeks to make a distinction between 'hybrid board games' – where digital elements are essential to gameplay (Rogerson et al. 2021) – versus 'augmented board games – where gameplay is 'enhanced' by the digital element (Arjoranta et al. 2016). However, since studies of both areas involve analysis of how digital tools interact with the physical game play experience, I have elected to critically apply lessons from both themes to inform this research.

8.2 Video Game Tutorials

Game approachability is a problem not just in board gaming, but also in video games, where the concern of approachability is to ensure that the game is 'friendly and accessible for players who have the desire to play, yet do not always follow-through to actually play' (Desurvire and Wiberg 2008). Video games face difficulty in ensuring that tutorials and rules learning does not dissuade potential players from continuing (Desurvire and Wiberg 2008; Johnson 2022; Poretski and Tang 2022). This echoes the earlier discussion regarding complexity and barriers to learning in 'hobby' board games, where the barrier is encouraging users to keep playing through the difficulty. Through study of video game tutorials, research has noted the potential for similar approaches and tools to be used in different contexts, where applications can 'interweave learning with the interaction itself', providing more context and clues throughout the experience (Poretski and Tang 2022). From such research, this project concludes that, in order to develop an appropriate digital learning tool for board games, one must consider the advice and research developed for rules learning in video games.

Within video game tutorials, the combination of text and images must be used consciously in order to 'decorate' – supporting immersion – 'indicate' – thereby teaching the rule itself – and finally, to 'provoke action' – meaning, triggering the user to take some action (Johnson 2022). Likewise, in their evaluation of 60 highest rated video games of 2020, Portski and Tang (2022) found that a combination of linked images and text were used extensively throughout the different methods of teaching (Poretski and Tang 2022). Therefore, the use of image and text within the rules teaching features of the companion application will be integral.

As a result of their research, Portski and Tang (2022) were able to identify conclusions on which rules teaching methodologies were most popular, and how these could be executed effectively. Of the rules teaching features identified, this research intends to include the elements of 'tutorials', 'personal advisors' and 'documentation', with a particular focus on tutorials (Poretski and Tang 2022). Such tutorial features enable the scaffolding of learning in a restricted way, allowing the gradual acquisition of knowledge through the very game play, helping to balance cognitive load, as is to be discussed further in the learning methodologies section (Pasqualotto et al. 2022). Therefore, the companion application must take in to account the design outlines for effective tutorials, where tutorials are usually provided as part of an 'external UI window', with the information separated into 'structured,

granular, and contextual' sections, with each section taking responsibility for only a small element of the wider game rules (Poretski and Tang 2022). Such guidance offers an understanding of how to design and create the user experience of the tutorials. This project intends to combine this understanding with that given for the content by the e-learning and learning methodology reviews in order to develop functional requirements of the rules teaching elements of the companion application.

4.3 Learning Methodologies, Approaches and E-Learning Tools

In order to develop a rules teaching tool, this research must consider teaching and therefore learning methodologies, particularly that of the schema and cognitive load. The excess of stimulation present in video games 'can often cause players to experience some level of cognitive load' (Pasqualotto et al. 2022), with cognitive overload being caused by an overload in the processing of 'essential information', 'extraneous material', and 'confusingly presented material', among other causes (Nelson and Erlandson 2008). As discussed in the Video Game Tutorials section, the companion application intends to use a similar video game tutorial approach, and so it is important to consider how video games cause such cognitive overload, and how these errors can be avoided.

Cognitive load refers to the amount of mental demand a task requires of a learner where the individual has only a limited capacity of load available to process information (Brünken et al. 2010; Pasqualotto et al. 2022). Under the theory of schema acquisition, schemas are stable patterns of relationships between knowledge, and represent the foundation which allows an individual to extract meaning from any given information (Kalyuga 2010). A balanced cognitive load within teaching materials will allow a steady building of schema. Extraneous (meaning unproductive or non-constructive) cognitive load can occur where there is an insufficient pre-existing knowledge base in the learner's schema or an 'excessive step-size of change of knowledge base' is required (Kalyuga 2010). As such, teaching materials must be carefully structured. Scaffolding – meaning 'the layering of increasingly complex levels' of knowledge (Pasqualotto et al. 2022) – has shown to support effective learning (Mayer 2019; Pasqualotto et al. 2022). Therefore, the proposed rules teaching features of the companion application must not attempt to teach everything at once, but should scaffold the user's learning effectively. Proposed design solutions for avoiding cognitive overload in video game environments include segmenting information and giving control over these segments to the user, along with including the close integration of 'visual and textual elements of information' (Nelson and Erlandson 2008). Meanwhile, suggested features that

can improve learning from video games include modality (meaning teaching elements such as visual, auditory and tactile), pretraining and coaching (Mayer 2019). Such supporting research will help to direct the design and structure of teaching materials to create an effective user experience in what will be not just a companion application, but therefore also an e-learning tool.

Design principles for the companion application must consider those set out for e-learning tools to ensure the teaching is appropriate and effective. While the application of such models will be limited – for instance, there is no lecturer in this context to provide support to learners – the theoretical framework can be applied. As a result, the companion application should utilise advised design features such as:

- Content: documents, digital audio and video, authoring tools, visualisation tools, knowledge repositories and search engines (Aparicio et al. 2015)
- Activities: contextualizing instruction, presenting and cueing content, synthesizing and sequencing processes into instructional lessons, and modelling and explaining (Aparicio et al. 2015).

Furthermore, the success of the application will be impacted by the system quality, the learning quality in a contactless environment, and the 'perceived fit of e-learning content' (Kim et al. 2022). Part of this research study will be to determine how fit the content of board game learning is for a digital platform, and will therefore help to determine how applicable such advice is within the board game companion application context. In order to ensure the learning quality and system quality however, the design must consider theory of learning, for instance by being informed by Julie Dirksen's 'Design for How People Learn' (2011). Dirksen noted that when designing teaching materials, it was important to use a goal based design strategy and consider ease of usability and motivation of students throughout design (Dirksen 2011). Dirksen's advice supports that of Al-Fraihat et al (2020) who argued that when designing an e-learning system, it was important to understand the learner's needs and motivation (Al-Fraihat et al. 2020). In this way, in order to produce an effective set of functional requirements for the companion application, we must identify and consider why players are motivated to play board games in the first place. Even though the application will be targeted towards new players, motivations for play will help this research understand what the benefits are of playing, and therefore where the appeal is to new players in getting the experience.

8.4 Motivations for Playing Board Games

Rogerson and Gibbs observed that, amongst hobbyist players, the primary elements of motivation for play included 'sociality, intellectual challenge, variety, and materiality' (Rogerson and Gibbs 2018). This supports the findings discussed in the background section, particularly intellectual challenge, with complexity and the opportunity for strategy being an appealing element that lead to immersion (Arnaudo 2017; Farkas et al. 2020). However, because the complexity presents a barrier for new players, the proposed companion application will have an impact on the game play experience of the board game in this respect by potentially reducing the complexity and therefore reducing the extent of the intellectual challenge. Similarly, because materiality can present a barrier of convenience, this may be impacted by the companion application, but such an impact should be kept to a minimum to ensure the support for the domains of materiality (Rogerson et al. 2016).

In order to support such domains, a companion application should seek to ensure any removed materials are still provided actions that make the game elements meaningful (Salen and Zimmerman 2004). For instance, replacing the physical game timer with a digital turn button removes the inconvenience of materiality, but still provides players a meaningful action – that being the need to press the turn button. By noting the ways in which these elements contribute to the play experience, they can be accounted for in the final product requirement development. However, Kosa and Spronck (2018) found that the more experience a user has with tabletop gaming, the more likely they are to have a negative feeling towards the tools due to their removing tactility from the game. This finding therefore supports the research in focussing the target user on new players, who may not yet have such attachments.

Companion applications must show concern not just for materiality, but game mechanics themselves. Research has identified many features that companion applications traditionally handle, and of note among these are game chores, with these being mundane tasks involved in board games, such as shuffling (Xu et al. 2011). Chores are thought to support rules learning and grounding of players and groups into the game context (Xu et al. 2011; Rogerson et al. 2015), helping to avoid player confusion (Wallace et al. 2012), thus representing essential features of board games (LaLone 2021). However, chores and housekeeping elements are often integrated into companion applications (Ip and Cooperstock 2011; Wallace et al. 2012; Kosa and Spronck 2018; J. Rogerson et al. 2021). Because of the necessity to find the balance between the convenience of automation and the teaching context

provided by such chores, it is therefore necessary to ensure chores are still given game presence through low-automation scenarios (Wallace et al. 2012), in order to ensure users have the time and opportunity to learn complex game mechanics and understand how the game is progressing.

Since the very earliest research in the field of companion applications, results have encouraged the prioritising of the physical over the digital in order to support sociality within board games (Mandryk et al. 2002). Further research has been done to explore how applications can even support 'socially negotiated play' (Wallace et al. 2012; Cheung et al. 2013), implying that, so long as companion applications are developed with sociality in mind, they do not inherently act as a barrier to social play.

8.5 Design Principles for Companion Applications

With player motivations and preferences in mind, much of the research performed to date on the subject of board game companion applications has focussed on how applications are perceived by players, how they impact player experience, and therefore what requirements they should be concerned with as a result. The resulting models and principles provided from previous research will be discussed here, and used to inform the development of requirements for this project's companion application. Three specific proposed models of design are to be studied: Rogerson's eight domains of digital tools, Rogerson's five principles for companion application design, and Cheung's principles for design.

Rogerson is a key researcher in the field of board gaming, and across several pieces of research has generated different models and advice for the design of companion applications. Affinity mapping was used to generate and understand the eight domains of digital tools (Appendix Section 2 - Figure 2.1). As such, the functional requirements of the companion application are to be restricted by drawing from these features as they have already been evaluated to be appropriate. In particular, the application will look to operate within the following domains: teaching, remembering, timing, randomising, housekeeping and informing (J. Rogerson et al. 2021).

Rogerson et al (2021) sought to support this research by developing five guiding principles for the design of digital tools, which can be used to guide the non-functional requirements of the companion application (Appendix Section 2 - Figure 2.2) (Rogerson et al. 2021). These principles echo the concerns shown so far in the background review, for instance, 'integration' which acknowledges the importance of social interactions with the

gameboard, and 'materiality' acknowledging user's preference for physical game pieces over digital tools.

Finally, Cheung et al's (2013) model similarly provides five design principles to follow when developing board game companion applications, however these principles offer a more practical checklist to follow, noting that implementing such principles would help to 'make accommodations for novices'(Cheung et al. 2013), therefore helping to solve the problem of helping new comers learn game rules. Cheung et al's principles consist of: dispensability, being the ability of a user to ignore a component of the software; live tweakability, meaning the ability of a user to make changes easily during gameplay; tangibility, so that a user is still able use physical game pieces such as game cards; mobility, so that a user is not restricted geographically or by the space available to them; and finally, value, being the necessity of the companion application to 'augment the game experience', adding something that would not otherwise be a benefit of the board game (Cheung et al. 2013). Cheung et al particularly noted that a potential value of a companion application could be 'introductory courses' (Cheung et al. 2013), supporting the value of this dissertation. Of particular note is the demand for tangibility of the game pieces in particular. This supports the observation that materiality and interactivity is important, especially considering the view that such elements are what make in-game actions meaningful (Salen and Zimmerman 2004).

From these three models, we can begin to see emerging patterns that should inform the design of companion applications. Flexibility was shown to be a significant factor in particular, indicated in 'dispensability', 'live tweakability' (Cheung et al. 2013), and 'tracability' (Rogerson et al. 2021). Furthermore, it was important to maintain the materiality of the game, and integrate the technology with this where possible. Finally, Rogerson's eight domains of digital tools shows that in order to act as an effective companion application system, the software should occupy a teaching role or a chores management role in order to support Cheung et al's model in ensuring value is added.

9. Project Approach Methodology

I will now outline my intended approach for solving the identified problem of complex rules and excess game components representing a barrier of entry to new players. In order to contribute research to help solve this problem, this dissertation intends to develop a prototype companion application software which can be used as a rules teaching and

housekeeping tool for new players. This companion application will be designed specifically for 'Bloodborne: The Board Game'. However, for the purposes of scoping this project appropriately, the extent of features will cover only the initial, core elements of the game, rather than attempting to integrate functionality for all unique circumstances and stories that can occur throughout the game.

In order to solve the identified problem and meet the technical objectives earlier outlined, there are to be three primary features included in the companion application:

- Integrate video game style tutorial loops to teach game rules, increasing the player's access to and ability to comprehend game rules.
- Implement an AI chat bot to answer player's rules related questions and therefore support player's understanding of game rules.
- Feature housekeeping elements to handle timekeeping and turn-keeping game chores – with these being identified as some of the most complex game mechanics (Samarasinghe et al. 2021) – with the intention of reducing potential cognitive overload that could accompany such unfamiliar game mechanics.

I have elected to focus on the video game tutorial element as the core of the companion application's value in response to the observation that tutorials represent 'an important design guideline for Hybrid Board Games […] in the context of creating positive first-time experiences' (Kosa and Spronck 2018; Rogerson et al. 2021). There is value in researching effective ways of communicating game rules as research has observed rules learning can be difficult, often to the point where players cannot negotiate the game rules according to their own interpretation because they are too confused to do so (Liberman 2011). As such, the companion application is to represent a tool of providing structured, scaffolded information, and represent another "player" in the group in the form of a chat bot who can take part in such rules negotiations – but with the depth of knowledge that new players may not possess. I argue that by choosing such rules teaching features as a focus for the project, rather than features such as the housekeeping element, I propose to add more value to my project in the field of research than if I were to focus on a more generalised approach that would only work to further support the research completed to date, rather than contribute something new.

The prototype will be based on design and functional recommendations provided by the models presented in the literature review, including Rogerson's eight domains of digital tools, Rogerson's five principles for companion application design, and Cheung's principles for design, along with the advice and principles gathered regarding teaching approaches and methodologies. With the research identified in the literature review as a basis, the process of developing the software's requirements is to be discussed in detail in the Requirements chapter.

I have elected to base the requirements off of existing research rather than complete a requirements survey because of the extent of research that has been completed to date regarding what users do and do not want from companion applications, and the features that should be integrated as a result. The work of Rogerson et al (2021), J. Rogerson et al (2021), Kosa and Spronck (2018), Cheung et al (2013), and Ip and Cooperstock (2011) are just a few key examples of work that has been done to advise on the core requirements of a digital tool that accompanies a board game. Therefore, I have concluded that a requirements survey would have a comparatively smaller contribution to the field of research than if I were to apply these given theories and evaluate their effectiveness within the context of rules teaching in a board game companion application.

Following the development of requirements, a prototype will be built containing three primary technical elements: a backend API built using Python and Django to store and supply game related content such as rules or game features; a frontend React app, built with the intention of being viewed on mobile, to act as the companion application itself; and finally, integration with the Microsoft Azure cloud platform to enable use of their Language Studio and to act as a deployment hosting platform for both the frontend and backend. GitHub actions will be used to enable continuous integration and continuous deployment onto the platform. Due to the complexities of game rules and the importance of language used within the original instruction manual, the games rules copy displayed throughout the application will be drawn directly from the existing physical instruction manual. All credit for copy content included in the instruction guides and chat bot are therefore given to Eric M. Lang and Michael Shinall (2020).

