A Random Bored

How randomization in cooperative board games create replayability and tension

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Abstract
This paper examines five cooperative board games from the perspective of how randomization is used and how it affects the replayability and player strategy, with the intent to properly identify and categorize elements that contribute to replayability and tension and uses randomization to do so. Each element directly affected by or causes randomization is identified, explained (both what it does and how and what it affects), and categorized based on where in the game the randomization originates in the effort to create a base for game designers to get a better understanding of randomization, if and how they can use it, and which method of using it that can be useful for their own designs.

The thesis discusses the impact of using certain randomization elements and draws some conclusions based on how they relate to the replayability and tension of games that use those elements.

Key words: board games, cooperative, randomization, replayability, tension
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1 Introduction
Cooperative board games is a relatively new genre of games within the board game industry but have risen to become one of the most popular genres in a very short period of time. In a cooperative board game, players work together toward a common goal and against the game itself rather than competing against each other.

This is where randomness as mechanics comes in. Instead of having an opponent that makes decisions to further their own goals or interfere with the player, a cooperative board game uses card draws, dice tossing, or other mechanics to challenge the players and make the game different for each play session.

1.1 Personal Motivation
I've always been interested in randomness and how it is used in games. While I must say I don’t always enjoy the thought of rolling a (figurative) die to determine my outcome in a battle, or whether or not I get a reward from my hard work of defeating a big dragon in a video game, I've found it fascinating how the game benefits from having these random elements and mechanics, and how randomness can be used to create challenges and make games play and feel different each time they are played, each play session generating its own story and outcomes in an otherwise static environment.
2 Background
Most of the material found has been based on video games and although most things stated is general game design and thus can be applied to board game design, I’ve found a lack for specific game design about board games.

For the purpose of this thesis, the definition of a board game (or tabletop game) is a game played with physical components on a physical play area marked out beforehand, usually (but not necessarily) by some sort of board. A board game is enforced only by its rulebook and the players themselves.

To make the example more similar to single player mode in digital games, and to remove the element of a human opponent, further specification is made in this thesis and thus only bring up cooperative board games. Cooperative board games are board games where players play together to achieve a common goal rather than playing against each other.

2.1 Concept of Replayability
“In principle, any game should be replayable. If you went down to the toy store, bought a board game in a box for twenty or thirty dollars, and then came home to discover that you could only play it once, you would be rightfully wrathful.” (Adams 2001a)

In games, it is often talked about replayability as a quality of a game, sometimes called Replay value, which can be described as “a type of affective capital generated by a game’s ability to be entertaining despite having already been played.” (Booth 2015)

Bruce Shelly states that “It is better to create a game that can be played over and over, rather than one that is usually played only once. Providing replayability increases consumer satisfaction and the perceived value of the game.” (Shelly 2001)

Frattesi and his colleagues agree, linking replayability as a factor in making a game more attractive for gamers and influential in making the game sell more copies and Adams says that games with high replayability achieves respect from both players and designers. (Frattesi et al 2011), (Adams 2001a)
2.2 Aspects of Replayability
Through their research, Frattesi and his colleagues isolated five aspects that contribute to a games replay value; Difficulty, Completion, Social aspects, Randomization, and what they call “The Experience”. (Frattesi et al 2011)

The aspects are defined as follows:

- **Difficulty**: An increasing performance curve that provide an increasing challenge for players. (Adams 2001b). The difficulty aspect causes a willingness within a player to practice on the lower levels and beat the hardest level to master the game as well as holding player interest as their skill increases. (Frattesi et al 2011)
- **Completion**: Is to make a game impossible to be experienced in full in one play through, thus the game will need to be replayed to be completed. (Frattesi et al 2011)
- **Social**: Encapsulates multiplayer and social interaction between other players. Social interactions around a game increase its success. (Kline 2009)
- **Randomization**: Deals with players not always knowing what is going to happen in a game through random elements within the game. Tekinbas and Zimmerman states that “... it is crucial in a game that players don’t know exactly how it will play out. Think about it: if you knew who was going to win a game before it started, would you even bother to play?” (Tekinbas and Zimmerman 2003).
- **“The Experience”**: Happens when a game goes beyond simple mechanics and becomes successful because they bring something unique to a player. (Frattesi et al 2011).

Frattesi and his colleagues state that these aspects are to a degree subjective, “The Experience” being the most subjective as they were unable to precisely isolate what the games do to achieve “The Experience”. (Frattesi et al 2011)

2.2.1 Applying the Aspects to Board Games
The five aspects that Frattesi and his colleagues have defined all carry unique directions that this thesis could take when attempting to apply an aspect of replayability to board game design. (Frattesi et al 2011)

The difficulty aspect, the social aspects and “The Experience” have less to do about the game as they do about the players. Board games are more often than not for multiple players in the same physical space and requires some form of social interaction so any thesis looking into these aspects should probably look less on the games themselves and more on the players.

What’s left is the completion and the randomization aspect and of the two, randomization is the one that can be most applied to board game design, and so I have chosen to focus the thesis on identifying parts of the rulebooks of some specific board games to bring out examples of how randomization can be used to achieve replayability in board games.
2.3 Skill Versus Luck
Ernest Adams states that the skill of the player must be the primary factor in determining a player’s success, and because of this he gives some examples in chapter 11 in his book *Fundamentals of Game Design Second edition* that are as follows:

- Use chance sparingly
- Use chance in frequent challenges with small risks and rewards
- Allow the player to choose actions to use the odds to his advantage
- Allow the player to decide how much to risk

Or to summarize, chance should not be used to determine outcomes of large magnitude unless the player explicitly chooses to take that risk, and has an option not to do so. (Adams 2009)

2.4 Fairness in a Cooperative Board Game
In his book *Fundamentals of Game Design second edition*, Ernest Adams lists six things to keep in mind when designing PvE (Player versus Environment, meaning games where one or more players play together against the game) games and how to make them fair to the players. (Adams 2009) They are as follows:

- A game should offer a challenge at a consistent maximum level of difficulty with no sudden spikes because if a game should suddenly become much harder, players perceive it as the game being unfair.
- The game should not suddenly cause the players to lose without any warning and without the players being able to prevent it.
- A stalemate should never occur between the player and the game.
- A player should not be asked to make critical decisions without having the information they need to make an adequate decision.
- Factual knowledge required to succeed should be contained within the game.
- Challenges normally not presented in the game’s genre should be avoided.

Overall, randomization should not cause sudden negative surprises while the game itself should not present challenges that in and of themselves are negative surprises for the players.

Soren Johnson agrees, stating that luck should be avoided to generate “nasty surprises” and risks of becoming noise, unable to be predicted by the players, if used inappropriately. (Johnson 2009)

Johnson goes on to explain how probability is an important concept to keep in mind in game design and that designers will need to ask themselves if luck is helping or hurting the game, and what role it should have within the game itself. (Johnson 2009)

He states that probability is one of the most useful tools a designer have when making a game, and that luck can make a game more accessible and easier to play because less skill is required and thus makes a game easier to win without being highly skilled at it. (Johnson 2009)

Mark Rosewater states that randomness allows a player to react to what the randomization caused, that it creates surprises for the players, and it causes variance in the gameplay that would otherwise always play out the same way all the time. (Rosewater 2009)

He does however also state that randomization can cause frustration for the players by consistently not providing the players with the outcome they anticipated or hoped for. This
can cause players to feel less powerful and create repetition by giving players a string of bad luck which prevent them from achieving what they want to do. (Rosewater 2009)

According to Rosewater it is very important to think about is how players perceive randomness and that players hate the appearance of randomness. He links this to the market research done by the game publishing company Wizards of the Coast that publishes the very popular collectable card game Magic the Gathering. He states that their research shows that cards with high perceived randomness, such as cards that uses coin tosses or die rolls are less popular because of their inconsistency to generate an outcome that players want. (Rosewater 2009)

It should be noted that players play games for different reasons, and that fun can be experienced in many ways. Raph Koster brings up this subject in his book A Theory of Fun for Game Design. (Koster 2005)

Koster states that game exhibit patterns that players discover and find fun in getting both confirmed, and broken from. He states that playing a game that offers little or no difficulty or variety can be boring, just as a game that is too hard and too random can be frustrating. (Koster 2005)

Finally, he defines Fun as the act of mastering a problem mentally. (Koster 2005)

In this thesis, it is thus be assumed that players can have fun in the game thanks to the game presenting problems and patterns to master, and that a player’s fun is not only reliant on winning the game. (Koster 2005)
2.5 Study Cases
The board games that will be studied in this thesis were selected mainly because of their mechanics, components and difference in theme. Some consideration has been made as for their popularity but that consideration is purely based on the author’s search on the board game database website BoardGameGeek (boardgamegeek.com) and the board game reviewers network The Dice Tower (dicetower.com).

