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A critical analysis of mystery in videogames

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A CRITICAL ANALYSIS OF MYSTERY IN VIDEOGAMES

BY

ALI ALKHAFAJI

A DISSERTATION SUBMITTED TO THE SCHOOL OF COMPUTING,

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A CRITICAL ANALYSIS OF MYSTERY IN VIDEOGAMES

Abstract

Historically, videogame research has focused on how different videogame attributes (like challenge, fantasy, control, goals, etc.) impact the player experience. This type of research is important because it can provide insight into how to design more enjoyable videogames. However, very little exists within the current literature that focuses on *mystery* and its impact on the player experience. This dissertation is concerned with providing the research community with a better understanding of how mystery manifests in videogames and consequently impacts the player experience, specifically curiosity and motivation. To this end, the research questions are: 1. How do players experience mystery in videogames? 2. How do game designers consider mystery when designing their games? 3. What is the relationship between player-centered and designer-centered views of mystery in videogames? 4. What is the impact of player-centered and designer-centered elements of mystery on player motivation?

Such understanding of mystery in videogames is provided in the form of a detailed taxonomy that concentrates on mystery from both the videogame designer and player perspectives. After a thorough review and summary of the related research, this taxonomy was created through two qualitative studies utilizing Grounded Theory. The findings of those studies were validated through an empirical instrument via a third, quantitative study. The conclusions and outcomes of this dissertation provide the gaming community with the knowledge on how to optimize mystery in videogame design which increases player curiosity and motivation. It also offers greater insight to the research community on the impact of mystery, as a videogame attribute, on the player experience. This dissertation describes in detail the methodology and processes of these research studies and how this taxonomy was established, and it explains the impact of this work as well as suggests areas for future work.

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1. Chapter One: Introduction

1.1 Problem Statement

Videogames are one of the more popular mediums for storytelling and entertainment. Gartner (2013) estimated the gaming industry in 2013 at \$93 Billion worldwide and forecasted it at \$111 Billion in 2015. Per a statista.com, that number was reported at \$112 Billion in 2015. Videogames are also a cultural mainstay and have a large and growing social following around the world. Players, adults and adolescents alike, have been playing commercial videogames for decades without, for the most part, any external motivating factors. Essentially, players spend time and energy and sacrifice money and sleep to play commercial videogames because they are internally (intrinsically) motivating. It is widely believed that motivation in commercial videogames is not accidental but a consequence of well-structured and fundamentally sound design, capturing all the right factors optimally. Essentially, designers of commercial videogames carefully plan and balance various aspects of games to make them intrinsically motivating and engaging. However, there is little in previous literature that focuses on how these aspects impact player motivation, especially mystery. Since the design process consists of the optimization of primary videogame attributes like challenge, fantasy, goals, control, mystery and sound (Garris et al., 2002; Malone 1980; Malone & Lepper 1987), understanding how each of these attributes is optimized and consequently impacts motivation is key. Primary videogame attributes are the essential elements and characteristics that form the storyline, gameplay and mechanics of games (Malone, 1980). A deeper understanding of these attributes and their impact on motivation will help better inform game designers on how to improve intrinsic motivation in their games, especially educational games.

Establishing a universally agreed upon description of videogame attributes is difficult because of a lack of consensus on what those attributes are, as evidenced by how many different lists researchers have provided for them (Ricci, Salas, & Cannon-Bowers,

1996; Hannafin & Sullivan, 1996; Juul, 2003; Wilson, 2008; Malone, 1980; Malone & Lepper, 1987; Pavlas, 2009; Gredler, 1996; Thiagarajan, 1999; de Felix & Johnston, 1993; Garris, 2002; Driskell & Dwyer 1984). Even if the videogame attributes were agreed upon, other challenges would exist such as understanding how disparate player characteristics and abilities interact with these attributes and how these attributes are manifested within different videogame genres. In this research, I have examined mystery as a videogame attribute from the perspectives of both game designers and players and compared that to manifestation of mystery in different story mediums like film, literature and advertisement. The goal of this research was to produce detailed hierarchical description (or taxonomy) of mystery in videogames. Additionally, I developed an empirical instrument to help validate the taxonomical description and determine mystery's impact on player motivation.

When analyzing videogame attributes, there are two perspectives to consider: how videogame design incorporates an attribute in games (designer-centered) and how players experience it (player-centered). An example of designer-centered mystery would be a designer purposefully hiding some elements of the gameplay to establish a gap of information for the player. This gap could be a hidden door or a path with an unknown destination. Comparatively, player-centered mystery is how the player perceives that gap of information that has been created within the design. Understanding both points of view on mystery will help establish a taxonomy for mystery in videogames by providing detail on how mystery is designed and how it is experienced.

Another benefit of this taxonomy is to provide insight into mystery in different game genres. For example, while detective games intrinsically showcase mystery within the gameplay, other genres like action, racing and sports might present mystery differently. In this research, I examined some of the popular and well-known genres and analyzed how they manifest mystery. Understanding the genre parameter in the mystery taxonomy will provide a deeper understanding for videogame designers of those genres.

While many researchers have explored videogame attributes (like Juul, 2003; Malone, 1980; Malone & Lepper, 1987; Pavlas, 2009; Gredler, 1996; Thiagarajan, 1999; Driskell & Dwyer 1984), there hasn't been a focused examination of just mystery. This

dissertation, by establishing a taxonomy of mystery and developing an instrument that can empirically validate the taxonomy against gameplay in a lab, should be a novel advance in knowledge in this field. That advancement will be in the form of more specific and concrete understanding of the different factors and elements of mystery in videogames for players and designers as well as their impact on player motivation. Having this understanding can influence the decision-making process of videogame designers when incorporating mystery in their design, specifically to mystery's impact on player motivation. Finally, I have utilized that instrument as a scale to measure the level of that impact of mystery on player motivation.

My research questions to establish that taxonomy are:

1. *How do players experience mystery in videogames?*

This research question focused on developing a detailed player-centered taxonomy of the experience of mystery in videogames. Answering this research question also involved clarifying how players perceive mystery differently in different genres and other story mediums.

2. *How do game designers consider mystery when designing their games?*

This question focused on how game designers perceive and subsequently establish mystery in videogame design. This question also considered how different videogame genres and other story mediums represent mystery differently. Defining designer-centered mystery has also established how mystery is manifested in videogames through the storyline and other attributes.

3. *What is the relationship between player-centered and designer-centered views of mystery in videogames?*

This question utilized the two sub taxonomies defined from the previous two questions to identify the relationship between how players and designers regard mystery in videogames. To understand and expand on that relationship, I compared and contrasted the different mystery factors identified in the two taxonomies.

4. *What is the impact of player-centered and designer-centered elements of mystery on player motivation?*

This question seeks to further analyze these two sub taxonomies by measuring the impact of mystery elements on player motivation. Those elements have been identified from the two taxonomies, player-centered and designer-centered, and validated using the Intrinsic Motivation Inventory and other behavioral measures.

2. Chapter Two: Related Research

2.1 Overview

In this chapter, I have summarized literature findings on all the concepts and topics utilized in this research. Those concepts mainly focus on the primary attributes of videogames, especially mystery. I have also emphasized the previous literature that examined mystery, in videogames and elsewhere, and specifically focused on different views of mystery from the player and designer's points of view. That discussion includes how mystery is manifested in different genres of videogames as well as other story mediums. Additionally, I have focused on methodologies for measuring intrinsic, or internal motivation without any external factors. Examples of those methodologies are the use of the Intrinsic Motivation Inventory and biometrics. Finally, I discuss the qualitative research methods that are used for this type of research, specifically Grounded Theory.

2.2 Primary Attributes of Videogames

Understanding the main elements that make games engaging for players and determining their impact on motivation can help game designers focus on those attributes that have the biggest effect on motivation. In this section, I discussed previous literature which focuses on these elements and more specifically on mystery as the main topic of this research. Below, I have summarized some of the more influential studies and have identified the list of the most common attributes. From this list of videogame attributes, as mentioned above, I selected mystery as the focus for this research.

One of the earliest studies to consider the primary attributes of videogames was Malone (1980). Malone originally identified three game attributes as critical for intrinsic motivation: challenge, fantasy and curiosity. Malone believed that challenge is an element that is important to motivation in games because games rely on the principle that they “must provide a goal whose attainment is uncertain” (Malone, 1980, p.162). While Malone's intent here was focused on challenge, uncertainty is one of the factors that drive mystery. Similarly, Malone specified that fantasy is important because “[n]on-fantasy

games involve only abstract symbols,” arguing that abstract symbols do not usually make for an enjoyable game (Malone, 1980, p.164). Also, Malone argued that curiosity is an integral part of a game because that uncertainty drives a player’s desire to play the game.

While Malone’s list seems intuitive for game designers, it does not account for attributes that are important elements in multi-player games. The emergence of online and multi-player games in the late 1970’s introduced a set of primary attributes of videogames that weren’t as relevant before that time (Malone & Lepper, 1987). To address these attributes, Malone and Lepper extended Malone’s original list by adding these interpersonal attributes: cooperation, competition and recognition. Malone and Lepper argued that cooperation and competition are beneficial since “the appeal of an activity is enhanced by enlisting the motivation to” cooperate or compete with others (Malone & Lepper, 1987, p.249). Similarly, they argued that recognition is important by asserting “we enjoy having our efforts and accomplishments recognized and appreciated by others” (Malone & Lepper, 1987, p.244).

Although both Malone (1980) and Malone and Lepper (1987) are widely recognized as key studies for videogame attributes, much of their work is theoretical and based on their intuitive understanding of games and human motivation. Before and after Malone and Lepper, there have been several studies that focused on videogame attributes, most with their own discrete list. Pavlas (2009) underlines this point by indicating “with such a range of attributes being identified in the literature, a more parsimonious list of attributes is necessary to approach them in an experimental fashion” (Pavlas, 2009, p.2). Pavlas performed a card sort exercise with selected game experts to narrow down the list of attributes from an original list of 19 attributes that he compiled from previous studies to a more condensed all-inclusive list of 3 attributes. Pavlas’ attributes are game reality (fantasy), assessment and challenge. Another reason for the drastic condensation of the list of attributes, was Pavlas’ admission that although there were a few other attributes that were deemed essential like immersion and control, they were a bit more complex to control in the game he designed for the study, InnerCell. So Pavlas opted to focus on those attributes that were more useful in a research setting.

Alternatively, Juul (2003) identified his list of game attributes by starting with the definition of a classic game model. His definition focused on the three concepts that, he argued, make a game: 1) rules of the game, 2) player interaction and 3) relevance to the outside world. He then analyzed how previous literature defined games and parsed those definitions by the concepts listed above. Using this process, he was able to come up with a unified list: rules, variable and quantifiable outcome (different outcomes are assigned different values), player effort, attachment (player connection with the game), valorization (some outcomes are better than others) and negotiable consequences. One key aspect that seems to be missing from his list, by Juul's own admission, is the fictional facet of games. He later elaborated that his decision was to focus on "real rule-based systems that players interact with" and not emphasize "describing games as fictive worlds" (p.265). This, in turn, is omitting a very large subset of games with rich fictional worlds.

Beyond these studies, several other researchers have come up with their own versions of the list of primary attributes of videogames. Gredler (1996) classified the attributes into four categories: task, user, goals and control. This is particularly interesting because it maps very well to the separation of player and designer-centered attributes. In this classification, user being the player-centered attribute while task, goals and control are designer-centered. This type of separation is highly informative for this dissertation, since I too focus on it. Other studies boiled down the list to the simplest set of elements that they felt essential to videogames, like de Felix & Johnston (1993) who broke down those elements into visual interactions, rules and goals. Wilson et al. (2008) performed a literature summary of a dozen other studies and came up with fantasy, representation, sensory stimuli, challenge, mystery, assessment, and control. Thiagarajan (1999) shared some of these attributes as he stated the four significant components of videogames to be conflict, closure, contrivance and control.

Given this wide range of attributes that previous literature has recognized over the years and the inconsistencies over the definitions of those attributes, it is difficult to rely on any of these lists as an academic consensus. With this concern in mind, Garris et al. (2002) performed an analysis of 18 different studies and summarized this list of primary

attributes of videogames to six overlapping attributes. These attributes are fantasy, rules or goals, sensory stimuli, challenge, mystery and control. Garriss et al. argued, “any type of game can be described in terms of these six key dimensions” (Garriss et al., 2002, p.447). Given the lack of consensus and Garriss' inclusive approach of analysis by using 18 prominent studies, his list seems to be the most comprehensive set of attributes. For the purposes of this research, I have considered Garriss' list and extended it by distinguishing the player-centered and designer-centered aspects of each attribute.

As described in the Introduction section, a designer-centered attribute is how a game designer embeds an attribute into a game. For example, challenge can be manipulated in games by building obstacles and establishing time limits. Player-centered attributes address how these design decisions are perceived by the player. Using the previous example, player-centered challenge is understood to be how difficult the player perceives the designed obstacles and time limit. This distinction is very important because it differentiates between how attributes are designed within a game versus how a player experiences them and the difference in how they are measured. The extended list I use for this research is shown in Table 1 below.

Table 1. Player and designer-centered attributes

Attribute	Player-Centered	Designer-centered
Challenge	Difficulty level of a game	Challenges built within the game such as time limit, enemies to battle or terrain obstacles
Control	Control a player has over gameplay	The number of objectives and directions available to a player
Goals	Gameplay goals	Short and long-term milestones within a game
Mystery	Curiosity, Suspense	Amount of information available to the player about their progress and what's upcoming
Fantasy	Level of fantasy elements	How rich are the characters, environment and storyline?
Sound	Auditory stimuli	How rich are background sound and feedback sound?
Narrative	Story of the game	The frequency and detail for in-game cut scenes

2.3 Videogame Genres

To analyze and understand how videogame players and designers experience and integrate mystery in videogames, there needs to be an understanding of the different genres that classify games. Each genre incorporates different elements in the game design and this dissertation will examine how those elements affect mystery differently. In order to determine that impact, I need to generate a list of common genres to examine. Such a list of genres could serve as a baseline and should be agreed upon by the research community. Laird & Van Lent (2001) made the case for action, role-playing games, adventure, strategy games, god games, team sports and individual sports for their study. While Laird & Van Lent argued for a more specific list of genres, Apperley (2006) opted to approach it with a more generic approach. In his study, Apperley asserted that simulation, strategy, action and role-playing games are the main defining genres, which encapsulate all sub-genres. To establish a significant number of genres to utilize for this research but maintain a limited and reasonable scope, I opted to use five popular (non-overlapping) genres. Those genres are first-person shooter, sports, racing, role-playing games and arcade/fighting games. Per a statista.com sales report for game genres in 2014, 21.7% were shooter, 13.3% were sports, 9.5% were role-playing games, 6% were arcade/fighting, and 5.2% were racing games (Statista.com, 2015). This indicates that those five genres cover over 50% of existing games in the industry.

2.4 Mystery

The Mystery attribute in videogames is the primary focus of this research. In this section, I discuss, in detail, the role of mystery in videogames as well as other story mediums like film, literature and advertisement. I have also examined both player-centered mystery (how players experience mystery) and designer-centered mystery (how design incorporates mystery) in previous literature. This section will also describe how mystery is manifested differently in different videogames genres. Additionally, I have analyzed previous literature on the impact of mystery on player motivation. The details of this literature review helped inform the upcoming studies of this research, mainly in constructing the interview questions to players and designers around mystery.

2.4.1 Mystery in Story Mediums

This section focuses primarily on mystery (and curiosity) in non-game story mediums, like film, literature and advertisement. Understanding how mystery is manifested and experienced in other story mediums is important to further understand the difference between those mediums and videogames for the end user (videogame player, book reader, movie and advertisement watcher). First, I have summarized previous studies that discuss mystery as well as how mystery is manifested in those mediums. Then I evaluated how those mediums enable, utilize and manipulate mystery to improve the audience enjoyment or message recall in the case of advertisement. There is a large amount of research on mystery in other story mediums, so without summarizing all of it, I am only going to highlight some of the major themes from that research.

Previous research examined in this section inspects how researchers have viewed mystery, and curiosity (sometimes called suspense in crime and detective stories) very similarly to the research in videogames. The definition of mystery is based on the notion of missing or inconsistent information, regardless of the medium. The only difference between how mystery is manifested in those mediums and videogames is the variability of how information can be withheld or set to confuse. This variability exists because of the nature and type of these story mediums and how they differ in format, audience, duration and purpose.

2.4.1.1 Mystery in Film and Television

How mystery is manifested in film and television and how their producers manipulate mystery to heighten viewer enjoyment can vary greatly. In this review, I have referred to both film and television shows as film as the structure and format is largely consistent between the types of media. While analyzing Patrice Leconte's *Monsieur Hire*, Duffy (2002) described how mystery is manifested in film by asserting that film suggests mystery by "the adoption of oblique viewing angles" because such angles can limit and alter "the viewer's access to the scene" (2002, p.209). This indicates that cinematographers utilize and manipulate the way the scene is staged and shot to heighten mystery. Other researchers describe mystery manifesting through the storyline, like Ely et

al. (2015). Ely et al. described mystery as missing or inconsistent information, which has taken on the form of “asymmetric belief swings” or “plot twists” (p.217). This suggests that storywriters can rely on the storyline to cause uncertainty and ultimately surprise the audience, although it is important to note that plot twists are the culmination of built mystery that aggregates and concludes during the plot twist.

How viewers experience information and consume data is also a bit different in film (or literature and advertisement for that matter) than videogames. That difference is highlighted by the lack of user input to the experience in film, literature and advertisements versus videogames. Playing videogames requires a player to contribute to the progress of the story and the events by playing the game, something that largely differs from film, advertisement and literature where the user is a spectator. In their book *The CSI Genre Effect*, Byers and Johnson (2009) asserted that the fast pace and hyper flow of CSI concluded by a supposedly scientific explanation leaves the audience feeling as if “they have just solved a complex mystery or puzzle” (p.9) even though they are just bystanders. The authors attribute that feeling to the show’s approach of presenting purported evidence in a scientific context much like in a courtroom, which immediately carries credibility, especially with Generation X’ers.

Discussing an important factor in satisfying the audiences’ curiosity, Ely et al. stressed that hiding then providing information to satisfy the audience only works when the revelation of the mystery occurs “in a manner that makes the experience more exciting” (p.216). Cheong (2015) argued that mystery doesn’t only add to the user’s enjoyment but rather mystery, along with suspense and curiosity, are used in literature and film because they transform a narrative from a mere series of events into a *story* (p.39). To summarize, whether be it embedded within the cinematography or part of the storyline, mystery is essential to satisfy film audiences.

2.4.1.2 Mystery in Literature

For literature, mystery is usually manifested like it is in film. Previous research suggests that mystery in the form of uncertainty elevates and heightens reader enjoyment.

Knobloch-Westerwick and Keplinger (2006) discussed in their study on short stories,

how mystery development and mystery resolution impact enjoyment. While other researchers, like Herbert et al. (1999), focused more on how mystery is manifested in literature using uncertainty. This section focuses on summarizing and analyzing these concepts.

The mystery storyline has sometimes been considered interchangeable with the detective storyline, but they are not always the same thing. Herbert et al. (1999) asserted that while the detective storyline focuses on the detecting part of the story to resolve unknowns and uncertainties, the mystery storyline focuses on how those uncertainties come about (p.303). The mystery storyline is much more about presenting the unknown rather than unveiling the known. A crime or detective story focuses more on how a crime occurred and affected the people involved, rather than who committed the crime and why. Herbert et al. identified various ways of including mystery or uncertainty in literature including red herrings, false and misleading clues or suspects, and even “in the form of literary conceit” or a surprising extended comparison. (p.378).

Other researchers, like Knobloch-Westerwick and Keplinger (2006), view both uncertainty and its resolution as two critical factors in the enjoyment of mystery for readers. Resolution is the segment of the story where the mystery is solved and is considered “the primary gratification” that can be achieved for fiction readers, especially in mystery (Herbert et al., 1999, p.384). In their study of a mystery short story, Knobloch-Westerwick and Keplinger’s results confirmed their hypothesis that not only is mystery enjoyed more but also the reader experiences higher levels of curiosity when they experience high uncertainty. In their empirical study, they also concluded that there exists an inverse relationship between enjoying levels of uncertainty and reader self-esteem (p.206). Their results show that readers with high self-esteem enjoyed mystery more when they were surprised by the mystery outcome while those with low self-esteem enjoyed mystery more when they expected the mystery outcome.

2.4.1.3 Mystery in Advertisement

In advertisement, mystery certainly has played a part in the golden age of television, and that’s by far the biggest type of advertising that most people are exposed to. Unlike film

and literature, advertisement has a much smaller duration to establish context and a storyline with mystery. In the last few decades, mystery has been utilized in the commercial medium where television ads became a big part of our daily routine. In its 2014 demographic report, Nielson described the average time Americans watch television ads is over 14 minutes a day. That level of user engagement has led to television ads being optimized for message recall, where mystery can play a big role versus being focused on enjoyment like in literature and film/television.

Research from the 1970s and 1980s was very much against mystery in advertisement. In fact, researchers emphasized that advertisement message recall is directly correlated with less mystery and less uncertainty. Examples of these researchers include McEwen and Leavitt (1976), Ogilvy (1983) and Stewart and Furse (1986) who all asserted that identifying the brand early in the advertisement leads to clearly improved message recall. Debating this hypothesis and its effect on the advertising world, Loewenstein (1994) argued the side of mystery. “Advertisers have begun to harness the power of curiosity in 'mystery' ads that reveal the identity of the product only at the end of the advertisement” (p.75). Other researchers, like Fazio, Herr and Powell (1992) had similar findings, saying that mystery advertisements are in fact very effective because they keep the viewer “drawn into the ad” and searching curiously for what is being advertised.

To validate their hypothesis, Fazio et al. conducted an empirical study, which measured the latency of recognizing the relationship between a brand and its product category after viewing different types of advertisements, including mystery ads. Their conclusion was that mystery advertisements enforce a much stronger brand and category relationship than non-mystery ads, except for brands already known to the research subject. This behavior led them to conclude that the excitement that builds throughout the mystery advertisement to find out what is the brand being advertised can diminish if the viewer is familiar with that brand and feels let down during the big reveal at the finish.

2.4.2 Mystery in Videogames

In order to fully understand mystery, I review how it has been defined in previous research and identify any gaps in that definition. Most prominent among these related terms is curiosity, which is sometimes even listed as its own, separate attribute within the literature. This difference has been a focus of previously-conducted research and will be touched on briefly in the remainder of this section. Finally, the following subsections concentrate on the different types of mystery and how they relate to the player and game designers.

There hasn't been a clear consensus in the literature on the definition of mystery in videogames. Despite that lack of consensus, there is a general agreement that mystery is a manifestation of curiosity in videogames, mapping a player's curiosity to the mystery in game design (Berlyne, 1960; Malone & Lepper, 1987; Loewenstein, 1994; Garris, Ahlers & Driskell, 2002). Malone & Lepper describe mystery as *cognitive curiosity*, the person's need to consume missing knowledge. Malone & Lepper tried to differentiate between *cognitive curiosity* (mystery) and *sensory curiosity* (sensory stimuli), described as sensation triggering interest. That distinction highlights the difference between creating mystery within game design and experiencing mystery as a player (i.e. curiosity). Malone & Lepper's assertion on players' desire and interest to be more informed is affirmed by Garris et al. "[M]ost experts agree that curiosity reflects a human tendency to make sense of the world and we are curious about things that are unexpected or we can't explain." (Garris, Ahlers & Driskell 2002, p.450).

Several previous studies examined curiosity as an interchangeable reference for mystery, or, at a minimum, as an indicator of mystery. Feldman & March described the importance of curiosity by asserting that people are curious and they "value the information for its own sake" and that people "systematically gather more information than they use, yet continue to ask for more" (1981, p.171). While performing a historical analysis of curiosity, Loewenstein asserted that curiosity is always seen as "an intrinsically motivated desire for information" (1994, p.76). Advancing the concept of curiosity and the motivation to learn, citing Cicero (1914), Loewenstein referred to curiosity as "innate love of learning and of knowledge...without the lure of any profit"

(1994, p.76). This is just a sample of previous studies that focused on mystery and curiosity as primary attributes of videogames.

Using a very common definition for mystery in previous literature, Garris et al. defines it as the “optimal level of information complexity” (2002, p.447). Defining information complexity as perceived discrepancies or inconsistencies in our knowledge is a common theme in previous literature. Kagan (1972) described information complexity as incompatibility between ideas and the failure to predict the future. Similarly, Malone & Lepper (1987) defined information complexity as incomplete and inconsistent information. Describing information complexity and how it relates to mystery and curiosity, Garris et al. asserted that the product of “perceived discrepancies or inconsistencies in our knowledge” while we seek to achieve that “optimal level of information complexity” causes and enhances curiosity (p.450). Citing Berlyne (1960), Garris et al. asserted that mystery is enriched by the presence of “hidden information, complexity, novelty, surprise and violation of expectations” (p.450).

While there's plenty of information about the nature of information complexity in the existing literature, the nature of the spectrum of potential experiences created by varying information complexity is not fully explored or understood. Figure 1, a summary of previous literature on mystery, illustrates how the information gap in existing knowledge can be manipulated and how it can result in an optimal information complexity and, hence, mystery. When the information gap is low, it causes a dismissive or bored experience for the player. When the information gap is too high, it causes a confused or anxious experience for the player. Consequently, when games provide an optimal gap in knowledge or an optimal level of inconsistencies between the player's knowledge base and the game, then they achieve optimal levels of mystery which in turn elevates the levels of player intrinsic motivation.

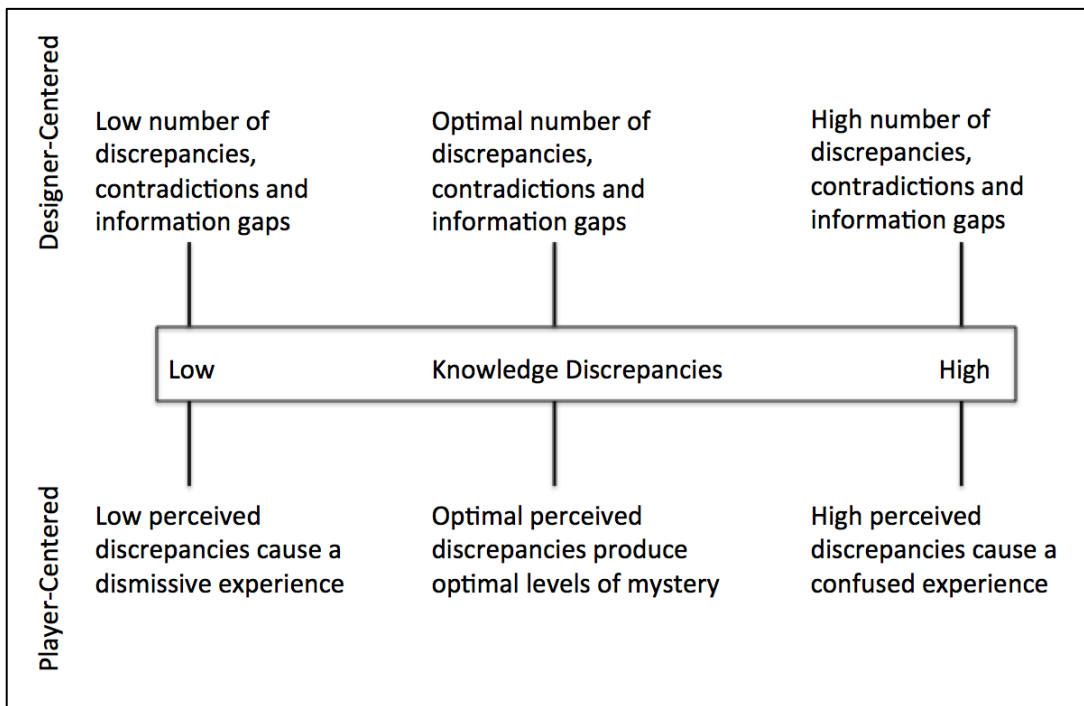


Figure 1. Perceived knowledge discrepancies in games and optimal mystery

Other researchers tie the concept of information complexity with a state of uncertainty (Kagan, 1972, for example). Wilson asserted that “the discrepancy or contradictory event” grasps the individual’s attention and transforms them into “a state of uncertainty” (2008, p.55). Kagan defined that state as observing or participating in an experience that contradicts the cognitive expectations of that experience (p.55). Like Loewenstein’s description of curiosity given above, Kagan emphasized that people are “primed to resolve” their state of uncertainty by “assimilating, removing or escaping from the event” (p.55).