Once a proof of concept prototype has been developed, this software will be assessed through a series of usability evaluations. These sessions will provide qualitative data to analyse which will communicate how successful the application was in introducing new

players to ‘Bloodborne: The Board Game’ and how effectively they were able to understand and learn the rules from the companion application. I have elected to complete usability evaluations as they have been observed to uncover issues specifically related to playability and usability in game settings, with the detail making it more likely to uncover problems ‘as they occur’ (Desurvire and Wiberg 2008). Alternative methods that could supply similar detail, such as heuristic evaluations, would be unsuitable in this context as the study is, by its nature, demanding the evaluation of amateurs and not experts, since users will all need to be new to ‘Bloodborne: The Board Game’. While research admits that usability evaluations do not necessarily have the ‘statistical validity of surveys’, the depth of data enables the researcher to gather a deeper understanding of a ‘participant’s motivations and experiences […] specific to the situation being studied’ (Rogerson and Gibbs 2018), therefore still supporting the validity of conclusions.

The qualitative data supplied by the usability study is then to be analysed using thematic coding under the guidance of Graham R Gibb’s ‘Analysing Qualitative Data’ (Gibbs 2018), using a hybrid approach of both concept-driven and data-driven encoding. I have elected to use this hybrid approach rather than just inductive or deductive coding to ensure the maximum amount of value is gained from the data. Inductive coding runs the risk of projecting the researcher’s aims and priorities onto the data, potentially missing any new revelations that may appear from unexpected common themes. However, utilising just deductive coding may risk the conclusions not being streamlined to answer the particular research question. The hybrid approach is to ensure that the data is analysed in a structured way that still enables unexpected conclusions to emerge.

The resulting themes will represent an evaluation of the effectiveness of the companion application according to rules teaching, along with an evaluation of the appropriateness of companion application design models proposed by previous research literature. Such evaluation will inform conclusions by establishing the success of the project in respect to the research objectives, and whether the project aim has been met. The project intends to deliver as a result of this conclusion a further model advising how companion applications should be designed, but with a particular focus on rules teaching features.

10. Application of Chosen Approach

In order to apply the approach outlined above, several steps were taken to ensure the software was developed according to researched and justified specifications, and that the usability evaluations were adequately planned to produce valid results.

Before starting the outlining of requirements, personas were developed based on understandings drawn from the review of existing literature, thus ensuring final requirements were targeted appropriately. Such personas could therefore also be used to generate appropriate screening criteria to be used when finding participants for the usability evaluation. The creation of these personas will be expanded upon in the Requirements chapter.

Following the development of the personas, software requirements have been developed based on the analysis of existing literature, with the needs of the persona user in mind. All requirements have been assigned satisfaction criteria to ensure the project is appropriately scoped and achievable.

All requirements were then broken down into individual issues and uploaded onto a JIRA board. The development of the software was then completed in four week-long sprints, with the issues distributed accordingly. The usability evaluation was designed before the start of software development so as to allow the project to progress at the same time as participants were recruited.

Guidance from the Nielsen Norman Group was used to design the usability evaluation research study to ensure the final approach would be robust (nngroup. 2016).

The personas developed in the requirements section were used to create participant screening criteria (Appendix Section 3 – Table 3.1). Potential participants were then asked to complete a screening survey which was evaluated against the screening criteria (Appendix Section 3 – Figure 3.2), with participation confirmed if appropriate. Finally, the two data gathering activities were created. The activities that participants were to complete during the usability evaluation were outlined (Appendix Section 3 – Table 3.3), and a feedback survey was put together to gain first hand qualitative feedback from users (Appendix Section 3 – Figure 3.4).

In order to aid the research facilitator during evaluations, note taking guidance was generated to provide success and failure behaviour criteria for each activity a user may

attempt during the session (Appendix Section 3 – Table 3.5). This ensured a single baseline comparison that could be used to ensure the note taking was consistent across sessions.

Once the prototype software had been constructed according to meeting all the required functional satisfaction criteria, a pilot study was completed. This ensured both the software and usability evaluation tools were adequate to produce valid results. However, as this study was a pilot, the results were not taken in to account during the final discussion and analysis.

Each usability evaluation consisted of a participant using the companion application to learn how to set up and play a solo game of 'Bloodborne: The Board Game' in person. Participants had no other individuals to interact with as part of the study, and instead were required to use only the tools provided by the companion application. Four individuals participated, each in a separate usability evaluation. The results were gathered and compared according to the hybrid thematic coding qualitative data analysis method.

The inductive themes chosen for the original thematic analysis were materiality, sociality, ease of play, ease of application use, and rules confusion. Remaining themes were to be deducted from the qualitative results using a data driven approach. From this analysis, the results were concluded, and the success of the project considered in the Analysis and Discussion chapter.

11. Requirements

11.1 Creation of User Personas

In the case of the companion application for 'Bloodborne: The Board Game', as the background section mentioned, this project is assuming that many of the new players will be motivated to pick up the game as they are a fan of the original video game. Therefore, the requirements must consider the personalities and preferences of video gamers along with causal and hobby board gamers. Taspinar at al (2016) and Ferro et al (2013) have both put forward research which builds on the idea of how player personalities can influence needs and features within gaming. These models can be applied to understand what elements of the game experience need to be maintained and nurtured within 'Bloodborne: The Board Game' to ensure a positive experience that would make new players want to come back. Such motivations can provide guidance on what elements of video game design could be applied to

the companion application to make the initial experience for new players one that seems more familiar. These theories are to be analysed in this chapter, and the results of this analysis will be used to create an appropriate user persona. Such a persona will be used as guidance through the production of the software, as well as for the screening of participants in the usability study.

Ferro et al (2013) linked game mechanics and personality types, suggesting that particular mechanics drew particular types of individuals as fans. Of the model, 'Bloodborne: The Board Game' most appropriately matches the 'inquisitive' classification because of its quest-based, narrative premise with strong world building elements. Ferro et al go on to therefore apply certain personality types to inquisitive games, based on the theories of Bartle (2003) and Fullerton (2008). These types include the Explorer and Seeker, who present characteristics of gaining pleasure from finding and learning new knowledge through sustained interest and curiosity, and the Daredevil and Survivor, who gain satisfaction from the sense of risk involved in gaming. Traits displayed by these player types which must be kept in mind when developing personas and requirements include high elements of independence, openmindness, and openness to experience, along with low traces of introversion and social assertiveness (Ferro et al 2013). Therefore, the designed companion application must attempt to maintain user's independence and show awareness of their potential introversion – even in a usually social setting of board gaming – whilst capitalising on their openness to experience.

While Ferro et al (2013)'s research gives us an initial awareness of personality traits displayed by expected players, in order to develop well informed personas it must be noted what overall motivations are for play in individuals. Yee (2006) developed a well-regarded model for player motivations in video games, outlining five motivations: relationship, manipulation, immersion, escapism and achievement. While these were initially developed with the view of applying to MMO (Massive Multiplayer Online) video games, Lui et al (2021) has since evaluated and confirmed the appropriateness of applying this given model to the tabletop context. Lui et al (2021) identified that board game players presented three primary motivations from Yee's original model, with these being Immersion, Social, and Achievement. Overall, Immersion and Social motivations were higher within tabletop settings, with Achievement being less so than when compared to the digital context counterpart. From this we can establish that potential players will be seeking a feeling of immersion and opportunity for socialisation, along with some sense of achievement from

‘Bloodborne: The Board Game’. As such, any companion application cannot detract from any of these features, and instead must seek to support and encourage them.

Through combining the findings from these two elements, we can establish that potential players of ‘Bloodborne: The Board Game’ will be social individuals, but from Ferros’ model less so than the usual board game player as there are elements of independence and social assertiveness. Furthermore, we can see that primary motivation for play will be immersion and story, as these will carry over from the elements of the original video game that they enjoy. The result of this comparison means a persona can be constructed based on the knowledge of the types of video games the individual already enjoys, and the resulting

Alex

Player Type: Explorer, Survivor, Daredevil (Ferro et al. 2013)
Age: 25
Bio: Recent graduate working as a buyer in retail, avid gamer in free time

> "It came as a shock to suddenly have so much disposable income after graduating. I love Bloodborne the video game, so it seemed like the perfect idea to treat myself to the board game."

Experience Level:

A fan of ‘Bloodborne’ the video game, having finished it multiple times, however the extent of board gaming experience is limited to mass market titles such as Monopoly.

Motivations for Gameplay:

Video game enthusiast, deciding the play ‘Bloodborne: The Board Game’ due to being a fan of the digital version of the game. As such, motivations prioritise immersion, social elements and achievement (Liu et al. 2021; Yee 2006).

Context of Interaction with Product:

Downloaded in order to help learn the game rules and reduce the complexity of the initial introduction to the game. Intends to use software primarily on mobile phone.

Goals and Concerns:

- Easy to use interface
- Clarity of games rules
- Help with playing through game rounds

Figure 1 - Companion Application Target User Persona

understanding of how this can impact and be carried over into the board game sphere. Accordingly, the persona shown in Figure 1 was created.

11.2 Research Models for Companion Application Design

The core functional requirements are to be based on previous research in the field, most notably the models proposed by J. Rogerson et al (2021), Rogerson et al (2021) and Cheung et al (2013).

The five guiding principles for the design of board game digital tools consist of traceability, completeness, integration, privacy, and materiality (Appendix Section 1 - Figure 1.2)(Rogerson et al. 2021). Such principles have been applied to or considered for the software requirements in the following ways:

- Traceability through not obscuring any of the game rules. This will be essential in the companion application which is seeking to teach the game rules. In order to ensure this principle is implemented, it will be a functional requirement that all game elements are given informative labels in the user interface.
- Completeness by including 'all necessary components'. As this research's proposed companion application is a prototype, the application will not have available all elements of the game, for instance the prototype will only make available one story campaign. However, this principle should be followed for any companion applications that sought publication.
- Integration by having the companion application be only one element of the board, therefore supporting the view that interaction with the digital component should be limited where possible (Mandryk et al. 2002). A non-functional requirement of the companion application will therefore be that it consistently encourages the user to interact with the physical board, rather than prioritising the companion application itself.
- Materiality wherein designers of companion applications and board games generally should expect low usage of the digital tool. By targeting the companion application for 'Bloodborne: The Board Game' to a specific use case – that being, the learning of the game rules – we intend to overcome the barrier of user's pre-conceptions being negative, therefore encouraging a higher usage rate.

Meanwhile, Cheung et al's (2013) principles contain an alternative set of principles to follow. In particular, this research intends to build requirements for the software that comply with the below:

- Dispensability: Functionality to include capacity for users to disable or enable certain features, for example, to only use certain tutorials or to only use the automation features.
- Tangibility: The tutorials will be built to be interaction-based, encouraging users to constantly focus on the game board and the material pieces.
- Mobility: Application to be responsive to computer and mobile devices to support mobility.

11.3 Final Software Requirements

From the background research and analysis that has been performed so far, we now have a collection of elements to inform the development of requirements for the companion application software.

Firstly, the developed persona informs us that the priority will be on achievement, sociality and immersion. User interface and design should therefore seek to maintain immersion, and help to give players a sense of achievement, while still helping to teach game rules to a detailed level. However, as this persona is for an individual who is considered an Explorer, the companion application should still leave the ability for the player to investigate and experiment with the rules and game strategy if desired. This supports the need for flexibility as defined in the design models studied.

Secondly, through study of the models so far put forward for the design of digital tools for board games, this research has a pre-existing understanding of features to include and which to avoid, in response to the focus on sociality and materiality which hobbyist value. As such, the requirements will seek to comply with Rogerson et al's (2021) five principles for the design of digital tools and Cheung et al's (2013) five design principles for companion applications. Finally, the functional features are to fit into one of the identified domain of digital tools, namely teaching, remembering, timing, randomising, housekeeping and informing (J. Rogerson et al. 2021) (Appendix Section 1 - Figure 1.1).

Finally, by considering the companion application development from the perspective of an e-learning tool, it is possible to define the teaching mechanisms which can be used

within the functionality to effectively teach game rules. In particular, this project's literature review has identified specific content and activities which will be used to inform the content and execution of the teaching functionality. This content guidance includes awareness of the need for scaffolded information, presented in an external UI window, which utilises a combination of visualisation tools, knowledge repositories, contextualised instruction, and modelling. Furthermore, the application is to feature teaching elements used within video games, such as tutorials, personal advisors and documentation, in order to support the user's rules learning experience as a new player.

As a result of this analysis, the requirements presented in Table 1 have been clarified for the companion application, each marked with how they comply with the domains of digital tools:

	Function	**Satisfaction Criteria**	**Model Basis**
1	Set up a single campaign automatically on input of number of players	After form submission, player is taken to dashboard displaying three chapter-relevant and randomised creatures.	Housekeeping (Ra)
2	'Game Set Up' instruction guide for non-automated game set up	Guide contains all information from the Setup section of the board game instruction manual	Teaching (Ra) Integration (Rb) Tangibility (C)
3	'Start Game' instruction guide	Guide contains all information from the 'Advancing Through the Hunt' section of the instruction manual	Teaching (Ra)
4	'Game Round' instruction guide	Guide contains all information from the 'Playing the Game' section of the instruction manual	Teaching (Ra)
5	'Combat' instruction guide	Guide contains all information from the	Teaching (Ra)

		'Combat' section of the instruction manual	
6	Game Feature Pop-Up Instructions	Labels and descriptions for all elements in the companion application, explaining their links with the game rules.	Teaching (Ra)
7	Track player statistics, including HP, Blood Echoes and Firearm	Player Dashboard tab integrated with application, containing adjustable attribute trackers. State for trackers should be saved even when player leaves and returns to the tab.	Remembering (Ra)
8	Remove individual application features from play	Players are able to host only the player tabs required, and have the capacity to hide creature information.	Dispensability (C) Live Tweakability (C)
9	Ability to track and manage player turns	Player Dashboard hosting capacity to toggle if a player has taken their turn.	Remembering (Ra) Housekeeping (Ra)
10	Track in-game "Hunt Track" timer	Game Hunt Track is displayed on all tabs of the companion application. When all player's 'Turn' attributes have been taken in a round, Hunt Tracker to progress automatically.	Remembering (Ra) Housekeeping (Ra) Timing (Ra)
11	Answer rules related questions	Azure hosted question and answer chat bot is embedded within application. When given a keyword, chat bot returns game information about keyword.	Informing (Ra) Teaching (Ra) Value (C)

	(Ra) - (J. Rogerson et al. 2021) (Rb) - (Rogerson et al. 2021) (C) - (Cheung et al. 2013)

Table 1 - Final Software Requirements for Companion Application

12. Software Design

12.1 Frontend Design

In order to ensure that the user interface of the companion application was designed appropriately for usability and user satisfaction, the elements of the webpage were designed with classic convention in mind and guidance from ISO 9241-110:2020, Ergonomics of human system interaction.