Less consideration has been made based on sale figures of the games or their sales price in order to make sure that the thesis doesn’t discriminate against factors that are mainly outside of actual mechanics design, however the game had to be readily available for the thesis’ author in order to ensure an accurate analysis.

The board games selected are:

- **Pandemic**, designed by Matt Leacock and published by Z-man Games.
- **Castle Panic**, designed by Justin De Witt and published by Fireside Games.
- **Forbidden Desert**, designed by Matt Leacock and published by Gamewright.
- **Elder Sign**, designed by Richard Launius and Kevin Wilson and published by Fantasy Flight Games.
- **Dead of Winter**, designed by Jonathan Gilmour and Isaac Vega and published by Plaidhat Games.

The board games are studies as base games, meaning the study does not contain any expansions to any game in the study. Some notes, discussions and conclusions may contain references to an expansion but those are noted as such and are exceptions.

3 Purpose
Cooperative board games requires players to work together against the different mechanics and components of the game. Because the game does not have an intelligence of its own, it must use other means to make itself a challenge and become more than a puzzle that can be solved and the solution reapplied each time the game is played.

The purpose of this thesis is to bring into light some of these elements of randomization with the intent to categorize them and surface them in order to provide an easy overview of their effect on the game and replayability for future projects.

To ensure a game is different each play session, many games add in various randomization elements so each time the game is played, the game’s “strategy” is different and different challenges are presented to the players. But what are those elements? How do the mechanics contribute to the overall experience of the game, and how does it relate to the replayability of the game?
4 Method
Each board game went through an analysis consisting of four rulebook overviews each with a focus to identify specific types of randomization elements, an example play through (not transcribed) to ensure that the game was properly understood and to see how the game works in practice, and a mechanics specification for the entire game with each mechanic categorized.

Ernest Adams brings up the term Variety and gives examples how to categorize how randomization contributes to replayability by mentioning two overarching ways to achieve replayability. (Adams 2011b)

These two ways are “Varying initial conditions” and “chance as part of gameplay” and can be translated into board game terms based on when they occur during a game session.

Varying initial conditions is done when players are setting up the game to be played, taking out all the components and makes the game ready to be played. In board game terms this is called Setup and to keep this thesis leveled with those terms, one of the overarching categories is defined as Setup. For the purpose of this thesis, decks that players utilize is defined as being part of the setup, and decks that the game utilizes are not even though they are both usually shuffled at the start of the game. The reason for this is explained below.

Change as part of gameplay however, is a bit too broad as there are two ways chance can happen during gameplay depending on what initiates the chance – the player or the game.

Player actions that initiate a chance element is placed in its own category aptly named Player action. These mechanics are significantly different from others as they are not automatically initiated and players usually make a choice in taking the action that initiate the randomization.

When the game initiates a chance element, this is done either through the base rules themselves or a component, for example a card drawn. For the purpose of this thesis, the category for a chance initiated by the base rules is called Encounter due to that the chance is encountered by the players from a rule, often being a challenge for the players. This includes cards being drawn from a deck that has been shuffled that shows what the game is doing.

Finally, components are able to initiate their own randomization outside of the confines of the rulebook. When initiated by a component, the act is usually originally initiated by something else (like drawing a specific card), however the act of chance is caused by the component such as a card or a cardboard tile. The difference between initiating from a rule and from a component is that the rules are always active while the component is only active when it is active itself. This category is called Component.

Using these four basic categories, each mechanic is analyzed and categorized for easier structure.
4.1 Analysis Process

In order to properly identify all mechanics that uses randomization, each game’s rulebook was put through an analysis process in four stages.

The purpose for each stage was to identify mechanics from one specific category of randomization, and to give insight into the game from that perspective to see how it affects the game in terms of replayability and tension.

The category is based on what generates the randomization. For example if a deck that players utilize is shuffled during the setup, then the randomization is triggered there while its outcome is generated later when cards are drawn, and so it is considered to be part of Setup, not Encounter. A deck of cards is considered part of setup even though it may be shuffled as a result of running out of cards (at which point the discard pile of used cards are shuffled and used as a new deck), as is done with the player cards in Castle Panic.

This is however not true for decks that the game itself utilizes as the randomization originates from the game where the card drawn is simply what action the game takes, and cards that players receive as part of doing something as opposed to simply drawing them as part of all of their turns. These decks are considered part of the Encounter, as players or the game takes an action to encounter them.

4.1.1 Setup

- **Purpose:** To identify mechanics that happen when the game is setting up to be played. This includes (but is not limited to) shuffling of decks, selection of components and player roles, and component placement.
- **Process:** As the name suggests, the entire rulebook was given an overview but the focus was on the initial setup of the game.
- **Desired result:** Each randomization aspect that is part of the initial setup was identified and explained.

4.1.2 Player Actions

- **Purpose:** To identify mechanics that are directly initiated by an action taken by a player. This includes throwing dice to resolve a challenge or playing a card from hand to initiate a specific action.
- **Process:** The rulebook was reviewed with the focus on what players are able to do in the pursuit to identify actions which involved randomization.
- **Desired result:** All actions that players take that uses a random element as part of the action was identified and explained.

4.1.3 Encounters

- **Purpose:** To identify actions that are initiated by the rules during the game.
- **Process:** Review of the rulebook again but this time focus on things like turn order and anything that might happen during a player’s turn that is not part of a player’s action.
- **Desired result:** A comprehensive list of all instances where the rules of the game causes something to happen by itself, lending to a randomization effect.
4.1.4 Components

- **Purpose:** To identify how an individual component affects overall game experience, each component had to be analyzed in detail with the specific focus on how it related to randomization and replayability.

- **Process:** Each unique component was studied and compared with what purpose it has and how it is played within the game.

- **Desired result:** Most, if not all, components that has a chance to be used in the game was identified and explained of how its use affects the outcome of a game, or components that themselves utilizes chance.

All of the mechanics that were identified was then summarized and categorized into tables for easier overview of them.
5 Analysis
Using the method described, each individual board game was given a specific in-depth analysis, and from that analysis a summary of each randomization element was made and compared across games.

It should be noted that while these analyses does give an overview of the games and how they are played, the focus of the analyses is to identify the elements that uses randomization and any overview and explanation beyond those elements is made to place the elements in context so that their effects can be understood.

In the thesis, each mechanic is summarized and categorized, and its effect on the gameplay and replayability is explained. For a more detailed analysis and explanation of the mechanics in the games, see the matching appendix for that game.
5.1 Castle Panic

In Castle Panic, players are working together to defeat monsters (represented by monster tokens) that are attacking their castle and must defeat them before they reach the castle (made up of tower pieces and wall pieces) and destroy it.

![Setup of Castle Panic](image)

**Figure 1: Setup of Castle Panic (Thålin 2015)**

The board is made up of a hexagon divided into what the game calls rings and six arcs in three different colors (red, green, blue), two arcs for each color. There are four rings and a center, and each arc is divided into two and numbered one to six. The tower pieces are located in the center, one in each arc, and wall pieces are located between the center and the first ring, also one in each arc.

Players take action by playing cards that deal damage to the monster tokens. Most cards have limitations on which color, arc and ring that they can hit. At the end of each players’ turn, the monsters move one space towards the castle and should they hit a tower piece or a wall piece, it is destroyed.

Players will have to take chances discarding cards to get cards that they can use, and trade cards to match the capabilities of their cards with where the monsters will be on a player’s turn.

After moving, additional monsters are drawn from the supply and the game ends when all monsters have come out on the field and been defeated, or when all of the tower pieces have been destroyed.

See Appendix A: Castle Panic for a more detailed analysis and explanations for the mechanics in this game.
5.1.1 Mechanic Summary

The following mechanics that uses randomization were thus identified and explained.