Wilson (2008) provided her attempt at defining mystery using simpler terms. She defined mystery as “the gap between known and unknown information” (p.233). That notion is certainly covered by other definitions I found in previous literature but Wilson added, “users must know the unknown information exists even if they don’t know what it is” (p.233). An example of that knowledge is knowing the inevitability of facing a boss at the end of an RPG level but not knowing what that boss is or what their capabilities are.

One important aspect of defining mystery in videogames as information complexity is to clearly identify what elements can produce this information complexity and what conditions need to exist in order to consider an unknown to be mystery. Simply introducing an unknown in the gameplay or storyline does not automatically cause mystery, because not all unknowns are equal. A player can encounter inconsistent or contradictory information within the gameplay which they have no interest in resolving if it doesn't directly impact their experience. For example, in the game Call of Duty: Modern Warfare II, the player starts the game by hitting the shooting range. In that first scene (<https://youtu.be/PPVq-pK2xk8?t=96>), the player is instructed to learn about their weapons and how to use them while their company observes. Even though the game annotates the players with their names as the player focuses on them, very little information is known about these soldiers. While this can be considered an unknown, there isn't a clear significance to knowing much about these soldiers, hence it shouldn't be considered mystery.

In contrast, later in the gameplay, the player is embedded within a terrorist group under the leader Makarov while they perform genocide at an airport (<https://youtu.be/PPVq-pK2xk8?t=2025>). At the end of the scene, Makarov shoots the player before the terrorist group makes their getaway with no clear reason as to why. For the player, this produces another unknown but this time this unknown is very much a significant one to the gameplay because it produces undeniable curiosity to the reasons behind the shooting. Because of this factor, this unknown can be classified as mystery. Using these two examples, the definition of mystery can be further focused as information complexity in videogame design which causes curiosity for the player. The significance of that unknown to the player is relative to the context of the gameplay because there could be other instances in the same or different games where knowing the names of the soldiers around you is pertinent and knowing why you were shot is not. Therefore, mystery is identifying what is important to the player and creating an unknown around that.

In summary, previous literature has addressed with some detail the definition of mystery (and provided some interchangeable use in curiosity or at least an association).

Overall, mystery is described as the level of information complexity. High levels of complexity might be confusing for the user and low levels of complexity might be boring to the user. However, optimal levels of information complexity produce optimal levels of mystery. To produce optimal levels of information complexity, there must exist one of two conditions. The first is optimal information gap and discrepancy in existing design (designer-centered). This means the game design should cater to a gap between the known and the unknown that is not too small or too large. The other condition is optimal levels of contradiction or inconsistencies in the user's knowledge base (player-centered). This means that within the knowledge space of the player there should be enough contradictions and inconsistencies to keep the player curious but not too many to render them confused. In either condition, Wilson (2008) emphasized that the user must know the existence of that gap or knowledge of inconsistencies to achieve information complexity. In other words, if users do not know that their knowledge base is inadequate or contains contradictory information, and then information complexity doesn't exist.

There are however, significant gaps in the current state of literature for mystery in videogames. For one, there isn't a clear understanding of how mystery is incorporated in games by videogame designers and later experienced by videogame players. Additionally, I found no clear analysis that compares mystery in different game genres or between different story mediums, like books and film. There is also a gap in knowledge from previous literature on how mystery and curiosity impact the player experience, primarily motivation. The next three subsections focus on these points, by examining what is available in previous literature on mystery in videogames and highlighting those gaps that this research addresses.

2.4.3 Comparison of Mystery in Videogames and Other Story Mediums

Writers of literature and film/television scripts view success of optimal mystery differently from those who write mystery advertisements. While engagement success in literature and film/television is measured by audience enjoyment, advertisement is all about message recall. That part is evident by the amount of catchy and memorable advertisements that audiences are exposed to everyday. With the usually less-than-

appealing jingles, it is the memorable tune or words that result in persistent message recall with the audience, as the writers intended.

Another difference between these different mediums is how they incorporate mystery. Storylines and plot twists are frequently used both in literature and in film and television. Film and television can also employ cinematography like slanted angles or blocked view. Advertisements, with their short duration, are limited in how they can leverage story line and plot twists. However, identifying the brand late into the advertisement (or not at all) is one approach advertisements use to incorporate mystery into their narrative to improve audience engagement and increase message recall.

Finally, one of the more prominent similarities between these story mediums and their utilization of mystery is how the user experiences mystery and how that is different from mystery in videogames. Videogames provide the mystery element as an obstacle for the player to actively overcome and advance to the next level or defeat the current boss. However, in these other story mediums, the end user is no more than a spectator who will observe and experience mystery but watching it unfold or getting it resolved is not up to them to decide. For example, audiences may enjoy the mystery of a detective novel or crime show, but if and how that mystery is resolved is completely up to the writers and cannot be influenced by the audience.

2.5 Player-centered and Designer-centered Attributes

This section focuses on understanding the correlation between how videogame design incorporates attributes and how players experience them. As mentioned above, much of the previous research on videogame attributes focuses on how designers introduce the attributes into games. Some of the prior research on attributes brings in player-centered attributes as well, but no one else, to my knowledge, has correlated the two. I addressed this important gap in the literature in some preliminary studies to this research by asking participants to answer questions related to the design aspects of the game during gameplay and correlating this with their overall impression of each of the attributes after gameplay.

To further understand that relationship, I examined the data from Alkhafaji et al. (2013) where players reported designer-centered attributes and answered questions about their perception (player-centered). For designer-centered and player-centered mystery, this study calculated the average and standard deviation of players' response to "How mysterious was this game? (0-10)" (player-centered) and grouped the values by whether that same player was able to answer (correctly) "What happens next?" (designer-centered) during gameplay. This type of analysis can map the perception of mystery with the level of information complexity. The data indicated that players who could successfully answer, "What happens next?" felt the game was less mysterious than those who weren't able to answer that. This means that games where players can fairly predict upcoming parts of the game, experience the game to be less mysterious. This study found similar correlation for other attributes like challenge, sound and narrative.

2.5.1 Player-Centered Mystery in Videogames

In section 2.4, I analyzed previous literature and their definition of mystery and how that relates to curiosity. Based on that analysis, most researchers seem to agree that mystery corresponds to the level of information complexity presented to the user. In this section, I will focus on how that relates to the player experience. In Figure 1 above, I explained how the player experience relates to information complexity, which will result in player reactions from dismissive and bored to confused and anxious (Garris, 2002; Loewenstein, 1994; Kagan 1972; Berlyne, 1960). The goals to achieving optimal levels of information complexity (and consequently optimal mystery) can be accomplished by achieving optimal levels of discrepancies in the user's knowledge base.

While experiencing mystery in videogames relies a great deal on how the game is designed, it also relies on the players themselves. Player characteristics, like age, gender, gaming experience, etc. certainly play a large role into how the player experiences mystery. While these factors are intuitive and can be safely assumed, other factors like different genres and how they affect players experiencing mystery are not. In fact, I found an information gap in previous literature focusing on how genres affect a player's

experience of mystery in videogames. However, this factor is one of the factors I studied further in this research.

2.5.2 Designer-centered Mystery in Videogames

In the previous section, I highlighted some of the background around player-centered mystery in videogames. In this section, I will focus on designer-centered mystery, meaning how designers can incorporate mystery in their videogame designs. While there are several studies focused on mystery in videogames *in general*, there is an information gap in focusing on how videogame design incorporates mystery as an element of videogames. Much of this research has focused on defining and analyzing how videogame designers represent mystery in videogames through their design, intentionally or unintentionally.

One variable that influences mystery in videogame design is the videogame genre. When analyzing different genres of videogames, the element of mystery can be presented in many ways in the design. In some genres, mystery can be presented through the storyline of the game by hiding information from the player until the opportune moment or by introducing contradictions and discrepancies. Comparatively, there are other ways mystery is presented in the game design that differs from genre to genre. In RPG games, a player needs to explore uncharted areas where the gap of knowledge produces mystery in the game and provokes curiosity for the player. First person shooter games rely on suspense and the unexpected in mission levels. Fantasy games rely on the graphics and visuals to present mystery. Other genres like sports, racing and arcade games lack any unique approach to manifesting mystery. The focus of this research is to expand on the analysis around how videogames designers utilize their design to manifest mystery differently in different genres, something I found to be lacking in the current state of literature.

2.6 Mystery and Intrinsic Motivation

Commercial videogames are not known for suffering from motivation issues and concerns. As stated in the introduction, players have been playing commercial video games for decades without, for the most part, any external motivating factors. Players

invest a significant portion of their day playing videogames because they are internally motivating. According to Nielsen, a global measurement and data analytics company, the average videogame player in the United States over the age of 13 spent 6.3 hours a week playing video games in 2013 (Nielsen, 2014b). That type of motivation is known as intrinsic motivation. Malone (1980) and Malone and Lepper (1987) define intrinsic motivation as motivation to perform a task because we want to.

Historically, the difference between intrinsic and extrinsic motivation is often attributed to Malone and Lepper (1987). Malone and Lepper defined an intrinsically motivating activity as “people engage in it for its own sake, rather than to receive some external reward or avoid some external punishment” (Malone & Lepper, 1987, p.229). Comparatively, extrinsic motivation is usually accompanied by an external motivating factor in the form of a reward or punishment (Malone & Lepper, 1987). Brown elaborated on this, referring to extrinsic motivation as “our tendency to perform activities for known external rewards, whether they be tangible (e.g., money) or psychological (e.g., praise) in nature” (Brown, 2007, p.143).

Intrinsic motivation is not unique to videogames. In fact, motivation in general refers to a person’s desire to perform a task or undergo an activity. Ryan & Deci (2000) focused on intrinsic motivation, discussing what enhances and diminishes it, and developed Self-Determination Theory. Ryan & Deci asserted that to promote intrinsic motivation, a feeling of autonomy must be established. Their research established the regulatory styles and relevant processes in relation to both intrinsic and extrinsic motivation. Essentially, they associate intrinsic motivation with enjoyment, interest and inherent satisfaction. Ryan & Deci identified three inherent needs for intrinsic motivation: autonomy, competence and relatedness. Considering this, it is easy to see how games tap into our intrinsic motivation by promoting those very processes.

A strong relationship is found between mystery and intrinsic motivation throughout previous literature. Malone & Lepper (1987) asserted that curiosity (or absorbing mystery) has the strongest impact on intrinsic motivation, specifically because a player’s curiosity implies interest and that implies motivation (p. 235). As described above, Malone & Lepper also distinguish between sensory curiosity and cognitive

curiosity. They asserted that incompleteness or inconsistencies would provoke the user's curiosity and, thus, increase their intrinsic motivation. Similarly, Cheong (2015), while speaking of suspense and curiosity, asserted the significant impact they have on enjoyment (p.39).

2.6.1 Theories of Motivation

In section 2.4.2, I explored the definition of mystery in previous literature as information complexity in videogame design which causes curiosity for the player. Furthermore, I emphasized the need for the information complexity to have great significance and importance to the player to generate curiosity. I also examined the player's innate desire to resolve that complexity presented within the gameplay, because that complexity has significance to the player. In this section, I survey previous research in motivation theories in the field of psychology and identify how they can explain that innate desire that motivates players to resolve mystery.

One of those motivation theories is Festinger's Cognitive Dissonance theory. According to cognitive dissonance theory, individuals have an internal desire to resolve inconsistencies in their beliefs and views (Festinger, 1962). If dissonance exists, individuals tend to seek change to remove it. The significance of that dissonance in Cognitive Dissonance theory is determined by the number of inconsistencies as well as the importance attached to each of them. To remove dissonance, individuals have to either decrease the importance attached to the dissonance, add more non-dissonant beliefs or change the dissonant belief so it is no longer contradictory. This theory is analogous to how I defined mystery in section 2.4.2: incomplete and inconsistent knowledge presented as a gap between the known and the unknown. Similar to the Cognitive Dissonance theory, players presented with mystery have an internal desire to resolve that mystery manifested in the form of player curiosity.

Internal desire and curiosity for meaning is a prominent need in another motivation theory, Maslow's hierarchy of needs. Maslow's hierarchy of needs is a motivational theory in psychology containing a five-stage model of human needs, which Maslow later expanded into a seven-stage and an eight-stage model of human needs

(Maslow, 1970). In his seven-stage model, Maslow introduced cognitive needs, specifically focusing on knowledge, meaning and the need for meaning. Placed more towards the top of his hierarchy, Maslow emphasized our need to make sense of the world and our tendencies to acquire knowledge because of our curiosity. Curiosity's placement towards the top of the pyramid of needs emphasizes that this need is basic and one of the first things that motivates our behavior.

Similar to Maslow's hierarchy, Reiss' 16 Basic Desires theory also placed a high premium on curiosity. The 16 Basic Desires Theory is a theory of motivation proposed by Steven Reiss which examines the sixteen fundamental needs that motivate a person (Reiss, 1998). Reiss interviewed more than 6000 people trying to answer fundamental questions like "What makes a person happy?", "What makes another person happy?" and "What makes me happy?". In his conclusion, he developed a profile describing curiosity as a fundamental force of evolution and desire which drives an individual's motivation (p.102).

Silvia (2012) examined Curiosity and Motivation from a psychology standpoint. In his work, Silvia considered some of the major historical models on curiosity and motivation like Clark Hull's body of work (1943, 1952), Harlow and McClearn (1954) and Berlyne (1960). He stopped short of introducing new models of his own but just published reflections on the older models, declaring: "Curiosity is an old concept in the study of human motivation...but too complicated to solve" (p.157). Based on this summary, he attached three "strands of thought" for curiosity, the first of which is motivation to resolve uncertainty (p.157). While I asserted earlier that curiosity can motivate to resolve uncertainty, given that complexity has significance to the individual, previous researchers, according to Silvia, haven't made that leap. He quotes Hull: "It's not obvious why an organism at rest would cease resting and start exploring" (p.158). So even though these studies on human motivation all claim that curiosity is a driver of intrinsic motivation to resolve uncertainty and information deprivation, it remains largely unexplained in their literature on why that is the case.

These theories of motivation provide more insight to how player curiosity as a result of mystery (missing or inconsistent information) can motivate them to resolve that

mystery. Additionally, some of these theories, like Festinger's Cognitive Dissonance theory, stressed the importance of significance attached to the knowledge and information to be acquired for the individual to be motivated. This insight is highly relevant to understanding a person's drive to fill that information gap, more specifically curiosity.

2.7 Measuring Motivation

In this section, I have examined different methodologies that have been used in games research to measure a player's motivation during gameplay. Because measuring intrinsic motivation of players during gameplay can be a difficult task, one must follow a proven approach. Historically, there have been two approaches followed for game research: biometrics and self-reporting. Biometrics use detectors such as Galvanic Skin Response (GSR) or heartbeat sensors. Self-reporting tools come in the form of questionnaires to assess a player's motivation.

One advantage of using biometrics, like GSR, is to gather data during gameplay without any interruptions for the player. However, using biometrics limits the researcher to relying on the interpretation of the body's reaction to the game, which is problematic if the body is responding to something else at the time, like room temperature.

Alternatively, there are several self-reporting tools in the field that focus on measuring motivation. The Intrinsic Motivation Inventory (IMI) has garnered much support within the game research community for measuring intrinsic motivation. Self-reporting utilizes predefined pointed questions to determine the level of intrinsic motivation of the player after gameplay. A disadvantage of self-reporting is its dependence on the player's response and feedback being reported after gameplay which is not guaranteed to be accurate or true.

2.7.1 Galvanic Skin Response

GSR is most commonly used to measure arousal through skin conductance during an activity (Lykken & Venables, 1971; Lang et al., 1993; Lang, 1995; Latulipe et al., 2011). Other studies, like Mandryk and Atkins (2007) have used GSR as a direct method of measuring motivation in videogames by mapping a player engagement to arousal. Davies

and Armstrong (1989) explained that when a person is emotionally aroused, it causes an increase in skin perspiration. They asserted that an increase in perspiration reduces the skin resistance to electric current. Then they concluded, “conductive levels will be high when the individual is highly motivated and will be low when the individual is tired, disinterested or quite content with situations as they are” (Davies & Armstrong, 1989, p.18).

2.7.2 Intrinsic Motivation Inventory

While there have been only a handful of studies that link GSR directly to measuring motivation, the Intrinsic Motivation Inventory is an established metric to measure the motivation of a participant in an activity. Although, the IMI contains many subscales for different measurements, the interest/enjoyment subscale is commonly used for intrinsic motivation. This is why I use the terms player motivation and player enjoyment interchangeably within this dissertation. This subscale, shown in Table 2 below, has been used before to measure motivation in many studies (e.g., Ryan, 1982; Ryan, Mims & Koestner, 1983; Plant & Ryan, 1985; Ryan, Connell, & Plant, 1990; Ryan, Koestner & Deci, 1991; Deci, Eghrari, Patrick, & Leone, 1994). These studies have validated the use of the IMI to measure intrinsic motivation while performing an activity.

Table 2. Interest/Enjoyment subscale of IMI

- | |
|---|
| <ol style="list-style-type: none"> 1. I enjoyed doing this activity very much 2. This activity was fun to do. 3. I thought this was a boring activity. (R) 4. This activity did not hold my attention at all. (R) 5. I would describe this activity as very interesting. 6. I thought this activity was quite enjoyable. 7. While I was doing this activity, I was thinking about how much I enjoyed it. |
|---|

* (R) denotes reverse value for data normalization.

The subscale questions are first tailored to the type of research being conducted where the phrase “doing this activity” is mapped to “playing this game.” Subsequently, the questions are presented to a participant after performing an activity to establish that

participant's intrinsic motivation. McAuley et al. (1989) described using the inventory by asking each participant to respond with a number value (1-7). The range of responses varies from "not true at all" by answering 1 to "very true" by answering 7. Before scoring the final response, questions 3 and 4 are reversed since they are aimed to establish the opposite of the rest of the questions. A higher value averaged between all 7 questions indicates a higher intrinsic motivation reported by the participant.

2.8 Qualitative Research for Games

Understanding the properties of qualitative research and how it can be effective is essential to the success of this research. Much of this research has focused on the human behavior and the essence of human interaction with videogames. Such types of studies – looking at human behavior and the social world in areas of social sciences – greatly benefit from qualitative research (Mack et al., 2005). In contrast, quantitative studies focus on repeatable objective measurements in areas of natural sciences (Mack et al., 2005). When researching the why, researchers must utilize qualitative research which looks beyond the how, how often and how many (Mack et al., 2005).

Since qualitative research is more focused on observing the natural occurrence of phenomenon as they are, it is quite time consuming. Understanding why people behave a certain way and how they are impacted by certain events requires a richer and deeper insight, which is why qualitative research allows for smaller sample size (Mack et al., 2005). Some of the more relevant purposes of qualitative research are seeking an answer to a question, producing discoveries undecided in advance and pursuing to comprehend a research subject from the viewpoints of the local populace.

While there are several different methods used for qualitative research like focus groups, observations and action research, for this research I have focused on the interview method (Mack et al., 2005). The interview method is optimal for collecting data on individuals' personal histories, perspectives, and experiences, particularly when sensitive topics are being explored (Mack et al., 2005, p.2). The interview method has also allowed for a direct interaction with the research participant to further understand mystery in videogames.

Interview methods can come in three different variations: structured, semi-structured and unstructured. The Mack et al. describes the three variations in detail; I will summarize those in this section. The structured interview method usual asks the same questions in the same manner with no deviation. Adhering to a tight schedule, structured interview methods also provide pointed and choice questions, resembling the makeup of a questionnaire. Semi-structured interviews may have a certain structure as well, but they do allow for both open-ended questions as well as having the researcher probe the interviewee for elaboration. Unstructured interviews have very little organization beyond a few topics to cover during the interview. While unstructured interviews do allow for discussing a topic in greater detail, it does make harder to compare results and develop themes. For this research, using semi-structured interviews has provided both the proper depth as well as the ability to baseline responses and develop themes.

Sampling for qualitative research has its unique qualities as well. The Mack et al. discussed different sampling techniques, two of which can be very effective for this research (purposive and snowball). Purposive sampling allows the researcher to create a theoretical saturation threshold, which marks the point where additional data collected might not provide additional understanding to the study. Using purposive sampling requires the researcher to perform data analysis in parallel to collecting the data providing them with the knowledge to pinpoint that threshold. Snowball sampling focuses more on the recruitment of interviewees. Snowball sampling relies heavily on interviewees to use their personal networks and recommend additional interviewees. This approach will be much needed to recruit a sizeable number of interviewees for this research. Theoretical sampling is focusing on collecting data that is more relevant to the findings of the analysis. Probing and concentrating on those concepts that have emerged as pertinent during the duration of the study is a sound approach to refine the emerging theories (Charmaz, 2006, p.96).

Once data is collected with qualitative research methods, such as interviews, proper and thorough analysis is critical in attaining valid results. This analysis should focus on systematically combing through the data to identify any categories and themes. This process involves continuous labeling and coding the data. After all themes have

been identified, the researcher will identify those that are most relevant and significant to the research. Following that, the researcher must prioritize the categories and themes into major and minor concepts. Doing so will allow the researcher to either merge some concepts or derive sub-categories. To conclude the analysis stage of qualitative research, the data should be presented along with quotes and examples to support validity.

2.9 Grounded Theory

Grounded Theory is a general methodology for research that is based on discovery and analysis of data. First presented by Glaser & Strauss (1967), Grounded Theory evolves during actual research and it does this through continuous iterations between analysis and data collection. The initial theory may be generated directly from the data or from a preceding grounded theory if it exists. Like other qualitative research methods, researchers can combine quantitative and qualitative data and techniques, but it is best suited for a study of human behavior through qualitative analysis. In this methodology, a theory is defined as likely relationships suggested among concepts and sets of concepts. These relationships are stated as propositions that are presented in discursive form, which means they are embedded in a thick context of descriptive and conceptual writing. Grounded Theory is designed to guide researchers in producing theory that is conceptually rich, that is, with as many conceptual relationships as possible.

2.9.1 Glaser vs. Strauss

As mentioned above, the original proposal of Grounded Theory was put forth by Glaser and Strauss in 1967. However, since then, Glaser and Strauss took Grounded Theory in two divergent directions after that original publication. The two directions are considered divergent because their views on analysis and verification were significantly different from each other. While Glaser maintained his focus on the original theory methodology, which is rooted in discovery, Strauss has altered his analysis approach in the direction of more verification. Strauss (1987) and his co-author, Juliet Corbin, published three editions of their book to further their articulation of Grounded Theory (Corbin & Strauss, 1990; Strauss & Corbin, 1990, 1998). Strauss (and Corbin) continuously revised and simplified their approach, especially with respect of verification, in the second and third

editions of their book. In the second edition, they changed the original approach and insisted that their views are to be considered as “suggested techniques but not commandments” (p.4). Later in the third edition, Strauss and Corbin simplified their views even further, calling for researchers to “... spell out their own procedures” (2008 p. 4).

In contrast with the Glaserian approach, Strauss and Corbin (1990) stressed that grounded theory research must strive towards verification within the course of the current research and not assume that verification is possible through follow-up quantitative research. This implies that the evolution of the Grounded Theory must not only include an iterative hypothesis but also implement techniques to verify that hypothesis in future iterations. This type of verification relies heavily on the researchers’ duty and responsibility to interpret, not just observe and record.

Remaining a purist, Glaser (1992) argued that grounded theory is inductive only and not deductive. Heath and Cowley (2004) agreed that Glaser remained faithful to this interpretation, where Grounded Theory is based on induction and theory emergence. Furthermore, Glaser argued that Grounded Theory should not be altered or evolved, specifically as dramatically as with the Straussian approach by maintaining that theory should simply “emerge” from the actual data (Bryant and Charmaz, 2007; Boychuk Duchscher and Morgan, 2004; Charmaz, 2000; Babchuk, 1996).

Many researchers agree with the notion that the Glaserian approach is the true and faithful approach to the original theory while the Straussian approach is a changed version (Walker and Myrick, 2006; Heath and Crowley, 2004; Glaser, 1992). In fact, Strauss received heavy criticism for his complicated approach to analysis, especially in his first book. Melia (1996, p.370) called it “...programmatic and overformulaic[sic]”. Glaser (1992) was another critic of Strauss’ first book approach, calling it “forced, full, conceptual description” (Glaser, 1992 p.5).

Consistent with the original theory or not, the fundamental difference between the Glaserian and Straussian approach is based in verification (Heath and Cowley, 2004; Boychuk Duchscher and Morgan, 2004; Holloway and Wheeler, 2002; MacDonald, 2001; Charmaz, 2000). While Strauss (1987) called deduction and verification “essential”

(p.12), Glaser (1992) maintained that there is only room for inductive analysis in Grounded Theory. The Glaserian stance has been met with agreement from some in the research community, for example Heath and Cowley (2004) argued Glaser's emphasis on theory emergence and induction is consistent with the original Grounded Theory since induction is mostly concerned with discovery, a pillar of Grounded Theory.

For the battle between Glaser and Strauss, count Charmaz (2000) as a neutral participant. Without choosing one approach over another, Charmaz did endorse the Glaserian approach as the purer form of Grounded Theory. In 2000, she noted that Glaser has maintained "...an objective, external reality, a neutral observer who discovers data, reductionist inquiry of manageable research problems, and objectivist rendering of data" (p.510).

Formulating interview questions for a grounded theory study requires both previous insights into the topic as well as a researcher that is well versed in the subject. In her *Constructing Grounded Theory* book, Charmaz (2014) describes the need for a researcher to be current on the topic they are researching, so much so that they need to be fluent in asking follow-up questions. Charmaz also indicated that previous knowledge in the domain could contribute to a feeling of comfort from the interviewee and help them provide detailed responses. As far as selecting the initial set of interview questions, Charmaz recommends "broad, open-ended questions" (p.65). She argues that open-ended questions can encourage unforeseen responses leading the story line to pivot and new narrative to develop. Equally important, Charmaz asserts that the questions to be relevant to the topic of the research to ensure meaningful responses. Charmaz also reminds that it is important to consider that at any given session, the researcher may never get a chance to ask all the initial set of questions.

Charmaz provides other principles to guide researchers as they are formulating their interview questions. Some of these principles focus entirely on the interviewee's experience such as framing the questions to elicit responses from the participant's view and insisting the importance of that view. Other principles are more focused on follow-up discussions like encourage elaboration in follow-up questions and constantly reevaluating the research questions throughout the study (p.66).

2.9.2 Example of Applying Grounded Theory

In this section, I have provided an example of how three researchers applied Grounded Theory in their videogames study. In their study about playability in video games, Fabricatore, Nussbaum and Rosas (2002) focused on exploring the factors that impact playability of an action videogame as perceived by players. In this methodology, data was collected via observations and interviews during and after individual playing sessions. For these play sessions, the researchers used 30 action games based on CGW's top-100 list. During the proceedings of the study, players were explained the game then had a chance to play it before being interviewed on the issue of playability.

In parallel to collecting data, Fabricatore, Nussbaum and Rosas were analyzing incoming data to determine theoretical saturation. Theoretical saturation suggests that data is collected until "no new information regarding the conceptual categories analyzed and their relations" (p.318). This implies an iterative collect-and-analyze approach throughout the study. During the analysis phase of this approach, researchers sought to break down the raw data, propose concepts and analyze relationships between those concepts. The next few paragraphs will examine these segments of the analysis phase. For each segment, I will describe what the researcher did and later map those actions to distinguished elements of Grounded Theory.

