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Mapping of the Board Game with App-Assisted Gameplay

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Abstract. Boardgame is one form of game that is presently popular. The development of board games is also interesting from board games which were originally just paper and boards, now they are starting to penetrate the digital world. Starting from board games that are present digitally, implementing a hybrid concept between physical and digital, to those that use the latest technology such as VR (Virtual Reality). The addition of digital tools or applications to board games seeks to enhance the playing experience by making games more exciting, fascinating and interactive. The existence of digital media in a board game, it is possible for intervention from digital media in the game, such as the use of audio, video, or even interactive displays. Currently there are many board games with digital applications on the market. Based on this phenomenon, with the guidance of a literature review, research was conducted on mapping board games with app-assisted gameplay. Gameplay observations are made to find out how application-assisted gameplay is implemented from the filtered board game. The results of the mapping and findings in this study can then be a propelling force for further research on the phenomenon of utilizing digital media to board games.

Keywords: *boardgames; game design; hybrid boardgames; digital app; app-assisted gameplay.*

1 Introduction

In the era of the COVID-19 pandemic, board games have become one of the most popular forms of entertainment, particularly for those confined to their homes with family or friends. According to Zachary Horton [1], an assistant professor in Pitt's Department of English, The Kenneth P. Dietrich School of Arts and Sciences who has studied bordgames among other media, according to the website www.pitt.edu/pittwire, "The interest in boardgames is a response to the existence of digital media, which is currently very popular." People are seeking more social activity and interaction because technology is isolating them; therefore, "People are constructing these social relationships, which distinguishes this genre or gaming medium from video games." Horton [1] continues. According to DW.com, the market for board games experienced a 20% increase by 2020. "Puzzle games for adults saw a 50% increase, while games for one

person saw a more than 20% increase," said Hermann Hutter, president of the German boardgames publisher Spieleverlage.

Originally, boardgames utilized only traditional physical mechanisms in their gameplay, but this has changed over time. Boardgame designers not only disregard the existence of digital technology. However, rather than fully digitizing their Boardgames, they prefer to combine physical and digital game methods by minimizing the loss of physical interaction's essence. The use of digital application media as support for board games is one of method that can be used to improve boardgames experience. The integration of digital media into the process of playing board games, or in other terms called as app-assisted board games, is an innovation itself. One of the articles on MeepleMountain.com (a website that publishes Boardgame evaluations) written by Reid Conley [2] describes one of the applications of digital media in the form of supporting applications to Boardgames Alchemists that was released in 2014. In this game, the application is beneficial for handling calculations involving randomization. Even though we can compute it ourselves, doing so will diminish the core gameplay of this game. The application's function in this game is not particularly noteworthy; it is merely a supporting component. Unlock! is a boardgame with the theme of solving puzzles, and the role of the application in this game is quite significant in the gameplay, serving as a timer for quests being completed and a source of existing visual and audible clue information, among many other functions. According to Conley [6], the use of applications in this game is sufficient to make it more enjoyable.In the view of researchers, the phenomenon of implementing digital applications in board games has not been widely discussed in the research. However, reseachers found several studies that have discuss about the application of digital media in a boardgame.

Thus, the purpose of this article is to investigate a number of scholarly articles that discuss the use of digital applications in board games. It is anticipated that this article will facilitate the research of other researchers interested in related topics.

2 Literature Review

2.1 App-Assisted Gameplay on Boardgames

Initially, board games incorporated only traditional physical mechanisms into their gameplay, but this evolved over time. The existence of digital technology proves to be a fascinating aspect for boardgame designers. However, rather than fully digitizing their board game, they prefer to combine physical and digital game methods by minimizing the loss of the board game's physical interaction. Using a digital application to assist in playing board games is one option. The

application of digital media to the process of playing boardgames, or app-assisted boardgames, is unique. One of the articles on MeepleMountain.com (one of the media that publishes Boardgame reviews) written by Reid Conley [2] describes one of the digital media applications in Boardgame Alchemists, which was released in 2014. In this game, the application includes functions that are beneficial for dealing with randomization calculations. Although we can technically compute it on our own, doing so will hinder the core gameplay of this game. The application's function in this game is not particularly noteworthy; it is merely a supporting component.

App-assisted gameplay is a method that combines physical game components with a digital application that supports the game [6]. App-assisted participation can be classified as Hybrid Digital Boardgames (HDBs) in the world of board games [3][4]. This discussion is currently being scrutinized by a number of researchers, especially due to the increasing popularity of board games.