<table>
<thead>
<tr>
<th>Mechanic</th>
<th>Category</th>
<th>Explanation</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Castle cards</td>
<td>Setup</td>
<td>Players draw the cards from a deck that influences what the players can do in the game. The deck is shuffled at the start of the game, and should it run out, its discard pile is shuffled and used as a new deck.</td>
<td>Players can never be sure what cards they get and what they are able to do. No strategy is guaranteed to succeed as player cards must align with the monsters that are already out on the board.</td>
</tr>
<tr>
<td>Monster token pile</td>
<td>Encounter</td>
<td>Players draw three monsters from a pile of monster tokens at the end of each turn to generate new monsters. Pile is finite and will run out.</td>
<td>In each session the order of which the monsters are drawn is different.</td>
</tr>
<tr>
<td>Monster token placement</td>
<td>Encounter</td>
<td>A six-sided die is rolled to determine the arc where a drawn monster token is placed.</td>
<td>Tension for placing the monster tokens is increased as it can cause the monsters to align with player cards, or potentially cause one area to get multiple monsters while another area get almost no monsters.</td>
</tr>
<tr>
<td>Boss and monster effect tokens</td>
<td>Component</td>
<td>Special monster tokens that can provide great challenges for the players when drawn such as drawing additional tokens or forcing players to discard a certain type of card.</td>
<td>Tension for the drawing of tokens is increased as it might generate a specific token at a time where it might do the most harm to the players.</td>
</tr>
</tbody>
</table>
5.2 Pandemic

In *Pandemic*, each player takes the role of a medical team in charge with finding cures for four different diseases that are spreading around the world, indicated by cubes of the respective color that are placed in the city where the disease is present.

![Setup of Pandemic](image)

**Figure 2: Setup of Pandemic (Thålin 2015)**

The board is made up of a world map with major cities marked with circles at their respective location in the real world along with connections to other cities indicated by lines. Each city is single-colored in one of four colors that matches the color of one disease. In addition, the board also features two tracks indicating how many outbreaks that have happened during the course of the game, and the infection rate track which indicates how many infection cards are drawn, and thus how fast diseases appears.

Players take turns doing four actions, and then ends by drawing cards from two different decks, one that's mainly beneficial to the player, and one that shows where diseases are spreading. On their turn, a player can move from one city to a connecting city, cure diseases by removing cubes in the city they are in, trade information with other players, and some other special actions.

The game ends either when all four diseases have been cured, which means the players have won, or in one of three kind of defeat; when 8 outbreaks have occurred, when players are unable to add more cubes of a disease that has spread, or not having enough player cards left when a player is supposed to draw them.

To find a cure for a disease, players will need to collect four of the same color of city cards (a city card matches a city on the board) that matches the disease they want to cure, and turn them in together in a city where there's a research station. Players are supposed to keep their cards in their hand but they are able to share the information of what they have with other players.

See **Appendix B: Pandemic** for a more detailed analysis and explanations for the mechanics in this game.
## 5.2.1 Mechanic Summary

The following mechanics that uses randomization were thus identified and explained.

<table>
<thead>
<tr>
<th>Mechanic</th>
<th>Category</th>
<th>Explanation</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Player roles</strong></td>
<td>Setup</td>
<td>Each player is given a player role that has special abilities. These can be selected randomly.</td>
<td>Players can play different roles from one play session to the next.</td>
</tr>
<tr>
<td><strong>Initial infected cities</strong></td>
<td>Setup</td>
<td>Cards drawn from the Infection deck during the setup is infected with diseases.</td>
<td>Players will need to consider how the initial infected cities affects their strategy in the game.</td>
</tr>
<tr>
<td><strong>Player deck</strong></td>
<td>Setup</td>
<td>Players draw player cards at the end of their turn. The cards are part of the object of the game and players need to collect them and turn them in to win. The cards can also be spent to get special actions. The deck is only shuffled once at the start of the game and players receives some cards to start with.</td>
<td>Players are not sure when they will be able to collect enough of the cards needed and which player gets which card.</td>
</tr>
<tr>
<td><strong>Infection deck</strong></td>
<td>Encounter</td>
<td>Infection cards decides where diseases are placed and they are drawn at the end of a players turn. The deck is shuffled at the start of the game.</td>
<td>Players will not know which cities gets infected or when they get infected.</td>
</tr>
<tr>
<td><strong>Epidemic cards</strong></td>
<td>Encounter, Component</td>
<td>Special cards that resides in the Player deck that when drawn causes the bottom most card of the Infection deck to be drawn and infect that city with three disease cubes, increases the infection rate that governs how many infection cards are drawn at the end of each turn, and the cards already drawn from the Infection deck is shuffled and placed on top of the Infection deck.</td>
<td>Tension for drawing player cards are greatly increased since players can never know when an Epidemic card will be drawn. When one has been drawn, players can somewhat anticipate which cities will be most likely affected soon. It makes the game harder but is outside of player control, and reduces the amount of player cards a player receives at the end of the turn by one for each Epidemic card drawn.</td>
</tr>
</tbody>
</table>
5.3 *Forbidden Desert*

In *Forbidden Desert*, players are stranded in the desert and have to fend off the sun and the sandstorm to survive the heat and find four parts to a flying machine that's hidden in the dunes of the desert.

![Figure 3: Setup of Forbidden Desert (Thålin 2015)](image)

The board is composed of a five by five grid of square tiles with a hole in the center representing the sandstorm. Each tile is two sided and they all start with the desert-side up. During the course of the game, players will have to move their pawns onto these tiles and flip them to find the location of the four parts of the flying machine.

Each player takes turn taking a total of four actions, and then ending their turn by drawing cards from the Storm deck which will show how the storm moves as time progresses. As the storm moves, sand is shifted onto the tiles in the forms of sand tokens that can hinder players from moving onto and from the tile.

On their turn, a player can move from one tile to another adjacent tile (cannot move diagonally), clear sand from the tile, excavate to flip the tile the player is on to show what the space hides, and pick up one of the parts. In addition to this but not costing an action, a player may share water and/or pass equipment cards to players that are on the same tile as the player.

The game ends in victory if all parts have been picked up by the players and each player's pawn is on the launch pad tile. Should any player die of thirst by running out of water, or the sand meter that indicates how many sand cards are drawn reaches the highest level, or a sand token is to be added when there are none left, the game ends in defeat.

See **Appendix C: Forbidden Desert** for a more detailed analysis and explanations for the mechanics in this game.
### 5.3.1 Mechanic Summary

The following mechanics that uses randomization were thus identified and explained.

<table>
<thead>
<tr>
<th>Mechanic</th>
<th>Category</th>
<th>Explanation</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Player roles</strong></td>
<td>Setup</td>
<td>Each player is given a player role that has special abilities. These can be selected randomly.</td>
<td>Players can play different roles from one play session to the next.</td>
</tr>
<tr>
<td><strong>Desert tiles</strong></td>
<td>Setup</td>
<td>The Desert tiles that makes up the play area are shuffled and placed out in a grid face down. The desert tiles contains various places within the desert.</td>
<td>Players are unable to know which tiles they need to turn in order to achieve their goal and the board is different for each play session.</td>
</tr>
<tr>
<td><strong>Storm Deck</strong></td>
<td>Encounter</td>
<td>Storm cards affect how the Storm moves and also hides various special cards that makes it harder for the players when drawn. Storm cards are drawn at the end of a players turn. The deck is shuffled at the start of the game and when it runs out the discard pile is shuffled and used as the new deck.</td>
<td>Players will not know how the storm moves or when certain effects will happen.</td>
</tr>
<tr>
<td><strong>Gear cards</strong></td>
<td>Encounter</td>
<td>When a player turns a desert tile that reveals itself to be a Gear tile, the player that turned it draws a Gear card from the Gear deck, giving them a one-time use card that can be used at any time during the game. There are different kinds of Gear cards that give players a specific effect.</td>
<td>Players receives a benefit at random that helps them. Depending on the Gear card they receive, they can change their strategy and tactics based on which player got the card, and its effect.</td>
</tr>
<tr>
<td><strong>Storm Picks Up</strong></td>
<td>Component</td>
<td>Causes the Storm meter to rise which in turn increases the amount of cards being drawn after each turn, and thus makes the game harder. Can potentially cause the game to end in defeat if the Storm meter reaches max level.</td>
<td>Ensures that the game becomes harder at a random intervals. Otherwise gives players a respite since the storm doesn’t move.</td>
</tr>
</tbody>
</table>
(Mechanic summary cont.)