When analyzing and breaking down raw data, researchers focused on extracting specific statements and interests raised by the players. Since the study is based on playability in action videogames, those statements surrounding the player's ability to play the game were given much focus. To categorize the raw data and labeling them accordingly, the researcher mined explicit and implicit concepts from player's statements during the interviews. An example of this the researcher gave was a statement made by a player, "*when I go under the bridge, I don't see my car anymore! Luckily, it's not for too long*" (p.320). From this, the researcher extracted explicit concepts like *Car* and *Bridge* but also implicit concepts like *Point of view*.

In the next segment of this analysis phase, the researcher sought to categorize the concepts identified, implicitly or explicitly mentioned by the player. To achieve this, the researcher identified the different properties of each concept, compared those concepts

with other concepts based on those properties, then defined categories of those concepts based on similarities in properties. An example the researcher used to highlight this process was the *Car* entity concept in the previous example and how it compares to other concepts from other games. Seeing how there are cars that the player can control and others where the player can't, the researcher saw similarities to creatures in another game where the player can control some and some cannot. So, his categorization of "entity" was "all the biological and non-biological, player- and non-player-controlled agents endowed with some ability to interact with the environment" (p.322).

In the next segment of the analysis phase, the researcher examined the different relationships between the categories defined in the previous segment. This was achieved by mining where the players' statement explicitly or implicitly establishes a relationship between different categories. In the previous scenario of the category of "entity", the researcher was quickly able to map out a relationship between that category and other categories, like identity. This relationship came through the interpretation of "Player is speaking about an entity, saying who he is."

Finally, to start formulating their theory using Grounded Theory, the researcher analyzed the preference of the players interviewed towards each of the categories identified. Also, having that dependency relationship chart between those categories can help the researcher to interpret how a player feels about a specific category and what that implicitly speaks to their preference about other categories in that connected to it. So, using this approach and relying on Grounded Theory methodology, the researcher was able to develop and iterate over an evolving theory consisting of a rich set of concepts. In the case of this study, those concepts were design prescriptions ("to be followed to design playable games") and recommendations ("considered playability enhancers, although not following them would not compromise the overall playability of a game").

2.10 Summary

This chapter focused on analyzing and summarizing previous literature in several areas related to this research. The first two sections discussed previous studies on primary attributes of videogames and how to operationalize attributes through player surveys. The

following section focused on different videogame genre classifications. The next section was primarily dedicated to mystery and how it is designed in videogames and later experienced by the videogame player. Following that, I discussed mystery in videogames, film, literature and advertisement. I also focused on how mystery impacts intrinsic motivation and how previous studies have measured intrinsic motivation through self-reporting and biometrics. Also, I described how these two approaches to measuring motivation have been used and defined in previous literature. Finally, I analyzed how qualitative research has been discussed in previous literature and specifically outlined the grounded theory methodology.

3. Chapter Three: Player-Centered Mystery

In this chapter, I have focused on my first research question and the study conducted to answer it. Within this topic, I sought to address the research question, “How do players experience mystery in videogames?” Using Grounded Theory and qualitative research techniques, I conducted 14 semi-structured interviews with videogames players to answer the research question. This approach enabled me to analyze and understand the videogame player’s perspective on how they experience mystery in videogames and other story mediums.

3.1 Aims

As described earlier in the Introduction chapter, for this question I sought to develop a detailed player-centered taxonomy of the experience of mystery in videogames. That description includes how players experience mystery in videogames and how the different elements and factors of mystery affect their experience as videogames players. This examination yielded several theories of mystery in videogames based on the different concepts and categories identified by this study. Another perspective that was investigated by this study was how players experience mystery differently in different genres as well as how they experience mystery differently in other story mediums like film, literature and advertisement. I also focused on three additional concepts that were identified during the analysis phase. Those concepts are fundamental elements of videogames, randomness during gameplay and factors affecting player enjoyment.

3.2 Methodology

In this section, I have described the process and approach I took for this study. This description will include details about the interview participants and their demographics. Also, within this methodology section, I will describe the design of this study, which uses the Grounded Theory approach. As described in the Related Research chapter, Grounded Theory is focused on using qualitative data gathering and analysis to formulate new theory in an iterative and exploratory fashion.

3.2.1 Participants¹

For this study, I interviewed 14 participants (10 male and 4 female) using semi-structured interviews on their experiences with mystery in videogames. The mean time for those interviews was 33:14 (33 minutes and 14 seconds) with a standard deviation of 9:15. This provided sufficient time to go through all the interview questions as well as time to probe and follow up with secondary questions. The mean age for those participants was 24.07 with a 5.23 standard deviation.

Consistent with the age range, seven of the participants had a high school diploma as their highest degree attained, two had an associate's degree and five had a bachelor's degree. As for their videogame experience, the mean years playing videogames for those participants was 18.07 years with 5.53 standard deviation. Essentially, all of the participants have been playing videogames for as long as they can remember. That experience started for many of them when they were Kindergarten or 1st grade. In addition, the participants played an average of 11.82 times (at least one-hour intervals each time) a week with a standard deviation of 7.78. Each participant that contributed to this study was compensated for their time with a gift card after the interview.

3.2.2 Design

For this research question, I incorporated a qualitative approach using Grounded Theory, which I outlined in section 2.9. Specifically, this study utilized the Glaserian approach of Grounded Theory, rooted in discovery, not the verification-oriented Straussian approach. Utilizing qualitative research aligns with the study's objectives (gathering opinions, feelings and experiences of videogames players), all of which are best attained using an interview approach. Also, to allow for follow-up and secondary questions to probe and sample, I chose a semi-structured interview design. I am using the Glaserian Grounded Theory approach (not the Straussian approach) for this study because as described in the related research section, the Glaserian approach is ideal for developing emerging theories through discovery with future research investigations to follow. Also, Grounded Theory fits this study design because there are relatively few pre-existing theoretical ideas about

¹ All studies with human subjects described in the dissertation received IRB Approvals

this topic. Following this Glaserian Grounded Theory approach, the interviews consisted of a series of open-ended questions based on the topic of mystery in videogames. While interviews using Grounded Theory and qualitative methodology encourage the ability to pivot and shift the narrative of the questions throughout the interview, they both advocate for a relevant initial list of questions that can focus the interview responses. I developed a list of initial questions based on Grounded Theory principles; those principles are described in Chapter 2. For some initial questions, I also indicated secondary questions that could be used as immediate follow-ups to the initial inquiry. One of the cornerstones of Grounded Theory is to ask open-ended questions with the least amount of assumptions, so the interview questions listed below were exploratory and minimized presuppositions.

1. What is your age?
2. What is your gender?
3. What is your highest degree attained?
4. How long have you been playing videogames?
5. How often do you play videogames?
6. Can you think of examples of games with a lot of mystery?
7. What is your most frequently played videogame? Genre?
 - a. What other genres do you play?
8. Have you designed videogames before?
9. What are your thoughts about mystery in videogames?
 - a. Can you think of some games where mystery plays a major role?
 - b. What makes a game mysterious?
10. How do you experience mystery in videogames?
 - a. How is that different in different genres?
11. How would you define mystery in videogames?
 - a. Is that different for different genres? If so, how?
 - b. Is that different from books and films? If so, how?
 - c. Which genres of books and film do you enjoy the most?
12. How important is mystery in videogames?
 - a. How is that different in different genres?
 - b. How is that different from books and films?

Following Grounded Theory methodology, I iteratively collected and analyzed data. This required a constant collect-and-analyze approach to ensure data could be

evaluated concurrently. This would also allow me to determine when we have reached theoretical saturation (described in section 2.8) to stop collecting data. There was a feedback loop from the analysis stream as well, informing the data collection process of theoretical sampling. Figure 2 below illustrates how data was collected and analyzed. In the subsections below, I describe each phase of this study shown in the figure and elaborate on how that phase was implemented.

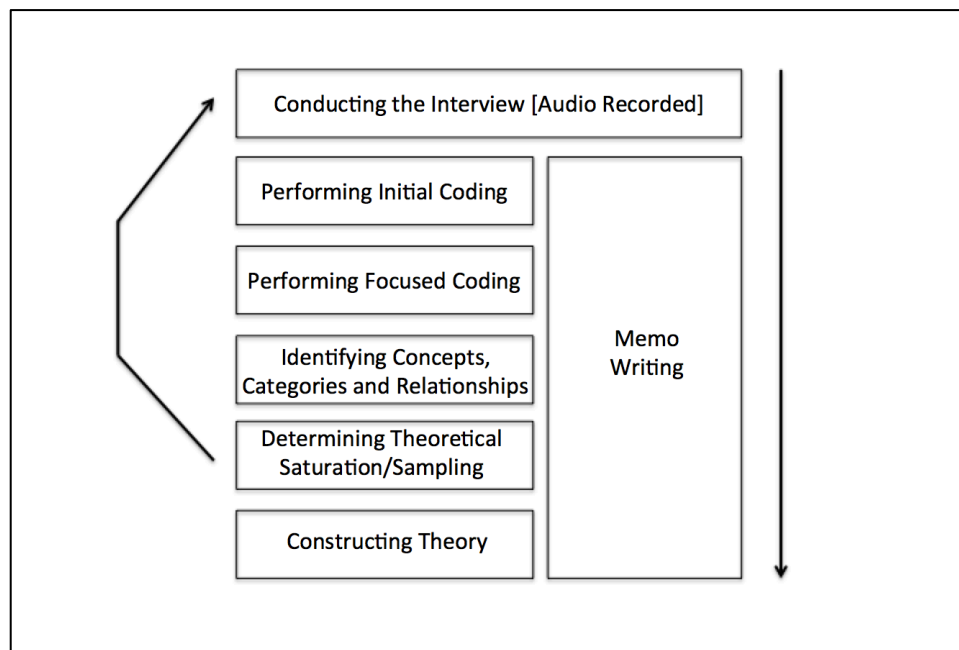


Figure 2. Methodology design for player-centered mystery

Conducting the Interview

As each interview started, I introduced myself, gave the participant a copy of the information sheet then asked them to read it and retain the copy. I also asked for their permission to voice record the interview using my smartphone (or a meeting voice recorder when conducting those interviews remotely) so I can go back and review the interview content during my analysis. Once the recording started, I began going through the questions listed above. Since this was a semi-structured interview, I often requested that participants expand or provide more details on some of their answers and asked

follow-up questions based on their initial responses. Starting at the seventh interview and gradually increasing the rest of the way, I started to focus the follow-up questions on the concepts, categories and relationships that had already been established in previous interviews. This approach is known as theoretical sampling and is described in section 2.8 of the Related Research chapter. At the end of each interview, I saved the audio recording and tagged it with only a four-digit number to maintain anonymity.

Memo Writing

In Grounded Theory, memo writing is an important method to capture thoughts and trends throughout the analysis phase. Two types of memos were used. The first type captured ongoing insights to the interviews themselves, like a diary of the study labeled early memos by Charmaz (p.80). The other type, labeled advanced memos by Charmaz (p.80), captured specific categories, relationships and theories that were emerging. For the ongoing insights or early memos, I created time-stamped memos dedicated to each interview I was analyzing, essentially just my thoughts captured in context. Below is an excerpt from the early memo of my first interview:

Right off the bat, this participant seems to have a low tolerance of mystery in video games. Observing some for the codes in place, I am noticing a clear pattern of mystery is irrelevant in games or worse harmful to the user experience. I can't help but wonder if the participant didn't exactly capture the meaning of mystery at first but by the end of the interview it was clear, they enjoyed games that are straightforward with no room of problem solving. They didn't appreciate unknown objectives to advance because they felt that made the games more difficult and frustrating. After they lose a lot, that game is casted as a bad game.

The excerpt from the first memo above was written informally. It was intended to be a personal diary pulling out ideas for later reflection, specifically focusing on what

statements the participants are making and what examples they are providing. The other type of memo used in the analysis phase, advanced memos, focused on emerging theories. These were more polished and focused on concepts, categories, relationships and emerging theory. Concepts are ideas that are identified in the analysis phase then grouped by categories. After these categories are established, a set of relationships is determined between the concepts as well as the categories. Based on those relationships and groupings, I was then tasked with establishing emerging theories. The key element of advanced memo writing is that it is an ongoing process that never stops throughout the entire analysis phase. As I continued to conduct interviews, code and identify categories, I was memo writing in parallel to those activities. Throughout the study, I maintained 10 advanced memos of some of the target concepts of the study as well as concepts that emerged from the onset during the first interview. Not all of these advanced memos are relevant to the findings of this study, since some of these memos focused on concepts identified early in the study but faded with subsequent interviews. Here is an excerpt example of an advanced memo, with key concepts in bold text to visually represent the key points of the memo. It is specific to randomness in gameplay and its relationship with mystery, one of the final code buckets established later in this section:

*Participants quickly pointed out that **randomness** can't be utilized realistically or effectively for the overall **story** but it can certainly apply to **short-term** gameplay. This implies that **randomness** can cause **transient mystery** not **persistent mystery** (I discuss these two concepts later in this chapter in section 3.3.1). Examples that were brought up were **shooting games** like **Call of Duty** or **Halo** as well as **arcade games** like **Tetris**. Some participants referred to the relationship between **randomness** and **transient mystery** as consequential or analogous. Other participants warned that **randomness** could cause **bad gameplay** especially since they are less controlled than **transient mystery** through designed **unknowns in gameplay**.*

Performing Initial Coding

As I analyzed the interviews, I listened to those recordings multiple times to identify key quotes by the participants. Using an analysis tool called ATLAS.ti, I parsed the audio recording into multiple clips and would mark the specific clip in the audio recording as a quote with its own title and description. Then I coded those quotes with specific codes (phrases describing a part of the quote). Initial coding allows for basic identification of phrases describing what the participant is saying or discussing. Below in Figure 3, is a screen shot taken of a quote and how it was parsed and coded.

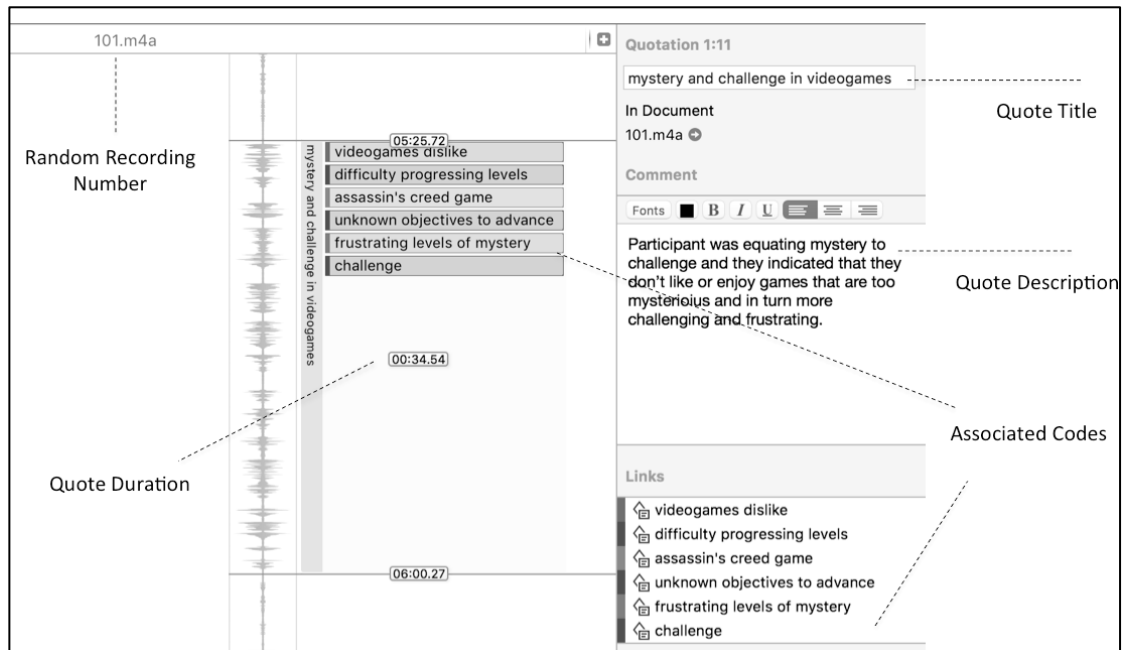


Figure 3. An Example of a quote and its associated codes

The figure above shows how those quotes and codes are tagged, stored and visualized for later analysis. Below, I discuss how those quotes were chosen, how they were coded and later extrapolated and highlighted into the main themes of the interview. Those themes could be nouns, actions or topics that are relevant to the study and significant enough to be singled out. During initial coding, the number of themes is relatively high, but during focused coding the themes identified are limited to those that have higher significance to the study question. The quote below is the same quote from Figure 3 with the audio

dictated and the codes selected from the quote highlighted. I didn't perform this level of transcription for all quotes but rather relied on the audio recording itself, however this provides an insight into how I parsed and coded these quotes. In this quote, the participant was equating mystery to challenge. The participant also indicated that they don't like or enjoy games that are too mysterious and in turn more challenging and frustrating.

Interviewer: *Can you think of some games where mystery plays a major role?*

Participant: *I think it plays certain roles in certain **games** and some people are **interested** in those **mysteries in games**. Some people like the **challenge**. I am more of a type that likes to play just to **enjoy** my time. **I don't like** to get **frustrated** while I am **playing the videogame**. So, for example, in *Assassin's Creed*, you **never know how to advance** it gets **frustrating** to me. **I got stuck on a level for a couple of days**. **I don't like** this. I like to see a little **challenge** but **quickly resolve it**.*

Identified Codes:

- playing games
- player's interest
- mysteries in games
- frustrating levels of mystery
- playing the videogame
- assassin's creed game
- player enjoyment
- videogames dislike
- difficulty progressing levels
- unknown objectives to advance
- challenge
- quick resolution

Performing Focused Coding

After identifying all quotes within the recorded interviews and initially coding them, the next phase was focused coding. Focused coding is identifying the more significant or frequently occurring codes and concentrating on those with yet another iteration of coding. This process is imperative because it starts to separate the one-off comment, phrase or example used by the participant from those recurring trends in that interview and in previous interviews. An example of how this filter worked would be omitting codes like “playing games” and “mysteries in games” since those are implicit concepts in studying mystery for videogame players. Glaser (1978) refers to focused coding as more directive and conceptual than initial coding and Charmaz described it as a process that enables us to “compare people's experiences, actions, and interpretations.” (p. 59). The example below shows the same response segment from above but this time with focused coding.

Interviewer: *Can you think of some games where mystery plays a major role?*

Participant: *I think it plays certain roles in certain games and some people are interested in those mysteries in games. Some people like the **challenge**. I am more of a type that likes to play just to enjoy my time. **I don't like** to get **frustrated** while I am playing the videogame. So for example, in *Assassin's Creed*, you **never know how to advance** it gets **frustrating** to me. **I got stuck on a level for a couple of days. I don't like this.** I like to see a little **challenge** but quickly resolve it.*

Identified Codes:

- frustrating levels of mystery
- assassin's creed game
- videogames dislike
- difficulty progressing levels
- unknown objectives to advance
- challenge

Identifying Concepts, Categories and Relationships

While conducting interviews, identifying quotes and performing initial and focused coding, I started to look for emerging and common themes, trends, concepts and categories. Some of those emerged immediately through focused coding and reoccurring ideas but some required deeper analysis. That deeper analysis was made possible through continuous memo writing and reflection as well as network diagrams. Network diagrams are a great tool to help visualize those relationships between identified and emerging concepts and categories. Network diagrams also allowed me to create complex relationship diagrams between codes and quotes by visually representing all the associations between those codes and quotes dynamically. Those associations are:

- *Is a*
- *Is associated with*
- *Is part of*
- *Is property of*
- *Is cause of*
- *Contradicts*

Below, in Figure 4, is an example of one network diagram I created specifically for the player enjoyment code and designed it by importing all the quotes and codes with any type of relationship to the player enjoyment code. This is very powerful because it provides a unique visual representation of these codes and quotes to help further analyze and reflect on them as well as the relationships between them. This enabled the start of emerging theories identification for those categories. Identifying emerging theories is accomplished through managing, annotating, grouping, color coding and creating different relationships between codes. The figure below is just an example of how these network diagrams look and can be leveraged during the analysis phase.

Determining Theoretical Saturation/Sampling

Measuring theoretical sampling is difficult as it is subject to the researcher's own findings and analysis. However, I exercised a more empirical approach to measure

theoretical saturation in my study. This approach was done through a comparison of all newly created codes for each interview versus existing codes applied to that interview. This comparison would imply theoretical saturation if, as the study progresses, I repeatedly reuse existing codes rather than identifying new ones while analyzing the participants' responses.

Constructing Theory

Constructing theory is an exercise that begins with reviewing memos and categories and concludes with a set of theories as the outcome of this study. As I indicated in the memo writing subsection above, I used advanced memos to start identifying and refining emerging theories. Listed above in that subsection is an example of an advanced memo that clearly highlights the different insights and how they evolve into emerging theories iteratively. Emerging theories in this sense are generalizations about relationships, identified during the data collection and analysis phases, between different concepts and categories. Charmaz argued that removing context with this type of generalization to explain “the world and relationships within it” is what Grounded Theory is based on (p. 128). This type of generalization filters the specifics to a person's experience and draws an overview from it for a larger context. An example in this study would be where the emerging theory is not focused on a specific game or player but types of games and types of players.

3.3 Results

This section presents the set of concepts and categories, identified throughout the study, as well as the relationships and theories emerging from them. This focus has provided a detailed view to the analysis phase and give insight to how emerging theories were identified. Theoretical saturation was required to cease data collection for this study, as described in the design section. To that end, theoretical saturation was achieved through theoretical sampling by focusing on already emerging categories for future interviews. To determine theoretical saturation, I applied the empirical method described above in the design section (which compares existing codes identified in previous interview responses

versus new codes identified for a new interview). This highlights how many new and unidentified concepts are being introduced in each interview. The number of previously unidentified concepts should be minimal at the end of the study if theoretical saturation is achieved. Below are the results, displayed in chronological order, in Figure 5.

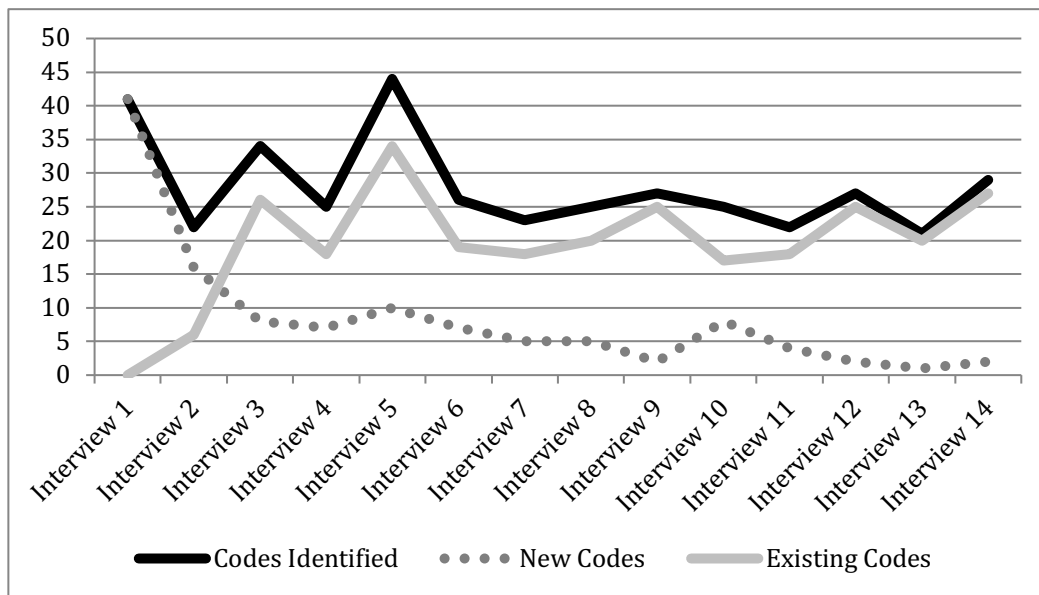


Figure 5. Theoretical Saturation – New vs. Existing Codes

As the number of new codes decreased over time from one interview to the next and finally diminished down to two new codes (new game examples) at the 14th and final interview, it was clear that there were no new significant concepts or even properties of existing concepts to discover. This conclusion then finalized the data collection phase of this study.

The data analysis performed and discussed in this section was done through both visualization of the network diagrams and evaluation of the advanced memos. To perform the analysis, a comprehensive representation of all the codes in this study was required, specifically their groupings and relationships. That list should encompass all concepts identified in this study. Through that list, the network diagrams and advanced memos provided more insight into the relationships between those concepts and their categorizations as well as helped establish some of the emerging theories of this study. I

started creating that comprehensive representation by capturing all the 114 codes identified in this study in one table, shown in Appendix A.

By examining the list of codes identified in this study, a few immediate observations were apparent. These observations helped shape the analysis phase by omitting redundant and irrelevant codes as well as highlighting significant and consequential codes.

- 33 of the codes are game genres, types or examples of specific games (like Halo or Call of Duty).
- 20 of the codes are explicitly focused on mystery in videogames instead of other concepts (like genres, story mediums, or player enjoyment).
- 34 of the codes are examples of gameplay properties or elements (like reload ammo or takedown a chopper).
- 7 of the codes are related to challenge in videogames.

The observations listed above provided a motivation to narrow the codes list down to a smaller list for analysis because most of the codes in this study are too specific for any intended generalization. A generalization about a concept to establish a theory is a cornerstone of Grounded Theory, as mentioned in the related research section. This smaller list was determined by mapping the top 15 codes identified in these interviews against the top 15 codes with established relationships with other codes. Those details are displayed in Figures 6 and 7 below. This mapping shows 6 of the top 15 codes identified most frequently in interviews are also in the top 15 codes with relations with other codes. Those 6 omit “mystery in games” since that is implicit in all concepts and categories given the overall goal of this study. These top 6 codes are the foundation of the final analysis, providing 6 concepts for examination. They are:

- *fundamental element*
- *player enjoyment*
- *storyline*
- *plot twists*
- *unknowns within gameplay*
- *random gameplay*

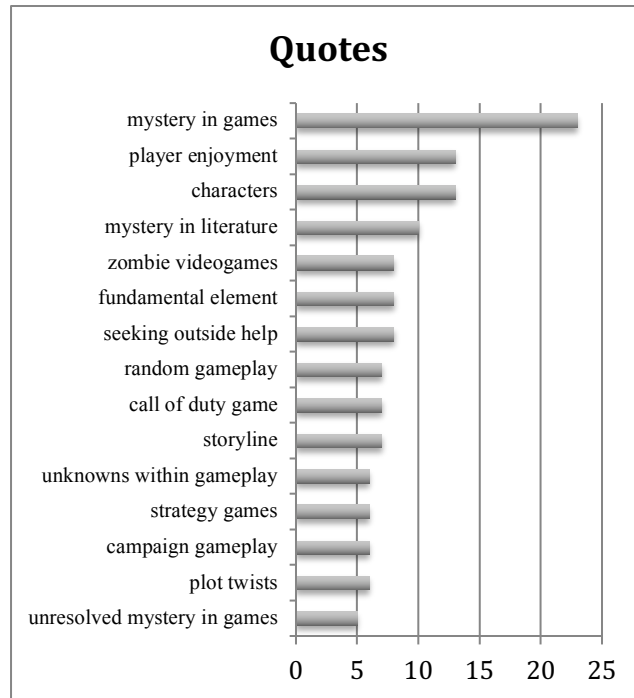


Figure 6. Top 15 quoted codes

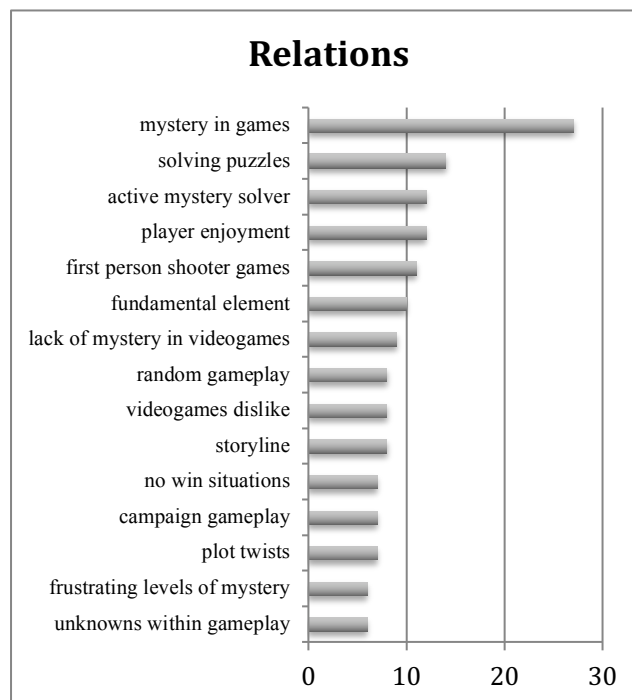


Figure 7. Top 15 associated codes

To start visualizing these 6 concepts and begin deriving relationships between them and other codes, I needed to ensure that I included all major goals of the study in the aims section. Those goals that were overlooked from these 6 concepts were mystery in different genres and mystery in other story mediums. Therefore, I included an additional list of codes that cater to those goals, listed below:

- *first person shooter games*
- *sports games*
- *zombie videogames*
- *strategy games*
- *historical games*
- *action adventure games*
- *mobile games*
- *role-playing games*
- *society building games*
- *walking simulator games*
- *mystery in literature*
- *mystery in advertisement*
- *mystery in film*

Combining both lists, the original 6 most quoted and associated codes with the codes related to genres and story mediums, yields the final list of concepts. Figure 8 below, provides a visual representation of that final list.