ISO 9241-110 outlines the interaction principles that software should follow to design interactive systems. These principles include 'self-descriptiveness', 'conformity with user expectations' and 'controllability', among others (British Standards Institution. 2020). In order to comply with the need for 'self-descriptiveness', primarily the need to ensure information is obvious to the user, all elements of the companion application will be clearly labelled, for instance each individual box on the player attributes screen will be labelled to match words and phrasing that would appear in the instruction manual. Furthermore, consistency in the design will be maintained to comply with user expectations by utilising React's single page web app functionality. As part of this feature, the page border (navigation bar and game timer) will be consistent across all screens, and only the main body of the application will change between pages. Finally, the controllability for the user will be supported through the same functionality as demanded in requirements, where the user must have dispensability and live tweakability of features. Therefore, elements of the application will have the capacity to hide, while different features will be separate from one another so that users can ignore certain features – such as the instruction guides – but still have the option to freely return to them or the housekeeping elements at any time.

In order to ensure that the user interface itself is intuitive for the user, popular layout conventions have also been followed. A top bar style of navigation is considered the most popular conventional format (Kalbag 2017), and so the header navigation was designed with this in mind. Such navigation style enables to user to quickly switch between the Chat Bot, Dashboard, and Player Attribute screens, as well as access the instructions sub-navigation.

However, when designing the navigation it was important to be mindful of the guidance from the background reading on video game tutorials and design principles for companion applications. The advice given was that tutorial UI should be separate from the core software (Poretski and Tang 2022) – in this instance, that core being the housekeeping elements which control the game itself – and that users should have the flexibility for 'dispensability' (Cheung et al. 2013). I have elected to think of the housekeeping elements as the core functionality in the design context because this is the element that will be carried through the whole game and offers potential for re-use even amongst experienced players, whereas the tutorial will theoretically only be needed for the first couple of rounds of the game. With the advised design principles in mind, I elected to separate the details and navigation for the instructions into a separate sub-navigation. However, in order to still support existing conventions, I elected to separate the instruction navigation into a 'hamburger menu' – a visual icon for navigation that was popularised by Facebook and has since become a convention through popular usage (Figma. [no date]). By separating the two core features of the companion application into two groups – features for learning and features for playing – users are given the clear option to 'dispense' with the feature that they do not wish to use.

Design choices have also been made to support the immersion within the game, showing awareness of the persona's desire to be 'immersed' within the story. A consistent colour scheme was used that matched the colours used on the original game pieces within the board game. Similarly, icons for speed and damage were replicated from the board game versions, and specific images used for the hunt track timer and creature dashboard to match their game board counterparts (Figures 2 and 3). This icon and image use supports not only immersion, but ensures consistency so that, were a user to utilise the printed instructions rather than the companion application's instruction loop, the symbols and their meaning would still be cohesive between application and board game.

Figure 2 - Companion Application Speed and Damage Icons

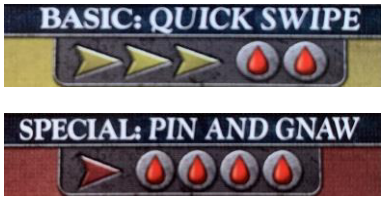

Figure 3- Board Game Material Card Speed and Damage Icons

12.2 Backend Design

'Bloodborne: The Board Game' is a story based game which has several different possible campaigns to play, with each campaign consisting of three chapters – each chapter is one "game" of the board game. In order to ensure this dissertation project was of reasonable scope, the content is restricted only to the first chapter of one campaign, thereby ensuring a reasonable project work load and consistency across usability evaluations, since all players would be playing the same version of the game. However, the software has been designed to show awareness of scalability, should future chapters and campaigns desire to be added to the application.

In light of this desire for scalability, rather than being hard coded, game data such as creature data and instruction rules are dynamically called into the companion application frontend from a Django based API backend. The core task of creating this backend API consisted of designing a database schema that reflected the scale of the game rules and features, and would enable the flexibility of information calling that the automated housekeeping elements of the companion application would require (Figure 4).

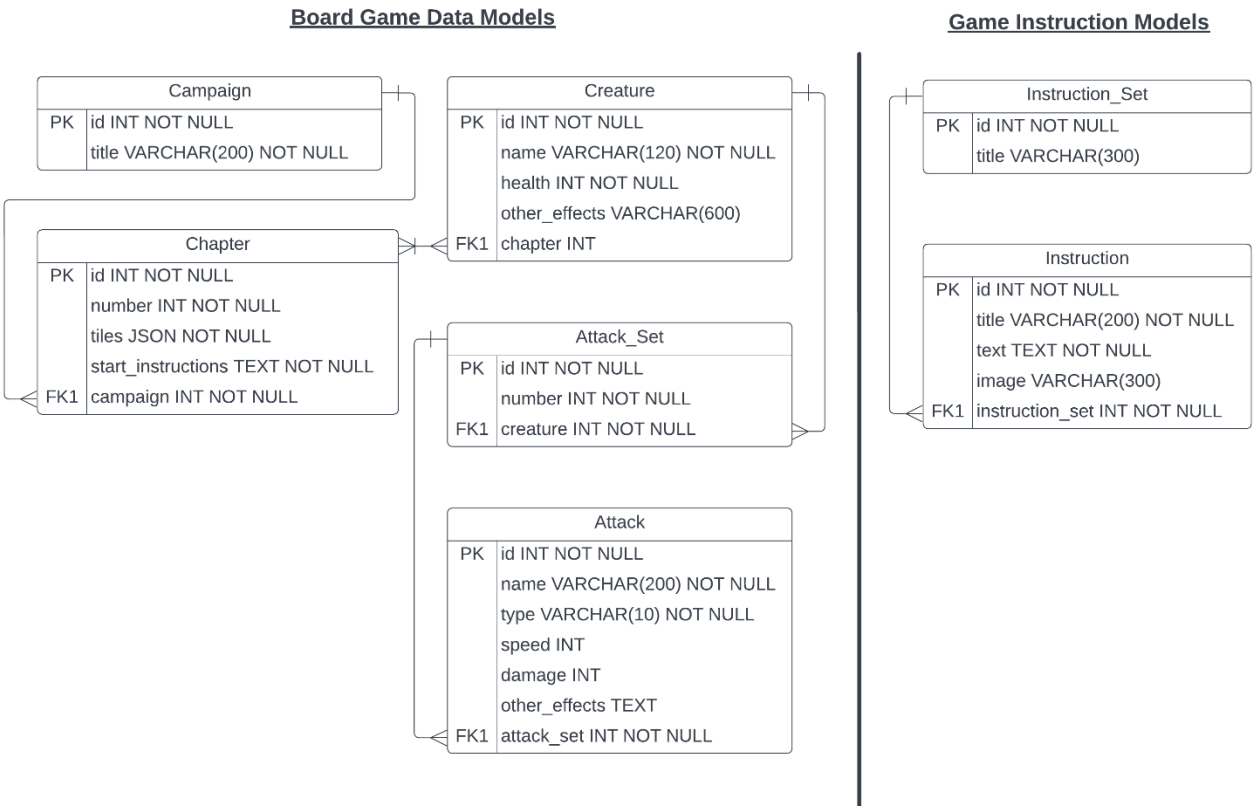

Figure 4 - Entity Relationship Diagram for Companion Application Backend API

The majority of API call functions were generated as list or detail views for each database model, enabling the companion application to access whatever elements were needed for the given call. However, the automatic game set-up housekeeping functionality required a slightly more complex programming logic, as this required the randomisation of creature options and creature actions. Each game chapter provides a list of possible creatures, and two options for their 'attack sets'. When the player would manually set up the game, they would be required to randomly select from these pools. Instead, to contribute to the automation of the system, a unique API call was developed which enabled the calling of random results, so that the logic could be stored in the backend rather than completed at the frontend, and only the results supplied to the frontend.

13. Implementation

The backend database was constructed first so that as the frontend companion application developed it was able to draw in the required data from first implementation. Following the creation of the database and the API, the housekeeping functionality was implemented for the companion application, and the instructions then built to overlay this. Finally, the application was deployed onto Microsoft Azure cloud platform to enable the integration of the Web App Bot which would act as the chat bot for rules questions. Once deployed, the companion application contained the following features:

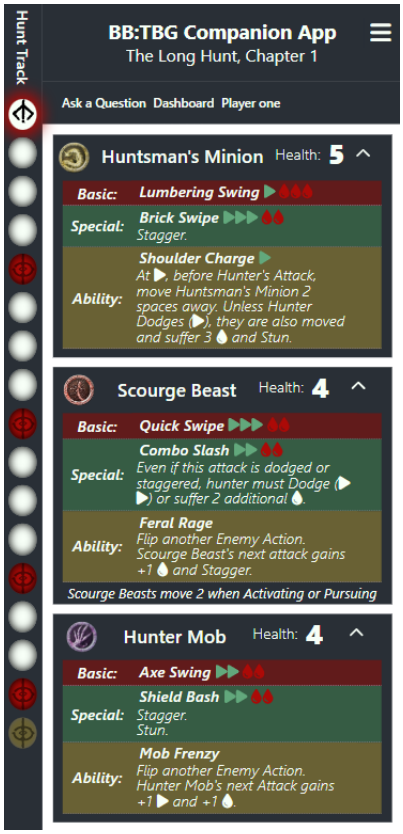

Figure 5 - Application Dashboard

13.1 Companion Application Dashboard Page

Figure 5 presents the Dashboard of the companion application which fulfils requirement one (Table 1). The primary content of this page is the three "Creature Cards" which have replaced the physical cards players would usually be responsible for randomising and setting up using the material game pieces supplied with the game.

This feature intends to contribute to completing this project's technical aim of reducing game complexity through automation. The housekeeping element of this function contributes to reducing the 'tediousness' of set up (Kosa and Spronck 2018).

13.2 Player Dashboard

Figure 6 displays the Player Dashboard screen, showing trackers for player attributes and the ability to manage the individual player's turn. These features fulfil requirements seven and nine (Table 1).

The companion application is built as a single page React app, which enables state to be saved between views of the website. This supports the need for flexibility, with users able to freely navigate around the application during a game without being fixed to the tracking screen.

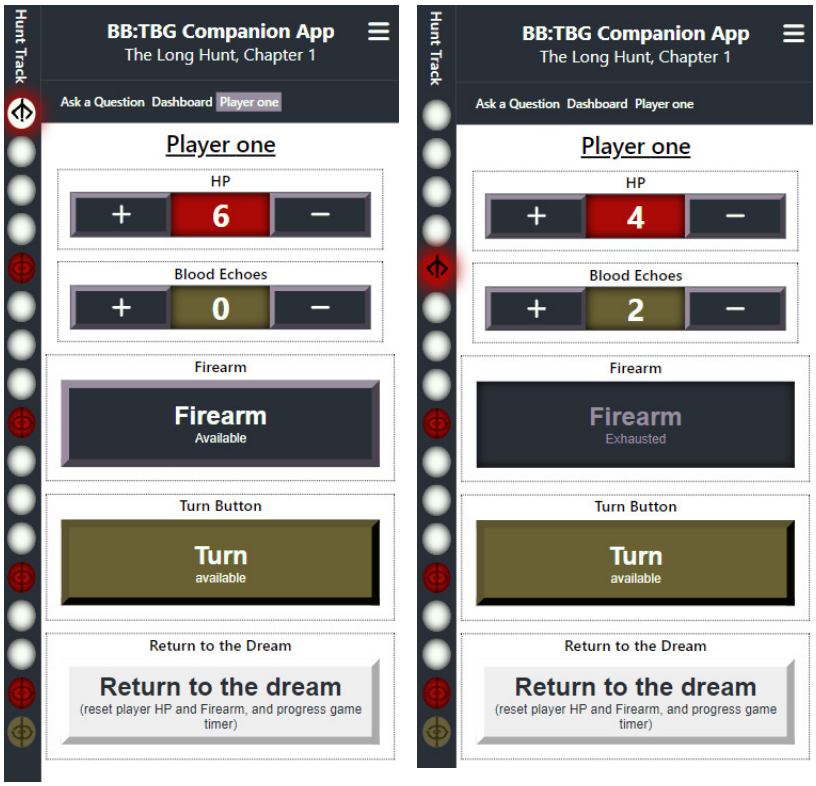

Figure 6 - Player Dashboard screen unedited (left), and with the timer progressed, Firearm toggled, and HP and Blood Echoes adjusted (right).

The design of this screen utilises popular convention to ensure the intuitiveness and learnability of the software for users, therefore supporting the aim of reducing complexity of the play experience as a whole. For instance, the use of a three dimensional button design calls on conventions that 'trigger behaviours' without having to specifically verbalise the mechanics to users (Kalbag 2017).

The ability to control the game turns also automatically updates the state of the game timer on the left hand side of the screen, fulfilling requirement ten (Table 1). Once all players have completed their turn, the 'Hunt Track' feature which borders all pages of the application will automatically progress, further fulfilling the housekeeping role of the companion application, and reducing the responsibility on the player.