<table>
<thead>
<tr>
<th>Mechanic</th>
<th>Category</th>
<th>Explanation</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun Beats Down</td>
<td>Component</td>
<td>Causes players not in shelter to lose water, reducing their water count by 1.</td>
<td>Increases the tension of drawing Storm cards since Sun Beats Down cards can cause the game to end in defeat, should a player be without shelter or water when drawn. It also cannot be predicted when it will be drawn, but may cause players to want to stay in shelters. Otherwise gives players a respite since the storm doesn’t move.</td>
</tr>
</tbody>
</table>
5.4 Elder Sign

In *Elder Sign*, each player takes up the role of investigators inside a museum working to find clues and *Elder Signs* in the effort to keep an ancient horror called an Ancient One from awakening. The game is based on *Lovecraft's Cthulhu Mythos* and players use dice to complete various tasks to attempt to complete adventure cards and must collect enough *Elder Sign* tokens before the Ancient One can collect enough *Doom* tokens to awaken and win.

![Figure 4: Setup of Elder Sign (Thålin 2015)](image)

*Elder Sign* does not have a regular board. Instead, the play area is made up of large adventure cards that contain the tasks that players can face, as well as the clock that moves at the end of a players turn, sometimes striking midnight and causing a mythos effect to happen, and the Entrance card that shows three special actions that players can take instead of going on adventures.

On their turn, a player moves their investigator marker onto an adventure card and then rolls dice to attempt to complete the tasks listed on the card by getting dice faces that match the dice faces listed on the task. A player can reroll their dice by discarding one die until they only have one die left. If the player manages to complete the tasks, they get the rewards listed on the card, but if the player fails, they suffer the penalties listed instead.

The game ends in victory if the players manages to collect enough *Elder Sign* tokens that is required to seal away the Ancient One that they are facing. The game ends in defeat if the Ancient One fills up on *Doom* tokens on its *Doom* track and awakens.

See Appendix D: *Elder Sign* for a more detailed analysis and explanations for the mechanics in this game.
5.4.1 Mechanic Summary
The following mechanics that uses randomization were thus identified and explained.

<table>
<thead>
<tr>
<th>Mechanic</th>
<th>Category</th>
<th>Explanation</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investigators</strong></td>
<td>Setup</td>
<td>Each player is given a player role that has special abilities. These are be selected randomly. Should a player die, they draw a new investigator to replace the dead one and continues playing.</td>
<td>Players can play different roles from one play session to the next.</td>
</tr>
<tr>
<td><strong>Player items</strong></td>
<td>Setup</td>
<td>Players are given items based on what the investigators show to start with.</td>
<td>Since the items are drawn from their respective item deck, the effects they give is based on the items they receive.</td>
</tr>
<tr>
<td><strong>Ancient One</strong></td>
<td>Setup</td>
<td>The Ancient One card affects which Ancient One players will be facing. This can be selected randomly.</td>
<td>The different Ancient Ones represents the opponent that players are facing which means each play session players can face different opponents with different effects and lore.</td>
</tr>
<tr>
<td><strong>Initial adventure cards</strong></td>
<td>Setup</td>
<td>Six adventure cards are drawn at the start of the game.</td>
<td>Players face different challenges based on which cards are drawn and may need to have a different initial strategy based on that.</td>
</tr>
<tr>
<td><strong>Player dice</strong></td>
<td>Player action</td>
<td>When attempting to complete tasks, players roll dice in an attempt to match the resulting symbols of the die to the symbols on the task.</td>
<td>Players can (almost) never be sure if they are going to succeed or fail to complete a task.</td>
</tr>
<tr>
<td><strong>Adventure cards</strong></td>
<td>Encounter</td>
<td>Adventure cards provides the various challenges for the players and has some story written on them.</td>
<td>Players will not know what they will face in the future, but can choose between multiple different adventures to attempt to complete and the selection is different for each play session.</td>
</tr>
</tbody>
</table>
(Mechanic summary cont.)

<table>
<thead>
<tr>
<th>Mechanic</th>
<th>Category</th>
<th>Explanation</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item cards</td>
<td>Encounter</td>
<td>The different item decks are shuffled at the start of the game (and should any run out, the respective discard pile is shuffled and used as a new deck) and contains different cards that provides different effects.</td>
<td>While a player can be sure that getting an item card is good, they cannot be sure how much the item they draw will help them.</td>
</tr>
<tr>
<td>Terror</td>
<td>Component</td>
<td>Some adventure cards have a Terror effect that is triggered when the player attempts to solve tasks on that adventure card and rolls a Terror symbol.</td>
<td>Players may be discouraged to do adventures that has a Terror die, and when a player rolls a terror symbol while on the adventure card, the player suffers a negative effect.</td>
</tr>
<tr>
<td>Monster tokens</td>
<td>Component</td>
<td>Monster tokens can add to some existing adventure cards when they are asked to be drawn. They are drawn from a pile, meaning any one monster can be drawn when asked. A monster token contains a special challenge for the players.</td>
<td>Additional challenges may be added to certain Adventure cards, making them harder than usual as well as triggering certain effects based on which monster is drawn.</td>
</tr>
<tr>
<td>Special task symbols</td>
<td>Component</td>
<td>Some tasks have special symbols such as locking a die, keeping it from being used.</td>
<td>Some task symbols have the potential to make it harder for players and cause them to want to get rid of that adventure or monster as soon as possible.</td>
</tr>
</tbody>
</table>
5.5 Dead of Winter

In Dead of Winter, players take the role of a colony of survivors of a zombie apocalypse struggling to survive one hazardous winter. Players will need to work together to complete one objective which is different for each game, as well as their own secret objective that they need to complete in order to win. The secret objectives are divided into two groups; Non-betrayal and Betrayal where the Betrayal objectives are objectives that do not require the main objective to be completed and requires the game to end in some other manner than the objective being completed. Non-betrayal objectives requires the main objective to be completed, as well an additional requirement such as holding certain items or having healthy characters.

![Figure 5: Showcase of Dead of Winter (Marc 2015, BoardGameGeek.com)](image)

The board mainly handles the colony itself, containing a morale track that shows how much morale the colony has, a round track to know how many rounds the players have left, and places for the survivor characters and zombies, both represented with standees (a plastic piece into which a cardboard piece is inserted, causing the cardboard piece to be able to stand up, the plastic piece serving as a base).

The game can end either when the morale track reaches zero, the round track reaches zero, or when the colony's objective has been completed.

See Appendix E: Dead of Winter for a more detailed analysis for explanations of the mechanics in this game.
### 5.5.1 Mechanic Summary
The following mechanics that uses randomization were thus identified and explained.

<table>
<thead>
<tr>
<th>Mechanic</th>
<th>Category</th>
<th>Explanation</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Secret objective</strong></td>
<td>Setup</td>
<td>Each player is given a secret objective that they must complete in order to win the game.</td>
<td>Players will need to do things specific to their objective as well as dealing with the main objective.</td>
</tr>
<tr>
<td><strong>Initial player characters</strong></td>
<td>Setup</td>
<td>Players are given four characters and picks two of them.</td>
<td>Player characters gives special abilities and capabilities for each player. Character abilities can align with a player’s secret objective.</td>
</tr>
<tr>
<td><strong>Exposure die</strong></td>
<td>Player action</td>
<td>Whenever a player moves or takes actions that require it, they need to roll the 20-sided Exposure die. Some sides are blank which causes nothing to happen, the other sides are either Wound, Frostbite or Bitten which causes negative effects for players.</td>
<td>The players need to take a risk when moving or performing certain actions which may discourage those actions.</td>
</tr>
<tr>
<td><strong>Continued search and Noise markers</strong></td>
<td>Encounter caused by Player action</td>
<td>Players only draw one card when searching. In order to draw more cards to choose from, a Noise marker is placed on the location for each card drawn. When zombies are placed at the end of a round, a six-sided die is rolled for each noise marker on a location. Results that end in three or less causes a zombie to be placed on the location.</td>
<td>Players are never guaranteed to get what they need when searching and can push their luck by searching for additional items to choose from. Tension when placing zombies is increased because players cannot know how many zombies will arrive at a location with Noise markers.</td>
</tr>
<tr>
<td><strong>Location items</strong></td>
<td>Encounter</td>
<td>Each location has an order of symbols that indicates how likely the item that matches the symbol can be found. Each locations search deck is shuffled at the start of the game.</td>
<td>Players can make a fair guess at what they will find when going to a specific location but is never guaranteed to receive an item they need and their continued strategy can be based on what they receive.</td>
</tr>
<tr>
<td>Mechanic</td>
<td>Category</td>
<td>Explanation</td>
<td>Effect</td>
</tr>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Crisis cards</td>
<td>Encounter</td>
<td>Each turn a crisis card is drawn that players must contribute their items to. Failure to fend of the crisis causes the negative effect indicated on the card. The crisis deck is shuffled at the start of the game.</td>
<td>Each round the players will need to deal with a new crisis that they cannot know before it is drawn, and the order and which crises appears is different for each play session.</td>
</tr>
<tr>
<td>Characters and Action die</td>
<td>Component</td>
<td>Characters have two values that relate to its respective action that players can take. Players need to spend a die with a result that matches or exceeds the respective value for that action and character. Character abilities sometimes also require an action die of a certain result.</td>
<td>Players are limited in their actions by what they roll and the abilities of the characters they have and are using to perform that action.</td>
</tr>
<tr>
<td>Crossroad cards</td>
<td>Component</td>
<td>A Crossroad card contain a conditional that triggers when fulfilled are drawn each turn by the player to the right of the active player. The conditionals are based on what the active player does or other various triggers in the game. The active player does not know the condition required to trigger, nor the effect of the card when triggered. In addition, the card contains a story segment which will be read when the card is triggered. When triggered, players are given a choice on how to proceed which determines the outcome of the card’s effect.</td>
<td>The crossroad system can create tension for the player that reads it, and for the active player. When triggered, the card gives players a bit of story and an important choice that can alter the course of the game.</td>
</tr>
</tbody>
</table>
6 Discussion
The use of randomization in cooperative board games is quite diverse. It can be used to create challenges for the players, influence how well a player action goes, and limit what a player can do on a turn, possibly forcing them to try a different strategy than what they usually do.