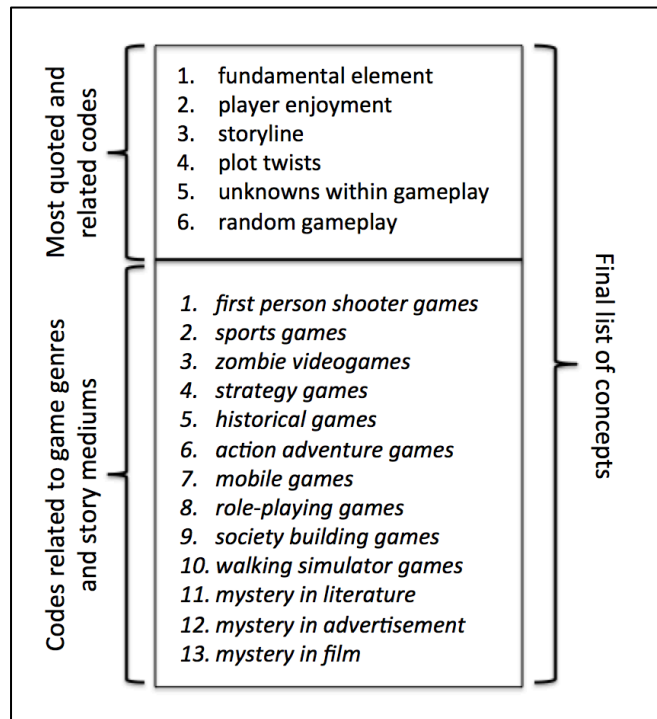


Figure 8. Establishing final list of concepts and categories

Based on the Grounded Theory approach, making generalization for concepts into categories to establish theories, I grouped all the codes in the final list into more generic categories. This grouping was done to examine a smaller set of categories that can be further generalized into meaningful theories. The method of the grouping was based on capturing some common properties of these concepts and placing them into broad categories. One of the simpler examples of this grouping was placing all game types into one bucket, labeled videogame genres. A less subtle example was placing *storyline*, *plot twists*, and *unknowns within gameplay* under one category labeled mystery manifestation since all those concepts describe ways that the interviewers said mystery can manifest in videogames. The final list of categories and the concepts within them are listed below in Table 3 and are discussed in detail in the following subsections.

Table 3. The concepts and categories for this study

Concepts	Category	Description
<i>storyline</i> <i>plot twists</i> <i>unknowns within gameplay</i>	Mystery Manifestation	The ways mystery manifests in videogames.
<i>fundamental element</i>	Fundamental Elements	The properties of an element core and essential to the player experience.
<i>player enjoyment</i>	Player Enjoyment	Making the player experience more enjoyable.
<i>random gameplay</i>	Randomness	Gameplay triggered by randomly generated events.
<i>first person shooter games</i> <i>sports games</i> <i>zombie videogames</i> <i>strategy games</i> <i>historical games</i> <i>action adventure games</i> <i>mobile games</i> <i>role-playing games</i> <i>society building games</i> <i>walking simulator games</i>	Videogames Genres	The different genres of videogames identified by the participants of the study.
<i>mystery in literature</i> <i>mystery in advertisement</i> <i>mystery in film</i>	Story Mediums	Other story mediums, besides videogames.

3.3.1 Mystery Manifestation

Understanding how players experience mystery in videogames was the primary objective of this study. As I mentioned above in the related research section, the only consensus I found in the literature about the presence of mystery in videogames was that it invokes a player's curiosity and their inner desire to fill-in the unknown gaps in their knowledge. This consensus maps mystery's manifestation in videogames directly with gaps of information that the player must fill. Those gaps could be focused around the story or the gameplay. It is with that consideration, that I grouped *storyline*, *plot twists* and *unknowns within gameplay* under the mystery manifestation category. While analyzing the interviews of this study, two ways began to emerge immediately about how mystery

manifests in videogames. Those two ways are long-term and short-term mystery and they define the range of how mystery manifests in videogames, I refer to these two types of mystery as persistent and transient mystery. **Persistent mystery** is long-term mystery that persists throughout an entire game, storyline or significant section of the game.

Transient mystery is short-term mystery that presents within the immediate gameplay with less significant consequence and importance to the overall game storyline than persistent mystery. Figure 9 below, shows the network diagram for this category and visualizes the relationships between the different concepts within it with other concepts in the study.

Persistent mystery was always the first thing participants thought of when responding about mystery in videogames. They immediately related that idea to mystery in movies and books that takes the form of a storyline unknown revealed only at the most opportune moment or a plot twist that surprises the audience. The network diagram in Figure 9 shows a visualization of how persistent mystery can be caused by plot twists, storyline, characters or unknown overall theme of the game. A good example of persistent mystery can be observed in the game *Gone Home*. A YouTube video of the gameplay can be seen here (<https://www.youtube.com/watch?v=SS5eQmRgBLY>). In this game, the character faces a number of unknowns that are significant to the gameplay like “*Where did everyone go in their home?*” and “*What happened to their sister?*” while receiving a number of plot twists during the gameplay, like learning their sister likes a girl. These types of unknowns are classified as persistent mystery. However, not surprisingly, most videogames do not offer the right canvas for a rich storyline that can sustain an unknown overall point, well-defined characters or a major plot twist. That was the reason why most participants struggled to explain how mystery could manifest in games that don’t have a rich storyline like sports, racing, first-person shooter or mobile games. The answer from most participants was what can be considered as transient mystery.

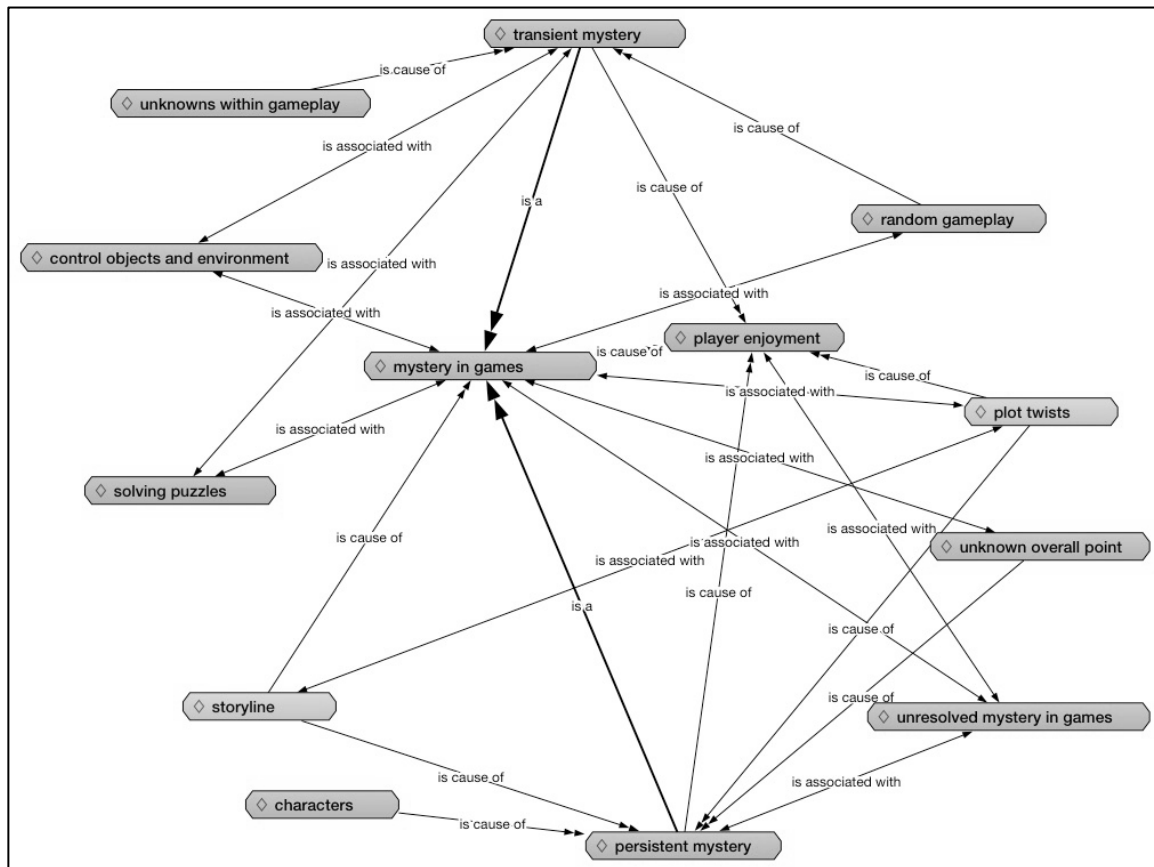


Figure 9. Mystery Manifestation Network

Transient mystery is the type of mystery that is more difficult to relate to or identify. Most participants started describing transient mystery as challenge, randomness or just gameplay but as I probed with follow-up questions, they began to elaborate and most reached the conclusion that this is mystery, but short-lived. Examples of this type of mystery can vary, caused by gameplay unknowns. A good example of transient mystery can be observed in the game *Rocket League*. A YouTube video of the gameplay can be seen here (<https://www.youtube.com/watch?v=634PPgu4WPE>). Within this game, the unknowns are primarily related to the gameplay, not the storyline. Each player is confronted with information gaps around how to control the car, how to do a trick play, who they are facing off next, but none are long lasting. These types of unknowns are classified as transient mystery. Naming examples of transient mystery, one participant mentioned “*The next unexpected enemy to encounter in Skyrim*” or another participant

said, “*What is this new enemy’s weakness in Undertail?*”. Other examples were focused on random gameplay as mentioned by some of the participants in saying, “*What race track will be chosen for the next race in a racing game?*”, “*If I execute the same play twice in Madden, would I get the same result?*” and “*What happens next?*” These insights highlight what the participants believed to be transient mystery and defining it as such because of the unknown it presents to the player, no matter how short-lived it is. To get a better understanding of how transient mystery is related to other concepts identified study, I refer to the network diagram in Figure 9 above. The network diagram shows association links between transient mystery with *control objects*, *environment* and *solving puzzles*. It is also showing causal links to *transient mystery* from *random gameplay* and *unknowns within gameplay*, highlighting transient mystery to be a byproduct of either randomness or information gaps introduced within the gameplay.

One of the more consequential differences, highlighted by the participants, between persistent mystery and transient mystery is how the player tends to interact with them. Persistent mystery, which manifests as part of the story, rarely requires direct action by the player and seldom produces different story lines based on those actions. One participant described it as “*like how mystery is presented in movies and fiction stories.*” Comparatively, transient mystery is often directly impacted by the players’ actions and frequently demands those actions are taken before the informational gaps causing mystery are filled with new information. Additionally, transient mystery is so much subtler and requires reflection by the player to even detect its presence whereas persistent mystery is much more transparent and visible to the player. As evidence to this assertion was one participant’s impression of transient mystery “*you rarely think about how much you don’t really know within the gameplay, in fact I never did until you just asked. Unless it is a major part of the storyline where you don’t know where you come from or who the bad guy is, every other unknown flies under the radar.*” Moreover, participants seem to consistently identify games where they think persistent or transient mystery were lacking or overwhelming, however none of the participants immediately recognized games with optimal mystery. In fact, it took most participants some time to recall a game where they enjoyed the mystery. This observation doesn’t indicate a

shortage of games that have optimal mystery but rather an indication that optimal mystery goes unnoticed, one participant likened it to “*a good sports referee, they are never noticed until they make a bad call.*”

To summarize this section, I encapsulated the four main ideas about this category (mystery manifestation) and its concepts. This encapsulation focuses on four main emerging theories and those theories would represent this concept in the final analysis in the discussion section. The four theories are listed below along with a brief description of each:

Emerging Theory #P1: Manifestation of Transient and Persistent Mystery in Videogames

Mystery manifests in videogames as either short-term (transient) mystery or long-term (persistent) mystery. Immediate unknowns or randomness in gameplay usually produces transient mystery. Persistent mystery can manifest through the fantasy element of videogames (storyline, characters and environment) as major story unknowns or plot twists. This distinction between long-term and short-term mystery was nearly unanimous amongst the participants of this study.

Emerging Theory #P2: Players Interaction with Transient and Persistent Mystery

Videogames players can actively engage in addressing and resolving transient mystery while their engagement has a smaller impact on the unfolding of persistent mystery. Essentially, a videogame player has to actively solve short-term mystery. However, long-term mystery usually manifests in the story line, which (similar to other story mediums) renders the player merely a spectator in the resolution of that mystery. This distinction is not universally applicable to all videogames, since there are some videogame genres, like open world games, which provide the player the opportunity to choose their own storylines. This also occurs within other story mediums, like in literature (Goosebumps book series).

Emerging Theory #P3: How Players Recognize Transient and Persistent Mystery

Transient mystery in videogames is subtler and hidden where players don't immediately recognize it. Additionally, even if players recognize the short-term mystery, they mistakenly identify it as challenge, randomness or just part of the gameplay. However, persistent mystery is more common with videogames and other story mediums, which makes it relatively faster to recognize.

Emerging Theory #P4: Transient and Persistent Mystery Recognition Factors

For both transient and persistent mystery, overwhelming or lack of mystery makes it easier to recognize than optimal mystery. Essentially, mystery in those games where the gap between the known and unknown is too big or too small is easier to recognize than mystery in those games where the gap is optimal.

3.3.2 Fundamental Elements

Fundamental elements in videogames is a concept that emerged early in the study when conducting the interviews, ranking 6th in both most quoted code as well as most related code. Quite intuitively, understanding how mystery relates to other core elements in videogames is essential to knowing how to understand mystery in videogames. To gain that understanding, there was a need to get more clarity on what the fundamental elements of videogames are and where mystery belongs in that list. To ascertain that, I asked each of the participants if they can name some of the fundamental elements of videogames and followed up with "is mystery one of those elements?" These two were lead questions to inquire about the relationship between mystery and other elements that are core and essential to the player experience. I visualized the different relationships of the fundamental element code with other codes by using network diagrams, shown in Figure 10 below.

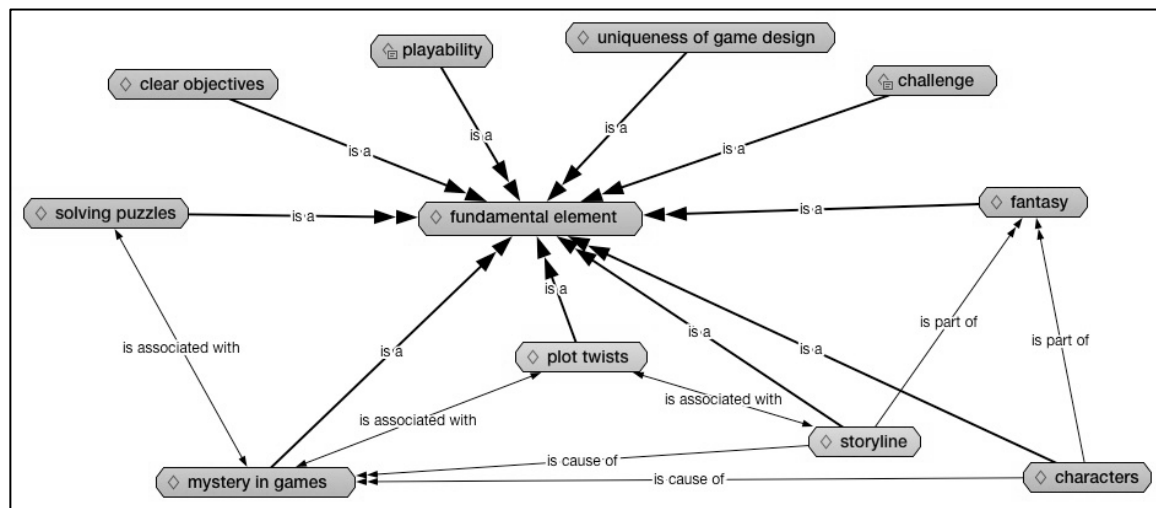


Figure 10. Fundamental Elements Network

The network diagram above shows several concepts that have *Is a* relationships with fundamental element, like *solving puzzles*, *clear objectives*, *playability*, *uniqueness of game design*, *challenge*, *fantasy*, *characters*, *storyline*, *plot twists* and *mystery*. However, the diagram doesn't show the weight of those relationships. For example, the diagram doesn't highlight that most participants singled out playability as the definite most essential element of videogames. The diagram also doesn't show challenge, competition, mystery and gameplay were all identified by the participants as factors of playability and more it doesn't show that storyline and characters were identified as factors of fantasy. In fact, after further analysis only three elements started to emerge as fundamental elements of videogames: playability, fantasy and audiovisuals. There were a few elements that were identified as sub elements or factors of these three. Participants gave several examples of videogame elements that can be folded under the playability category, mainly challenge, mystery, competition and gameplay. One Participant dubbed playability as “*re-playability. If you can play it over and over and keep enjoying it then it has high levels of playability.*”

Fantasy was another umbrella category that covered several participant responses like storyline, characters, environment, content and (in some cases) mystery. The one distinction between mystery under fantasy from that under playability was the fantasy

mystery was based on long-term mystery that is driven by the storyline or characters, persistent mystery. Comparatively, playability mystery is represented as both persistent and transient mystery. Finally, most participants indicated that audio and visual properties are core to the user experience. However, one participant was adamant that neither audio nor visual properties are core elements of videogames by highlighting successful mobile games like “Flappy Bird” that doesn’t have a very appealing sound or graphics in the gameplay. While the participant made a valid point, “Flappy Bird” doesn’t have fantasy or mystery elements either which suggests this type of game to be an outlier rather than a typical videogame.

To summarize this section, I again encapsulated the main ideas about this category (fundamental element) into one emerging theory listed below.

Emerging Theory #P5: The Fundamental Elements of Videogames

The fundamental elements of videogames are playability, fantasy and audiovisual effects. Critical factors in playability include persistent mystery, transient mystery, challenge, gameplay and competition. Fantasy in videogames consists of the storyline, characters, environment and persistent mystery. Audiovisual effects are the sound and visual stimuli inserted in gameplay. There was very little connection drawn between audiovisual effects and mystery.

3.3.3 Player Enjoyment

Player enjoyment was another concept that emerged early in the analysis of this study. The player enjoyment category contained only one concept, player enjoyment. Analyzing player enjoyment throughout the study required an understanding of the participant’s viewpoint on what makes them enjoy videogames. Their perception often referred to specific examples from their experience rather than a holistic or blanket declaration. Most of the examples relating to player enjoyment centered around difficulty level of the game. One participant responded with “*In Assassin’s Creed, you never know how to advance. It gets frustrating to me. I got stuck on a level for a couple of days. I don’t like this. I like to see a little challenge but quickly resolve it.*” Another participant provided a different

impression on difficulty levels and enjoyment by saying “*I think challenging gameplay is important because a big draw to videogames is based on the players feeling like they are accomplishing something.*” These two opposing views are examples of how players perceive player enjoyment differently. While participants didn’t agree on the amount of challenge or difficulty, I found a lot of agreement on the fact that challenge is necessary to keep up with player interest and enjoyment, at the right amount. The participant from the first quote might have enjoyed lower levels of challenge but the participant from the second quote clearly favors more challenging gameplay. Ultimately, getting the right amount of challenge for each player is paramount to maintain his or her enjoyment and interest. Illustrating this point, in Figure 11 below, the player enjoyment network diagram highlights how challenge has a *is cause of* relationship with both player enjoyment and videogames dislike.

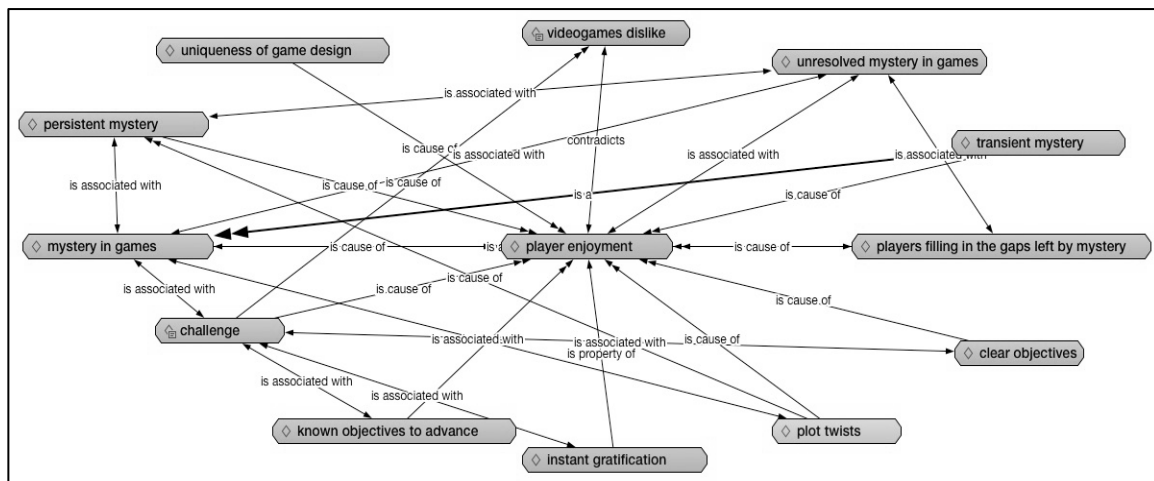


Figure 11. Player Enjoyment Network

The relationships identified between challenge, mystery, player enjoyment and other concepts indicated players prefer clear and known objectives on how to advance throughout the gameplay and achieve instant gratification. Participants also viewed both transient and persistent mystery as elements of challenge affecting player enjoyment. Participants indicated that since persistent mystery is a byproduct of plot twists or unknowns lasting throughout the different levels of the game, which heightens player

enjoyment. The emerging theories below summarize the different ideas captured in the analysis of this category.

Emerging Theory #P6: Impact of Both Mystery Types on Player Enjoyment

Transient and persistent mystery are core factors impacting player enjoyment in videogames. The manifestation of both persistent and transient mystery which affect player enjoyment is directly related to the challenge element of the gameplay.

Emerging Theory #P7: Impact of Persistent Mystery on Player Enjoyment

Persistent mystery embodies story unknowns and plot twists which enhances player enjoyment. Particularly unveiling persistent mystery in the form of a plot twist is a fairly enjoyable event for the players.

Emerging Theory #P8: Impact of Transient Mystery on Player Enjoyment

Transient mystery produces instant gratification to enhance player enjoyment but must not produce frustratingly difficult or no-win scenarios as those drive players away from videogames.

3.3.4 Randomness

Even though randomness in gameplay was a prominent factor in the mystery manifestation category, specifically transient mystery, it was a significant enough concept that it warranted its own category. Using a network diagram for analysis, shown below in Figure 12, I could get a good understanding of how participants viewed randomness in gameplay and its relationship to mystery. Random gameplay has a strong *is cause of* relationship with transient mystery and no relationship with persistent mystery. The strong causal relationship with transient mystery aligns with the notion that random gameplay is a contributor to short-term mystery by presenting the videogames player with less determinability throughout the gameplay. Determinability in this context would be a player performing an action and having the ability to determine and ascertain the outcome or result of that action. One participant provided an example of randomness in

gameplay of a sports game like Fifa, “When the game places you in a random matchup of a subdivision B team rather than what you are used like, like Barcelona or Real Madrid.” Another participant elaborated on how randomness in gameplay can create mystery, “In some games, when you do x and y happens and randomization takes place, it creates mystery and suspense. Because you may play the same level 20 times and you think you have it figured out but the 21st time something different happens in that same level. That is an example of what I think of as mystery.”

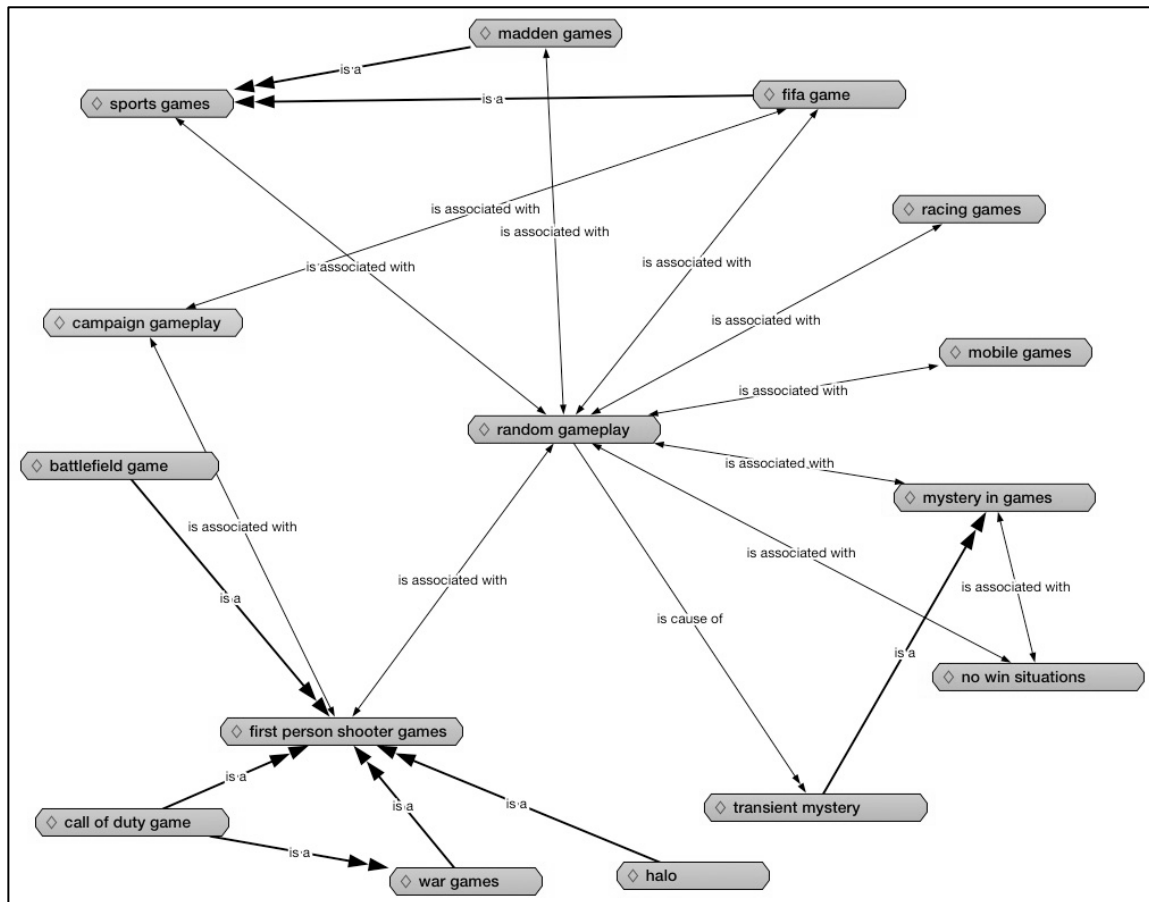


Figure 12. Random Gameplay Network

Dissimilarly, randomness has no relationship (casual or otherwise) with persistent mystery since persistent mystery manifests through a pre-determined storyline and plot

points. Below, I captured an emerging theory on this category summarizing the points made in this section.