13.3 Instruction Guides

Figure 7 presents a selection of initial pages of the companion application's tutorial guides, fulfilling software functional requirements two, three, four and five (Table 1). As per

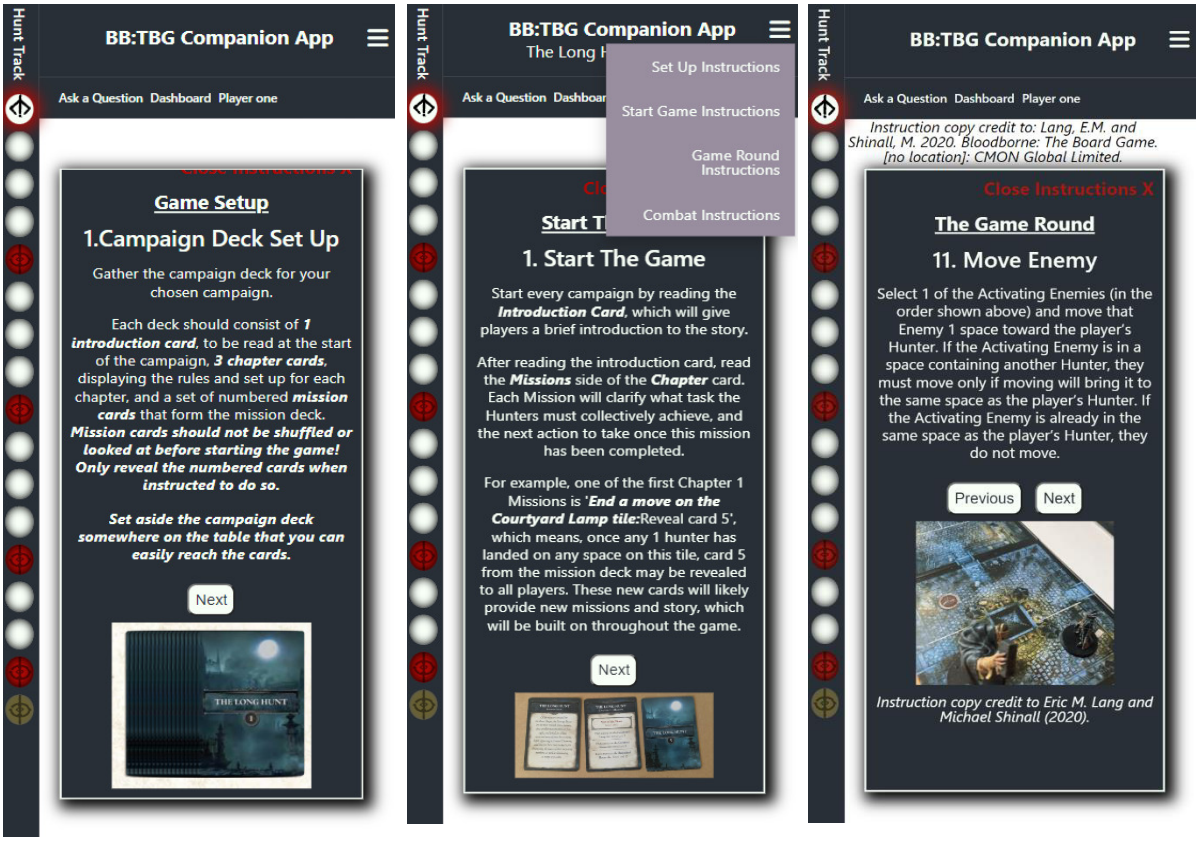

Figure 7- Companion Application Instruction guide screens. Game Set Up instructions (left), Start Game instructions featuring instructions navigation bar (centre), Game Round instructions (right).

guidance from background literature regarding video game tutorials, the guides operate on a separate user interface that overlays the application, utilising a three dimensional design to separate the feature from the background. Furthermore, the feature consists of four segmented guides – 'Set Up Instructions', 'Start Game Instructions', 'Game Round Instructions', and 'Combat Instructions' – the navigation to which is also kept separate and accessed by the navigation controls in the top right. By keeping the tutorial features separate from the navigation bar of the housekeeping elements – which contains the 'Ask a Question', 'Dashboard' and 'Player One' tabs – the design supports the dispensability of features, as experienced players could freely avoid tutorial features if desired.

The guides themselves follow an ordered loop in order to ensure the contained information is appropriately scaffolded. Such implementation supports the activities suggested in the principles for e-learning tools, in particular the act of 'sequencing processes into instructional lessons' (Aparicio et al. 2016). The intention is that the user would follow through the guides step-by-step, completing actions on the game board as they are instructed to do so by the companion application, thereby supporting the need for integration with the

original board game and encouraging users to experience the materiality of the game (Rogerson et al. 2021).

Central to the content of instruction guides is the use of images, with gifs being included on slides where a dynamic action is required. Such a feature supports the recommendation of utilising visualisation tools in e-learning teaching materials and within video game tutorials (Aparicio et al. 2016; Johnson 2022).

13.4 Instruction Pop-Ups

In order to fulfil the 'Game Feature Pop-Up Instructions' requirement (Table 1 - requirement 6), I elected to implement on-click or on-hover hint guides for the elements on the companion application (Figure 8). These guides are available for features including:

- The Hunt Track Timer on the left
- The overall Creature Card elements, of which there are three on the Dashboard screen
- The individual elements of the Creature Cards, such as speed and Damage

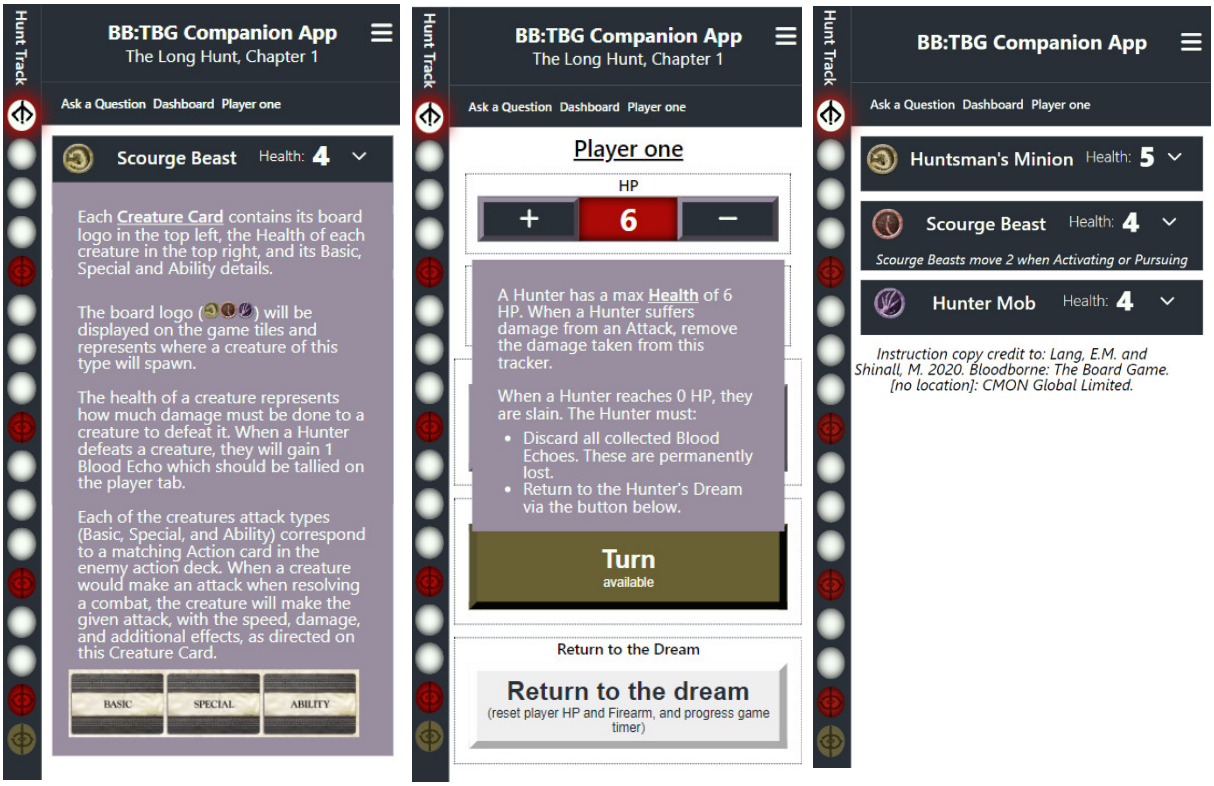

Figure 8- Application flexible features and instruction pop-ups. Creature Card instruction pop-up (left), HP pop-up (centre), hidden Creature Cards (right).

- The individual elements of the Player Dashboard screen, such as HP, Firearm button, and Return to the Dream button

These elements are to support not just the user's understanding of 'Bloodborne: The Board Game', but also the interface of the companion application itself. The feature utilises a distinctive yet flexible method of presenting and cueing information, exercising its role as a digital teaching tool (Aparicio et al. 2016), yet the presence of the feature ensures the traceability of the system, since users are provided 'all required information' via their presence (Rogerson et al. 2021). Furthermore, their mobile-based on-click flexibility supports the dispensability of elements in the application, similar to the ability to hide creature cards as also shown in Figure 8, thereby fulfilling the needs of functional requirement eight (Table 1).

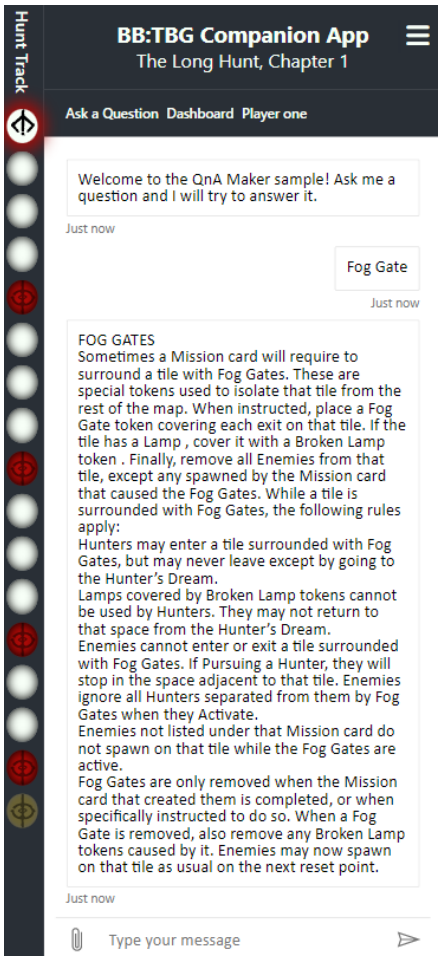

Figure 9- Question and Answer Chat Bot

13.5 Chat Bot

Finally, the rules index chat bot feature was implemented through the Language Studio tools of the Microsoft Azure cloud technologies platform (Table 1 – Requirement 11), and is shown in Figure 9. The Azure services were used to generate a question and answer bot which was then embedded within the final website through the Direct Line channel. This feature intends to fulfil the e-learning content advisement of 'search engines' (Aparicio et al. 2016). However, through implementing this feature as a chat bot rather than a simple rules reference, this research intends to explore how users may think of the companion application as a 'helper' rather than a tool, observing if such an element would help to provide the social negotiation of board gaming rules (Liberman 2011), even when playing a solo version of the game.

The Azure framework provides the options of short or long answers, and as such the long answer option was selected in an effort to ensure the consistency with which the system provides traceability – that is, the consistency with which players are provided 'all required information' (Rogerson et al. 2021).

Following the implementation of all features, the four usability evaluations were performed.

14. Results

Table 2 outlines the themes and results that emerged from the thematic decoding of gathered qualitative data. Players exhibited generally positive feelings towards the companion app, considering it a 'valuable assistant' and 'superb proof of concept'(P2). A trend emerged through behaviours and feedback that learning game rules was 'embarrassing' and awkward, though the companion app helped to relieve this by taking away the feeling of being watched, giving players the confidence to continue. P4 expressed that they did not like to play complicated games because they felt like they could not keep asking other players questions. The chat bot feature of the companion application helped to avoid this issue, as P4 still had somewhere to ask their questions, without negatively impacting any other players.

All four players were able to complete the set up and play 'Bloodborne: The Board Game' having learned the required rules from the companion application. Such a result implies there is some merit to the use of a companion application as a board game rules teaching tool. While one player who had more experience with hobby board games thought the game 'easy enough to get hold of'(P1), another who was new to the hobby board gaming genre experienced more difficulty (P4).

Theme, Description	**Successes, Data Example**	**Challenges, Data Example**
Rules Comprehension	Successful understanding. Although some experienced difficulty, all players were able to demonstrate successful understanding of the rules. *"The game had some* kinks but seemed easy enough to *get a hold of."*	Forgetfulness. Fixed step-by-step approach overwhelmed users with too much information at once. Users forgot rules and game elements with lack of access to reminders. User requests included: *"adding a reminder to activate enemies." Users were observed* to forget game elements, particularly the red timer reset points. Combat. The game round seemed to present most confusion. *"I struggled to understand* the strategy needed to play – *especially how to do combat."*

Ability to Remember	Chat bot. Players generalised applications of chat bots to other games, appreciating its usefulness and effectiveness as quick rules reference. *"Great QnA bot for individual skills and terms."*	Reminders. Players consistently requested built in reminders as improvements to application. *Felt a bit lost […] would* have liked more prompts / updates.
Emotional Response	Confidence. Application took away pressure of responsibility from players. Step-by-step instruction *format "gives you […] confidence to just keep playing."*	Embarrassment. Users exhibited timid behaviour, although confessed companion helped to relieve this pressure. *"It's humiliating to be* learning board game r*ules"*
Ease of Application Use	Completable. All users were able to use the application to complete a game round. *P4 "liked how the tutorial* had been put together – very step-by-*step."*	Choice. Intention to implement flexibility and dispensability left users unsure how to proceed. *"Have fewer freedoms. Tell me more about what I must do."*
Intuitiveness		Navigation. Confusion presented over two navigation bars and fixed ordered loop of instructions guides. *"The app exper*ience could *be more streamlined."*
Flexibility	Chat bot as reference. Players used chat bot as quick rules reference with flexibility of asking any questions. Chat bot fulfilled the purpose of quick reference index of all terms.	Wasted Turns. Indication that users wanted to learn by playing, but would have preferred to do so in a practice round. "[liked] fixed instruction loops [least] - would like the tutorials to be more flexible, or not linked in to your actual game." Chance. The possibility that given instructions may not apply to the player's actual scenario left users without guidance. Learning approach should be a specific and well-defined scenario.
Learning Approach	Fixed Guidance. Users expressed appreciation for the step-by-step style teaching technique, although it requires refinement. *"I liked the step*-by-step approach, which helped when there were a lot *of rules."*	Misuse. 50% users not following the tutorial using intended step-by-step approach. Rather than follow instructions step-by-step, user was inclined to read all *instructions first…*

		Feeling that user did not *like going in 'blind'.*
Materiality	Repurposing. Repurposing of materials provided in the board game for a more streamlined approach.	Excessive unneeded materials. *"I am now trying to work out when I'm repurposing stuff."* Anti-Technology. *"A lot of my life is within a* digital space so board games are *an escape from 'screens'."*
Humanisation	Confidence. Players thought of chat bot as 'helper' who offered support. *"It gave me security, it was like having you next to me."*	Colloquialism. Attempted use of colloquial interactions with chat bot indicated humanised perception of tool. Challenge because tool was restricted to keywords. *"It was also nice to have* the chat bot there for when I did *have questions."*
Imagery	Effective imagery. Images, and particularly gifs, that were used offered immediate guidance and provided users with confidence. "Initial set-up was also confusing but greatly aided by the app, especially diagrams and gifs"	Text-heavy. Too much text provided, and not enough imagery. *"So m*any terms have been *thrown at me, and I don't know what to associate."*
Trust		Untrustworthiness. Demonstrated lack of faith in companion application. Player checked physical rules manual when disagreed with digital version.

Table 2 - Usability study results found through thematic decoding

14.1 Overall Application Experience

Players experienced frustration and confusion throughout use of the application, due to a confusing language, lack of an intuitive navigation, and inflexible instruction guides. Participants P2 and P4 found themselves at points wondering what they were supposed to do next in the app or in the game, therefore showing that the layout and content was not self-explanatory.

14.2 Instruction Guides

Among the four participants in the usability study, 100% followed the step-by-step method for the 'Set Up' guide as intended, but only 50% of users did the same for 'Game Round' and 'Combat' guides. P1 and P3 attempted to read through all slides of the

instructions before playing, only starting the game once they were satisfied they had read through all instruction content. As a result, P1 observed in their feedback that it 'feels like the [instruction] book could have done the same job'.

However, players who followed the step-by-step method observed feelings that they were 'wasting' their opening turns as they did not know what they were doing and would rather have a 'video game style' opening tutorial (P2). This sentiment was echoed in other players who expressed that they did not like learning and playing, although P4 appreciated that the format encouraged them to get 'hands on' with the game, rather than just reading the instruction book. As such, while the general feedback from the players expressed that the instruction guide format for rules teaching was an effective teaching approach, the execution needs some refinement in order to be applied to further companion applications.