6.1 Difference In How The Base Component Contributes To Randomization
So what’s the difference between drawing a card from a deck, pulling a token from a bag or cup, or rolling a die? The difference is predictability, capability, and magnitude of the randomization that the component(s) allow.

6.1.1 Pair Of Dice
A die is limited to the faces that it has, and each time it is rolled, its result will be one of those faces, with an equal probability for each face. Using multiple dice of the same type and with numbers on them, and adding the results together, permits the creation of non-uniform probabilities.

For example, rolling two regular six-sided dice with the numbers one to six on the sides and adding them together will result in some numbers being generated more often than others, with the number seven being the most likely to be rolled, while the numbers two and twelve the least likely. Knowing this, a designer can use the probability of something being rolled, and players can use that knowledge (if presented to them, or as a result of discovering it on their own) to wager their odds of success.

Without a numerical value, like in Elder Sign, each regular die has an equal chance of rolling a specific result each time. This means that there is no guarantee for a player to successfully roll the required symbols at any one time, and no result has a higher chance of getting rolled.

Three of the die faces do however have the same symbol, just different numerical values to that symbol – the Investigation symbol. This means there is a greater chance of rolling Investigation, even though each individual number has an equal chance of being rolled.

A game can also use an interval when using a numeric die to alter the chance of something happening as a result of a die roll. Dead of Winter uses this mechanic in two different ways – character action values and resolving noise markers.

Each character has two values, Search and Attack for the respective action, which can only be taken if the player can spend an action die which has a result which is equal to or above the required value for that action. For example a character with a Search value of 3 requires a die with a result of 3 or above to be spent. The effect of this is that some characters are easier to attack or search with, as the chance of rolling higher than the value increases as the value itself decreases.

When resolving noise markers, a six-sided die is rolled and checked if its result is within the interval 1 to 3. The effect of this is that there is a 50% chance of the result ending in being within the interval and thus triggers the effect, placing a zombie onto the location.
6.1.2 Deck Of Cards
In contrast, a deck of cards is shuffled and the outcome of it is set, ready to be revealed when the cards are drawn. A deck is also less random; a regular deck of playing cards will have four aces, one of each color, and 13 cards of each color. The probability of drawing a specific card is thus based on how many cards in the deck that is left.

The probability of drawing a card of one specific color is also higher than a specific card and although certain cards of certain numbers, such as Aces and Kings are usually worth more in card games, the probability of drawing any one specific card is the same.

However, the order in which the cards are drawn is locked once the deck has been shuffled. There is no randomization once this is done, it is simply that the players have no knowledge of the order in which the cards will appear. This is used for great effect in Pandemic since there are four diseases each with 12 cities to make up the 48 cards in both the Infection deck and the player deck. Adding in the special event cards that players can draw and the Epidemic cards to the player deck, there is a total of 57 (or 59 when playing with all six Epidemic cards) cards in the deck. Players can thus use this knowledge to guess the probability of each card being drawn based on what has already been drawn.

A deck of cards can be manipulated and this can be seen in Pandemic where the Infection deck is affected in two ways by the Epidemic card. Firstly, the bottom-most card is revealed and taken into effect. This card would have likely never been drawn before, and so it is almost guaranteed to not have cubes onto it.

Then, the cards that have already been drawn is shuffled and placed on top of the deck. Thus, they will appear once again. This means players have some knowledge of which cards that will appear, and can plan their strategy accordingly.

6.1.3 Bag Of Tokens
Tokens drawn from a pool such as a cup or a bag is sort of a mix between a deck and dice. It could be the equivalent of a deck that’s always being shuffled before drawing from it, since the order in which tokens are drawn is not set, similarly to the order in which die results is not set.

Similar to a deck however, there can be multiple different tokens, more so than what a die result can usually show, and in order to make some tokens more likely to be drawn can be achieved by having more of that token type than others.

Unless the tokens are returned to the container from where they are drawn however, it becomes less and less likely that tokens of a particular kind can be drawn, and more likely that tokens of types that haven’t been drawn will be drawn.

6.1.4 How The Components Are Used
In the games studied there is a difference in how the components are used, but also similarities, and that too affects how the randomization affects the game. For example in all games, a player’s capabilities are reliant on cards that they draw from one or more decks of cards. In Elder Sign however, players are initially at the mercy of what they roll to complete tasks, and in Castle Panic what a player can do is directly limited to what cards they have, but Pandemic rarely uses their cards to do an action and relies more on collecting the cards.

Each game also features a way to forward the scheme of the game and in it, some form of randomization is used to make up for the fact that the game cannot make a decision of its own.
In *Elder Sign* this is done through Mythos cards that are active in at most four turns while in *Dead of Winter*, a Crisis card is drawn each at the start of each round and resolved at the end of the round. *Pandemic, Forbidden Desert* and *Castle Panic* are all forwarded by drawing cards (or in the case of *Castle Panic*, tokens) at the end of a player’s turn that presents challenges for the players.

Finally, tension arises from drawing specific components that presents specific or more difficult challenges which is something all of the games use that forces players to cooperate rather than each player applying their own strategy at all times.
6.2 Categories
During the analysis process, I encountered some problems with categorizing certain mechanics such as the Noise marker causing zombies to appear if a die result equals to three or less during the placement of zombies. It is caused by a player action, but is only encountered and resolved at the end of a round when the game is doing things. In the end, the player did cause it but since the action is delayed it was hard to categorize this mechanic. The categorization is thus somewhat flawed because of this but for the purpose of surfacing mechanics that uses and causes randomization the analysis should still be effective.

Each category provides some ways to contribute to replayability, tension and creating challenges for the players.

6.2.1 Setup
When a game is being set up, the randomization elements of the setup contributes to making the game unpredictable. Sometimes, it can affect how the players play the game right from the start, but most of the time the setup simply ensures that the game won’t be the same each time it is played.

The setup is also where randomization can potentially decide how card the game is for the players. In *Pandemic*, there can be an Epidemic card right after another, or one at the top of the deck, or one at the very bottom and the difference this makes is quite large.

In *Elder Sign*, the initial Adventure cards may all reward *Elder Signs*, but they can just as well be simpler (or harder) to overcome. In *Forbidden Desert*, the way the tiles are placed out can mean players don’t have to go very far to find the parts in one play session, while in another they are spread out across the entire desert.

In none of these cases is the outcome of the game decided from the start. The setup does however in most cases affect the challenges that players will be facing, the initial challenges, and sometimes how difficult the game can become. This is consistent with what Mark Rosewater states that players are allowed to react to the randomization elements. (Rosewater 2009).
6.2.2 Player Action
A big issue with using randomization as part of player action is that players cannot accurately control their actions. For this, randomization will need to be mitigated as is done in Elder Sign, or optional as is done in Dead of Winter, in order to allow the skill of the players to be the deciding factor in determining a player’s success.

Dead of Winter allow players to take risks by wagering their odds and allowing them to decide how much to risk or if they want to risk anything at all, and to go to locations that allows them to use the various abilities of their characters to their advantage when taking risks, thus following the guidelines set up by Ernest Adams in Fundamentals of Game Design Second edition. (Adams 2009)

Elder Sign relies mainly on luck mitigation by allowing players to collect items that they can choose to spend to increase their odds of achieving their goals.