Emerging Theory #P9: Impact of Randomness on Player Enjoyment

Randomness can be a major contributing factor in producing transient mystery in videogames. Like transient mystery, a lack or overwhelming presence of randomness can severely cripple player enjoyment, while only optimal levels of randomness can maintain enjoyable gameplay. Randomness also caters to the element of re-playability where predictable gameplay reduces players' enjoyment.

3.3.5 Videogame Genres

The videogames genres category was one of the main research goals for this study and its analysis was relatively more complex than other code buckets. One of the reasons of complexity was the definition of each genre. There isn't a universal agreed-upon definition and taxonomy of genres to reference, as I stated above in the related research section. In fact, genres defined by our participants tend to overlap a lot, like mobile games with other genres (since mobile games can be of different genres). So, my approach for this category was to take their responses as they intended and try to examine these inconsistencies during my analysis.

Shown in Figure 13 below, the network diagram gravitates a bit towards the two types of mystery, persistent and transient. The diagram also shows that all genres have a *is associated with* relationship with transient mystery but only a few (like role-playing games and historical games) have a *is associated with* relationship with persistent mystery. This observation is rather intuitive since, per the findings from the mystery manifestation category, all games contain a level of unknown or randomization in the gameplay but not all contain a story unknown that persists from level to level.

The visualization in the network diagram was echoed in the advanced memo I maintained throughout the study, displayed in Appendix B. This memo provided a more detailed description of how transient mystery can be designed in all genres while persistent mystery requires a rich storyline to manifest, making it difficult to manifest in some genres like sports and racing games. The emerging theories below summarize the different ideas captured in the analysis of this category.

Long-term (persistent) mystery relies on rich storylines, which usually manifests in genres like role-playing games, first person shooters and mystery games. Other genres

that do not contain rich storylines like sports, racing, arcade and mobile genres cannot sustain persistent mystery.

Emerging Theory #P11: Manifestation of Transient Mystery in Different Genres

Short-term (transient) mystery relies on immediate unknowns or randomness in gameplay, which allows it to manifest in all videogames genres since those elements are present within almost every game.

3.3.6 Story Mediums

Identifying how mystery manifests to other story mediums is another category that maps directly to one of the major topics of this study. In the related research section (Section 2.4.1) I reviewed previous research that focused on mystery in other story mediums and identified a few gaps in the knowledge base. Examples of those gaps are how mystery manifests in other story mediums and how that compares to mystery in videogames. In this section, I address some of these gaps based on the interview results of videogame players. Participants mostly agreed that mystery in videogames could be inferred in a way from the perception of mystery in other story mediums like film, literature and advertisement. When responding to questions about these topics, participants drew strong relationships with those story mediums and videogames, particularly persistent mystery. Highlighting those relationships, Figure 14 below shows a network diagram of the three concepts in the story mediums category and the collection of concepts they are related to.

One of those relationships is the similarity between how persistent mystery manifests in videogames with how it manifests in film, literature and advertisement. Since these mediums, including videogames, can have a storyline element to them, they can utilize it for persistent mystery. This is more common in film and literature but not entirely universal in videogames and advertisement. I discussed in previous categories how some videogames could lack the rich storyline to sustain persistent mystery and advertisements sometimes do as well. In fact, it is more common for advertisements to be short-term focused with no overarching storyline. Transient mystery can still but rarely manifest in film and literature, but it is especially relevant to advertisements.

In film and literature, there is still the notion of short-term mystery where it might be explicit to a specific scene without having to be significant to the overall storyline. One participant elaborated on this point by giving this example, “*Sometimes in horror movies when there is a strange sound in the house at night and the rest of the scene is focused on finding out the source of that sound. Sometimes it turns out to be a cat tripping over some prop and it results in an insignificant find.*” In advertisement however, any sense of mystery is almost always short-term. One participant referred to television advertisements where the product is only revealed at the end as evidence of short-term mystery. However, a mystery spanning the 30 seconds of an ad running time should not be considered transient, because the 30 seconds is the entire duration of the advertisement. So, if a mystery persists throughout the entire duration of an ad, regardless of how short it is, that should still be considered persistent. Although, one participant refuted that notion by asserting that the lifespan of the advertisement is not necessary over even at the end, “*Some ads don’t reveal their purpose or even the product name even at the end. They require you to go out of your way and look up a hash tag or website to find out what this is all about.*” Still, this is not very common, most television advertisements have a lifespan of 30-60 seconds.

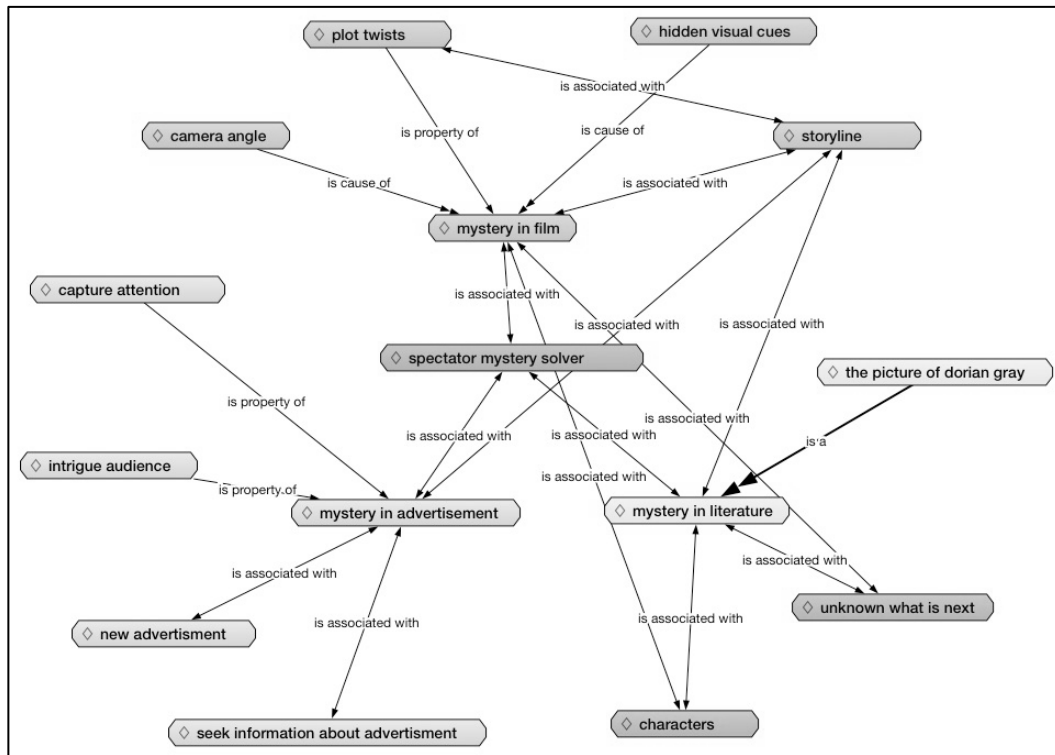


Figure 14. Story Mediums Network

Another theme for this category was the differences between these mediums and videogames regarding mystery. A major difference identified by the participants was the notion that a videogames player is an active contributor to resolving mystery (even if they can't change the outcome of the story) but those other story mediums consider the audience to be spectators. This view is more relevant for transient mystery and having the player actively contribute to resolve unknowns within the gameplay. This difference is not as significant with persistent mystery since most videogames have a pre-determined storyline and do not allow the player's action to impact any major development. However, in that case, one participant argued, *"It is not just what are the plot holes or plot twists, but in videogames the player is often in charge of how and when you find them."*

Another difference between those four-story mediums that emerged during the analysis was that the visual element of videogames, film and advertisement provide them with an advantage of how to portray mystery with different shot angles and visual cues over literature. Though, one participant argued that could be an advantage for literature,

since “*Authors can control what to tell the reader without bothering with unintended visual cues.*” Addressing these points, below I captured a list of emerging theories on this category summarizing the points made in this section.

Emerging Theory #P12: Mystery Types in Videogames vs. Other Mediums

One of the primary differences of mystery in videogames vs. other story mediums (film, literature and advertisements) is videogames demands players to actively participate in the game’s unfolding of mystery while those other mediums manage the user as a spectator. This is possible because persistent mystery usually only unfolds one way and the user is often a spectator along for the ride. That is the only type of mystery available to those mediums. However, videogames (not other story mediums) can also manifest transient mystery, short-term mystery which relies on the player to help, or solely own resolving mystery.

Emerging Theory #P13: Actors in Videogames vs. Other Mediums

Another difference of mystery in videogames vs. other story mediums (film, literature and advertisements) is those mediums usually encompass several actors where usually two or three are taking center stage in the narrative, while videogames storylines often consist of one protagonist where the player impersonates during the gameplay. There are exceptions to this assertion, mostly in videogames where the player can choose between different characters. However, it is unusual for the other characters not chosen by the player to remain a significant factor in the storyline as much as the one character that was chosen.

Emerging Theory #P14: Adaptation of Mystery in Videogames and Other Mediums

Another difference of mystery in videogames, film and advertisement vs. literature is those three mediums can leverage shot angles and video manipulation to enhance mystery where literature cannot. However, authors of literature have the power and advantage to control what and how the reader consumes the content, which can be difficult to manage with those other mediums.

3.4 Discussion

This study has provided a rich source of information about mystery in videogames from the players' perspective. Gathering players responses on their experience of mystery in different games, genres and story mediums led to several theories and conclusions. The analysis in this chapter also included assertions related to different game genres and different story mediums, aligned with the goals of the study. The entire set of conclusions was developed into a taxonomy depicting how mystery is perceived in videogames and in turn how players experience it, shown below in Figure 15. Subsequent sections will expand on this taxonomy by providing more details around fundamental elements of videogames as well as other story mediums. Even though the participants were recruited as videogame players, their responses did also lead to several conclusions about design-related aspects of mystery – not just how players experience it. Additional and more detailed insight into game design is discussed in Chapter 4, which is focused on mystery in videogames from the videogame design perspective. The following sections will discuss each segment of my findings about mystery in videogames in greater detail and map that discussion to the emerging theories identified in the results section. Finally, the last section will summarize these findings and discuss future research in this area.

As shown in Figure 15, mystery in videogames can be manifested as either transient mystery or persistent mystery. The game playability element and its factors are responsible for instilling transient mystery in videogames. This type of mystery is usually present in every type of videogame genre. As for persistent mystery, the game fantasy element and its factors are responsible for instilling it within videogames. This type of mystery is usually present only in story-based genres. Along with audiovisual element, fantasy and playability make up the three fundamental elements of videogame design. As shown in the diagram below, incorporating those elements in videogames, at optimal levels, can lead to better gameplay and more enjoyable experience for the player. Figure 15 below shows an overview; however, the following sections will highlight those areas based on the study's focus.

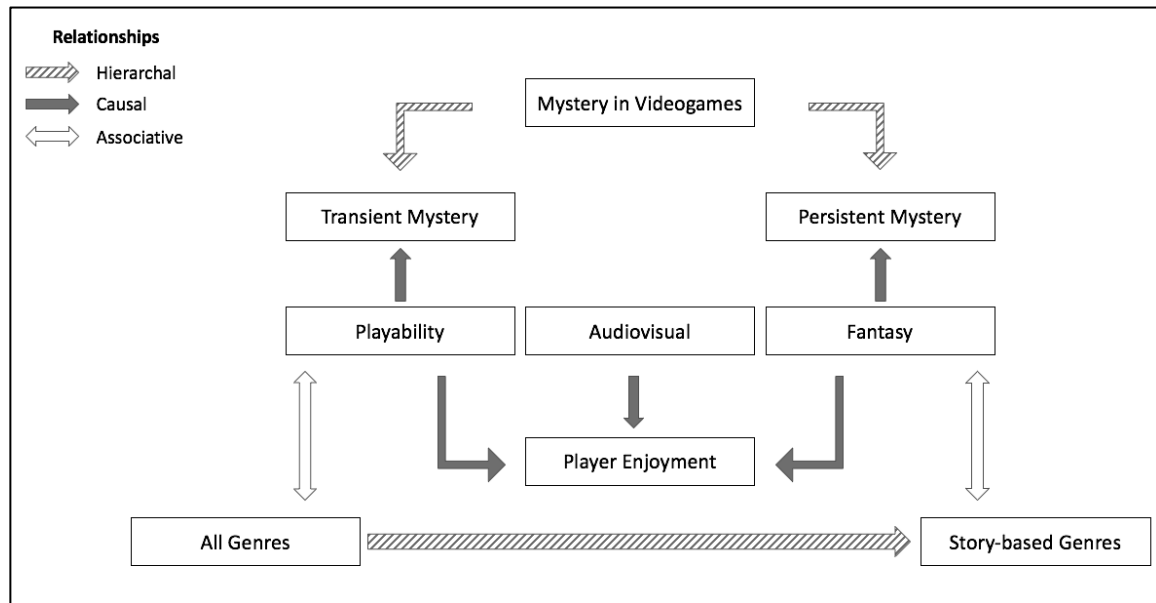


Figure 15. Mystery in Videogames and The Player Experience

3.4.1 Transient and Persistent Mystery

As shown in Figure 15 above, mystery in videogames manifests as transient mystery or persistent mystery, based on the players' responses that formed Emerging Theories #1-#4, and those are:

- ***Emerging Theory #P1: Manifestation of Transient and Persistent Mystery in Videogames***
- ***Emerging Theory #P2: Players Interaction with Transient and Persistent Mystery***
- ***Emerging Theory #P3: How Players Recognize Transient and Persistent Mystery***
- ***Emerging Theory #P4: Transient and Persistent Mystery Recognition Factors***

Transient mystery manifests through the same factors that impact playability; they are challenge, gameplay and randomness. Essentially, transient mystery occurs when randomness or unknowns are injected in the gameplay to produce challenge and invoke the player's curiosity. Like playability, transient mystery is applicable and relevant to all different types of genres, since all genres contain a certain number of unknowns and

randomness in the gameplay. In contrast, persistent mystery manifests through the same factors that impact fantasy: storyline, characters and environment. Unlike transient mystery, persistent mystery can only manifest in genres with a storyline, where non-story-based genres cannot sustain persistent mystery. These findings provide an extension to the previous literature on mystery in videogames discussed in Section 2.4.2. Section 2.4.2 in the related research section summarized previous studies that define mystery and how it manifests in videogames. Previous research defines mystery as information complexity in videogame design which causes curiosity for the player. This study further breaks down that information complexity into short-term and long-term categories (transient and persistent).

3.4.2 Fundamental Elements of Videogames

There are three fundamental elements of videogames, which are playability, fantasy and audiovisual effects, as shown in the center of Figure 16 below, which expands on Figure 15 by adding the different factors for these elements. These three elements have been the focal point from participants when asked about core elements of videogames. Essentially, all the core elements identified by the players fall under those three elements. However, these elements are better described as categories, as they themselves consist of several factors. Critical factors in playability are challenge, gameplay and randomness. Also, highlighted in the figure below, is the relationship between playability and transient mystery, where transient mystery is manifested through playability factors. Factors of Fantasy are the storyline, characters and environment. Like playability and transient mystery, fantasy has a relationship with persistent mystery, where persistent mystery is manifested through fantasy factors. Audiovisual effects are the sound and visual stimuli inserted into gameplay. These fundamental elements, as recognized by videogame players in this study largely mirror those primary attributes in videogames identified in related research from Section 2.2. From that list, all of those attributes have been recognized in this study with the exception of control, goals and narrative. These three attributes implicitly map to playability (control and goals) and fantasy (narrative) elements.

As discussed extensively in section 2.2 of the related research section, the list of fundamental elements of videogames is a field that researchers have never had a consensus on in the past. This conclusion is driven purely from the player's perspective by analyzing comments of the players to form **Emerging Theory #P5 (The Fundamental Elements of Videogames)** and is consistent with widely-referenced lists of fundamental elements in existing literature, see section 2.2 for those studies.

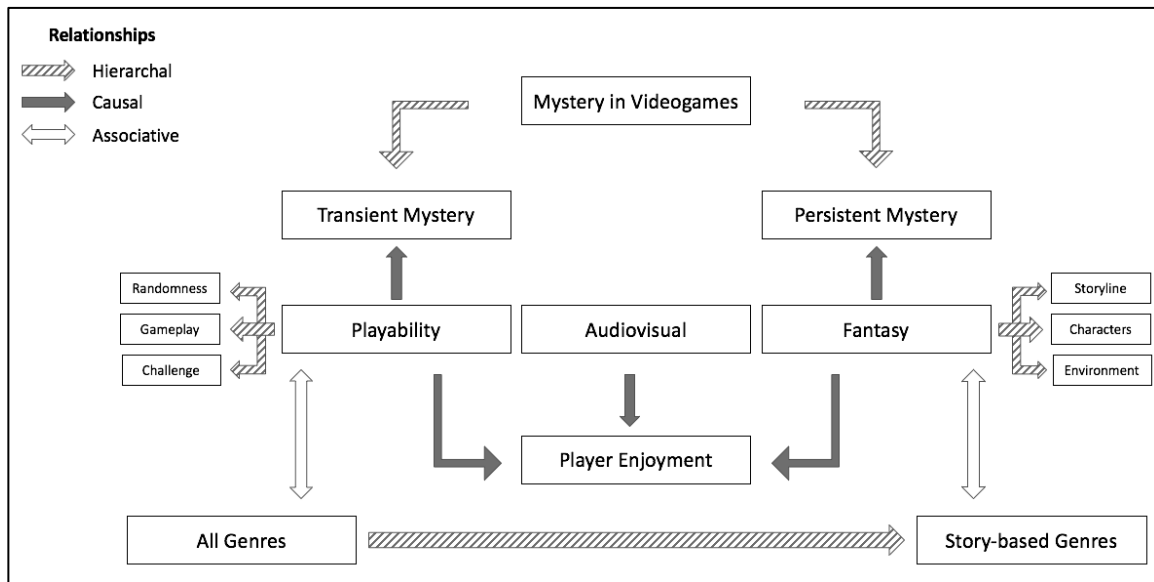


Figure 16. Fundamental Elements of Videogames

3.4.2.1 Playability

As mentioned in the previous section, playability is one of the fundamental elements of the player experience in videogames. Also, indicated in the previous section, the critical factors in playability are challenge, randomness and gameplay, as described in **Emerging Theory #P9 (Impact of Randomness on Player Enjoyment)**. The responses gathered from the players identified that a challenging player interaction with an optimal level of difficulty, a gameplay with randomized events and interaction and optimal levels of control in the gameplay are all essential to enjoyable playability. When asked about game genres, the players noted that the playability/transient mystery relationship is strongly

connected to all genres of games, since these factors (randomness, challenge and gameplay) typically manifest in all videogames based on players' responses forming **Emerging Theory #P11 (Manifestation of Transient Mystery in Different Genres)**.

3.4.2.2 Audiovisual

Auditory stimuli and visual stimuli are the two factors affecting the audiovisual element of player experience as discussed in **Emerging Theory #P5 (The Fundamental Elements of Videogames)**. While those two factors are not ways that mystery manifests in videogames, they certainly are contributing factors that enhance or diminish mystery for the player. Optimal audio and visual cues inserted into the gameplay has a direct impact on the player experience and specifically how they experience mystery in videogames. For auditory cues, some players gave an example of suspenseful sound tracks or "creepy" sound response from the game to a player's action. For visual cues, the players gave examples of how the right camera angle can enhance the suspense and thrilling aspect of the game, thus adding to the mystery.

3.4.2.3 Fantasy

Fantasy is another fundamental element with multiple critical factors; they are storyline, characters and environment. The responses from the players indicated a storyline filled with unknowns, unknown characters and suspenseful environment are all critical to a mysterious fantasy experience. Essentially, these three factors also represent how persistent mystery manifests in videogames shown in **Emerging Theory #P3 (Transient and Persistent Mystery Recognition by Videogame Players)**. This manifestation occurs in story-based genres only (like fantasy, horror, survival, etc.), as non-story based genres (like sports, racing, shooting, etc.) do not offer a rich enough storyline, characters or environment to sustain persistent mystery as discussed in **Emerging Theory #P10 (Manifestation of Persistent Mystery in Different Genres)**.

3.4.2.4 Story Mediums

Strongly aligned with the previous section, other story mediums can also sustain persistent mystery, as shown below in Figure 17. These story mediums are film, literature

and advertisement. These mediums manifest mystery differently than videogames. They treat consumers as spectators rather than demanding them to actively participate in the unfolding of mystery. Therefore, these story mediums can only manifest persistent mystery and not transient mystery, since there is no gameplay producing transient mystery as shown in **Emerging Theory #P12 (Mystery Types in Videogames vs. Other Mediums)**. Another key difference of mystery in videogames vs. these story mediums is the story mediums usually encompass several main actors, while videogames consists of one controllable protagonist at a time (in most games). While videogames can have multiple characters, the player typically only plays as one character at any given moment, shown in **Emerging Theory #P13 (Actors in Videogames vs. Other Mediums)**. However, videogames do share with film and advertisement the ability to leverage shot angles and video manipulation to enhance mystery, where literature cannot. Additionally, literature can have more control on what the reader is told and when, which can be difficult to control with those other mediums, as discussed in **Emerging Theory #P14 (Adaptation of Mystery in Videogames and Other Mediums)**.

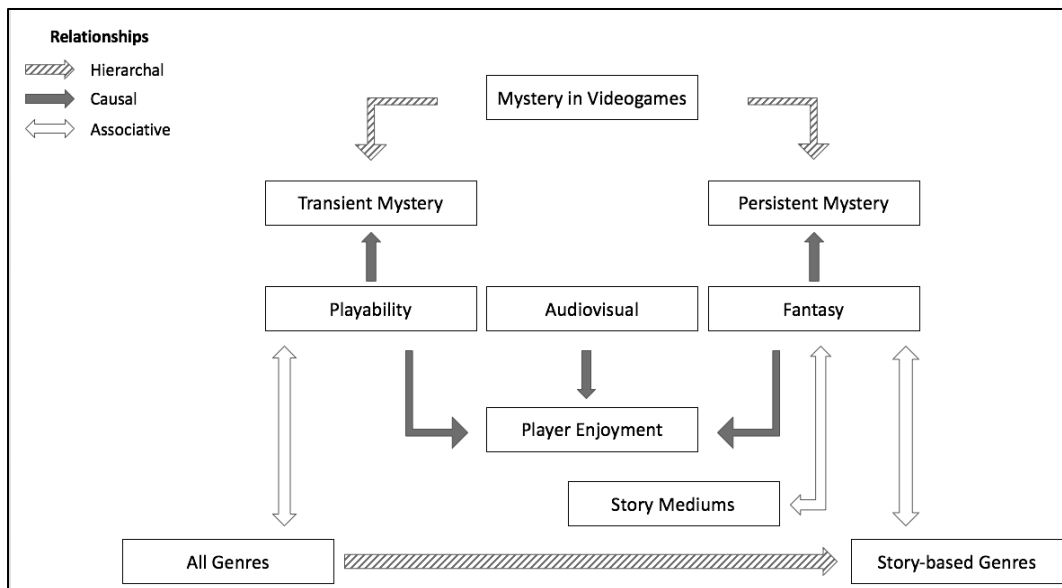


Figure 17. Story Mediums

3.4.3 Player Enjoyment

The player experience in videogames can be binary in nature. That means the player, either enjoys their experience or they don't. The level of enjoyment however, can vary from one experience to another. Player enjoyment has been referenced in different ways in existing literature, like motivation, immersion, interest, engagement, etc. Successfully achieving intrinsic motivation (i.e. an inherently enjoyable task) for videogame players is difficult and requires achieving optimal levels of certain elements or attributes, as discussed in the related research section. Previous literature referred to these as *primary attributes*, but I use the term *fundamental elements* in this study, because the phrase *primary attributes* caused some confusion amongst study participants in the past and *fundamental elements* was better received. Essentially, this aspect of the mystery in videogames asserts that player experience is reliant on the player's level of enjoyment, which is driven by the presence of the optimal levels of the fundamental elements of videogames, as shown in Figure 18 below. A tabular representation of this player-centered taxonomy is also shown in Table 4 below. Since mystery manifests through the fundamental elements (as described in the preceding subsections), this relationship directly maps transient and persistent mystery to player enjoyment, based on the players' responses forming Emerging Theories #6 - #8, and those are:

- ***Emerging Theory #P6: Impact of both Mystery Types on Player Enjoyment***
- ***Emerging Theory #P7: Impact of Persistent Mystery on Player Enjoyment***
- ***Emerging Theory #P8: Impact of Transient Mystery on Player Enjoyment***

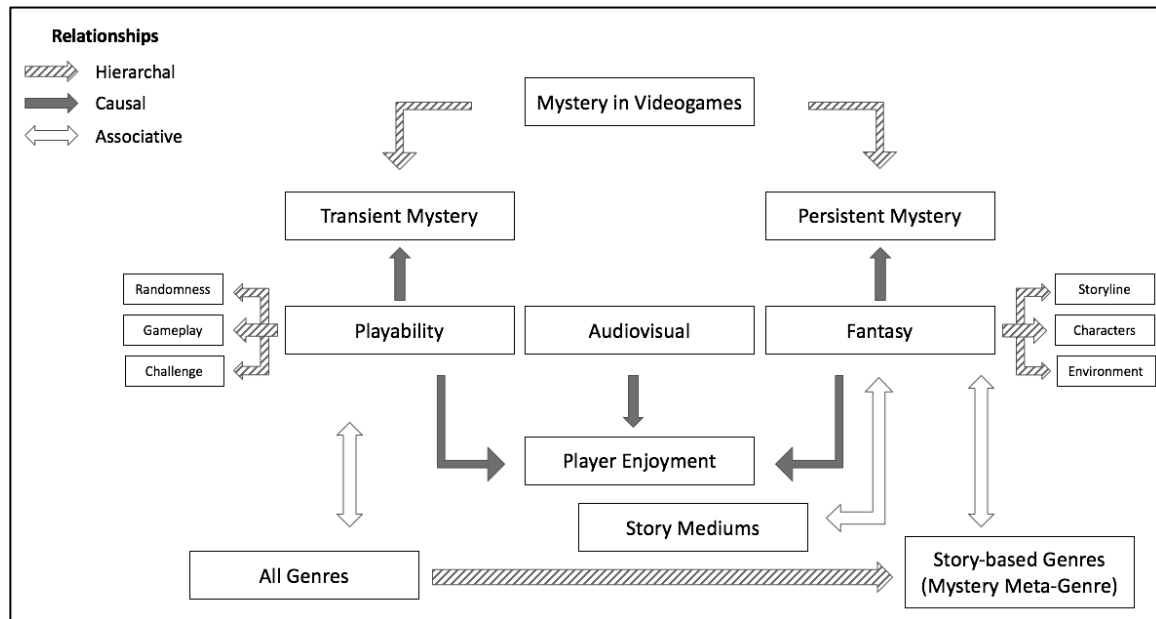


Figure 18. Player Enjoyment and Mystery in Videogames

Table 4. Player-centered Taxonomy of Mystery in Videogames

Taxonomy Factor	Persistent Mystery	Transient Mystery
Mystery Type	Long-term	Short-term
Videogame Elements	Fantasy	Playability
Videogame Factors	Storyline, characters, environment	Challenge, randomness, gameplay
Player Enjoyment	Positive impact	Positive impact
Videogames Genres	Story-based, Mystery Meta Genre	Any Genre
Story Mediums	Comparable manifestation	Does not manifest
Fundamentality for Player Experience	Through fantasy element	Through playability element
Player Interaction	Passive audience	Active solver
Recognition in Games	Obvious	Subtle

3.4.4 Summary and Future Work

This chapter focused on answering questions about mystery in videogames from a player's perspective. Mystery in videogames from the player's perspective can enhance

or diminish player enjoyment. This change in player enjoyment is triggered by instilling an optimal level of a core set of the videogame elements: playability, fantasy and audiovisual. These elements are categories that are impacted by several factors, including gameplay, randomness and challenge for playability; storyline, characters and environment for fantasy; auditory and visual stimuli for audiovisual. Playability factors are also responsible for the manifestation of transient mystery, i.e., short-term mystery caused by the unknown in the gameplay. This type of mystery is present within every type of genre since it relies entirely on the gameplay. Fantasy factors are responsible for the manifestation of persistent mystery, i.e., long-term mystery caused by the storyline. This type of mystery is only present with genres that are story-based, since it requires rich fantasy to manifest. Since other story mediums, like film, literature and advertisement, also leverage rich storylines, they too can sustain persistent mystery.