The 'Set Up' instruction guide was consistently successful, however 'Game Round' and 'Combat' guides presented more difficulty. Players kept returning to the 'Game Round' and 'Combat' instructions throughout their play experience, having forgotten some of the rules and needing a reminder. The lack of flexibility included in the ordered instruction guides caused frustration for players at these points, who may have only wanted a reminder of one small element of the rules, but were forced to navigate their way through all related rules. P1 observed of the 'Combat' guide that this feature 'made the rules more complicated than they needed to be'.

There were further barriers presented consistently throughout all instruction guides, including an excess of terms that players would often forget, leading to confusion when terms were later used again. The copy included in the instructions guide led to confusion amongst all players, particularly when players would confuse the meaning behind keywords or make incorrect assumptions regarding game rules. In some instances, the confusion was due to phrasing used in the original printed instruction guide. As such, the proposed companion application could be improved by not relying so strictly on the language, content and structure of the original material.

In contrast to the feedback given regarding language, all players expressed that they liked the use of images. The inclusion of gifs was noted by all players as an exciting element, one that particularly utilised the advantages of the companion application medium over that of a printed instruction manual, where only flat images could be used.

14.3 Housekeeping

The companion application's housekeeping features included turn tracking, player attribute tracking, creature randomising, and game timer tracking. While the session was completed as a solo game, both P1 and P3 mentioned that they appreciated the idea of the turn tracker and could see it being useful in a multiplayer game. However, the automation of the turn tracker contributed to the player's forgetting of some game rules, as they failed to notice that a 'Reset Point' had been reached on the game's timer. P4 consistently failed to notice the 'Reset Points' on the game timer, forgetting about the existence of the rule. Meanwhile, both P1 and P3 did not always notice a 'Reset Point' had been reached, and would therefore perform the game mechanic a several turns later when they realised their mistake.

All players expressed a desire to have reminders built in to the companion application when different events in the game were to occur – such as 'Reset Points' – or to remind them of the order of events, for instance triggering a 'Creature Activation' pop-up after each turn. Such features would have also offered support in the scenarios when players forgot certain game rules.

14.4 Chat Bot

All four players mentioned the chat bot as one of their favourite features of the companion application, particularly noting that it offered aid when searching for information about the game's keywords, abilities, skills and specific terms. There was a lot of feedback that the companion application would have benefited from a rules quick reference or index, but that the chat bot could often fulfil this role – when the user knew what to search for to gain an answer.

Initially, all players attempted to use colloquial language with the chat bot in fully worded questions, despite being informed at the start of the study that the chat bot is currently limited to respond to only key words. Once players had grown accustomed to how to interact with the bot, players naturally began to search using the key words that confused them. For instance, P2 read 'Fog Gate' on one of the game's physical mission cards, and was able to find all answers and context needed on the subject by searching the two word term through the chat bot.

14.5 Player Re-Use of Application

Players were consistently positive about the further applications of the companion application's features in future games, especially regarding the chat bot. However, most

players were inclined not to use the application's instruction loops in a future play experience, and would instead try to use the game's officially published instruction manual to 'see if [it was] easier to follow' (P3).

The success of the chat bot as a teaching and learning tool is shown in player's consistent keenness for a flexible rules reference and index, with players recognising the potential for this existing in the chat bot. In order to achieve this, the chat bot's AI would need to be taught to be more robust, and be able to take part in colloquial communication, although this was not possible in this research due to the time and budget constraints required to manually train such an AI tool.

Furthermore, both participant P1 and P2 expressed potential generalised applications of the chat bot feature, mentioning that they would like similar features for games such as Blood Bowl and Star Wars Legion. P2 clarified that Blood Bowl was a keyword heavy game, and that the chat bot tool presented a convenient and quick way of repeatedly referencing and therefore learning the rules that are attributed to the different keywords.

Additional features suggested by players included the aforementioned rules reference, along with pre-programmed reminders to guide gameplay. P4 suggested 'difficulty levels' of instructions, so that the tools provided could be responsive to the experience level of the user. Such a feature could be extended to teach game strategy, thus offering features and information not available at all in the printed rules manual.

15. Discussion and Analysis

Throughout the results, there was an overall generally positive feeling toward the principle of a rules teaching companion application, implying that there is value in the concept and that the rules of board games do constitute content that is 'fit' for an e-learning tool, the necessity of which was outlined in the background reading (Kim et al. 2022). However, this project's prototype must be streamlined in order to act as an enjoyable tool to use when learning game rules that meets the user's needs and expectations. Only when a user's physical and emotional response to a software matches or supersedes a user's needs and expectations of the software will a software be considered to meet high standards of user satisfaction (British Standards Institution. 2020). Therefore, though the results of the usability evaluation technically met the outlined success criteria of being able to set up and complete a game, the player's emotional responses do not imply that user satisfaction was met. The

extent of rules knowledge taught to players was only enough for participants to understand that the way the rules were communicated was more complex than necessary.

From analysis of results, there are three emerging elements that introduced the most unnecessary complexity, with these being the navigation of the companion application, the execution of the tutorials in such a way as players were expected to learn while playing, and finally the way that content and copy was communicated itself.

Both the frustration regarding the navigation and the difficulty of working with the tutorials indicated there were problems with the 'learnability' of the companion application itself, when considering interaction principles (British Standards Institution. 2020). Users were unfamiliar with companion applications, with two of the users having very limited experience of hobby games as a whole, so participants had no understanding of what to expect from the application itself. More features need to be integrated into the companion application that support the exploration and discovery of information and features within the application itself, before progressing directly to the rules of the board game.

In a similar vein, the choice of splitting the navigation between functional and instructional elements led to confusion. While both the top bar and 'hamburger menu' followed convention individually, and received brief recognition from some participants as such, the combination of both types was unusual and disorientating for users. The difficulty in navigating the application made already complex rules harder to process, demanding attention and effort from players that detracted from the cognitive load available to them, instead of enabling them to focus this cognitive load on learning the game rules. Therefore, minimal navigation options are key to a rules teaching companion application so as not to overload the user.

Such an issue could be remedied by making the companion application responsive to the user's experience level. Therefore, rather than separating elements of the application into different navigation areas, instead links to features would appear dynamically in a single navigation bar. Users would only be shown instructions that had been considered relevant to their experience level. Such a feature could be included through the integration of an 'Assessing Prior Knowledge learnability strategy' (Poretski and Tang 2022), enabling the application's features and instruction guides to be scaled appropriately. Such features could be extended to include P4's strategy based tutorials suggestion.

The pattern that emerged from the experience and feedback of the strictly ordered instruction guides is somewhat contradictory: users found the feature both too inflexible – as they could not skip to the rule they needed – and too flexible – as the segmenting and separating the different themes of rules ('Set up', 'Start Game', 'Game Round', and 'Combat' respectively) left users often unsure where to go to find the rule that they needed.

The instruction loops were designed with scaffolded learning in mind, and so each set of instructions consisted of strictly ordered sets of pages that users could only access chronologically. While this functionality was acceptable for each user's first iteration of the loop, once users wanted to try and look back through previous instructions or access quick reminders of rules, this strict navigation lead to further frustration and inconvenience. However, users expressed that they liked the step-by-step approach in principle, implying the intention to strictly scaffold learning is appropriate when developing a rules teaching tool. Once again, the implication to fix such an issue was suggested by the users themselves, with the implementation of an overall rules index. The fixed loop step-by-step approach would therefore offer users the guided teaching approach required for their first experience of the rules, while the index would represent the flexible, quick reference guide when users needed reminders only.

The effort to make rules learning flexible included the segmenting of different rules into four different sections, and leaving it to the player's choice when to access each set of instructions, including only text-based prompts as a guide. While such flexibility was integrated in response to the principles of companion application design, the consistency with which users were unsure what to do next implies that, for new players, flexibility and the freedom to play the game "how they want" is not as much of a necessity. Players are not yet aware enough of the game rules to understand what part of the game rules they desire to be flexible. Such understandings explain why other features for flexibility, such as the ability to hide and show items on the application screen, were never used.

The success of the 'Set Up' instructions compared to the frustration of the 'Game Round' and 'Combat' guides is important to explore to understand effective rules teaching implementation. The 'Set Up' instructions guide proved to be easy to follow and effective, as indicated in the success all participants had in setting up the game. Positive feedback implied that the effective elements of this feature included the use of clear images, especially when labelled, supporting the guidance given in the background material regarding the use of

images to create effective teaching materials. When comparing the success of the different instruction guides in the application, the presence of chance was observed to impact the effectiveness of the instructions themselves. The 'Set Up' instructions did not include any element of randomness, and so the user could clearly and consistently follow along. However, the same cannot be said for the game round instructions. For instance, one user drew a tile from the deck and followed on to the next slide of the instructions. This next slide instructed them to populate the tile with various tokens and creature models, however the player faced confusion because the tile they had drawn had no areas that needed to be populated. Because of the restricted nature of the instructions, participants were left unsure how to progress when faced with such circumstance.

In addition to the frustration regarding the restricted navigation, the guides for game round and combat, in particular the latter, suffered from repetitive slides that drew out the experience when players were showing eagerness to get started. While the content of these slides was drawn from the book, the indication is that when learning while playing, players want to be given only the information necessary for their immediate action. For instance, the slides that explained player's Trick Weapon dashboards were included in the combat round guide, but players did not need to read this every time they wanted to follow along with each combat step-by-step. Therefore, the instructions do not need to be restricted by the content that was given in the original printed guide, but instead should be adapted and streamlined for quick play. Such amendments would help to overcome the third identified unnecessary complexity, of copy and language, where the content of the instruction guides could be more streamlined. However, the focus of this project is on the result of the user experience considering the technology used, and so the analysis of language and copy used must be considered in future work.

Learning while playing itself seemed to cause some contention in several ways. First, some players would not follow along step-by-step, implying that they wanted all of the context regarding the game before sitting down to play. This is explained by the feeling expressed that participants felt like they were 'wasting' their initial turns when trying to learn while playing, as they were following along to the instructions blindly. Therefore, a distinction needs to be made when developing companion application rules teaching guides between "learning while playing" and "learning by playing".

Players expressed positive thoughts in regards to the ability to get 'hands on' while learning, therefore the step-by-step approach has merit as a teaching tool. To avoid the reluctance to waste turns, companion applications should therefore consider acting as 'pretraining' (Mayer 2019) for games through the application of 'sandbox' tutorials, wherein players practice skills through a predefined level separate from the version of the game they would play themselves (Poretski and Tang 2022). Generating a well-planned and defined sandbox level would solve many of the issues identified in this project's tutorial technique while still capitalising on the positive teaching elements the functionality enables. The elements of chance could be removed by instructing players on the specific cards and tiles to draw for the practice round, and players would not feel like they were impacting on the progress of their actual game. Meanwhile, scaffolded knowledge could still be communicated through the unique tools enabled through the digital medium, such as gifs or onwards into audio and video.

However, when considering implementing further rules teaching companion applications, one must consider the lack of trust that seemed to be indicated towards the software. If there was a rules confusion or discrepancy, users were quick to blame the companion application rather than the game. The instance of one user checking the physical instruction manual when confused by a rule, only to find the very same wording, implies a lack of 'trustworthiness' in the system when considering software interaction principles (British Standards Institution. 2020). In order to overcome such barriers, more work must be done to support the user's faith in the companion application software. Although there may be legal implications, one possible way of doing so, were a companion application version to be released officially, may be to gain the official endorsement of the original board game publisher.

Finally, the emotional response to the chat bot was positive despite the limitation of users being restricted to only searching using keywords. Unlike the frustrations with navigation and ease of use, which were repeated persistently throughout usability evaluations, once users understood that the chat bot would only work with key words, they continued with such an approach without complaint. Users consistently attempted to use colloquial language with the chat bot, indicating a humanising mentality towards the AI as the medium of the chat window gave the impression of being part of a conversation. Even in feedback, players thought of the chat bot as a 'helper', giving a role to the feature as though it were another individual at the table. In this way, the chat bot function supported the desires of participants

to avoid the embarrassment of learning game rules, while still having the freedom to ask questions, replicating the relationship of learner and 'more knowledgeable other', as theorised by Vygotksy (1978). Under this theory, a 'More Knowledgeable Other' – usually a teaching adult or a peer – would help an individual overcome the gap between what they do and do not know by offering guidance and encouragement. In this way, the individual is able to help scaffold learning and avoid the aforementioned potential of cognitive overload when a learner does not have the required pre-existing knowledge. By integrating elements of AI through a chat bot, a companion application could itself occupy the role of more knowledgeable other, and in doing so act as the 'avid player' drawing new players into the genre, as discussed in the introduction.

The theme of sociality appeared throughout the results, both in the response users had to the chat bot, and in the ways participants would consistently try to draw the facilitator in to conversations regarding the rules. Such negotiation is thought to be a core part of board game play (Liberman 2011), and as such, because this rules learning theory has been evaluated in a solo game environment, responses to the companion application may have been influenced due to the inability to negotiate. Liberman's research notes that much of the understanding of game rules develops due to the conversation around their interpretation (Liberman 2011). In a similar way, were this study's participants playing in a group rather than solo, their confusion may have been lessened due to the ability to discuss and combine interpretations of features both in-game and as part of the companion application. For instance, P2 encountered difficulty when trying to find where to access the instructions again, while P1 and P3 found the navigation immediately intuitive. Were these two individuals playing together, through discussion neither would have encountered difficulty. Therefore, the discussion and conclusion presented in this project must take in to account that feedback was given from participants in isolation, despite board gaming being a usually social event. However, such findings still add value, given the prevalence of solo-play options in hobby board games.

16. Conclusion and Future Work

The results and analysis of this project indicate that there is desire for a rules teaching application, and that in principle such features would help to make hobby board games more approachable to new players. The chat bot represented a feature with potential throughout board gaming and tabletop gaming, with users persistently keen to utilise such a feature in settings even outside of 'Bloodborne: The Board Game'. Evidence collected from user feedback continues to support previously proposed theories that convenience features of

companion applications – such as housekeeping or the repurposing of materials – are of benefit to users with experience of hobby board games. However, for new players such features did not achieve the project aim of reducing complexity, and instead left users with the possibility of forgetting game features entirely.

While the principle of a rules teaching tool was met with positive feedback, the execution of this feature in this dissertation's software prototype was not adequate for effectively supporting users' learning experience. This was due to excessive confusion which could occur from difficulty in navigating the app and the presence of chance in the instructions which could lead to some lessons being inapplicable to the user's game scenario. As such, when considering methods of implementing tutorials into companion applications, game designers and application developers should consider a restricted approach, contrary to the flexibility and adaptability usually required of companion applications. Users should be provided 'sandbox' tutorials which involve users playing a set round of the game – separate from any attempt to play a chapter or campaign – which has no elements of chance involved. This enables learning to be specifically directed and 'scaffolded' to ensure an effective learning experience.