2.2 Application of App-Assisted Gameplay

Melissa J. Rogerson et al. [3][4] and Saverio Cavicchini et al. [5] presented discussions of models for incorporating digital applications on board games. In these two articles, the functions and benefits of incorporating digital applications into boardgames, referred to in the articles as HBDs (Hybrid Digital Boardgames), are discussed.

Melissa J. Rogerson et al [3][4] describe what functions can be performed by using digital applications in board games. Where the function is as follows:

Figure 1 Hybrid Digital Boardgame Model by Melissa J. Rogerson et al [3][4]

1) Timing

The Timing function in this context serves as a timer and scheduler in a game, with the Timing function remaining divided into Countdown.

Time Rounds, Track Game Time, Commence Game Event, and Sequence Time.

2) Randomizing

Researchers and respondents (both parties) in this study agreed on the function of randomization. Digital technology's ability to generate arbitrary numbers is a distinct advantage. Roll Dice, Order Components, and Generate or Select Random Events constitute the domain of the randomizing function.

3) Housekeeping

In this case, the researcher explains that the housekeeping function entails managing the game board and its components. Off the board, game designers are also demonstrating the potential for HDBs to combine card decks in new ways, generate or decide between card decks and maps or playing boards, and create or produce updates for games. This function is then subdivided into the subsequent sections: Include or omit specific products or objects Monitor in-game assets, Create or choose a board or configuration, Manage the Ai participants and NPCs, Know the position of the combatant, Display or conceal portions of the board or its components, and Update the game's content with new or revised material.

4) Inform

According to participants, designers, and researchers involved in this study, digital applications can aid in regulating the flow of information between players. This function is explained in the following sections: Describe a scenario or environment to the participants. Know secret information, prevent players from accessing specific information until a given condition is fulfilled. Communication with and between players.

5) Storytelling

The use of media or digital instruments in board games can augment and represent the game's theme and storytelling. This function is also explained in multiple sections, including Background Effects, Play scripted events, personalize participating elements or characters, and visualize a game space or element.

6) Remembering

Digital tools can record player progress and actions, providing a form of 'digital reminder' of game status and events that extend across sessions or can even span across multiple sessions. This function is also divided into several domains as follows:

Register player, Remember player progress, actions, or choices within a session, Remember players progress, actions, or choices from session to session, Produce shareable artifacts, Compare scores or results with other groups playing the same game, Take notes as a group, and Unlock achievements.

7) Calculating

According to study respondents, one of the functions of digital instruments in a video game is to perform calculations. The use of digital tools to conduct calculations saves the user time and reduces complexity; however, as previously mentioned, it can also reduce players' understanding of the game's inner workings and structure. This function is also divided into the following domains: Perform Math, resolve a result, Consider who performed something first or best. Utilize data to determine which cards, sections, or actions are superior, and determine if the players have finished an assignment they have.

8) Teaching

In that study several interviewees noted the potential for digital tools to teach games and, potentially, to make them more accessible to the general public – both by explaining the rules. The teaching function itself is divided into several domains as follows: Know the rules of a game, provide setup instructions, Explain the rules of the game, Answer specific rules questions, and Give players prompts or hints.

Then, another study by Saverio Cavicchini et al [5] that focused on Hybrid Boardgames (HBDs) from an interaction design perspective alluded to the capacity of computerization and IOT in Hybridization, which was associated with Hybrid Boardgames (HBDs). This discussion generated several significant observations regarding the benefits of hybridization in board games. The addition of computing power to board games can provide numerous benefits. The capability of the Boardgames system to perform calculations and make decisions based on its programming and instructions. The following is a list of advantages presented in the study from the perspective of players rather than game designers:

1) Cognitive Load Reduction

The first advantage of integrating computing power into board games is the potential to reduce the quantity of information that players must comprehend while playing the game. Cognitive excess can eventually lead to deficits such as carelessness and temporary paralysis of brain function caused by a highly analytical approach to playing, which can be a devoid of meaning or satisfaction. The assistance of applications or digital tools can facilitate the playing experience

by relying on data from the game itself rather than requiring players to recollect and process the information themselves, where the information generally pertains to game-affecting strategies. Leaving minor calculations and memory processes to digital tools can also relieve participants of a number of tasks while providing accurate and timely information.

2) Artificial Intelligence (AI) integration

Saverio and Ilaria stated in their article that one of the benefits of hybridization in board games is the integration of Artificial Intelligence (AI) into an analog playing experience. AI in board games can be utilized in numerous methods, including as an NPC. In the board game Zombicide, for instance, the behavior of the opponent in all conceivable situations is meticulously described in the rule book. However, it is ultimately the player who must acquire additional principles to determine the NPC's actions based on the situation, and it is the player who must carry them out. AI can be designed with a greater degree of complexity and freedom of choice, resulting in a more engaging gaming experience, because it does not require human intervention during gameplay. This is also consistent with the development of Machine Learning, which will make it possible to provide a more meaningful playing experience in the future due to the development of AI that is beginning to learn and adapt to all circumstances.