Additional work in this area can focus further on these two types of mystery (transient and persistent) and how players experience them differently. This study does not focus on the emotional response of the player when exposed to these two types of mystery, although such knowledge can be very useful. Chapter 5 will focus on how players experience mystery in videogames through a quantitative study. Another area that wasn't covered in depth in this study is other elements and factors that are fundamental to videogames, especially those dependent on competition, collaboration and cooperation. Most of this study's interviewees referenced campaign gameplay versus online gameplay, which is very common in videogames. The difference is that online gameplay places the player in competition or cooperation with other players. This style of gameplay should produce additional core attributes to consider beyond the ones identified in this study. Additional considerations include understanding mystery in videogames from the game designer perspective. This perspective should complete the picture and provide a much-needed viewpoint to recognize how mystery incorporated into the design process of videogames. This topic will be the focus of the next chapter.

4. Chapter Four: Designer Centered Mystery

In this chapter, I will focus on a qualitative study conducted with videogame designers to answer the two research questions: “How do game designers consider mystery when designing their games?” and “What is the relationship between player-centered and designer-centered views of mystery in videogames?” These are the second and third questions of this dissertation and concentrate entirely on mystery in videogames from the point of view of videogame design and how that differs from the players viewpoint.

4.1 Aim

Like the first research question in Chapter 3, for these questions I started to gain understanding about the experience of mystery in videogames. However, in this chapter, I will not focus on the experience of mystery by players but rather on how mystery is being incorporated during the videogame design process and manifest in videogames. I will also identify and examine any similarities and differences between this analysis of mystery and that is done in Chapter 3, which is the focus of the third research question. This study also considered different videogame genres and other story mediums (like film, literature and advertisement) when investigating how mystery manifests in videogames.

4.2 Methodology

The research methodology of this study resembles that of the previous chapter by utilizing a qualitative methodology using Glaserian approach of Grounded Theory. Using interviews and an initial set of questions, I have promoted an open discussion with videogame designers on how they consider mystery in their design and ultimately how mystery is manifested in videogame design. All methodology and research design aspects from Chapter 3 applied here in this study, except the number of participants and some of the interview questions.

4.2.1 Participants

For this study, I interviewed 15 participants (9 male and 6 female) using semi-structured interviews and focusing on their experiences with mystery in videogames. Each

participant that contributed to this study was awarded a gift card after the interview. The mean time for those interviews was 30:18 (30 minutes and 18 seconds) with a standard deviation of 9:43 (9 minutes and 43 seconds). Like Chapter 3, the 30+ minutes provided ample time to go through all the interview questions as well as additional time to probe and follow up with secondary questions. The mean age for those participants was 23.86 with a 6.91 standard deviation.

Nine of the participants had a high school diploma as their highest degree attained, two had a bachelor's degree, two had a master's degree and two had their doctorate. As for their videogame experience, the mean years playing videogames for those participants was 16.6 years with 4.88 standard deviation. Also, the participants of this study played much more videogames than our previous study (Chapter 3), averaging a total of 24.33 times a week (at least one-hour interval each time) with a standard deviation of 12.66. Additionally, these participants designed 6.46 games on average with a standard deviation of 3.34. Moreover, three of them have designed ten games or more, while another three have designed three games or less. This provided enough insight from new game designers and seasoned ones as well. The level of quality and clarity in the interview responses from the seasoned designers far exceeded those from the novice ones however. While there weren't contradictions between designers of different experience levels, the richness of answers with elaboration and examples was much more common from those who had a lot of design experience.

4.2.2 Design

As mentioned in the previous sections, I employed a qualitative methodology using the Glaserian approach of Grounded Theory. To collect data, I used a semi-structured interview approach with a list of initial questions that were followed by secondary then follow-up questions. My initial list of questions for this study were similar to that of chapter 3 but again focused on the designer perspective:

1. What is your age?
2. What is your gender?
3. What is your highest degree attained?
4. How long have you been playing videogames?
5. How often do you play videogames?
6. What is your most frequently played game? Genre?
7. How many games have you designed?
8. Can you think of examples of games with a lot of mystery?
9. Do you consider mystery a vital element of videogames?
 - a. What are the other vital elements of videogames?
10. Do you spend any time or effort designing mystery in your games?
 - a. How much
11. How do you incorporate mystery in your design process?
 - a. Have you designed games that have a lot of mystery?
12. Have you designed different genres?
 - a. Which ones?
13. Have you written, produced or directed a book or a film?
 - a. Did you incorporate genre as an element in those mediums?

Data collection and analysis followed the same approach as Chapter 3, illustrated in Figure 2 of the previous chapter. As seen in that figure, the analysis for this study occurred in parallel to data collection. Again, this allowed me to employ theoretical sampling and determine when we have reached theoretical saturation to stop collecting data.

4.3 Results

In this section, I will describe all the results accumulated from this study along with all the concepts and categories identified. Part of that description will be exploring the relationships and theories emerging between those concepts and categories. First, I conducted the interviews in this study until I reached theoretical saturation. As discussed in Chapters 2 and 3, theoretical saturation is reaching a state where no more new insights about the concepts and categories will be introduced. Theoretical saturation was achieved by theoretical sampling, focusing on emerging theories and concepts in subsequent interviews. To determine whether theoretical saturation was achieved, I utilized the same empirical method from Chapter 3 which is the determination when a few or no new codes

are introduced with each interview. Figure 19 below, shows how that method was applied and the results I collected after each interview.

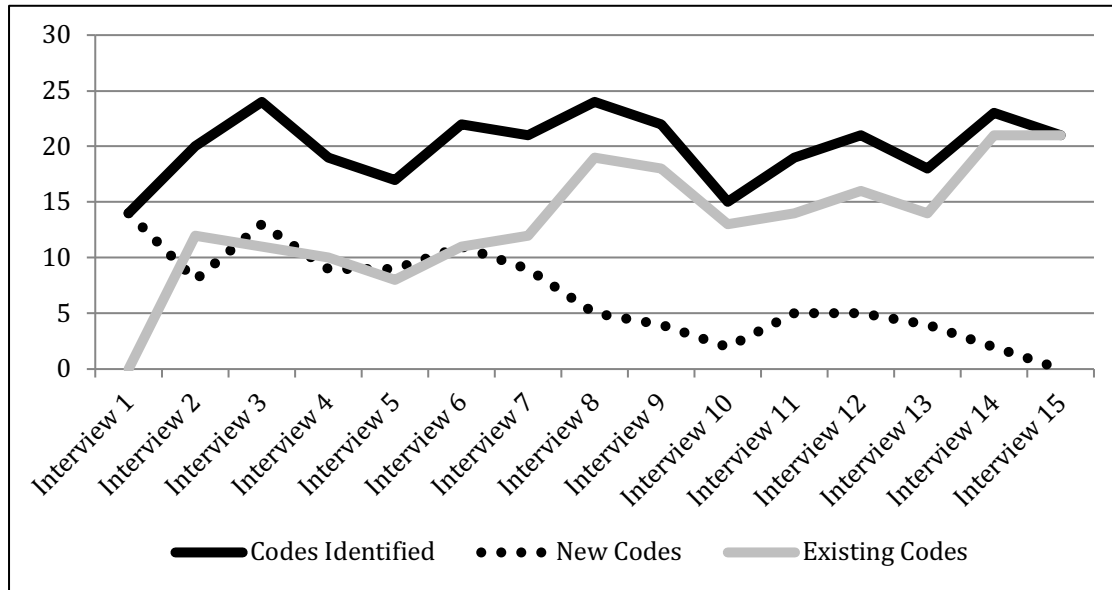


Figure 19. Theoretical Saturation – New vs. Existing Codes

As seen in Figure 19 above, the number of new codes introduced with each interview was decreasing consistently throughout the study, especially during the last 5 interviews and finally ending up at 0 in the last interview. This behavior indicated that theoretical saturation was reached, and I can stop collecting and analyzing new data.

Like Chapter 3, the data was analyzed using visualization of network diagrams as well as evaluation of ongoing focused memos captured during the study. The list of the 100 codes identified in this study is provided in Appendix C and the content from those advanced memos is provided in Appendix D. Here are some of the observations identified from the codes and memos:

- 16 of the codes identified are related to the player or an action they perform in a videogame.
- 32 of the codes are related videogame design.
- 13 of the codes are related to mystery in videogames.
- 18 of the codes are related to different elements of videogames.
- 27 of the codes are related to a specific game or genre.
- 3 of the codes are related to other story mediums.

As I did in Chapter 3, I narrowed down the list of codes identified to a smaller list of codes that were both highly quoted by designers and frequently associated to other codes in the study. The resulting list became my initial set of concepts to analyze in this chapter. To obtain this set, I started with the five common codes between the top 15 most quoted codes and top 15 most related codes, shown in Figure 20 and Figure 21 below. These codes were identified only after removing some very common codes that are implicit within almost every concept of this study like *mystery in games* or *design process*. The remaining common codes were:

- *persistent mystery*
- *transient mystery*
- *dynamically adjusting design*
- *player curiosity*
- *mystery games*

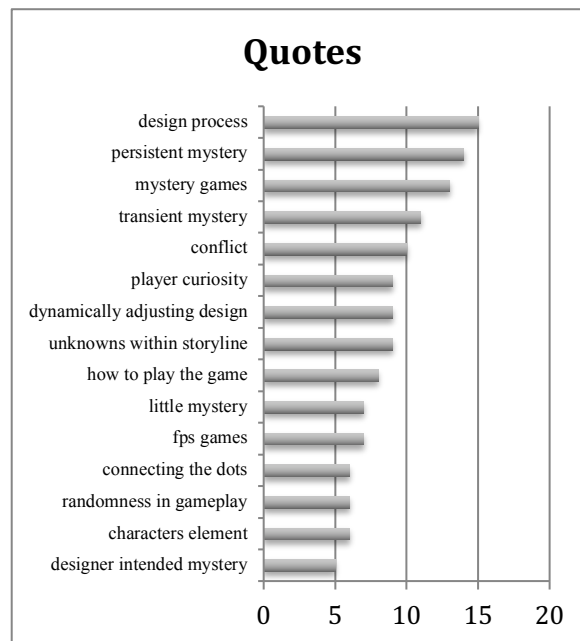


Figure 20. Top 15 quoted codes

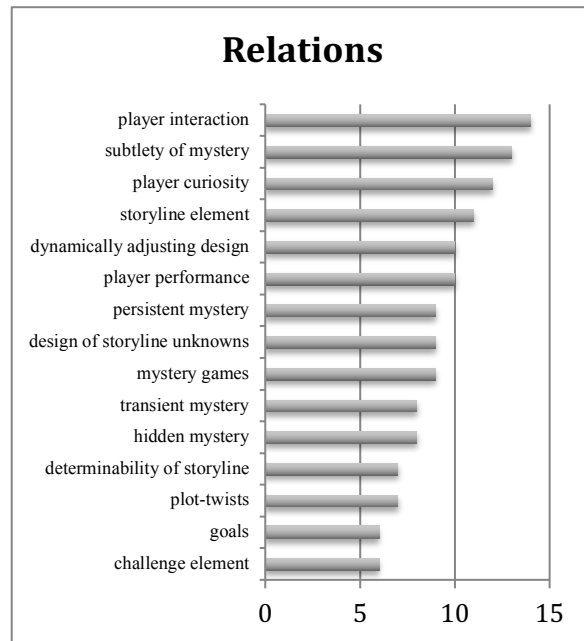


Figure 21. Top 15 associated codes

To also account for the concepts that were identified as core concepts in the design of this study, I added the following list of codes to the list of concepts:

- *mystery in videogames*
- *designing mystery*
- *fundamental elements*
- *mystery books*
- *mystery films*
- *mystery advertisement*
- *videogame genres (multiple codes)*

Combining both lists, the original 5 that were common amongst most quoted and associated codes with the codes related to core concepts of this study yields the final list of concepts. Figure 22 below, provides a visual representation of that final list.

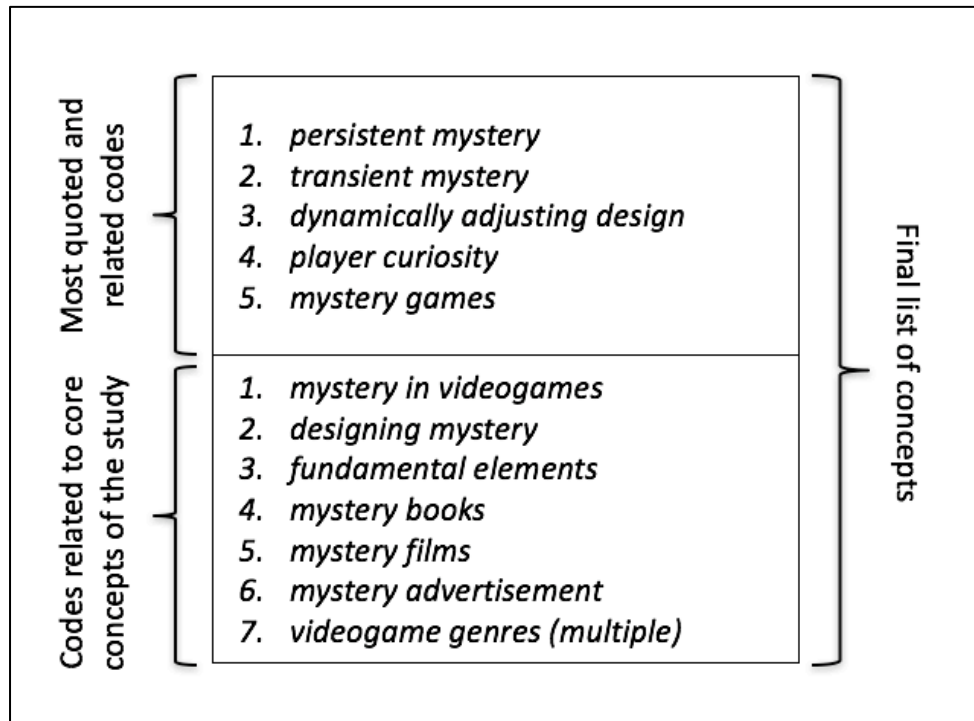


Figure 22. Establishing final list of concepts and categories

As in Chapter 3, I followed the recommendation of Grounded Theory to generalize these concepts and establish categories. After grouping them based on type of code, the final list of concepts and categories is shown in Table 5 below. In the following six sections, I have examined each category and its concepts by analyzing the data from both the ongoing focus memos and the network maps. Finally, for each category, I formulated a set of emerging theories that highlight the findings from the analysis phase of this study. I used those emerging theories as the basis of the conclusions on this chapter in the Discussion section.

Table 5. The concepts and categories for this study

Concepts	Category	Description
<i>designing mystery</i> <i>persistent mystery</i> <i>transient mystery</i>	Designing Mystery	The different aspect of designing mystery in videogames.
<i>dynamically adjusting design</i> <i>playtesting</i>	Optimizing Mystery	The concepts of optimizing mystery in videogames based on a player's performance.
<i>fundamental elements of videogames</i>	Fundamental Elements	The properties of an element core and essential to the player experience.
<i>player curiosity</i>	Player Curiosity	Triggers of player curiosity within videogame design.
<i>mystery games</i> <i>mystery in videogames</i> <i>fps games</i> <i>rpg games</i> <i>zombie games</i> <i>open world games</i> <i>action adventure games</i> <i>alien isolation game</i> <i>animal crossing game</i> <i>call of duty game</i> <i>dead space game</i> <i>detective genre</i> <i>documentary games</i> <i>fantasy games</i> <i>gone home game</i> <i>halo game</i> <i>horror games</i> <i>life is strange game</i> <i>mario kart game</i> <i>outlast game</i> <i>pokemon game</i> <i>professor layton game</i> <i>reporter genre</i> <i>sign and tell game</i> <i>silent hill game</i> <i>sly cooper game</i> <i>watch dogs game</i> <i>witcher 3 game</i> <i>zelda game</i>	Mystery Videogames	The differences and similarities between mystery in games and mystery games genre.
<i>mystery games</i> <i>mystery books</i> <i>mystery advertisement</i> <i>mystery films</i>	Story Mediums	Other story mediums, besides videogames.

4.3.1 Designing Mystery

Designing mystery was a clear choice for the first category since the foundation of this study is to understand how designers incorporated mystery in their videogame design process. Also, because most of the questions were inquiries into that process, there were 29 associations between the *designing mystery* code and other codes in the results, as shown in Figure 23 below. Most of the designers acknowledged that as players, they experience mystery in videogames in both its persistent and transient forms. However,

they only mentioned persistent mystery is mystery that is purposefully designed and intended by the designer. I later examine this claim and its validity in the discussion section of this chapter. This means that only persistent mystery is manifested through the design process into the fantasy element while transient mystery is accidentally manifested through the design of the gameplay mechanics. Even though playability factors, such as gameplay mechanics, can still generate transient mystery that is experienced by the player, such mystery is not often intended by the designer of the videogame. By definitions, whether designers intend to do so or not, transient mystery is a byproduct of the design process implicitly or explicitly.

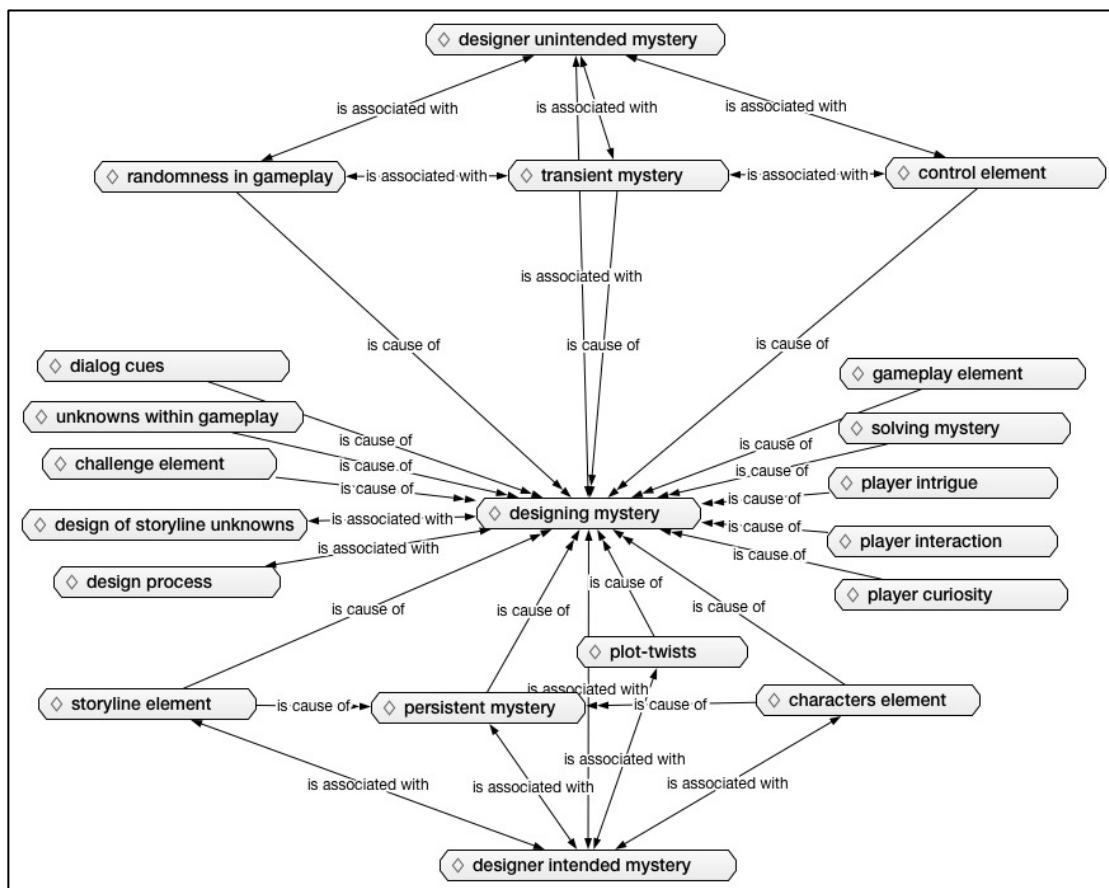


Figure 23. Designing Mystery – Overall Network Diagram

Unlike transient mystery, persistent mystery is always intended by the designer in their process, as shown in Figure 24 below. Furthermore, since persistent mystery is rooted deeply in the fantasy element and its factors, especially storyline, it is often integrated into the game very early in the design process. Most designers indicated that for story-rich games with a significant presence of persistent mystery, they would incorporate mystery as early as the concepting or brainstorming sessions. The timing of when to incorporate persistent mystery is critical since optimal persistent mystery is a fundamental component of the fantasy element of videogames.

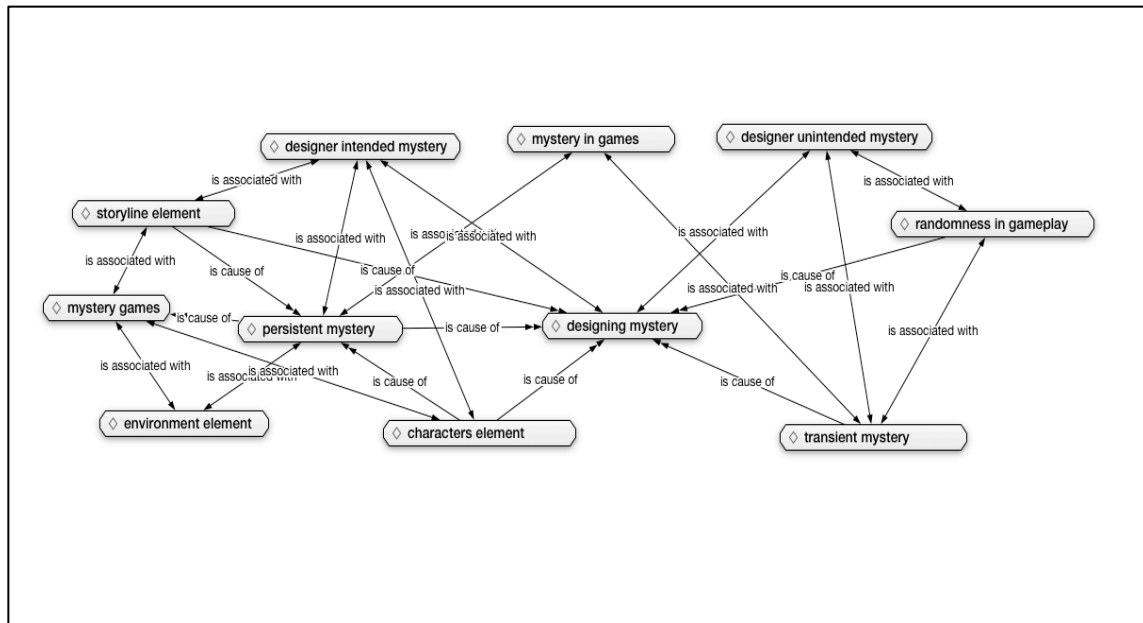


Figure 24. Designing Transient and Persistent Mystery

To summarize the analysis of this category, I created the following emerging theory on designing mystery:

Emerging Theory #D1: Intended vs. Unintended Mystery in Videogame Design

While mystery can manifest as both persistent and transient in videogames, persistent mystery is the only type that is intended by the designer. Designers do not incorporate playability factors like randomness or unknowns within the gameplay to trigger mystery.

Persistent mystery, however, is intentional while designed in the storyline very early in the design process.

4.3.2 Optimizing Mystery

This category focuses on how persistent mystery can be designed and adjusted based on the players experience in videogames. I focused on persistent mystery and not transient mystery because as described in the previous section, transient mystery is not a mystery that is intended by the designer but rather an accidental result of the playability element. For this category, I examined two specific codes, *dynamically adjusting design* and *playtesting*, as shown in Figure 25 below. If the gap between the known and the unknown is too small, then the players will become bored with the gameplay. However, if that gap is too big, then the players will be frustrated with the gameplay. Both scenarios will lead to a less than optimal player experience. Since different players experience mystery differently, the most effective method of designing optimal mystery would be adjusting it throughout the gameplay based on the player's experience. So, the level of mystery would be adjusted by increasing or decreasing the gap between the known and unknown based on the player's levels of boredom and frustration.

Dynamically adjusting the mystery, however, is a very expensive process in terms of design resources. Doing that would require numerous parallel storylines and narratives with varying levels of mystery to account for that dynamic adjustment. This would be a very difficult and time-consuming task for the designer. So, while having a dynamically adjusting game design for mystery would yield a more optimal game experience for the player, it is unlikely that designers would invest the time and effort in their design to do so.

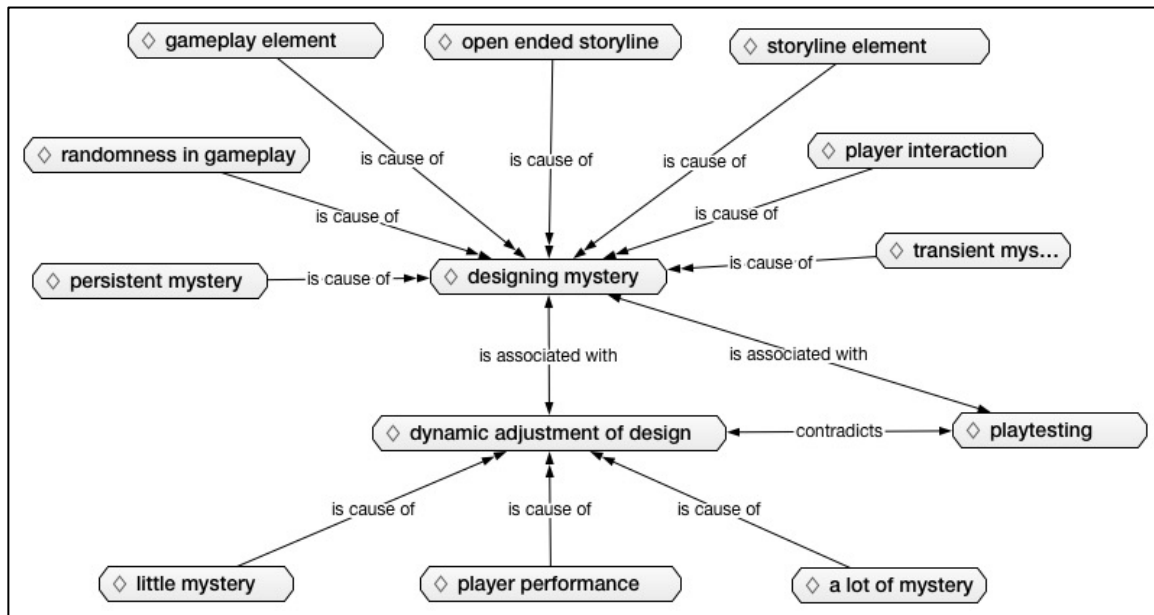


Figure 25. Optimizing Mystery

Another method of creating optimal experience of mystery for the player in the design process is playtesting. Designers must ensure exhaustive playtesting takes place for their games and in turn adjust the mystery in their game design to create the most optimal mystery levels. Playtesters would provide valuable input to the designers on whether the gap between the known and the unknown in the game design is optimal or not. While playtesting is a more cost-effective method to designing mystery than creating a dynamically adjusted mystery design, it has its own set of drawbacks. The biggest drawback is no matter how many playtesters are involved in the game design process, they wouldn't represent the entire population of intended players of the game. So even if the game passes the playtesting phase successfully, there are still players who were not represented by the playtesters and would consider the mystery in the game design as less than optimal. Another drawback that was expressed by several designers in this study is that they no longer feel ownership of the game design if it is dramatically adjusted based on the playtesters feedback. Essentially, the result game design might be significantly different than the original design intended by the designer.