Furthermore, automated elements of the companion application, while receiving positive feedback for their potential in future games for the new player's, put users at risk of accidentally missing and ignoring game rules. Therefore, features for rules teaching and features for housekeeping and automation should not be combined in a companion application for new players. If a single companion application were to feature mechanics for both elements, a system should be put in place to understand the user's existing experience level, and provide automation accordingly. The less experienced the player, the less elements of automation should be present.

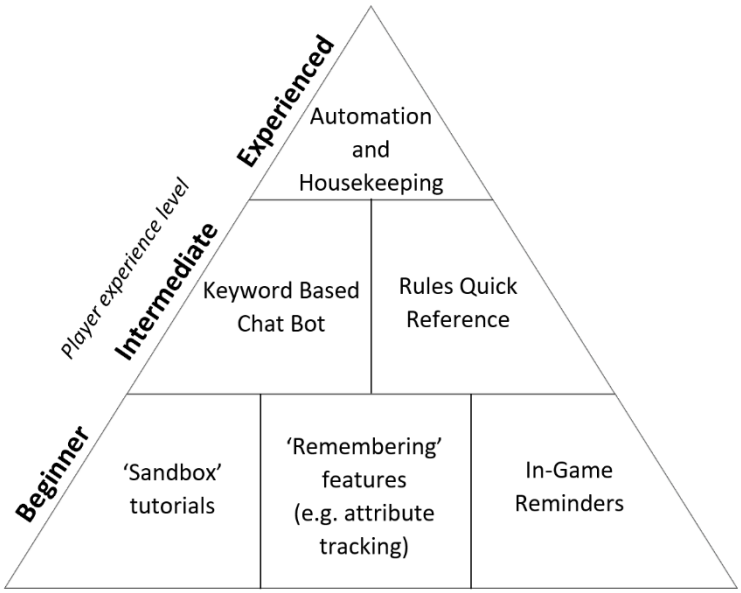

Figure 10- Model for Companion Application Features According to Experience Level

With this conclusion in mind, this project contributes to the research field a model for 'Companion Application Features According To Experience Level' (Figure 10). When attempting to develop a companion application for rules teaching purposes, game designers and researchers are encouraged to consider this model of recommendation. Absolute beginners should have more restricted features available to them, such as 'sandbox' tutorials and in-game reminders (Poretski and Tang 2022). Convenience features of companion applications at this stage should be restricted only to the 'remembering' feature of Rogerson et al's model (J. Rogerson et al. 2021), since these do not have an impact on gameplay and still require the user to manually update the system, thus encouraging the individual to interact with the rules. Intermediate players are to be considered those who have some experience of the game, but still need to remind themselves of rules occasionally. While the features of the beginner should still be available to them, these individuals should now know enough of the rules to be able to "know what they are looking for" in the keyword search. Finally, experienced players are already familiar with the manual rules set, and so it is at this stage game features can be automated and made flexible, as players at this stage should be considered to know enough about the rules that they could adapt and house rule features, should they desire.

In retrospect, designing a rules teaching companion application based on existing models for companion applications had a restrictive impact which limited the potential of this project's prototype. The principles of Rogerson et al (2021), J. Rogerson et al (2021) and Cheung et al (2013) were based on the feedback of existing and experienced hobby board gamers already familiar with game and mechanic rules. New players did not need features such as dispensability and live tweakability, as they were not yet familiar enough with the game rules to recognise what rules they wanted to be flexible or where house rules could apply.

Rather than focus on existing models for companion applications, the research project needed to show more understanding that users would be unfamiliar with hobby board games, and therefore companion applications themselves. Assumptions were made regarding the ability of participants, which left the game experience more complicated than it would have been had the user followed the written instruction manual. Therefore, this project could have focussed more on understanding the principles of e-learning theory and applying these instead, rather than focussing on the principles of companion applications as a priority. In order to achieve the aims of reducing game complexity and teaching game rules, the final

project and companion application needed to be more of a learning and teaching tool, rather than a game companion application.

Therefore, the next step for future work to explore companion applications as rules teaching tools for the purposes of making hobby board games more approachable would be to refine the existing prototype in light of the model proposed by this project. Such refining would include adapting the tutorial into a sandbox format and implementing an 'Assessing Prior Knowledge learnability strategy' (Poretski and Tang 2022). A more in-depth exploration of the effectiveness of the chat bot feature would also be of benefit to the board gaming technology research community.

The effectiveness of the chat bot in its current form was limited due to budget and workload capacity restraints. Although the Azure AI technology could be trained through manual feedback to learn to adapt to fully-phrased questions from the user, this would have required the capacity of an individual to manually train the function, or the project would have needed the budget to hire help to do so. Furthermore, the lack of budget restricted the function to utilising only the free tier services of Azure, which meant the file capacity was not capable of hosting images. As this study has shown, the usefulness of images in a rules teaching scenario cannot be understated. As such, were budget to allow, the integration of images into chat bot replies would have further supported the rules teaching capabilities of the application. Furthermore, the ability to interact colloquially with the chat bot could also make the feature more adaptable and robust, potentially extending its applications to benefit beginners. For instance, if the AI were able to more intuitively decipher the meaning behind the user's question, the chat bot feature would not need to be keyword based, and so could be featured in the lower 'beginner' level of the proposed model (Figure 10), rather than in the intermediate level as it currently does.

Future work could also consider exploring the social impact of learning game rules through companion applications. The potential for technology to act as the 'more knowledgeable other' in a game learning context, while being briefly referenced in this project, could benefit from more in depth research. Such research could focus on the role of AI, whether through chat bot or audio, to explore how users respond to one of the game's "player" participants being represented by a companion application, and how this can help support player's rule learning. Some research to date has been completed on the concept of technology as the 'more knowledgeable other' in relation to children's literacy, using a pre-

existing integrated learning system. The study found that the support offered by the technology was effective in providing opportunities for practice, however the feedback provided by teachers manually had 'a larger effect' (Putman 2014). However, a similar study under this theory has not been completed in relation to a technology specifically designed to represent the 'more knowledgeable other', as opposed to assessing a pre-existing software as Putman's research did. A software that was specifically designed to represent the 'more knowledgeable other' could utilise modern technology such as AI and text-to-speech to produce responses and feedback that are of a more social kind, rather than being data driven, thus exploring the sociality of technology.

The sociality of board games were found in the results of this project to have their drawbacks, since players articulated feelings of awkwardness and embarrassment when attempting to learn game rules in the company of others. In this sense, the companion application rules teaching tool did succeed in making hobby board games more approachable, by removing this embarrassment yet still representing – in principle – the aid to ensure the player developed their understanding of rules. Therefore, if a rules teaching companion application tool were to be developed with the model for 'Companion Application Features According to Experience Level' in mind (Figure 10), a successful resulting companion application could represent a tool for making hobby board games more approachable for new players.

17. Reflection on Learning

Throughout this project I attempted to achieve the learning outcomes of the dissertation, with particular emphasis on the process of design oriented software development. I was able to apply the skills developed throughout the masters course to perform a requirements analysis against the problem, and then design and implement the project through software development practices. Finally, I evaluated the prototype through consideration of end user engagement. Using Gibb's reflective cycle (1988), I reflected on my dissertation project experience to understand my strengths, weaknesses, and how I should develop my skills and experience going forward.

I believe my project management and approach to timing was successful. I planned the project in week long sprints, including the writing of chapters, so as to ensure all writing was not left to the end. However, I did not adequately scope the programming project initially

so the program requirements were too broad at first. This left me feeling panicked that I would not finish application development in time for usability studies, especially when I was still in development up until the day before the first session. Advice should have been followed to scope the project appropriately, such as by following 'Managing Project Scope' by Elizabeth Harrin, who advises keeping the project small by understanding the wider strategy of the project (Harrin 2013). In the instance of my project, this would have come from focussing on the final companion application as an e-learning tool, and not getting distracted by additional companion application features such as housekeeping elements. As the project progressed, I streamlined my requirements. However, due to the ineffective use of time initially, the final product did not meet the software quality standards I would have preferred. I believe this is somewhat responsible for the difficulties users had with navigating the final product. In future projects, I will scope projects according to two criteria: both the capabilities of the engineers – in this case, myself – and according to the final intention for the program. If the final intentions for the program are too broad, these must be refined before the project can be adequately scoped.

My ability to work to sprints ensured I had time to perform a detailed literature review. While I was initially concerned there would be too limited resources specific to my area, I found that there was a small niche of specific research, and that some literature could be cross examined and applied to my topic. For instance, the focus on video game teaching techniques could be cross-applied through examination throughout the dissertation. I used advice from Keshav (2007) to gain the skills to effectively read and analyse academic papers, which ensured I was able to quickly filter through papers that would not be useful, while drawing out as much information as possible from valuable resources. I struggled with the feeling that there were always more papers to read, but my method of project management ensured I did not stay on the literature review for too long. By following Keshav's (2007) three pass method of reading academic papers, and storing my results in an excel spreadsheet, this made it easier to find patterns across research, and return to my notes to remember the paper's details. The depth with which I read and recorded the academic literature available to me ensured that I was able to use the research extensively even outside of my literature review, such as where it informed the development of user personas and software requirements. As such, while there may have been more academic literature out there still to read, I have concluded that I am happy with the extent I understood and was able to read and apply the literature I did study throughout my research. I prioritised a quality over quantity

approach. However, when this approach was combined with my initial broad scope, some of the time I spent deeply analysing some literature could have been better targeted towards papers of a more appropriate subject. Therefore, for future research scenarios, while I would follow a similar 'quality over quantity' three pass approach for reading academic literature, I would ensure the project's strategy and focus was appropriately specific first.

One of the most difficult elements of the project was developing my technical abilities. I had limited experience with React, and none with Django or the Azure platform. I followed a learn-by-doing approach to develop my React skills, supported by tutorial books from Kirupa Chinnathambi (Chinnathambi 2018) and Art Yudin (Yudin 2020). Meanwhile, I followed Microsoft Azure's teaching resources to learn how to deploy an application onto their services using GitHub actions (Microsoft Azure Training [no date][b]), and how to develop and integrate a chat bot into my application (Microsoft Azure Training [no date][a]). I found I struggled against the tight timeline to implement all the features I needed while using tools and platforms I was unfamiliar with, as I could often waste time stuck on issues that would be easily fixed by experienced programmers. As such, I should not have tried to learn three new tools in one project, unless absolutely necessary. I should have used Flask for the backend, as I had experience, and only learned React and Azure, as these both had unique contributions that different platforms could not offer (for instance, the chat bot capability). However, by learning as I was building the application, I felt I worked to my strengths as I learn most effectively when gaining hands on experience. Therefore, any future tightly time-scaled projects that I complete will consider the value added by the new tool before deciding to learn it in a short time frame, rather than learning something new for the sake of it, when such skills could be better developed during ad hoc projects.

While learning during production worked to my strengths, my limited knowledge of user experience and user interface design was a weakness that had a big impact on the project. While I followed resources such as Figma and Laura Kalbag's 'Accessibility for Everyone' to help inform design choices, and developed some limited wireframe designs before starting application production, the depth of this research was not completed to the extent that was required from a human-centric technology project. My focus was incorrectly on the backend features of the application, as evidenced by my choice to develop a backend API – which the end user would never see – rather than choosing to spend this time further developing and refining the front end experience. Going in to the dissertation project, I had not considered the significance of the user interface above all functional features and so did

not notice the skill gap. In retrospect, when considering my limited experience with Django, React and Azure, I should have also thought about the necessity to develop my understanding of user interfaces into these technical deficiencies. Being as this project was my first experience of human-centric research, before starting the project itself, I should have done more overarching research into the concepts and concerns of HCI itself. As a result of this weakness in my skillset, the final companion application was more difficult to use than necessary, thereby distracting the user during the usability evaluations with concerns and complaints that were not particular to companion applications specifically. As such, following this project, my continued personal development in the human-centric computing area should focus on developing my skills in designing user interfaces. This will be done through more wider reading, and continual practicing with wireframing and designing user interfaces.

My initial over-extended scope, and my lack of focus on the user interface had a direct negative impact on the effectiveness of my companion application. For instance, rather than focussing feedback on their experience with the interaction between board game and companion application, users could be preoccupied with the difficult navigation. However, despite this distraction, valuable lessons were taught by user's interactions with housekeeping features of the application and the way they interacted with rules teaching methods and tutorials. The final study did not solve the problem of complex rules making hobby board games difficult to approach. However, my research provided value through the proposed methods and features to avoid with the aim of lessening such an issue. Further supportive research could be performed based on the findings proposed in this dissertation to further aid solving the identified problem. Therefore, some understanding regarding the subject of board game approachability has been contributed to the research field. While it was initially disappointing to feel that the companion application as a whole was not effective at solving the identified problem, it was exciting to understand which features were effective. Furthermore, it was satisfying to be able to use the resulting conclusions to develop an advisory model.

The extensive feedback and lessons learned in retrospect of this project make the experience a good one, as I have learned many lessons about how to approach a project of this kind. Were I to have the capacity to continue this project and further refine the companion application, I believe that I could take the conclusions presented and use them to tweak the existing companion application to create a successful version of the program.

Therefore, while the limited effectiveness of the dissertation's products seems initially disappointing, the extensive evaluation enabled makes the experience a good one because of the extent of lessons learned and the potential to improve going forward. In future scenarios, I would try to ensure multiple rounds of usability evaluations and surveys could be completed, with the view to complete the first as early as possible. My experience during this dissertation project has taught me that both research and technical development is an iterative process, and only after many reflections and evaluations will one be able to find well-rounded and well-supported advice and answers to achieve the solutions to an identified problem.

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19. Appendix

Section 1 – Companion Application Software

Figure 1.1 – Companion Application Code GitHub Links

GitLab hosted project files for access through the university VPN:

- Frontend and Backend: https://git.cardiff.ac.uk/d1526794/1526794-dissertation-code

GitHub Hosted (Used throughout the project and connected to Azure hosted version of application):

- Backend API Project : https://github.com/LinseyRi/back_bbtbg_companion.git
- Frontend Application Project: https://github.com/LinseyRi/front_bbtbg_companion.git

Figure 1.2 – Companion Application Live Web Links

Companion Application: https://bbtbg-companion.azurewebsites.net

Backend API: https://bbtbg-api.azurewebsites.net

Please note: The two web applications above (companion application and backend API) are hosted on Microsoft Azure cloud services on a pay-as-you-go contract. When the web addresses are considered inactive, the live web links are automatically made dormant. As a result, initial loading times when the links are first visited may be long. There is a strong likelihood that the companion application will load before the backend API, so there may be a further delay as data is populated.

Such load times are acceptable only because this web application is a prototype minimum viable product.

Figure 1.3 – Suggested Test Cases for Chat Bot

If the above link is used to access the companion application hosted via the Azure cloud framework, the below game keywords are suggestions for test cases that can be used as input to the chat bot.