3) New Interactions and Game Mechanics

In this article, one of the advantages of HBDs is the expansive scope of game mechanics made possible by systems that interact directly with the variables of the encompassing environment (including players). The introduction of sensors and computing power calls into question the fact that human action has traditionally been the only source of input to board games, opening the system to a wider range of interactions, including with the player and the surrounding environment, as well as being viewed as a set of variables that can influence gameplay and decision-making processes. in-game. Physical parameters such as temperature, humidity, light, and sound can be influenced by the game itself to activate new mechanics automatically.

4) Hiding information on players

The final advantage of digital and analog coexistence in board games is the ability to conceal information from players. To play a board game, every item of information, event, or situation must be described in detail in the rule book, and the player must comprehend everything in order to organize the game and apply the rules accurately. Any information intended for the player must be declared because it must be displayed on the screen; otherwise, it will remain concealed.

However, at the level of coding, the information is still purposefully withheld from the player.

3 Boardgame Mapping

3.1 Mapping Methods

Mapping In the process of mapping a boardgame with an app-assisted gameplay system, some preliminary findings or actions must be taken, such as determining the boundaries or grouping criteria. Limits and criteria for grouping are based on the findings of a literature review based on the research of Melissa J. Rogerson et al [3][4] and Saverio Cavicchini et al [5]. Whereas, in this study, the criteria were divided into two major sections, based on the type of game and the function of digital applications within the game itself. With respect to specifics:

1. Grouping By Game Type

Game type classification refers to the website boardgamegeek.com, where the game type is very close to the game genre.

2. Grouping Based on Digital Apps Function and Role

Mapping based on digital application functions in the Hybrid boardgame was originally based on what had been explained by Melissa J. Rogerson [3][4], who divided it into 8 points. The researchers simplified it to 5 points to simplify research, and some of the functions described by Melissa J, Rogerson et al [3][4] can be grouped. Where the 5 points are as follows:

1) Game Masters

This role represents the functions of Housekeeping, Randomizing, Remembering, and Calculating by Melissa J. Rogerson et al [3][4] in 2021, where the application functions as a game master in a game whose primary function is to regulate how the game proceeds and assist participants.

2) Timekeeper

Timekeeper or timekeeper is a role that positions digital applications as game administrators in charge of managing and monitoring all aspects of time, including game time and the duration of each round.

3) Source of Information

The following function is as a source of information in the game, as described by Melissa J. Rogerson, et al. [3][4] in their explanation of the informing point, which regulates the flow of information to players during the game and what information players know or is confidential. In addition, the function of information source can include the teaching function.

4) Storytelling

In this role, digital applications can generate a game environment consistent with the game's concept. This ambiance can be created through the use of visuals and sound, and the implementation of technology can extend to blended media such as VR and AR.

5) Game mechanics

Digital applications as Game Mechanics can be interpreted to imply that extant digital applications have a significant impact on the game, becoming a means for players to take actions, move pieces, or even represent themselves during the game. According to Melissa J. Rogerson et al. [3][4], this point is not discussed in terms of digital application functions on boardgames, but Saverio Cavicchini and Ilaria Mariani [5] discuss it in terms of interaction locations and new game mechanics.

One of the mapping criteria that has been determined is the function of digital applications in recorded board game titles. The significance of digital applications in this context refers to the extent to which digital applications in a board game can influence the game's progression. Which is then subdivided into three criteria:

a. As a Core Component

This indicates that the digital component plays a significant role in the game. Where its existence cannot be supplanted by other elements and where games cannot be played without digital applications.

b. As a Replaceable Component

In this category, digital applications play crucial roles in games, such as game masters or game mechanics, but these roles can be filled by humans or other components.

c. As an Additional Component

In this category, digital applications play significant roles in games, such as game masters or game mechanics, but these roles can also be played by humans or other components.

The process of grouping the roles of digital applications in the board game that is documented in this game refers to the outcomes of observations made regarding the board game's gameplay.