Using randomization as part of player action does however make the game simpler. It takes away some decisions for players and forces them to focus on ways to increase their odds as opposed to which action to do when and such. Getting lucky when rolling some dice thus makes the game more accessible, as stated by Soren Johnson. (Johnson 2009)

6.2.3 Encounter
When encounters are being drawn, there is a very real possibility for players to lose because of what is drawn. Rarely however does this happen entirely outside of players knowing the odds beforehand. The “nasty surprises” that Ernest Adams and Soren Johnson warns against using should of course be minimized, and designers will need to balance their games accordingly to prevent them.

The Epidemic cards from Pandemic, Storm Picks Up and Sun Beats Down cards from Forbidden Desert, and the boss monster tokens from Castle Panic all have the potential to randomly increase the difficulty of the game, thus going against what Ernest Adams says; that games should offer a consistent challenge and not suddenly become harder as that makes games be perceived as unfair. (Adams 2009).

Without those elements however, the games becomes almost static and too easy. In fact, part of the challenge of those games is to deal with the various larger challenges that players encounter. Players can somewhat predict that they are going to be drawn at one point or another, given that they have properly understood how the game works. Because of this, players know those larger challenges exists, just not the order in which they appear.

The games are also balanced in a way that the first time one of these bigger challenges are presented, their effect is smaller, meaning players get the chance to see the effect once or even twice before it starts to pose a large threat to them. This, along with players knowing that those cards exists from the start (as they are explained in the rulebook) and the games being fairly easy without them means the “nasty surprises” they could potentially provide are negated.
6.2.4 Components
Components provides a great ability to be variable. In the published expansions for the various games studied in this thesis, more components are added that provide large variability and replayability for the game by varying which components are actually presented in the game.

For example in *Castle Panic: Wizard’s Tower expansion*, multiple different special boss monsters are added but only three are used in a game and which monsters are used is randomized at the start of the game.

The Crossroad system from *Dead of Winter* provides plenty of replayability and tension for players by incorporating player choice, random triggers, and a story that becomes different for each time the game is played. Because this system only uses cards, more cards can be added both from the publisher themselves, and from the players themselves.

In *Castle Panic*, the boss monsters and special effects tokens have the most potential for players to have bad luck however. For example, players could draw the Plague that forces them to lose cards they desperately need, or the Goblin King can cause the Draw 4 or 3 more monsters tokens to be drawn which would mean a lot of monsters appears on the board, creating an overwhelming challenge for the players to deal with.

The chance of such an event to happen is small, given the amount of tokens in the game, but it does become a nasty surprise should it occur, as it does has the potential to make the game unwinnable for the players. In this instance, the designer would have to wager if the small risk of this happening outweighs the necessity of the effect that the various tokens provides.

Designer will also have to factor in what might have happened before this happens. Because it happens, it is probable that players are in fairly good standing against the game at this point, since they probably have only had to deal with regular monster tokens. Because of this, the potential for this event to cause the game to be unwinnable is very small, and the variety and other challenges that the tokens provides, the risk can be allowed to stay in the game.
7 Conclusion
Randomization contributes greatly to replayability and tension in cooperative games. It makes up for the lack of competition from other players, and also allow the game to be more simple and provides ways for players to cooperate and share their thoughts on what they think the game might do to fight back.

A random setup can greatly influence the replayability by presenting a unique challenge for the players each game and making sure players cannot apply the same solution for each play session.

Randomness in player actions can provide high tension as well as various strategies that players can try out by presenting the challenge of mitigating the randomness.

What the players encounter in the game can present challenges that are unique for each play session, while still familiar as the actual things that players encounter are not really different, just that the order in which they are encountered are different.

Finally, specific components can greatly influence the game by creating special challenges, bringing variety to the game and they even have the potential of creating unique stories for every single play session.

There are multiple ways randomization can be used, and each way contributes differently to replayability and tension and the game as a whole.

Designers of cooperative board games will need to balance their games carefully to avoid nasty surprises and to make sure that the game doesn't act entirely outside of players’ control, while still creating a challenging game that forces players to think about their strategy together and cooperate to beat it.

7.1 Final Thoughts
Cooperative board games are here to stay, and for me personally, most of them are one of the most enjoyable games I’ve ever played, including both board- and digital games. They rely on randomness to generate a challenge for the players, but they rarely actually feel random, in fact sometimes it can feel like a game actually decides what it will do to win, even if it has no actual intelligence of its own.

Any designer looking to create a cooperative board game must know what the impact a random element can cause and allow the players to truly cooperate, rather than relying on the luck of the draw. Each different mechanic that is identified in this thesis brings a different approach to randomization and how it affects the game as a whole.

Both Encounter and Player action in the game studied relates to probability. Here, a major part of the game is played out as players can anticipate what they will encounter, and mitigate the randomness of their actions.

Finally, components provides great anticipation of when they will be drawn, and are great at giving a play session something that’s different from the next session.

All in all, randomization elements in cooperative board games ensures that the game is not just a static board with puzzle, and provides stories, experiences, and hours of fun.
7.2 Future Research

The purpose of this thesis was to surface various mechanics that already exists and with mechanics that uses physical components. In recent years however, board games have been moving towards digital implementations and with digital components. There are already cooperative board games that uses digital elements to generate tension and randomization that this thesis did not study – games such as *XCOM the board game* and *Space Alert* both uses digital components in different ways.

How does this affect probability, replayability, and perceived randomness when the randomness is not generated by drawing cards or throwing a physical die and instead generated from digital algorithms? What would happen to the nature of a cooperative board game if the game actually could know what is happening and respond accordingly like it does in a video game? These are questions that can, and should, be researched.

The digital aspect also means a game can be updated indefinitely with new cards and components and scenarios, not being limited to expansions and possibly even allowing players themselves to create content and publish it for everyone to use.

Something not discussed in this thesis is the matter of house rules – rules that players themselves make up to alter the game, either making it easier or harder for the players to win, or altering things that happen in the game to make it shorter or longer, or simply removing some mechanics the players don’t enjoy, or adding things players do enjoy.

The other various aspects that relates to replayability can also be studied and how they work specifically to board games, as most of the research already made only looks at video games.

More research should also be done specifically on cooperative board games. Because what is cooperation?

An argument could be made that *Dead of Winter* is not actually a cooperative game, since the game doesn’t have to end with everyone winning, or everyone losing and each player have their own secret objectives that they must complete in order to truly win, and there is a chance one of those objectives is to make each other player lose.

In *Castle Panic*, there is a variant where players keep the monster tokens that they defeat on their turn, and at the end of the game if the players manage to defeat all of the monsters, the player with the most monster tokens is declared the winner.

This has the potential to affect the game drastically in cooperation to the point where it might not really be cooperative, but rather competitive with cooperative elements.
References

Literature


Games


Appendix A: Castle Panic analysis
The following is a detailed explanation of the various mechanics that uses or are affected by randomization for the game Castle Panic.

Setup
The game has a fairly quick setup with specific stages that determines the order in which it’s set up.

Initial monsters
During the setup, a specific group of six monsters are taken and placed in the second outmost ring, called the Archer ring, each in their own arc. The monsters are always the same in the base game; three Goblins with one hit point each, two Orcs with two hit points each, and one Troll with three hit points.

The players may place the monsters in any arc they want, as long as there is only one monster in each arc. While the players place them, as no other variable is known by the players, this can be considered randomized for the purpose of this analysis.

Castle Cards
The main way players interact with the game is through castle cards and during the setup this deck of 49 cards is shuffled and each player is dealt a number of cards based on the number of players in the game. The cards are dealt and kept face up so all players can see each other's cards. What cards each player get is thus random.

Player actions
The game features almost no randomization in terms of player actions.

Discard a card
At the start of a player’s turn, the player has the choice to discard one of their cards to draw a new card. This can be used to get rid of a card the player doesn’t need for the potential to get a card they might need.

Game encounters
The two randomization aspects that happens directly because of the rulebook as part of a players turn is to draw monsters and to draw castle cards.
Draw up

At the start of a players turn, the player whose turn it is draws up to the stated maximum of cards that a player has (called hand size or hand limit). Should the deck of cards be empty, the discard pile that is made up of all the cards that players have played previously in the game, is shuffled and made to be the new deck, and players draw from it.

Drawing monster tokens

At the end of a players turn, after monsters have been moved, more monsters are drawn from a pile. The number of monsters are limited and there are different kinds of monsters which means that which monster a player draws is random and affects their strategy.