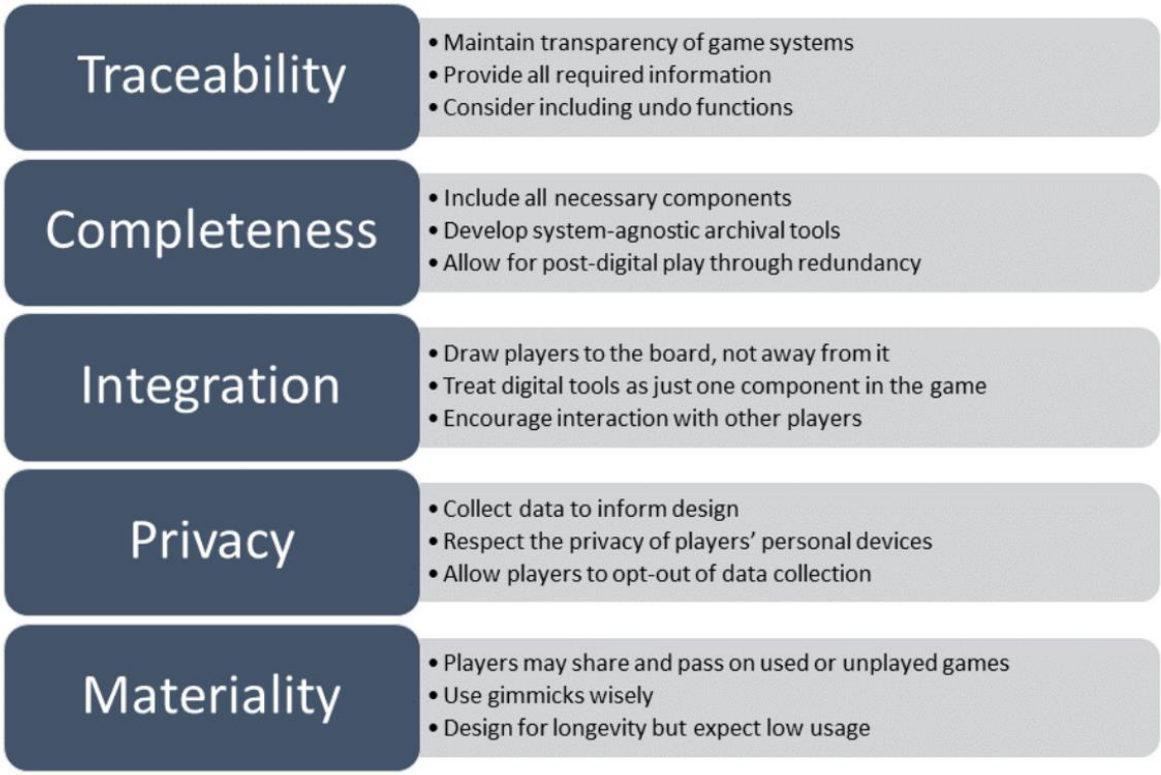
- Action
- Attack
- Fog Gate
- Move

Please note: Due to restrictions on security tokens, the chat bot cannot be successfully run locally.

Section 2 – Existing Literature

Figure 2.1 – Eight Domains of Digital Tools. (J. Rogerson et al. 2021)

Figure 2.2 – Five guiding principles for the design of digital tools. (Rogerson et al. 2021)



Section 3 – Usability Evaluation Materials

Table 3.1 – Participant Screening Criteria

Participant Characteristics for System Usability Test All participants should subscribe to both of the below user groups.	**Number of Participants Needed**
User Groups: - **Fans of 'inquisitive' style games (Ferro et al 2013)** => individuals who are fans of games that involve questlines and immersive experiences	1 pilot 4 regular 1 backup
Experience Levels: - **No experience with 'Bloodborne: The Board Game', but familiar with the video game** => individual must have never played 'Bloodborne: The Board Game' before, but ideally has had experience playing a FromSoft published video game such as 'Bloodborne' or a 'Dark Souls' title in the past	1 pilot 4 regular 1 backup
Total:	1 pilot 4 regular 1 back up

Figure 3.2 – Participant Screening Survey

Participant introduction survey, which was used as an initial screening survey. Content was hosted on Microsoft Forms and completed by the participant at their convenience. Questions included:

1. On a scale of 1 to 10, 1 being none at all and 10 being extensive, how much experience do you consider yourself to have in board gaming?
2. What board games have you previously played, or particularly been a fan of?
3. Have you ever played 'Bloodborne' the video game, or a FromSoft video game of its like such as 'Dark Souls'? If yes, did you enjoy the experience?
4. Do you consider yourself to have plenty of free time, or do you consider yourself to only have limited time, such as to spend on leisure activities like board games? Would you say you would "make time" to play?

Table 3.3 – Usability Evaluation Activities

Task Title	User Goal	Task Text
Game Set-up	Set up a game of 'Bloodborne: The Board Game'	You have decided to play 'Bloodborne: The Board Game' and have chosen to play the 'The Long Hunt' campaign. You have gathered the board game box and loaded up the application on a phone screen. Use the board game companion application to guide you through set up of 'The Long Hunt' campaign of 'Bloodborne: The Board Game'. Explain what you are thinking as you do so.

Game Round	Play a round of 'Bloodborne: The Board Game'	The game chapter is set up, and your phone screen is hosting the companion application. You have heard the task given on card 1 of the campaign deck. Follow the instructions given on the application's 'Hunt Dashboard' to play through the first round of the campaign. Explain what you are thinking as you do so. The application may prompt you with instructions of actions you are able to take as a player. Please feel free to use or ignore these prompts as desired.
Continue Game	Continue playing 'Bloodborne: The Board Game' until Chapter 1 of the campaign is completed.	Now that 'Bloodborne: The Board Game' and its companion application is set up, and you have completed the initial instruction round, you are prepared to complete the rest of the campaign chapter. Using the 'Hunt Dashboard' and character attributes screen on the application, continue to play through 'Bloodborne: The Board Game' until Chapter 1 of the campaign is failed or completed. Explain what you are thinking as you do so.
Look Up Rules	Find instructions or rules regarding a particular element of the game	You are currently several rounds into the game of 'Bloodborne: The Board Game', but would like to check the rules on an aspect of game play that could be found in the physical instruction rulebook. Use the application to search for an answer to your rules query.

Figure 3.4 – Participant Follow Up Survey

Following completion of all activities and a finished game of 'Bloodborne: The Board Game' using the companion application, participants were asked to complete a feedback survey via Microsoft Forms on a supplied laptop. Questions included were as below:

1. How would you describe your overall game play experience during this session of 'Bloodborne: The Board Game'?
2. How would you describe your overall experience using the companion application for 'Bloodborne: The Board Game'?
3. In what ways, if any, did you find the game confusing?
4. In what ways, if any, do you feel the companion application made game play easier or more difficult?
5. In what ways, if any, did you find the audio tools helpful?
6. What did you like most about the companion application?
7. What did you like the least about the companion application?
8. What, if anything, caused you frustration when trying to use the application?
9. Are there any additional features you feel could be added to the application, or any existing features that should be removed or adjusted?

10. If you were to play 'Bloodborne: The Board Game' again, would you use the companion application in its current format, or would you choose to play the game as traditionally designed?

Table 3.5 – Facilitator Note Taking Guidance

The below table outlines the tasks that participants may complete as part of the activities clarified in section 3.3. For each task, successful and failing behaviour is given to enable the facilitator to recognize if the given feature meets the intended goal, and problem-solving strategies are provided to indicate where participants are to find the knowledge required to complete the activity.

Activity	**Success or Failure Behaviour**	**Problem Solving Strategies for Participants**
Set up game and chosen campaign	Success Behaviour: - Setting up game campaign without referencing external resource or game's provided instruction booklet Fail Behaviour: - Seeking answers to questions from resource outside of application or game's provided instruction booklet	- Following instructions given on the companion application
Track and update player attributes	Success Behaviour: - Using application to track all elements of player's changing attributes Fail Behaviour: - Resorting to using physical 'Hunter Board' character tracker or physical tokens at any point during play - Failure to keep player attributes up to date during play (i.e. not updating health or echoes when lost or gained) -Failure to use all available features of individual character gameplay, such as ignoring the firearm	- Look for application instructions during play
Use Application 'Hunt Track' Timer To Guide Gameplay	Success Behaviour: - Consistently updating the application at the end of each player turn - Updating board game state at correct times according to the instructions given by the application hunt track timer (e.g. resetting the board on a red 'Reset Point' timer node) Fail Behaviour: - Losing track of rounds in the game and player turns - Manually overriding the game timer	- Following prompts from the application when given - Regularly checking the application dashboard for prompts

	mid-game for any reason other than pre-game house ruling - Failing to notify the application at the end of each player turn - Not updating the game state according to instructions, or updating the game state early or late	
Use chat bot to ask rules related question	Success Behaviour: - Using the chat bot without prompting from the session activities multiple times - Understanding rule answers from chat bot well-enough to be able to continue playing the game Fail Behaviour: - Seeking answers to questions from external resource or game's provided instruction booklet - Chat bot not returning any information to participants question - Chat bot returning irrelevant information to participant	- Following prompts from session activities
Remove Feature From Application Dashboard	Overall Application Success Behaviour: - Never needing to remove an application feature Success Behaviour: - Removing application feature due to house rule Fail Behaviour: - Removing over 20% of the application features in order to play	- Reviewing initial application instructions at the start of the session - Look for application instructions during play

Section 4 – Qualitative Data Results

Figure 4.1 – Screening Criteria Survey Responses

ID	1	2	3	4
On a scale of 1 to 10, 1 being none at all and 10 being extensive, how much experience do you consider yourself to have in board gaming?	6	8	7	5
What board games have you previously played, or particularly been a fan of?	Star Wars: Legion, Warhammer, Middle Earth SBG, Dark Souls Board Game	Carcassone, Munchkin, Ticket To Ride	Stardew valley, catan, monopoly, risk, dark souls	Stardew Valley, the board game.
Have you ever played 'Bloodborne' the video game, or a FromSoft video game of its like such as 'Dark Souls'? If yes, did you enjoy the experience?	Yes, I have played and enjoyed both Dark Souls 1-3, Bloodborne and Elden Ring	Dark Souls: completed - LOVED Bloodborne: recently started - AM LOVING	Dark souls series and Elden ring but not bloodbourne. Enjoyed a lot.	No.
Do you consider yourself to have plenty of free time, or do you consider yourself to only have limited time, such as to spend on leisure activities like board games? Would you say	I have to make time around work. Evenings and weekends although rarely top priority	I have plenty of free time (single, no kids, reasonable 9-5 working hours, no health care issues/familial dependencies). I often have to focus on doing things (games - video/board) for enjoyment's sake as am quite	Limited time, do have to make time to play.	I only have limited time to spend on leisure activities like board games.

you would "make ...		results-driven as a person.		

Figure 4.2 – Usability Evaluation Qualitative Data Observation Notes

Participant 1

- Good to have links between images and what I would find in the box
- Excess pieces in the box lead to some confusion
- A lot of text (which provided context) made it difficult to follow step-by-step
- Clearer language was needed – e.g. “Firearm card will have the same hunter picture as the dashboard”
- To add:
- Picture of firearm card
- Make distinction with bolding between Trick Dashboard and Hunter Dashboard
- User struggled to understand where or how to ask a question – there wasn’t a clear user interface
- Chat bot required too clear a keyword / input to be able to effectively search. The user didn’t know enough of the specific rules to be able to search keywords effectively
- “Where do I go” was asked when trying to find an answer to a question that was asked
- “It was more intuitive than the principality website”
- Questioned how generalised the instructions were – i.e. how much do these lessons apply to just this chapter, or the wider game too
- Impressed by the small play area needed compared to the wider amount of items implied by the amount of “stuff” left in the box
- Attempting to refresh the game led to confusion -> not a very robust system, and error heavy
- Rather than follow instructions step-by-step, the user was inclined to read all instructions first – flicking through all windows on the page – rather than playing while following along with the instructions as they appeared
- Multiple overlaying instruction tabs lead to a difficult to use user interface
- User received excessive amounts of info through chat answers that was difficult to filter
- User remembered to regularly and consistently use turn button
- User liked the implemented limits e.g. health limit, echo limit – trusted the app to take care of those elements
- Would like more prompts i.e. “Remember to take the enemy activation!” “Remember to reset the board”
- Did use the firearm tracker, but felt it was unnecessary being as you also have to track the original card anyway
- Liked space saving of being on phone
- Forgot turn tracker once

- Confusion over when turn vs enemy turn should be noted i.e. when the game reset happens
- Phone screen kept locking which led to some frustration
- Resorted to checking physical game pieces to check wording of rules
- Could do with more round reminders
- Images disappeared on apps leading to a reliance on physical board (for the creature assignment logos)
- Double pressed turn taken button as lacked indication the button press / turn change had been registered
- Remarked upon not losing track of turn
- Didn't use the firearm tracker, because still had to use the card
- Lost track of personal turn once, but was able to return to button and catch up – meant never lost track of the timer too much
- Remarked that favourite feature was chat bot, and how great that would be for other games, especially their favourite game Star Wars Legion, which while a table top war game rather than board game, was also key word heavy

Participant 2

- Initially questioned whether phone app was designed for portrait or landscape
- Instructions don't start from opening of the box – should highlight all the things that will and won't be needed
- Instructions load at bottom / where previous person is scrolled to, rather than reverting to the top of the page
- Language confusion over "card" vs "sheet" – interpreted that "card" should always mean a playing card sized item
- Restricted view of phone screen size meant user couldn't see what was below – led to asking "I don't know what that is" as couldn't see the accompanying image
- "What is a player number?" – should dictate between 1 and 4
- Didn't know weapon card because didn't know what hunter dashboard was, almost went to discard a needed piece
- Lack of context / labels from not-needed items made difficult to understand what was required
- "When you've been told not to look up stuff on other cards, you don't want to be randomly looking at the reverse" – when having to search for items in the box => need a "What you'll find in the box" tutorial
- "Long sentences with commas in physical instructions -> new players overwhelming -> they will do everything very literally -> chronology is important"
- Use bolding consistently
- Two 3.s in instruction loop
- Clarify what user doesn't need -> user kept holding on to unneeded cards
- Use better imagery and diagrams for what you do need
- Consistent confusion with instructions provided – program assumes some pre-knowledge not remembered from earlier in tutorial, or information wasn't provided
- "I like the image for this, but copy is less helpful…"