3.2 Boardgame Data

This is a list of boardgames with app-assisted gameplay used. (this list is based on database from boardgamegeek.com)

The Bad Karmas and The Curse of the Zodiac	Fuse	Stop Thief
Madorica Real Estate (steam)	Atmosfear: Interactive App Edition	Detective: A Modern Crime Board Game
Dropmix	Forgotten Waters	Cryptid
Mask Of Moai	Clank! In! Space!	The Search for Planet X
The search for lost species	Flatline	Destinies
Unlock!	Lands of Galzyr	UBOOT: The Board Game
XCOM the boardgame	World of Yo-ho	Sea of Legends
Chronicle of Crime	Morse Karuta	Air Scarmush: Tactical Flight Contest
Mansion Of Madness: Second Edition	Expedition: The Roleplaying Card Game	DemLoc
Yummy Yummy Monsyer Tummy	my father's work board game	Alchemist
Lord Of The Rings: Journeys In Middle Earth	Werewords	
Descent Legends Of The Dark	Escape Tales: The Awakening	
Last Defense!	Return To Dark Tower	
Beasts of Balance	飛び出すAR 恐竜パズル　ディノバーン Dinobaan	

Figure 2 Board games with app-assisted gameplay list for this study

3.3 Mapping Result

The following illustration is the consequence of the mapping that has been performed. The titles of screened board games are categorized according to the type of board game and the function of digital applications in the gameplay. Then, it is accompanied by a description of the digital application's functions.

Tipe	Main Component	Game Master	Time Keeper	Source of Information	Storytelling	Game Mechanic	Replaceable Component	Game Master	Time Keeper	Source of Information	Storytelling	Game Mechanic	Additional Component	Game Master	Time Keeper	Source of Information	Storytelling	Game Mechanic
Children	**Yummy Yummy Monster Tummy**	O			O	O	**Dinobaan AR**			O		O						
Family	**Stop Thief**		O	O	O	O							**Fuse**		O			
Family, Party	**Beast of Balance**		O			O												
Family, Thematic							**World of Yo-Ho**	O		O		O						
Party	**Dropmix**	O	O			O	**Werewords**	O		O	O							
Strategy	**Cryptid**		O	O	O	O							**Flatline**		O			
Thematic	**The Search of Planet X**	O		O		O							**Alchemist**	O		O		
	Madorica Real Estate (steam)	O	O	O	O	O	**Expedition: The Roleplaying Card Game**		O	O		O	**Forgotten Waters**			O		
	Unlock!	O	O	O	O	O	**My Father's Work Board Game**		O	O	O		**Lands of Galzyr**			O	O	
	XCOM the boardgame	O	O	O	O	O	**Escape Tales: The Awakening**			O		O						
	Chronicle of Crime	O	O	O	O	O	**Return to Dark Tower**	O		O								
	Mansion Of Madness: Second Edition		O	O	O	O												
	Lord Of The Rings: Journeys In Middle Earth	O		O	O	O												
	Descent Legends Of The Dark	O	O	O	O	O												
	Detective: A Modern Crime Board Game	O		O		O												
	Destinies	O		O	O	O												
Thematic, Wargames	**UBOOT: The Board Game**		O	O		O												
Uncategorized	**The Bad Karmas and The Curse of the Zodiac**	O		O	O	O	**Morse Karuta**	O				O	**Atmosfear: Interactive App Edition**		O		O	
	Mask Of Moai	O	O	O	O	O							**Clank! In! Space!**	O		O		
	The search for lost species	O		O		O												
	Last Defense!	O	O	O														
	Sea of Legends	O	O		O	O												
	DemLoc	O		O		O												
Wargames	**Air Scarmush: Tactical Flight Contest**			O		O												

Figure 3 Mapping of the board games with app-assisted gameplay result

Result By Game “Type”

From the results, it can be seen that "thematic" is the type that is most common on the list, and that, of all the board game titles recorded, the use of digital applications as a central component is the most prevalent.

In this form of Thematic board game, the rules and mechanisms are intended to convey the game's theme. Unlock! and Chronicle of Crime provide examples of collected data, as both games have a similar approach to game mechanics, namely solving puzzles. In games of a thematic nature, digital applications play a significant role in the gameplay. With digital applications, the atmosphere or motif of the game can be enhanced by the application's background sound. Then, the process of solving existing puzzles becomes more challenging as players concentrate not only on clues in the form of cards or paper, but also videos, images, sounds, and virtual spaces that appear through VR. This is also consistent

with how digital applications function in games; based on the collected data, it can be seen that many thematic-type games use digital applications as a narrative function that can bolster preexisting themes in a board game.