When placing a monster, the player rolls a die that decides which arc the monster is placed on, and the monster is placed in the forest.

Components

There are few special components that uses randomization, or are affected greatly by randomization; the boss monsters and the monster effect tokens.

Boss monsters

In the game there are four specific monsters that all have a special effect that happens when they have been placed.

- Goblin King: Requires the player to draw more monsters.
- Orc Warlord: Causes all monsters in the same color as the Warlord to move forward once.
- Troll Mage: Causes all monsters on the board to move forward once.
- Healer: Causes all monsters on the board to regain one hit point.

Monster effect tokens

In the pile of monster tokens there are some that are not monsters but instead have an effect that is instantly triggered when that token is drawn.

- Plague: Forces players to discard specific cards in their hand.
- Monsters move: Causes some monsters to move forward once.
- Draw: Causes the current player to draw more monsters.
- Boulder: Destroys all monsters in one arc that is chosen by a die roll, and stops when it hits a castle piece, destroying that in the process.
Appendix B: Pandemic analysis
The following is a detailed explanation of the various mechanics that uses or are affected by randomization for the game Pandemic.

Setup
The setup of Pandemic mainly has to do with the cards that are in the game and at the start of the game, each deck is shuffled and placed onto the board.

Player setup
Each player either selects or randomly receives one Role card which gives the player something unique about their character in the form of special bonuses or actions, indicated on the role card.

Then each player is dealt cards from the Player deck (the amount dealt is based on the amount of players).

Game setup
A total of nine cards are drawn from the Infection deck. An infection card show a city and when drawn it causes the disease that matches the color is spread to that city. During setup, the first three cards causes three disease cubes to be placed onto the cities they indicate, then the next three gets two disease cubes, and the final three gets one disease cube.

The infection cards drawn are placed in the discard pile for infection cards.

Then specific cards called Epidemic cards are shuffled into the Player deck. The number of Epidemic cards is based on the difficulty that the players want to experience in the game.

Player Action
There are no randomization elements based on player action in Pandemic.

Game Encounters
When a player has completed their four actions as part of their turn, two things happen.

First, the player draws two cards from the Player deck. Usually the cards drawn are city cards that players need to cure the diseases, but in the deck there are also special Event cards that allow a player to do something special, and there are also Epidemic cards which are bad for the players (explained below).

Secondly, cards are drawn from the infection deck equal to the current infection rate level and one disease cube of the matching disease is added to the city indicated on the infection card.

Should a city have three cubes on it already when the matching infection card is drawn, then an outbreak happens. Instead of adding a cube, the disease is spread and a disease cube of that disease is added to each connecting city, and the Outbreak track is increased by one.
Components

When an Epidemic card is drawn, its card text is instantly taken into effect in the order indicated on the card and thus three things happen:

1. Increase: The infection rate is increased by moving the infection rate marker forward one space.
2. Infect: The bottom card from the infection deck is drawn and if the city doesn't have cubes of the disease color, then three cubes of that disease is added. The card is placed in the discard pile.
3. Intensify: The infection discard pile is shuffled and placed on top of the infection deck.

In addition, players do not get to draw any card to replace not getting a card from the player deck that turn, since an Epidemic card was drawn in its place.
Appendix C: Forbidden Desert analysis
The following is a detailed explanation of the various mechanics that uses or are affected by randomization for the game Forbidden Desert.

Setup
As part of the setup, each player is given an adventurer card that give them special abilities and an initial and maximum water level that the player can carry. Adventurers can either be selected or assigned randomly.

The tiles are shuffled and placed out with the desert-side up and oriented so that they are all facing the same way. Then a total of eight sand tokens are placed onto tiles in a simple pattern shown in the game rules. Finally, the storm deck is shuffled and the Sand storm level is set based on the difficulty players want it to be.

Player Action
Forbidden Desert has no randomization elements that is generated by a player action except for excavating a tile by flipping it to its revealed side, either revealing a clue to where a part of the ship can be located, a gear tile that allows a player to draw a gear card, just desert, a tunnel that provides protection against the sun for players that stay there, or one of the three water tiles that either provide water or nothing.

Game Encounter
At the end of a players turn, cards are drawn from the storm deck. The number of cards drawn is based on the Sand storm level. The cards revealed all do something specific to each card. If the deck runs out of cards, the discard pile is shuffled and used as the new storm deck.

Components
The cards that are drawn from the Storm deck all do something specific when drawn and there are a few different kind of tiles that all cause different things when they are revealed.

Wind Blows
The most common cards in the deck, Wind blows cards causes the sand storm to move as indicated on the card. This means the tiles are shifted in the direction of the wind and a sand token is placed on each tile that moves because of this.

A Wind Blows card cannot cause the storm to move if the storm is at the edge of the board and the wind blows towards that edge. This is called a Respite and nothing is done to replace it.

Storm Picks Up
There are three of these cards in the deck and they increase the Sand storm level by one when drawn, successively causing players to draw more storm cards.
Sun Beats Down

There are four of these cards in the game and they cause players who are not protected from the sun to lose one water that they are carrying. If a player does not have any water when this happens, the adventurer of the player dies of thirst and the players lose.

Row tiles and Column tiles (Location clues)

When a location clue tile is excavated, the location of a specific part indicated on the tile is partially given as it shows with arrows that the part is located in the row or column of that tile. If another location with the same part indicated on it is excavated, the respective part is placed on the tile where the two location clue arrows intersects.

Gear tiles

When a gear tile is excavated, the player who excavated draws an equipment card from the Equipment deck that they can play at any time to do what the card says, often giving the player a special action in form of protection against the sun, additional water, or the ability to move far or clear sand effectively without spending actions. An equipment card that has been played is removed from the game after its effect has been resolved.

Water tiles

There are three tiles that all are marked on their desert-side to have water on them, however the tiles are all different and gives different amount of water from zero to two per player whose pawn is on the tile when it is excavated.

Tunnel tiles

If a player stays at a tunnel, than that player is protected should any Sun Beats Down card be drawn and will not have to lose water.
Appendix D: Elder Sign analysis
The following is a detailed explanation of the various mechanics that uses or are affected by randomization for the game Elder Sign.

Setup

Elder Sign relies a fair amount on the initial setup as it selects both the initial challenges that players are faced with, the capabilities of the players, and which Ancient One the players are trying to seal away to keep it from awakening.

Player setup

As part of setup, each player is dealt one Investigator card (players may also chose to select the investigator instead) and collects the respective marker that matches the investigator. An investigator has three things; Initial stamina and sanity, starting items, and an ability that players can use to get an advantage in the game.

The starting items are drawn from the different decks of unique and common items, allies, and spells, giving players something that can be spent to get an extra advantage in the game, for example the ability to add an additional die to roll.

Game setup

Firstly, the Ancient One can either be randomly drawn or selected by the players. The card shows a special effect that is either triggered at certain points during the game or is always active, and how many Elder Signs and doom tokens that is needed to either seal or awake the Ancient One.

Then the Adventure deck is shuffled and six cards are drawn and placed out on the table so that each player can see. Another deck called the Other World Adventure deck is also shuffled and placed in reach of the players. Other World Adventure cards are drawn by effects in the game, while an adventure card is drawn when a player completes one of the six adventure cards that are on the play area.

The Mythos deck is shuffled and placed by the clock and the top card is drawn and revealed, causing its effect to be taken into effect, either causing something to happen immediately or create a limitation for the players that are in effect until another Mythos card is drawn.

Player Action

To complete tasks, players roll dices and want to match the faces (sides) on the die with the symbols listed on the Adventure card.

There are a total of four different symbols on the die faces and the cards; Lore, indicated by a scroll, Peril, indicated by a skull, Terror, indicated by tentacles, and Investigation, indicated by a magnifying glass. On a dice there are three Investigation faces, each with a unique number going from one to three.
Should a player be able to match a task on the Adventure card they're on, they place the dices needed onto the symbols. The player can then continue rolling dice to complete the other tasks.

Usually players can complete tasks in any order, however some adventure cards requires tasks to be completed in order. This is indicated by an arrow to the left of the tasks.

**Rerolling**

Should a player be unable to match a task, they must discard one die and roll again. Before rerolling however, the player may choose to keep one die and store it on their investigator marker. Only one die can be stored on an investigator marker, however should other players investigator markers be on the same adventure card as the current player, then the current player may choose to store a die on their marker as well.