The summary of this analysis is represented below in the following two emerging theories:

Emerging Theory #D2: Dynamically Optimizing Mystery in Videogame Design

Designers struggle with designing mystery that dynamically adjusts based on the player's performance. Since designers assert that transient mystery is not designed intentionally, designers cannot create transient mystery that dynamically adjusts. As for persistent mystery, creating dynamically adjusting persistent mystery requires a completely open-ended storyline with a significant number of narratives and alternate endings based on the numerous levels of players understanding or confusion.

Emerging Theory #D3: Creating Optimal Mystery in Videogame Design through Playtesting

Utilizing play-testers to understand the optimal level of mystery within a game's design will never achieve optimal mystery for every player, just those who play-tested.

4.3.3 Fundamental Elements

For this category, I focused on the concept of mystery as a fundamental element of videogames. As shown in Figure 26 below, I examined the *fundamental elements of videogames* code. As discussed in the previous sections, mystery can manifest through the fantasy element as persistent mystery or through the playability element as transient mystery. In its persistent form, mystery is a fundamental element to those games with rich storylines like fantasy, mystery or role-playing games. However, persistent mystery is not a fundamental element in videogames that are not rooted in fantasy like sports, racing or shooting games. This is an intuitive assertion because of the very definition of persistent mystery.

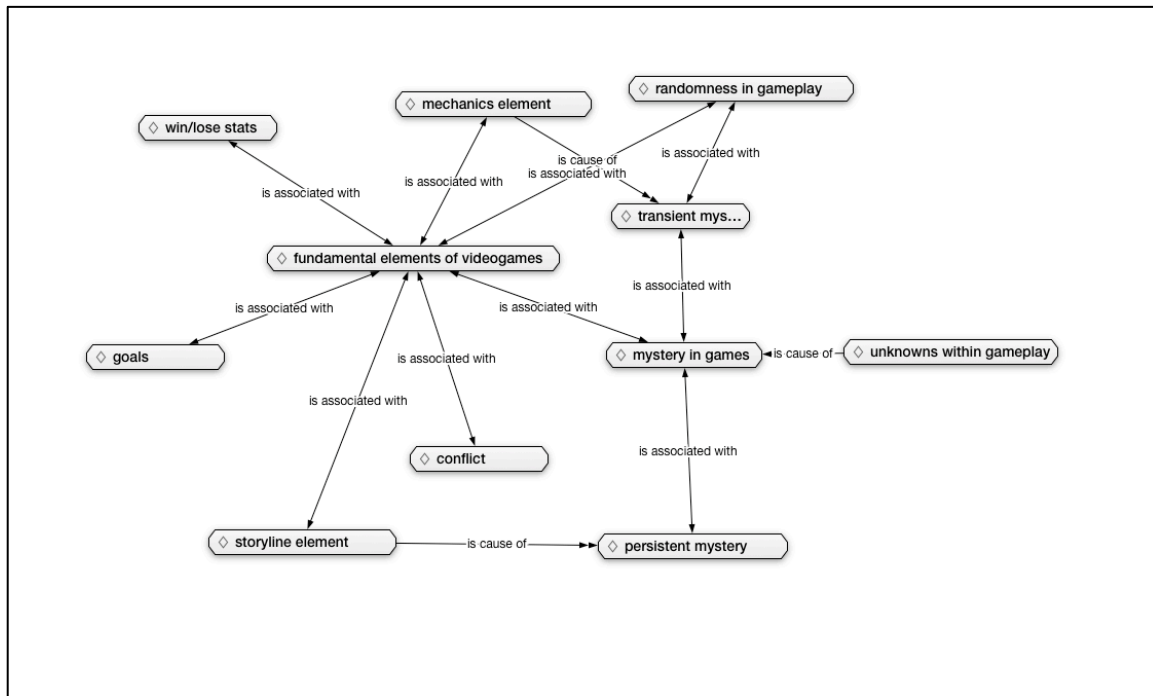


Figure 26. Fundamental Elements

Transient mystery, however, manifests in any genre because it is rooted in the playability factors like gameplay unknowns and not the storyline. While players in Chapter 3 indicated that this type of mystery is fundamental to their experience, designers in this study disagreed. Designers asserted that because transient mystery is not intended by the designer, it cannot be fundamental to videogame design. It is interesting to note that some of those same designers gave a different impression of transient mystery when speaking about their playing not design experience. Some designers claimed that transient mystery is critical to their experience as players but not to their design process, not fully aware of the disconnect this creates between the designers and players.

I created an emerging theory to summarize the results of this category, shown below:

Emerging Theory #D4: Fundamental Elements in Videogame Design

Persistent mystery is not a fundamental element of videogames, rather only fundamental to those games with a very rich set of characters and storyline. Also, designers do not

view transient mystery as fundamental because it is a mystery that is not accounted for in the design process.

4.3.4 Player Curiosity

The player curiosity category is focused on one code, *player curiosity*, as shown in Figure 27 below. The concept of curiosity is the goal of designing mystery in videogames. When mystery is manifested in videogame design optimally, that is when the gap between the game knowns and unknowns is optimal, it triggers the player's curiosity. However, this concept does not align with the designers' point of view on transient mystery. Although designers asserted that transient mystery is not intended by the game design but accidentally manifested through the playability element and its factors, it can still trigger player curiosity, thus serving its purpose as optimal mystery. This continues to be a counterintuitive point raised by the designers and implies a lack of understanding on how designers view transient mystery in videogame design.

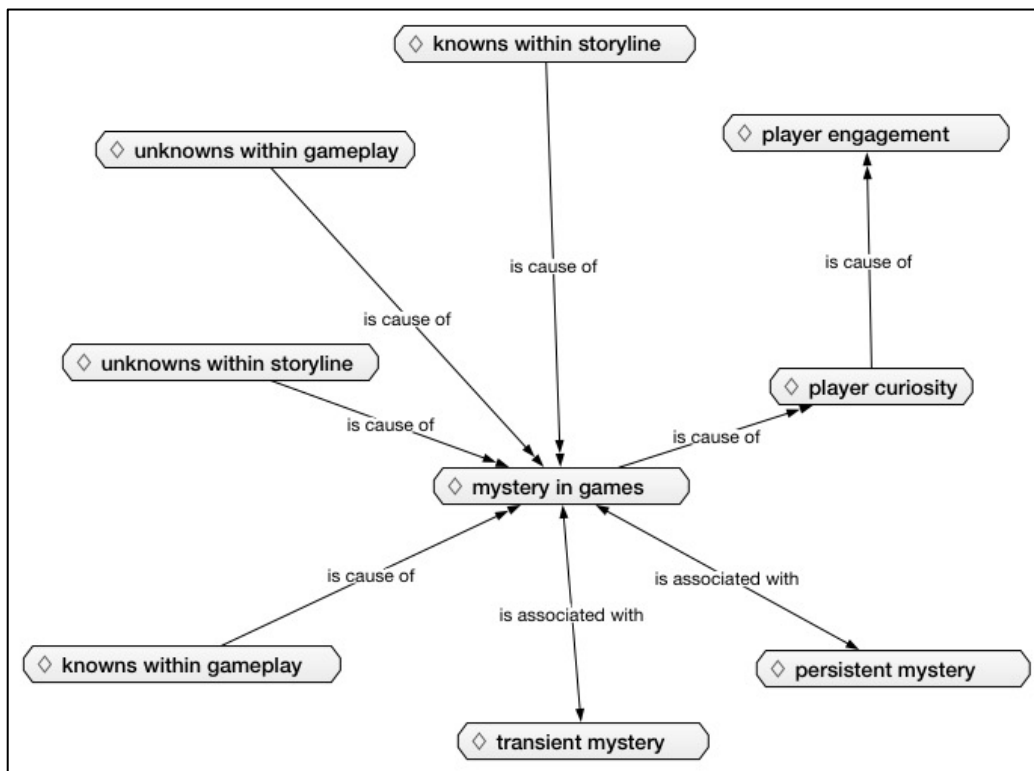


Figure 27. Player Curiosity

A description of the player curiosity category is summarized in the emerging theory below:

Emerging Theory #D5: Mystery Triggers for Player Curiosity

Well-designed mystery always triggers curiosity, but it is not a pre-requisite for curiosity. Curiosity can be triggered by unintentional mystery through the playability element. Curiosity, for persistent mystery, can also be triggered through the storyline. Curiosity exists when the gap between the game knowns and unknowns is optimal. If the gap is too big, curiosity turns into confusion and if the gap is too little then curiosity turns into boredom.

4.3.5 Mystery Videogames

This category focuses on the similarities and differences between mystery in videogames and mystery videogames. Mainly, mystery in videogames can be manifested by all genres, primarily as transient mystery, while mystery games are videogames that belong to story-rich genres as persistent mystery, as shown in Figure 28 below. Videogames with rich storylines and optimal persistent mystery can be identified as mystery games, regardless of the specific genre they belong to. This is an isolated classification or meta genre, independent of the intended genre of the game itself. For example, a fantasy videogame that belongs to the fantasy genre, can also be referred to as mystery game if it manifests a significant amount of persistent mystery in its storyline. Comparatively, videogames can manifest mystery without being mystery games. This type of game usually manifests transient mystery or alternatively a smaller portion of persistent mystery that doesn't dominate the storyline.

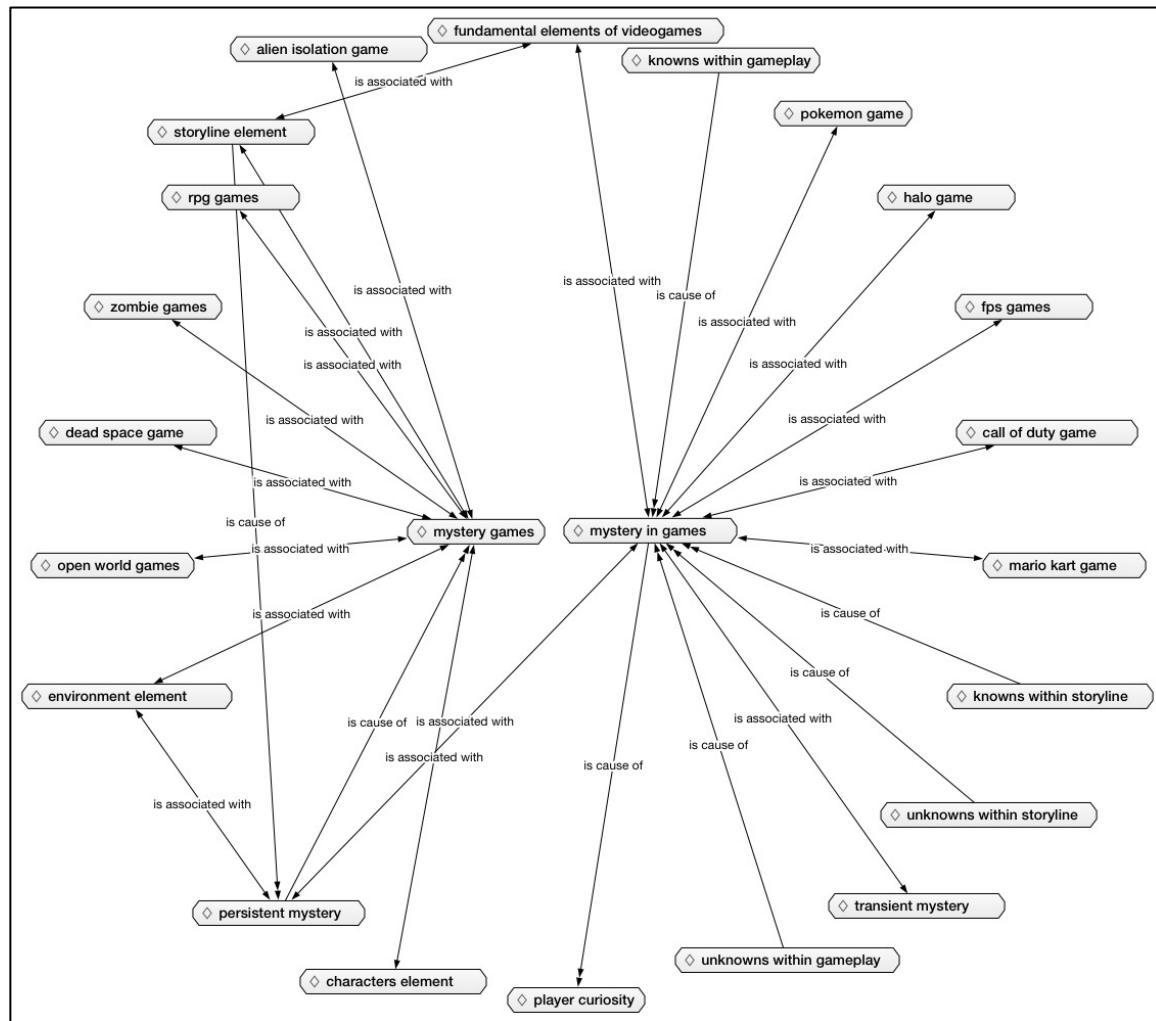


Figure 28. Mystery Meta Genre

I summarized the results from the mystery videogames category in the following emerging theory:

Emerging Theory #D6: Mystery Meta Genre Classification

Mystery element in videogames can be triggered by several conditions that provide a gap between the known and unknown. However, mystery videogames is a classification where mystery manifest through the fantasy element and its factors (storyline, characters and environment).

4.3.6 Story Mediums

The story mediums category focuses on the following codes: *mystery games*, *mystery film*, *mystery books* and *mystery advertisement*, as shown below in Figure 29. For game designers, mystery design in videogames can map directly to incorporating mystery in other story mediums, like film, literature and advertisement. This resemblance is a byproduct of the type of mystery that designers focus on during videogame design, persistent mystery. Since persistent mystery is manifested through the storyline, characters and environment, it can be likened to how mystery is manifested in the fantasy element of film, literature and advertisement. However, similar to the findings of the previous study in Chapter 3, transient mystery relies on the playability element and its factors and these are attributes not commonly found in other story mediums.

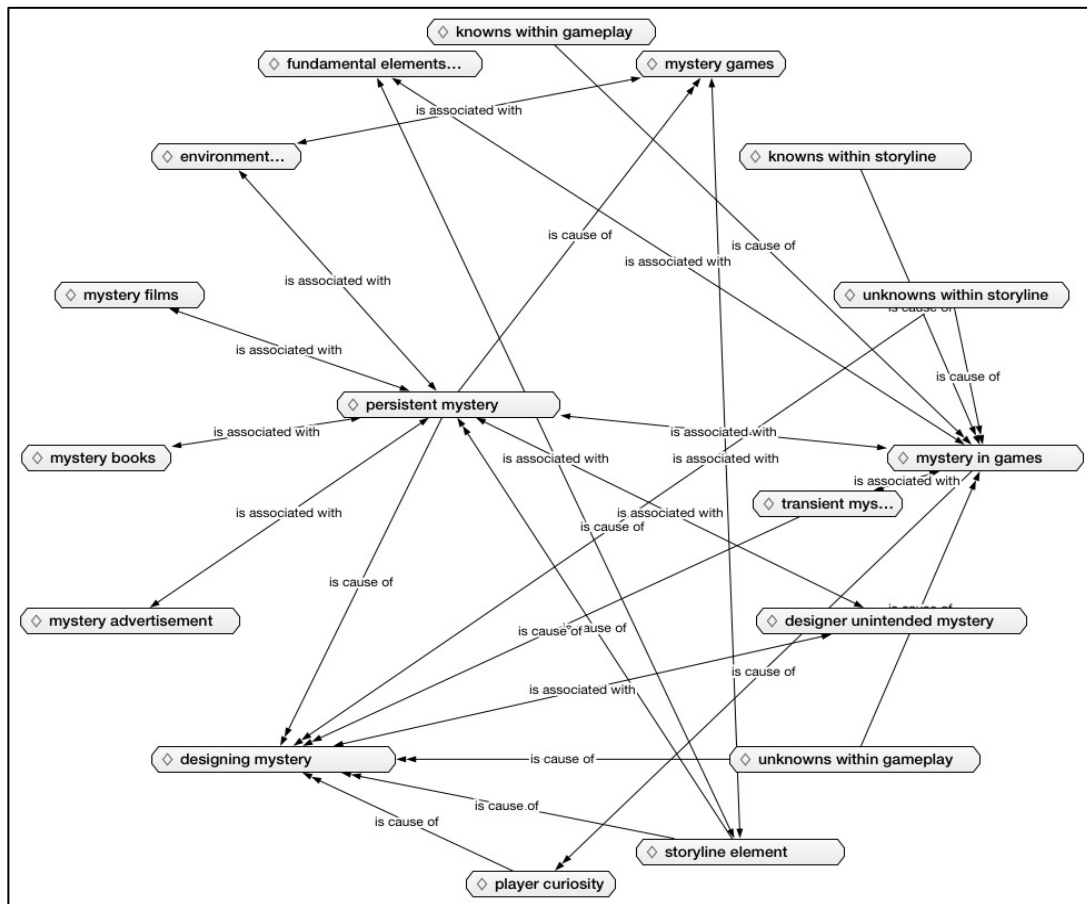


Figure 29. Story Mediums

Another interesting insight I gathered from the interviews was persistent mystery is much more recognizable in those other story mediums than videogames. That is because in videogames, mystery has many other elements to compete with for the player's attention like playability factors, where in those other story mediums it does not. Reading a book or watching a film or an advertisement with optimal mystery usually dominates the user's experience where in videogames, the player will be much more occupied with other attributes of the gameplay.

A summary of this category's results is shown below in the following emerging theories:

Emerging Theory #D7: Mystery Manifestation in other Story Mediums

Since designers only use fantasy factors to manifest mystery in videogames, their methods very much resemble script writers of literature, advertisement and film. It is only transient mystery that cannot be mapped into those other story mediums, but persistent mystery can be duplicated in literature, film and advertisement.

Emerging Theory #D8: Mystery Recognition in other Story Mediums

Mystery, even in its persistent form, is more recognizable in film, literature and advertisement than videogames because there are very few tangent elements in those mediums that compete for the audiences' attention the way they do in videogames. In videogames, for mystery to be recognizable, it must compete with the gameplay, sound, visuals and other elements. In those other story mediums, the author or director can ensure the audiences' attention is geared towards any element specifically, including mystery.

4.4 Discussion

This study has provided valuable insight into how designers manifest mystery in their videogame design. Part of that insight is focused on the design process and how incorporating mystery aligns with other elements of that process including playtesting.

Also, part of that insight is the role of mystery in triggering player curiosity. Another finding of this study is focused on the mystery meta genre and which broad videogame genres can adopt it. Finally, this study has provided some understanding into the differences and similarities between designing videogames and writing literature or producing film and advertisements.

I organized the major themes of these findings into one comprehensive model that will evolve throughout a set of conclusions in this discussion section, shown in Figure 30 below. While mystery in videogames can be manifested as both persistent and transient mystery, designers only intentionally design for persistent mystery. Transient mystery is manifested through playability factors, more specifically, gameplay mechanics. Since gameplay mechanics are fundamental within any game design, transient mystery can be incorporated in all videogame genres. Otherwise, persistent mystery is manifested through fantasy factors, more specifically, the storyline. However, the storyline is a fundamental element in only story-based genres, where persistent mystery is more prominent. Persistent mystery is also prominent in other story mediums like film, literature and advertisement. Despite the differences in how they are manifested in the design process, both persistent and transient mystery can trigger player curiosity.

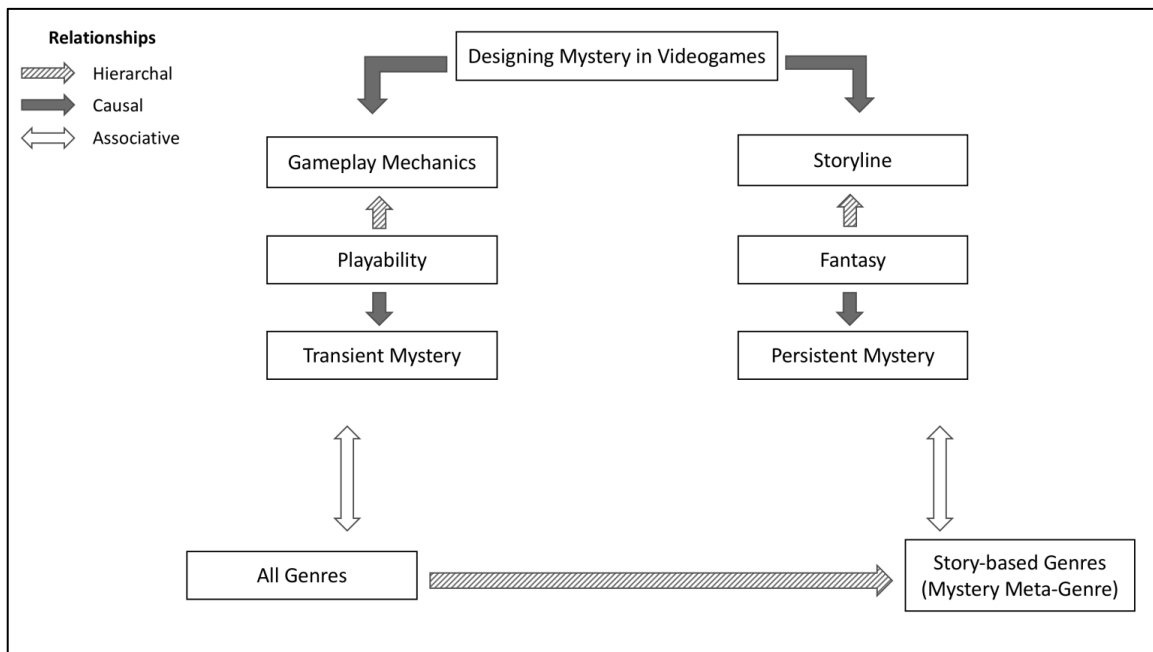


Figure 30. Mystery and Videogame Design

4.4.1 Intended versus Unintended Mystery

The most striking finding of this study is how videogame designers perceive transient versus persistent mystery, as shown in Figure 31 below. Although designers admit both are real manifestations of mystery in videogames, they asserted that only persistent mystery is intentionally incorporated via the design process. The distinction between intentional and unintentional mystery design is very important because transient mystery is still a result of the design process, but just an unintentional result. Essentially, transient mystery is the result of playability factors, such as gameplay mechanics. They do not plan for transient mystery because it is an unintended consequence. This is a bit counterintuitive since there are strong counter examples like loot boxes in gameplay, which is very much part of what is designed. However, it can be assumed from the responses of the videogame designers that those elements were not designed to promote mystery rather than enjoyment (even if it is through mystery). The implication behind this conclusion is that designer-centered mystery in videogames should include both intentional and unintentional mystery in the design. One possible reason for this counterintuitive finding is that the designers interviewed for this study were novice

designers with mostly academic experience in design not a professional one. This could influence their opinion because in their design experience they focused much more on the story design rather than the gameplay and playability elements. In contrast, designers plan for persistent mystery through fantasy elements like the storyline when designing videogames. This is a novel and noteworthy distinction of designing mystery in videogames and produces our first emerging theory - ***Emerging Theory #D1: Intended vs. Unintended Mystery in Videogame Design.***

Consistent with the first finding, another insight from this research is how mystery is related to the fundamental elements of videogame design. Because persistent mystery only manifests through the fantasy elements, it is only fundamental to those games with a rich set of fantasy factors like the storyline. Also, while transient mystery is manifested through playability factors like gameplay mechanics, and those factors are usually present with any type of game, as discussed above, designers do not view transient mystery as part of their design process. Hence, transient mystery cannot be a fundamental element of videogame design, as described in ***Emerging Theory #D4: Fundamental Elements in Videogame Design.*** While the fundamental elements recognized by the designers are very similar to those identified from previous literature in section 2.2, designers stressed that mystery is not a fundamental element of all games.

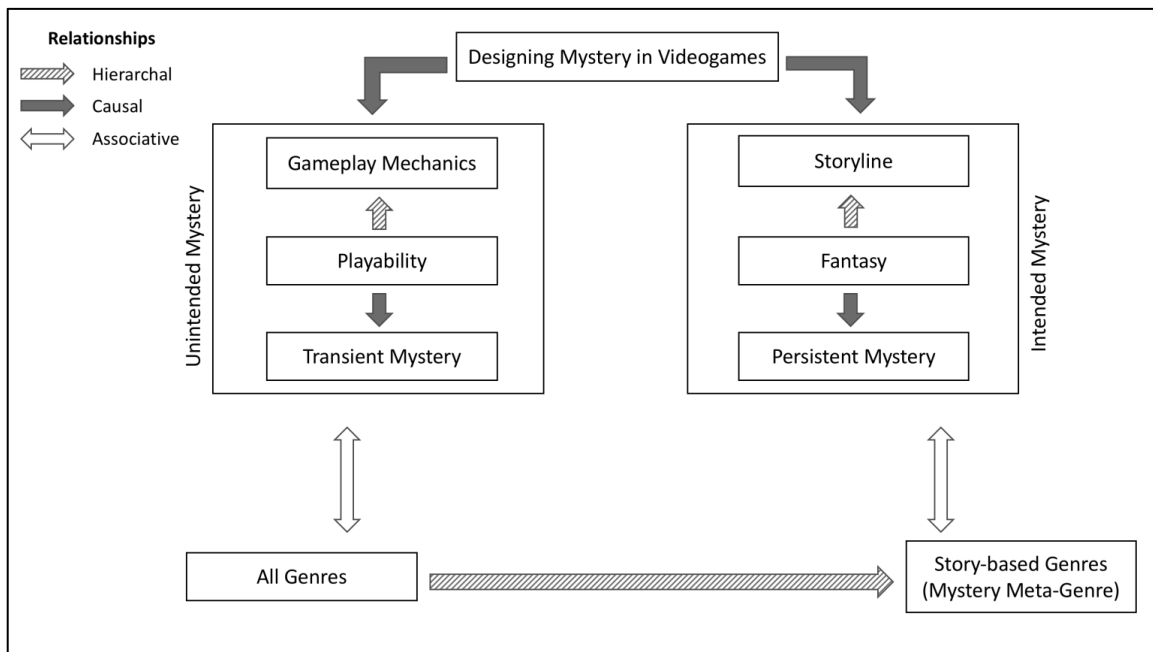


Figure 31. Mystery and Videogame Design

Additionally, this study provided some insights into how videogame designers adjust and produce optimal mystery. The most common method for designers to ensure optimal mystery in their videogame design is playtesting, where a group of players test the gameplay throughout the creation of the game. While this method is a sound approach for ensuring that the intended design is producing a better level of mystery, it also has some drawbacks. One of those drawbacks is no matter how large is the set of players playtesting the game design, they can never represent all of the potential players that will eventually play the game after it is complete. This means that with an increased number of playtesters, videogame designers can ensure optimal mystery in their design for a larger set of players but there will always be a set of players not represented by the playtesters and suffer a suboptimal mystery.