Figure 4 VR implementation on Cronicle of Chrime Boardgames (Source: Screenshot from gameplay video on Youtube.com)

Then, a second function is extensively utilized as an information source in digital applications. The table demonstrates that the majority of thematic board games with app-assisted gameplay utilize digital applications as information sources. Digital applications are indeed effective at encapsulating the game-related information required by participants. As in the boardgames Unlock! and Chronicle of Crime, where information can be stored in a more organized manner, including what participants may and may not know, and as a source of information required to complete the game.

According to boardgamegeek.com, the next type is "Uncategorized", which means it has not been categorized in detail. The board game Mask of Moai is an excellent example of a board game that employs app-assisted gameplay. According to the author, the board game Mask of Moai can be classified as a Family game. This board game requires players to explore a labyrinth in virtual reality to map the creatures contained in the game, and then to replicate those creatures using the provided clay.

Figure 5 Replicate creature with clay on Mask of Moai Boardgames (Source: Screenshot from gameplay video on Youtube.com)

The party type is another variety that may seem less popular but is worthy of discussion. The game DropMix provides an illustration. The function of digital applications in DropMix also contributes to the game's overall concept. Whereas in this game, the existence of digital applications with aural and visual assistance will be of great assistance to the concept of mix-and-match music.

Figure 6 DropMix gameplay (Source: Screenshot from gameplay video on Youtube.com)

Three categories of children are featured in the Yummy Monster Tummy game, where digital applications can attract children's attention to play the game. In particular, the visualization and intriguing mechanics.

Figure 7 Yummy Yummy Monster Tummy gameplay (Source: Screenshot from gameplay video on Youtube.com)

Result By Digital Apps Fuction and Role

From the mapping results there is also a tendency that in boardgames that implement digital applications as their core components, the average function covered by digital applications is between 3 and 5 functions, although in some

cases only 2 functions are covered, such as in the AirScarmush board game. In addition, in the digital application category as the core component of the titles recorded, all of them utilize digital applications as the game mechanic of the board game. In the category of digital applications as replaceable components, the functions covered are not too many, only around 1-3 and several board games apply their digital applications as game mechanics. The difference is that game mechanics in this category are game mechanics whose function is not very significant or can be replaced by other components, such as the Morse Karuta board game where the digital application functions as a source of sound from Morse code in games, where this function can still be replaced by other components. others, such as the whistles of players. Whereas in the category of digital applications as an additional component, functions replaced by digital applications tend to be fewer, around 1-2 functions.

According to research findings, digital boardgame apps serve as a source of knowledge, a game mechanism, and a storytelling tool. The storytelling function is used in recorded boardgames rather frequently, at least according to the findings of Melissa J. Rogerson et al. [3][4]'s study. The ability to narrate stories is said to boost the board game's originality. The capacity to control the flow of information and store information is a benefit of playing board games. The function of the source of information is also pretty commonly applied. in agreement with the findings of Saverio Cavicchini et al's [5] study on lowering players' cognitive burden. In addition, Saverio Cavicchini et al. [5] claim that the presence of digital applications in a board game might result in a new game mechanic that is not just an extra mechanic but even takes over as the primary mechanic of the game.

Based on the results of the mapping and analysis, it can be seen that the function of digital applications as game mechanics can strengthen the role of the digital application itself in a board game with app-assisted gameplay, although this must also be clarified with details on what kind of game mechanic is being replaced by a digital application.

4 Conclussion

In this study, we found benefits, functions, and examples of the implementation of digital applications in boardgames. Also produced a map of the boardgame that develops the concept of app-assisted gameplay. From Melissa J. Rogerson dkk [2] and Saverio Cavicchini dkk[1] can be drawn the conclusion that digital media can alert the cognitive burden of the player because some activities that should be performed by the player depends on the presence of the digital media, such as the player no longer need to count the game because it has been replaced by the application. The results of the mapping that has been done indicate that

board games with the Thematic type are the most implemented app-assisted gameplay and this also opens up further possibilities for the emergence of detailed research of the phenomenon. In addition, there are also other types – types that are quite fascinating to discuss, such as the type of children that can present a more interactive and engaging visualization for children with the aid of digital applications. From the results of mapping also emerged a trend where more and more functions conducted by digital applications make the role of the digital application in the game so essential that it can be considered to be a central element of the game itself. However, some functions of digital applications in a board game can still be supplanted with other components, such as a pawn, timer or a game master. In fact, there is also that the digital component is not required at all to operate the game, and only as a supplement.

In this study we see the potential of further investigation of the application of digital media in a boardgames to deepen the potential – existing potential and a more comprehensive explanation of findings – the existing findings. Further research on the correlation between board game types and the application of digital applications in board games is also required to provide additional information about the concept of app-assisted gameplay.

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