Spells can also be used to store dices. The difference is that when the players turn is over, the dices stored on investigator markers are removed from the marker but dices stored on spells are kept there and can be used by any other player to help complete a task.

**Entrance card**

Instead of going to an adventure card, players can go to the entrance of the museum. At the entrance the player chooses to do one of three actions; receiving first aid to regain some sanity and/or stamina, buy a souvenir by spending trophies that the player receives from completing adventures and defeating monsters, or roll a regular die and resolve the effect based on the result of the die and the following chart listed on the entrance card;

- Investigation: Lose either 1 sanity or stamina.
- Lore: Gain 1 clue token which can be spent instead of discarding a die when a player would otherwise need to discard a die.
- Peril: Gain 1 common item, drawing it from the deck with common items.
- Terror: Gain 1 spell, drawing it from the deck with spells.
- Yellow and Red die

Player can spend an item to receive special dice to be used in addition to the regular dice.

The yellow die is identical to the regular dices except that it doesn't have a Terror face and instead has an Investigation face with the number four on it.

The red die on the other hand doesn't have the Investigation face with the number one on it, and instead it has a Wildcard face that can be used as any one other dice (although in Investigation, it can only be a one).

**Game Encounters**

At the end of a players turn, the clock's clock hand is turned three hours forward. Should this cause the clock to strike midnight, a Mythos card is drawn.
Components

In *Elder Sign*, there are a few components that uses randomization to create additional challenges for the players.

**Terror effect on an Adventure card**

Some adventure cards have a Terror effect listed on them. A terror effect is triggered when a player that is attempting to complete tasks on that adventure card rolls a dice that lands with the Terror face up.

**Failure**

Should a player fail with an adventure, the failure effects listed on the card is triggered, usually causing players to lose sanity or stamina but it can also cause for example a monster token to be drawn or a Doom token to be added to the Doom token track.

Similarly, some effects are triggered when a player completes an adventure.

**Monster tokens**

There are Monster tokens in *Elder Sign* and they are placed in a bag or cup to be drawn when asked by an effect. A monster token adds an additional task to specific adventure cards that has a monster task listed on them, indicated by white borders around the task.

**Dice locking**

Some tasks or monsters causes specific dices to be locked, meaning a player cannot use that die to solve any task.

**Investigator cards**

Some investigator abilities use randomization, and should a player lose either all of their sanity, stamina, or both, that investigator is devoured and the player must select a new investigator.
Appendix E: Dead of Winter analysis

The following is a detailed explanation of the various mechanics that uses or are affected by randomization for the game Dead of Winter.

Setup

While the main objective of the game is selected by the players by taking one of the double-sided main objective cards, the secret objectives are sorted out in Non-betrayal and Betrayal and shuffled. Two Non-betrayal cards per player are drawn and placed in a pile and then 1 Betrayal card is added to that pile. That pile is then shuffled and each player is dealt 1 card from that pile. The rest of the secret objectives are removed from the game.

The Crisis deck, the Survivor deck, the Crossroad deck and the Exile objective deck is shuffled separately and placed on their respective place on the board.

Next the Starting item cards are shuffled and each player is dealt 5 starting items and the rest of these cards are removed from the game. Items are spent by placing them in the waste pile and the player receives the effect written on the card, they can also be spent by placing them face down to contribute to a crisis.

The rest of the item cards are separated based on which location it comes from (as stated on the card) to form a deck for each of that location and placed on that location. Each location has a list of symbols (that matches the symbols for each kind of item) listed on it which states which items are more (and less) likely to be found in that location based on the order of the symbols; the more to the right a symbol is, the more likely it is to be found at that location.

Each player is dealt four survivor cards and chooses two of them, returning the rest to the deck and the deck is reshuffled. Then each player selects one of their survivors as their leader. The other survivor becomes a follower. Each survivor has an influence value and the player whose leader has the most influence becomes the first player.

Player Action

After a crisis card has been drawn at the start of a round, each player rolls one die for each survivor they control and one additional die. The dices are normal six sided dices with one to six value faces, and are used to take various actions that sometimes requires specific values on the dices to be used. There are however actions that does not require a die to be used that a player can do as well.

It should be noted that all survivors have an ability that a player can use and some of these abilities requires a die with a result that matches or exceeds the value indicated in parentheses at the start of the ability. An ability also has a location where that ability can be activated.
Moving to another location

The current player may move each of their survivor during their turn from one location to another. In doing so, the player must roll a ten-sided Exposure die that has four kind of faces; Blank which causes nothing to happen, Wound which causes a survivor to suffer a wound, Frostbite which causes the survivor to get a Frostbite wound, and Bitten which instantly kills the survivor and may spread the bite effect to other survivors.

When spreading the bite effect, a survivor at the same location that the bitten survivor arrived at must choose to either die which stops the bite effect, or roll the exposure die. If the die result is a blank, nothing happens and the bite effect stops but with any other result, the survivor dies and the bite effect is reapplied. If two or more survivors are at the same location as the bitten survivor, the effect is applied to the survivor with the lowest influence value.

Frostbite wounds counts as one wound and at the start of the player turn the survivor receives an additional wound and must be healed in order to survive.

Searching for items

When searching for items, a player needs to spend one of their dices and the die needs to have a value that matches or is higher than the Search value of the survivor they want to use to search.

The player draws a card from the location where the survivor is and may either stop and add it to their hand, or place a noise marker (explained below) on a free noise space at the location to draw another card. The player may continue placing noise marker until satisfied or until there are no more free spaces for noise markers. The player may only keep one of the drawn cards and have to place the rest of the cards at the bottom of the deck from which they came from.

Attacking

A player may choose to attack a zombie that is in the same location as their survivor by spending one of their dices with a value that matches or is higher than their Attack value indicated on that survivor. When attacking, the player must roll the Exposure die.

Survivor death

Should a survivor receive a third wound, the survivor instantly dies and is removed from the game and the morale of the colony is decreased by one. If the survivor was a follower, it is just removed from the game but if the survivor was the leader, then that player must select one of their follower as their new leader.

However if the player doesn't have any other survivor left, that player has to remove all of their cards from the game and draw a new survivor as their leader.
**Becoming exiled**

In the game, players can vote to exile a player that they think have a Betrayal secret objective and thus is working against everyone else. If the vote majority is thumbs up (in a tie, the player with the first player marker decides), the player is exiled and draws the top Exile objective card.

If the player had a Non-Betrayal secret objective card, that player reveals that card and replaces it with the newly drawn Exile objective card.

If the player had a Betrayal secret objective card, that secret objective is altered by replacing the first part of the objective with a new one written on the Exile objective card.

Exiled players cannot move their survivors into the colony and should they have survivors inside the colony when they are exiled, they must all move to another location. This move still counts as a regular movement and thus the exposure die is rolled. Exiled players also have some additional rule changes applied to them, for example when exiled players survivors are killed, they don't affect the morale of the colony.

**Luck mitigation**

Players have two ways to alter the results on their action dices. One of them is to remove a food token from the food pile at the colony which allows the player to increase the result of one die by one for each food token removed. The other way is to play a Junk card which allows a player to reroll a die.

**Game Encounters**

The game features some encounters, the Crisis cards that drawn at the start of a round, and the zombies and noise resolution that happens at the end of a round.

**Crisis cards**

A crisis card is drawn at the start of each round, showing a specific challenge that must be completed until the end of the round or else the players suffers a consequence stated on the card.
Adding zombies

At the end of each round, additional zombies are added to the various locations, including the colony. For every two survivors at the colony, one zombie is added and for each survivor at a location, a zombie is added. Then for every noise token at a location, an action die is rolled. Should the result be three or less, another zombie is added to the location.

There are limited spaces for zombies to be at for each location and should all spaces be filled and another zombie needs to be added, the location is considered overrun and the survivor with the lowest influence at the location or colony is killed.

Components

The game features a new system called the Crossroad system that handles the story and offers players a choice written on the card to get an effect.

The player to the right of the player whose turn it is draws a Crossroad card at the start of the turn. A Crossroad card contains a story and game event that can be triggered if the conditions stated on the card is met during the turn.

If the conditions are met, the player with the card has to stop the other players and read the text on the card which gives both story and then states the effect of the card.

Most crossroad cards contains one or more options and if the card contains numbered options, then the player whose turn it is have to choose one of the options to do. If the card contains a "Thumbs up" and a "Thumbs down" options, each player gets to vote on which option that should be taken. Players may talk about what they should do and then simultaneously each player must cast a vote of either a thumb up or thumb down.