- “Repurposing the materials provided in the board game for a more streamlined approach” -> this element of the companion app was something user appreciated
- “My memory isn’t what it should be”
- Language is important e.g. “next to / put in place of” as next to has a very specific meaning
- “Fewer freedoms => tell me more about what I must do”
- “So many terms have been thrown at me” I don’t know what to associate
- “Mention that the rest of the deck will be your upgrade deck”
- Provide context AFTER instruction demands given
- Diagrams occasionally inconsistent with what would actually be done
- “I am now trying to work out when I’m repurposing stuff”
- “Inconsistent to have some things on the board but other things don’t have a place” => this would be the same even with the original board game without the companion app, in fact, through repurposing, the companion app reduces the extent of this
- “I would assume by colour of the item cards that they are the same, but it is worth acknowledging they aren’t all the same, but be aware and voice the unfriendly design of the board game to be clearer e.g. mention the consistent “Top and bottom design” of the reward cards
- Suggested using a table for name, description, image, rather than vague token picture, as this is easier to read and more accessible for users with restricted vision
- Careful with semantics e.g. don’t say “all hunter models”
- “Put the board out first, because I don’t know how much space I need”
- Self reflection: should amend order of instructions and not stick to what’s in the book – the flexibility is part of the strength of using a companion app
- Label diagrams more clearly
- “I forget / don’t know what I’m talking about with too much text…”
- “I didn’t know what a random tile was… from what’s left, draw two random – clarify that they are to be stored upside down”
- “image labels are your friend”
- Utilise “will eventually look like this…” visuals throughout, so user can follow along whole set up visually step by step – like a lego instruction manual
- Assume the player is “dumber than you think”, however the visuals really are a great idea for a way to help with complicated set up, just needs refinement
- New feature could include pronunciation help for unknown words (especially in bloodborne e.g. yharnham)
- Clarify in more detail about the different sides between mission / chapter cards
- Love clear example for game start instructions
- “weird cognitive dissonance between instructions from card and then more from app and then more from card”
- Put “start the hunt” in red so it is consistent with card from game
- Liked how the tutorial had been put together – very step-by-step
- APART from answering a question I haven’t asked yet -> which makes you think you have missed something (insight token convo). Although, this subject came up again when reading through the game playing card in question, and the user made the very mistake the sentence on the slide had been trying to get the individual to avoid -> the

ordering between context and instruction could have helped this, i.e. include more "stop reading this slide now, then read the playing card, and then return to read the rest of the slide"

- "At this point, I don't know how to win" – need to clarify that the game is a thread / chain of missions to win => user wasn't a fan of learn by playing, but instead wanted to know all the rules and context before ever making a move in the game
- CSS headers not working correctly
- Consistent bolding and upper cases needed
- Consistency of using "game" vs "chapter" language
- Found it fascinating that one could take their turn in any order, were other plays involved -> showing inexperience with more "complex" hobby board games
- Noted that it was obvious that the player would take a turn
- Visually, the app navigation needs to be improved – didn't like having two different navigation elements, and disliked that the turn buttons were all separate from the Hunt Track – because felt they were associated, wanted these to be closer together
- Felt more navigation should be incorporated into the hamburger menu -> especially on mobile view => it's currently trying to do both, which is problematic from an accessibility stand point and responsive design (especially a problem on mobile view)
- Noted semantics between "timer" vs "turn limit", because there isn't an actual specific timer
- Great use of gifs and these stand out as being a particularly good feature
- However, could still use images and diagrams more, and more consistently
- "Enemies will activate" confused user – doesn't know anything about enemies until this point. Again, this is a problem of ordering – when do you reveal what information, because enemies all behave relative to the player
- Clarify that you will need a discard pile too
- Tell me what you COULD do before telling me WHAT to do
- Bind instructions together with reassurance that all WILL Be explained – try to make this as visually obvious as possible
- "it's humiliating to be learning board game rules"
- Re-clarify the limit of how board movement works => emphasis on reclarify i.e. offer reminders and repeats
- User once again attempted to read through a large chunk of the steps without following on step-by-step , commented "I don't think I've associated each slide as I do something with each one"
- "I don't know if there's something I have to do first"
- Should explain the mechanics of the actual app somewhere
- Should include a tutorial run that isn't part of the actual game – learning AND playing puts players in a difficult position
- Learning tool should set up a specific and well defined practice scenario
- User rarely recalled / absorbed rules in context – needed a reference, but this was where the chatbot came in handy
- Although answers were not always correct, when a response to chatbot was received, it was very helpful and user found the answer they wanted => with more context around it than was supplied by the app itself, which user found helpful

- Ordering of slides in tutorial led to some confusion – the app should take advantage of the fact that it doesn't HAVE to stick to the order of rules supplied in the printed game guide; it can be flexible
- Initially tried to use colloquial style full question with the chatbot, rather than keyword based questions
- Recommended removing the campaign deck from play entirely, and embedding it into the app itself => suggested that this would enable "patching" and renaming of terms, e.g. insight cards vs insight tokens
- Fog gate search worked organically with chat bot, but gave a lot of unneeded excess information that could be streamlined
- User interface wasn't fully compatible with all screens e.g. on hover / click help boxes didn't work on the Firefox phone app as designed
- Force breaks in speed HTML to avoid misleading line breaks
- Can't minimise instructions and view the dashboard at the same time
- Format of execution is good, but there needs to be less chance involved in the tutorial -> a pre-defined scenario would be easier to follow
- Suggestion of tracking creature health feature e
- Over all, user liked the app but consistently requested it to take over responsibility of more and more game features e.g. card deck, health tracking,
- Would have liked a unified quick reference index of all terms – although admitted chat bot (when working) fulfilled this purpose when the user already knew what they were looking to research
- Tutorial linear paths were "fine for tutorial" but not for actual game play
- Did LIKE the long answers from the QandA, especially for 'Enemy activation' where there was a lot to know, and being a new player, he didn't know how MUCH there was to know, so appreciated it being all given at once
- Button for turn should be closer to hunt track
- Chatbot excels when questioning about abilities (i.e. its keyword dictionary, processes) but falls down in being able to teach the actual game because requires keyword search or provides unnecessary info
- "Mark of a good product is being able to see it in other parts of life – for instance, I can really see myself wanting something similar for Blood Bowl"
- Great loading times, accessible being hosted online so can access from any device without download
- Combat loop specifically made process more difficult than it needed to be
- Didn't use the firearm tracker, because still had to use the card
- Used attributes trackers i.e. health and souls
- Didn't initially realise the reset button point because of display area issues on firefox phone app
- Never tried to hide a feature on the creature dashboard – although never was in a situation to do so, as all screens held by users was able to display all information in one screen

Participant 3

- Initial instructions were read easily and followed easily - i.e. matched intro and campaign cards to instructions given

- Likes pictures
- Wording of some of the instructions introduced difficulty
- Title of slides led to some confusion => didn't necessarily read whole slide first, so needs to be more intuitive
- Likes examples given
- Thinks the app is pretty good, likes rules learning and appreciates having a tool to help
- Standard web page layout - intuitive to navigate - even mentioned recognising the classic burger menu symbol
- Read on mobile which is great and useful and convenient
- Even picture of web page shows you what you are looking for
- Impressed by the gif - "Gif has given me fabulous insight into the mechanics of the game in a very engaging and dynamic way"
- Made wrong assumptions about not shuffling all decks again - noted that they liked instructions told you NOT to shuffle, but meant they didn't shuffle their Stat deck hand initially
- Although user completed the game instruction loop, they didn't like that they felt they "wasted" a turn on their learning action. After the first round loop, they wanted to reset and try again
- Really liked the principle of a deck building and card collecting game, and liked that still got to take part in many of these features
- Although followed the round instructions loop initially, ran into trouble when kept forgetting the rules, but struggled with flicking back through the predefined set order of instruction slides
- Liked the turn management feature as didn't have to concern self with time limit, only so long as individual turns were tracked, which was easier to remember and manage
- Could see the housekeeping elements becoming quite confusing the more players there are, rather than the less – e.g. could do with a flexible naming feature so you don't all have to remember who's player 1, 2, etc…
- Successfully set up game without referencing external sources
- Didn't use the firearm tracker, because still had to use the card
- Lost track of personal turn once, but was able to return to button and catch up – meant never lost track of the timer too much
- Used attributes trackers i.e. health and souls
- Forgot to reset creatures on a turn as hadn't been consistently checking the game timer – hadn't been moving it on
- Never tried to hide a feature on the creature dashboard – although never was in a situation to do so, as all screens held by users was able to display all information in one screen
- Wonder if some of the flexible elements were never used because they were never advertised as features to the user? I.e. interface and features were not intuitive at all

Participant 4

- Nuances to rules aren't clear – the fixed loop to instructions made them difficult to access, especially when you wanted a very specific and particular rule
- The amount of text was a bit overwhelming at first on some of the slides – felt they had to reread quite a few times
- Regularly looked to facilitator for guidance
- Struggled where to turn to find answers – the interface wasn't immediately obvious, and could have done with an initial tour of the app before even beginning with the rules of the game itself
- Also tried to use the chatbot using initially fully worded colloquial questions at first => when didn't work, resorted to key word searching which worked occasionally
- Most chatbot success on individual keywords e.g. Move, Attack, => liked these answers, commented that the "Format is a great idea and could be really useful"
- Found interface not initially intuitive – got confused between overlaying instruction tabs and how to access the game's dashboard
- Tried to refresh but this broke the game session and they were forced to reset
- Felt turn tracker was redundant when only playing single player, but appreciated may be more helpful in larger groups
- User followed step by step for set up and start of the game loops, but then attempted to read through the whole instruction loop for first game round without following step by step => feeling that the user didn't like going in "blind"
- Successfully set up game without referencing external sources
- Didn't use the firearm tracker, because still had to use the card
- Used attributes trackers i.e. health and souls, and liked the enforced limit
- Would often forget to reset creatures on reset point, had to look up what the logo on the timer meant a couple of times – first used the chatbot, then realised about the pop up – i.e. the help popups needed to be more intuitive
- Never tried to hide a feature on the creature dashboard – although never was in a situation to do so, as all screens held by users was able to display all information in one screen
- Felt a bit lost after all the instruction loops had been completed – they didn't feel flexible enough to be able to return to them when user got lost / didn't know what to do next => would've liked more prompts / updates
- Could have done with a flexible rules reference, rather than having all rules locked into a non-flexible loop
- It could do with different levels of instruction – some people will need a really heavy handed approach where they can learn by copying, while others need a different approach, such as following different learning theories => then next game, you could have a less detailed instruction loop, but still
- "It gave me security, it was like having you next to me" <- i.e. a helper there next to me
- You feel like you can't keep asking the other person you're playing when you keep having the same questions -> so it was nice to have the helper / guidance thing that I could pop into if and when I need it

- Help you learn more and more complex strategies -> introduce higher level strategies that you could opt in to using, like when playing chess, higher level moves => a teaching element not just of the game, but of the strategies
- “Show me, do me” learning theory
- Giving you hands on instructions takes away the element of having to read through all instructions book -> gives you that little bit of confidence to just keep playing
- If I find it too difficult, if I have to ask too many questions, it puts me off and I don’t want to play, especially when playing against other people
- Quite timid in playing – almost embarrassed

Table 4.3 – Participant Feedback Survey Results

ID	1	2	3	4
How would you describe your overall game play experience during this session of 'Bloodborne: The Board Game'?	I had fun, the game had some kinks but seemed easy enough to get a hold of. I enjoyed the tactical play of the cards	Found variety of physical objects confusing (i.e. which cards were which) but overall greatly enjoyed the game's concept and execution.	It was ok. I found there were a lot of rules that I’d never come across before that made the game a little awkward to play.	I really liked it - the story elements of the game were great. I also love the opportunity to take part in deck building.
How would you describe your overall experience using the companion application for 'Bloodborne: The Board Game'?	The app was helpful for tracking health, echoes and if I had used my firearm. It also freed up a lot of space on the table so we had room to play and expand the board.	I found it to be a superb proof of concept. There were multiple areas I felt could be improved upon such as layout (i.e. double navbars), displaying of multiple information (i.e. easier ways to show/hide instructions) and flow of tutorial information (i.e. would have benefited from more pre-set examples). However it was a valuable assistant to learning for	I appreciated having a tool that I could use to help me play, although I found even the app itself could be a bit confusing to use.	It was a great app. I appreciated having a convenient tool on my phone as a quick reference to game rules with a step by step guide. I think the app itself could be more streamlined, with more flexible access to all the rules, but I liked it in principle.

		such a complex game.		
In what ways, if any, did you find the game confusing?	Sometimes the order of operations in combat was confusing	Vast quantity of physical tokens with little description on the token itself (i.e. what was a Trick Weapon) and confusing terminology (i.e. Insight vs Insight tokens). Initial set-up was also confusing but greatly aided by the app, especially diagrams and gifs.	I struggled to understand the strategy needed to play - especially how to do combat. I was unsure how the cards you had were meant to be used.	I found navigating the game board quite complicated - I.e. the difference between a "space" vs a "tile".
In what ways, if any, do you feel the companion application made game play easier or more difficult?	Easier to track turn order, hunt track and other refreshable items. Got the enemy cards set up for me which streamlined setup. Made the game easier but freeing up table space, everything needed can be on the table and saves hunting around for bits in the box. Didn't really make anything more difficult	Easier: great QnA bot for individuals skills and terms. Good for showing initial layouts of game pieces. More difficult: hard to see multiple sets of information simultaneously (i.e. combat stats).	I liked the step by step approach, which helped when there were a lot of rules. It was also nice to have the bot there for when I did have questions.	The instructions weren't very flexible to follow. Sometimes you would just have a quick question or something you wanted to look up during game play, but it was difficult to get to the right part of the instructions. The chatbot answers wouldn't always work, but when they did, they managed to fix this issue.
What did you like most about the companion application?	Trackers for player items and the hunt track. The turn-by-turn	QnA bot.	Chat bot. Set up instructions.	player stats tracker. Chatbot.

	tracking of hp, echoes etc for individual players was very helpful			
What did you like the least about the companion application?	Sometimes found the gameplay instructions difficult to follow, feels like the book could have done the same job.	I personally dislike companion applications with board games as a lot of my life is within a digital space so board games are an escape from "screens". Thus I have a mild prejudice against a companion app's use in a predominantly physical media.	Combat instructions were difficult to follow and I don't think they gave me all the information I needed.	fixed instruction loops - would like the tutorials to be more flexible, or not linked in to your actual game.
What, if anything, caused you frustration when trying to use the application?	Nothing	Navigation. Difficulty when moving between multiple pages for combat, and lack of central index of terms.	I got confused by the navigation around the instruction pages at times and had to refresh…	Trying to go backwards and forwards between different instructions, or trying to remember where to find descriptions of a detail
Are there any additional features you feel could be added to the application, or any existing features that should be removed or adjusted?	Adding a reminder to activate enemies after you select you have completed your turn. If each player could look at the info on their own phones at the same time it would help them strategise	Mission cards to be digitised. Combat stats (specifically health) to be added.	A feature where you can choose how detailed you want your instruction help to be. Also advice about strategy rather than just game play.	a way to follow the step by step instructions outside of your game. a full, quick and easy to read rules reference outside of a tutorial.

If you were to play 'Bloodborne: The Board Game' again, would you use the companion application in its current format, or would you choose to play the game as traditionally designed?	I would use the companion app for the player tracking, hunt track timer and for displaying monster data.	I would try playing the game traditionally while using the companion app to quickly look up key words (i.e. Stun, Stagger) and, if possible, edge-case rules which have been the subject of online discussion (i.e. Reddit forum posts needed to clarify). I've been told that the turn counter is useful for multiple player games as the turn order can be player-defined each turn (and thus causes confusion) - as an a solo player I didn't find this problematic but I understand that this is also a valuable use case.	I would probably use the app for the chat bot function, but try to see if the combat instructions were easier to follow through the book. I'd also like to try with a few other people rather than playing solo, to see if that makes the game easier.	i'd be interested to see what the game was like without the app. But i would consider having it on hand when i needed the game to be more portable or to save on space