Another drawback comes from the negative view videogame designers have of playtesters because they feel playtesting could result in a different game design than they originally intended. This is an interesting point made by videogame designers considering that one of the pain points of design is that designers tend to have a blind spot when considering the player's point-of-view. A common pitfall for designers is forgetting that

the players who play their game are not predisposed to the designers' intentions and must discover those within the gameplay. These findings on the role of playtesting in videogame design of optimal mystery is consistent with ***Emerging Theory #D3:***

Creating Optimal Mystery in Videogame Design through Playtesting.

Alternatively, designers can ensure an optimal level of mystery in videogame design by creating a mechanism of dynamic adjustment of mystery throughout the gameplay based on the player's experience. While this is a more complete approach that is tailored specifically for each player, it is very expensive to design in terms of time and resources. Designing a game with dynamically adjusted mystery for better optimization requires the game to account for a large set of parallel narratives and storylines, which is inefficient with current design methodologies. This finding was based on ***Emerging Theory #D2: Dynamically Optimizing Mystery in Videogame Design.***

4.4.2 Mystery Meta Genre

One of the findings of this study focused on how to classify mystery games in relation to other genre classifications. While all videogame genres can have an aspect of mystery, manifesting as transient mystery, only story-based genres can manifest persistent mystery. And since many game types can be story-based, like role-playing games, fantasy games, detective games, horror games, historical game and adventure games, the mystery categorization is an additional classification to the main genre for those games. This type of classification can be viewed as a meta genre as it relates to mystery in videogames. This can also be viewed as an extension to the list of genres identified from previous literature in Section 2.3. Also, since persistent mystery is the only type of mystery that is intentionally designed in videogames, only those games with persistent mystery can carry the mystery meta genre classification. This finding is described in ***Emerging Theory #D6: Mystery Meta Genre Classification.***

4.4.3 Other Story Mediums

A primary goal for this study was to understand how designers incorporate mystery in their videogame design in comparison to literature, film and advertisement (as discussed

in related research, in section 2.4.1). There are two main findings in this comparison, mystery manifestation and mystery recognition in videogames and other story mediums. For the manifestation of mystery, videogame designers perceive videogames are very similar to those other story mediums. Primarily, designing persistent mystery in videogames is analogous to literature, film and advertisement because they all rely on the storyline, as shown in Figure 32 below. Additionally, transient mystery does not translate to other story mediums but as mentioned in previous sections, it is not intended in the videogame design either. This finding is highlighted in ***Emerging Theory #D7: Mystery Manifestation in Other Story Mediums.***

The other finding in this category is the recognition of mystery in videogames and other story mediums. Persistent mystery is much more recognizable in other story mediums than in videogames. While mystery is usually more prominent in those other story mediums, there are other elements to compete with in videogames. In film, literature and advertisement the audience can easily recognize mystery because, with a few exceptions, there is usually little else to compete with their attention. However, in videogames the players must distinguish the mystery from other elements like sounds, visuals, gameplay, etc. This finding is highlighted in ***Emerging Theory #D8: Mystery Recognition in Other Story Mediums.***

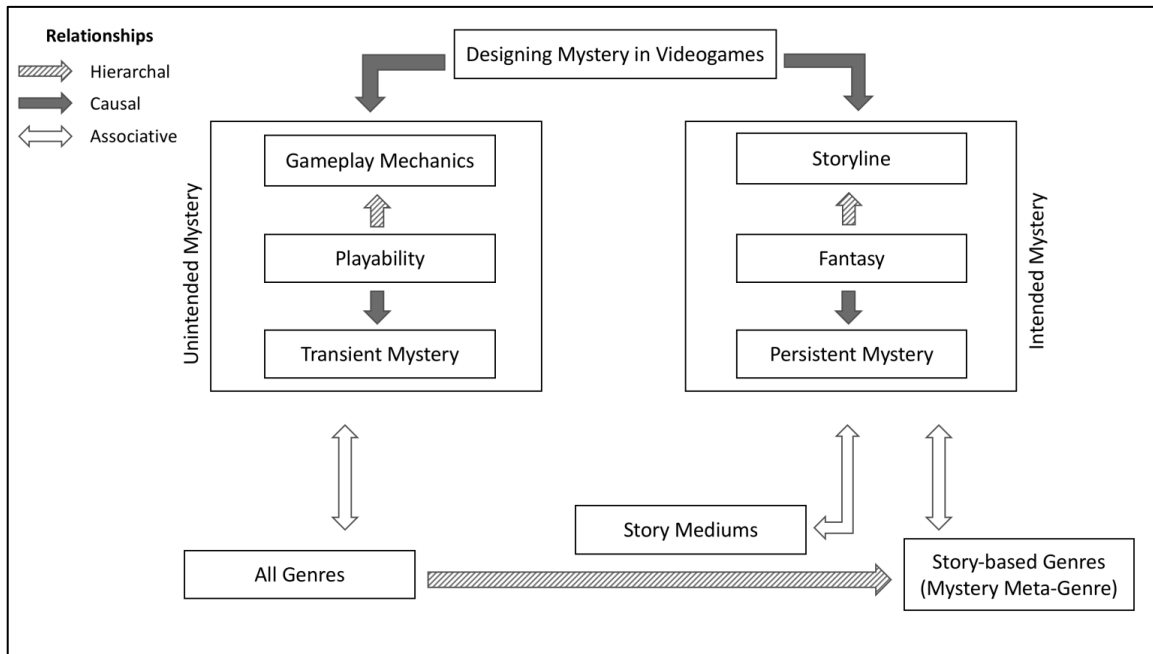


Figure 32. Mystery and Videogame Design

4.4.4 Player Curiosity

The goal of incorporating mystery in videogame design is to trigger the player's curiosity, as shown in Figure 33 below as the final state of the taxonomy for design-centered mystery. A tabular representation of this taxonomy is shown in Table 6 below. Ultimately, triggering that curiosity should lead to a higher level of player engagement. While both transient and persistent mystery can trigger the player's curiosity, as mentioned in previous sections, only persistent mystery is intentionally designed to do so. This finding maps persistent mystery to the earlier definitions in related research as information complexity causing player curiosity. Also, the level of a player's curiosity depends on the level of mystery in the game. An optimal level of mystery can trigger optimal player curiosity, whilst too much mystery produces frustration and too little mystery produces boredom. This finding is summarized in *Emerging Theory #D5: Mystery Triggers for Player Curiosity*.

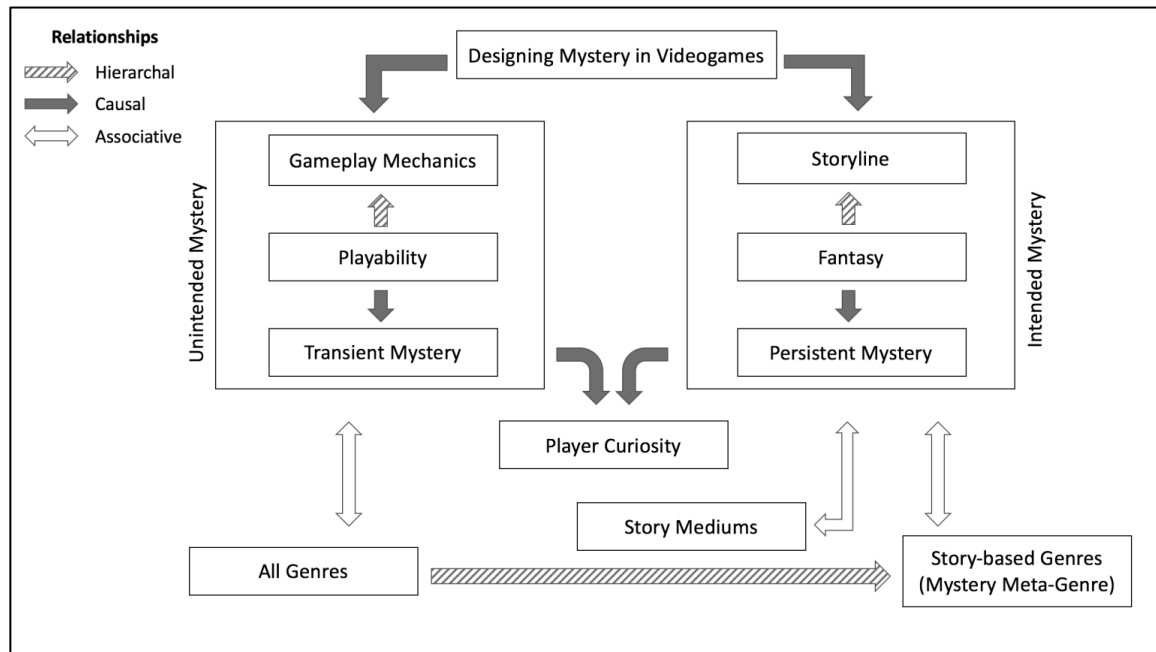


Figure 33. Mystery and Videogame Design

Table 6. Designer-centered Taxonomy of Mystery in Videogames

Taxonomy Factor	Persistent Mystery	Transient Mystery
Mystery Type	Long-term	Short-term
Design Process	Intentional	Unintentional
Design Elements	Fantasy	Playability
Design Factors	Storyline, Characters, Environment	Challenge, Randomness, Gameplay
Curiosity	Through Fantasy Element	Through Playability Element
Videogames Genres	Story-based, Mystery Meta Genre	Any Genre
Story Mediums	Comparable Manifestation	Does not Manifest
Fundamentality in Game Design	Only in Story-based Games	Not Fundamental
Mystery Resolution	Prolonged	Immediate

4.4.5 Summary and Future Work

For this study, I sought to gain a better understanding of mystery in videogames from the designer's perspective. The most prominent finding of this study is the notion that designers only incorporate persistent mystery intentionally while leaving transient mystery as an unintended consequence of their design. This finding has a wide-reaching effect on all other aspects of this study. With this notion in place, only persistent mystery is considered when highlighting the relationship between mystery and fundamental elements of videogame design, videogame genres, other story mediums and player curiosity. Only the fantasy element and its factors are fundamental, because only those are related to persistent mystery. Also, mystery is manifested in videogames in a very similar manner as in other story mediums like literature, film and advertisement. Finally, while both persistent and transient mystery can trigger the player's curiosity, as mentioned before only persistent mystery is doing so as intended by the design process.

Future work could validate the notion that transient mystery is truly unintended by the design process. Because transient mystery is such a large aspect of how mystery manifests in videogames, it would be valuable to learn more about how it relates to the design process. Another topic that bears more investigation is optimization of mystery in videogame design. Future work should focus on a more efficient method of optimizing mystery than playtesting since playtesting is crippled with several drawbacks, as described in previous sections. Also, since dynamic mystery adjustment addresses a number of those drawbacks, future work should focus on how designers can incorporate it more efficiently in their design. Finally, future work should also focus on the relationship between player curiosity and player engagement and consequently player motivation.

5. Chapter Five: Player Curiosity and Motivation

This chapter is focused on using an empirical study to validate the insights described in Chapters 3 and 4 on the relationship between mystery and the player experience. These insights are:

1. Player-centered experience of mystery in videogames
2. Designer-centered approach to mystery in videogames
3. Impact of mystery on player motivation and player curiosity
4. Mystery manifestation in different game genres

The purpose of this study is to validate those insights as they relate to videogames. While Chapters 3 and 4 relied on qualitative research methodology, particularly Grounded Theory, to identify those insights, in this study quantitative and empirical analysis is used to validate them. However, the study design for this chapter focuses on player-centered experience of mystery in videogames since it is based on in-lab experiments of different videogame sessions --- i.e., on players playing games. This study also focuses on the story element within videogames and not on other story-based mediums like film, literature and advertisement as those were addressed in Chapter 4.

5.1 Aim

This study broadly addresses all the research questions listed in the Introduction Chapter:

Research Questions

1. How do players experience mystery in videogames?
2. How do game designers consider mystery when designing their games?
3. What is the relationship between player-centered and designer-centered views of mystery in videogames?
4. What is the impact of player-centered and designer-centered elements of mystery on player motivation?

To focus the approach of the study, a more targeted list of specific research questions was developed. These questions helped shape the design and methodology of the study and inform the analysis of the results to better address the four major research questions listed above. These specific research questions and their corresponding hypotheses are:

Focused Questions

1. Is there a significant difference for the level of player curiosity triggered by transient and persistent mystery?
 - a. Is there a significant difference for the level of player curiosity triggered by transient mystery in story-based games versus non story-based games?
2. How does a player's prior experience in a specific game impact their curiosity levels playing that game?

Hypotheses for Focused Questions 1 and 2

- **Hypothesis #1:** Player curiosity in videogames with persistent mystery will be higher compared to videogames with only transient mystery as well as videogames without any mystery. This hypothesis is rooted in the assertion that persistent mystery manifests in long-term information complexity which will garner more of the player's curiosity compared to short-term information complexity or no information complexity.
- **Hypothesis #2:** Player curiosity in videogames with transient mystery will be higher compared to videogames without any mystery. This is because transient mystery manifests through short-term information complexity which induces player curiosity more than lack of information complexity.
- **Hypothesis #3:** Player curiosity in story-based videogames with transient mystery will be higher compared to non-story videogames with transient mystery. This is due to the positive impact of a storyline on the player curiosity based on the findings from Chapters 3 and 4.
- **Hypothesis #4:** Player curiosity in videogames they have experience playing in the past will be lower than those games they haven't played

before. Since prior experience in a particular game will reduce information complexity for videogame players.

3. Is there a significant difference for the level of player motivation caused by transient and persistent mystery?
 - a. Is there a significant difference for the level of player motivation caused by transient mystery in story-based games versus non story-based games?
4. How does a player's prior experience in a specific game impact their motivation playing that game?

Hypotheses for Focused Questions 3 and 4

- **Hypothesis #5:** Player motivation in videogames with persistent mystery will be higher compared to videogames with only transient mystery as well as videogames without any mystery. This hypothesis relies on findings from Chapters 3 and 4 that emphasize the impact of long-term mystery on player motivation.
- **Hypothesis #6:** Player motivation in videogames with transient mystery will be higher compared to videogames without any mystery. Again, this is rooted on the impact of mystery on player motivation, even at the short-term level.
- **Hypothesis #7:** Player motivation in story-based videogames with transient mystery will be higher compared to non-story videogames with transient mystery. This hypothesis was based on Chapters 3 and 4 showing a clear impact of the storyline on player motivation.
- **Hypothesis #8:** Player motivation in videogames they have experience playing in the past will be higher than those games they haven't played before because prior experience playing a videogame implies higher motivation to play it again.

5. Is a player's level of curiosity a good indicator of their motivation?

Hypotheses for Focused Question 5

- **Hypothesis #9:** Player motivation in videogames will be higher if the player shows higher levels of curiosity. This hypothesis is based on the assumption that if a player is more curious about a game, they will be more motivated to play it.

All of the focused questions above contribute to the first research question in the Introduction Chapter, but from different angles. The first two focused questions consider player curiosity as it relates to their videogame experience while the third and fourth questions consider the motivation angle of videogame experience. Finally, the fifth question is designed to find the correlation between those two angles. The second and third research questions are not directly addressed in this study, since they are specific to player-centered and designer-centered mystery, which were covered in Chapters 3 and 4. However, the findings from Chapters 3 and 4 are addressed and validated in this study. The fourth and final research question is measured directly through the third and fourth focused questions. This mapping between the research questions and focused questions is illustrated visually in Figure 34 below.

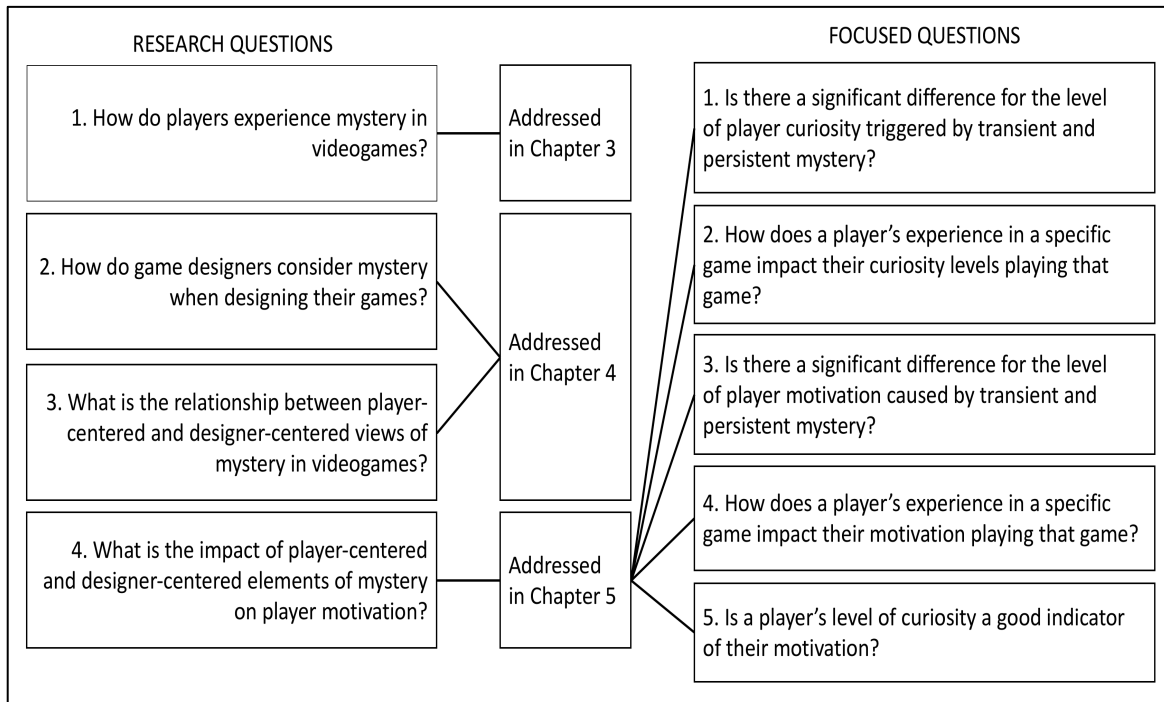


Figure 34. Mapping Research Questions to Focused Questions

5.2 Methodology

This study follows a quantitative approach to measure player curiosity and enjoyment as they relate to mystery in videogames. Since the focus of the study is to validate findings from the qualitative studies in Chapters 3 and 4, it utilizes an empirical data analysis methodology. This study uses the results of a quantitative analysis to determine if the findings of Chapters 3 and 4 are validated or invalidated. This is done via examining the data for motivation and curiosity in this study and how they relate to these findings of the previous chapters.

5.2.1 Design

To address the focused questions and their related hypotheses listed above, this study was designed to extend the community's knowledge on player experience in videogames and how it is impacted by mystery. The three concepts that are primary to answering the focused questions as well as validating the hypotheses are mystery in videogames, player motivation and player curiosity. In this section, I will describe how these concepts are

pivotal to the study goals as well as how I operationalized them within the study's methodology.

For mystery in videogames, there are two constructs, persistent and transient mystery, that I utilized for this study as the independent variables of the research. Those two constructs were identified from Chapters 3 and 4 and describe how mystery can be manifested in videogames. Since this dissertation is mainly a critical analysis of mystery in videogames, identifying how mystery is manifested in games as well as how it impacts the player experience is vital. Persistent mystery, as defined in Chapter 3, is operationalized as long-term mystery that persists throughout an entire game, storyline or significant section of the game. Transient mystery, as defined in Chapter 3, is operationalized as short-term mystery that is usually presented within the immediate gameplay with less significant consequence and importance than persistent mystery.

As there are two independent variables in this study, there are also two dependent variables. The first dependent variable in this study is player motivation. Player motivation can be broadly defined as player enjoyment but more specifically as the player's intrinsic motivation to play a particular videogame. To measure the intrinsic motivation of a player, the Interest/Enjoyment subscale of the Intrinsic Motivation Inventory was used. I described the IMI in more detail in the Related Research chapter, section 2.7.2. For this study, I calculated the IMI score for each player based on the Interest/Enjoyment subscale questions shown in Table 2. Since the IMI is a self-reporting tool, I asked the players those questions to determine their intrinsic motivation playing a game.

Another concept I operationalized for this study is player curiosity, as the other dependent variable of the research. As mentioned in Chapter 4, Curiosity exists when the gap between the game knowns and unknowns is optimal. If the gap is too big, curiosity turns into confusion and if the gap is too little then curiosity turns into boredom. To measure player curiosity in this study, I utilized a behavioral measurement of their choice to watch 60 seconds of advertisement to continue playing a particular game or skip the advertisement and play a different random game. Since consumers are more inclined to avoid advertisement (Kelly and Drennan, 2010), the second option provided insight to the

level of curiosity the participant had playing the game segment. If they were curious enough about the gameplay or what happens next, they were more tolerant of watching the advertisement and then carrying on with the gameplay. If they were not curious, they would be more likely to skip the advertisement and play a different game.

The motivation and curiosity operationalizations in this study are very similar but are measuring two separate factors. Motivation is being measured by the Intrinsic Motivation Inventory (Interest/Enjoyment Subscale) and it focuses on the player's experience of a game they are playing or finished playing. Curiosity is more focused on an upcoming task, essentially: is the player curious enough to watch an advertisement so that they can play the next session of the same game.

5.2.2 Participants

The study had 26 participants, 19 years or older. Participants were invited to join from two sources, one was the GameDev distribution list (mailing list for DePaul students) by awarding them a gift card upon the completion of their session. The other source was the research pool available through the DePaul University CDM Pool, those participants were awarded with credit towards their research requirement. Out of the 26 participants, 18 were male and 8 were female. 17 of the participants had a high school diploma as their highest degree attained, while the other 9 had a bachelor's degree. The average age of the participants is 24.5 with a median of 21.5, so that number was skewed by outliers with two people over 40 and 17 of them 22 years of age or younger.

The split between the two sources was 50%, 13 participants each. While most of the CDM pool was graduate students with an average age of 28.54, the majority of the GameDev participants were younger with an average age of 20.54. The GameDev participants also played an average of 2 more hours a week of videogames and have had much more design experience academically and professionally. A detailed look at that breakdown is shown in Table 7 below.

Table 7. GameDev Distribution List vs. CDM Pool Participants

	Count	Avg. Age	HS Diploma	B.S.	Avg. Yrs. Playing Games	Avg. Hrs. Playing Games	Avg. Games Designed
GameDev List	13	20.54	12	1	14.92	10.85	4
CDM Pool	13	28.54	5	8	20.42	8.77	0.31

5.2.3 Materials

In this section, I will describe the materials used for the study, more specifically the videogames chosen and their respective game segments. Ten videogames games were selected from a list of highly-rated commercial games in the CDM Game Lab, shown in Table 8 below. In this table, I list all 10 games as well as their Metacritic Review. Metacritic is a well-known review website, owned and operated by CBS corporation, that aggregates review scores for videogames, films and TV shows from major sites, newspapers and magazines. The range of Metacritic review scores below ranges from 71 to 89 which indicates generally favorable reviews or B- score or higher (Metacritic, 2015).

Table 8. Game Selection and Review

Game	Metacritic Review
Gone Home	86
Never Alone	73
Metro Last Night	76
Counter Strike	88
This War of Mine	83
SOMA	82
Left 4 Dead 2	89
Rocket League	86
Subway Surfer	71
Temple Run	80

For each videogame in the table above, I identified 5-minute game segments for this study, totaling 30 segments. The choice of 5-minute game segments versus a longer duration was validated through a pilot study which examined the difference of player intrinsic motivation of playing a game segment between 5-minute sessions and 20-minute sessions. I measured the pilot testers motivation through the Interest/Enjoyment subset of the Intrinsic Motivation Inventory. This pilot test was conducted for 20 participants, 10 playing 5-minute segments and 10 played 20-minute segments. 6 of the participants were female and 14 males, with an average age of 25.8. The pilot test was based on one first-person shooter game (Call of Duty: Modern Warfare 2) with 5 different setups with varying difficulty levels set by the game. Five of the participants have played the game before, while 18 of them have played the genre before. There was not a significant difference in the player enjoyment of the game sessions of 5-minutes ($M= 5.66$, $SD=2.80$) and the player enjoyment of the game sessions of 20-minutes ($M=5.77$, $SD=0.43$) for their IMI rating of the game session experience; $t= -0.28$, $p = 0.39$. This indicates that the duration of the pilot test had no significant impact on their motivation playing the videogame session. The results of this pilot test indicated that a 5-minute game session is just as effective to determine the level of player motivation as a 20-minute game session.

After identifying each of the 30 game segments, I classified them under one of the following conditions:

1. Control condition where no specific mystery is selected at the end of the gameplay.
2. Persistent mystery in story-based game sessions.
3. Transient mystery in story-based game sessions.
4. Transient mystery in non-story-based sessions.

The persistent and transient mystery classification followed the definition listed in the Design section above. Essentially if there was mystery present within the game segment based on the fantasy element (storyline, characters or environment), then the segment was classified under persistent mystery. If the mystery present within the game

segment was based on the playability element (randomness, gameplay or challenge), then it was classified under transient mystery. Transient mystery segments were then further classified under story-based and non story-based games. If no mystery was present, then the game segment was classified under control.

The selection of the game segments was then pilot tested to ensure the presence of those mystery types at the end of each selected segment. The pilot test was conducted with 7 testers prior to the study to validate the original selection. The pilot test was conducted with 5 male participants and 2 female participants, with an average of 20.57. Each of the 7 pilot testers played six 5-minute sessions from the 30 preselected game sessions to help identify which condition does that session align with. I asked each pilot tester to identify if there is mystery present with the game segment, then asked them to describe the mystery if any existed. That description was mapped to how I defined persistent and transient mystery in Chapters 3 and 4. To provide more clarity below are two excerpts from the pilot tests:

Pilot Test #2, Tester 1

Game: Gone Home

Session: 1st 5 minutes of play

Original Classification: Persistent

Q&A:

Researcher: Did you experience any mystery during the gameplay?

Tester: Yes, I did.

Researcher: Can you describe it that mystery that you experienced?

Tester: I had no idea who my character was? Where I was? What the objective of the game is?

Conclusion: Game session was validated as persistent because the mystery present was long-term and related to the fantasy element of the game, specifically the storyline and characters.

Pilot Test #5, Tester 3

Game: Left 4 Dead 2

Session: 1st 5 minutes of play

Original Classification: Story-based Transient

Q&A:

Researcher: Did you experience any mystery during the gameplay?

Tester: A little bit.

Researcher: Can you describe it that mystery that you experienced?

Tester: I wasn't sure about the controls, I didn't know how to switch weapons or pick up a gun. I also didn't know the powers of the zombies attacking me until they did and I died.

Researcher: Was there a storyline that you can describe to me?

Tester: Yes, I am one of the last remaining humans on earth battling a zombie army in a building. I think I am trying to kill them all to make it out of the building but I am sure there will be more after I leave.

Conclusion: Game session was validated as transient mystery because the mystery present was short-term and related to the playability element of the game, specifically the mechanics. However, there was a specific storyline to the game which makes it story-based transient mystery.

This process validated that all of the game sessions were classified under the same classification I originally performed with 6 exceptions. Those exceptions were all the second or third segments of non story-based games with transient mystery. The pilot testers indicated that transient mystery within those games was lost after the first session due to mystery habituation. This means that the transient mystery existed within those videogames was no longer there after the player finished one segment of that videogame because they were able to figure out those controls by then.

The result of this classification exercise (after the pilot test) provided the following list of game segments and their classifications in Table 9:

Table 9. Game Segments Classification

Code	Game	Segment 1	Segment 2	Segment 3	Condition
A	Gone Home	A1	A2	A3	Persistent
B	Never Alone	B1	B2	B3	Transient: story-based
C	Metro Last Night	C1	C2	C3*	Transient: non-story-based
D	Counter Strike	D1	D2*	D3*	Transient: non-story-based
E	This War of Mine	E1	E2	E3*	Transient: non-story-based
F	SOMA	F1	F2	F3	Persistent
G	Left 4 Dead 2	G1	G2	G3	Transient: story-based
H	Rocket League	H1	H2*	H3*	Transient: non-story-based
I	Subway Surfer	I1	I2	I3	Control
J	Temple Run	J1	J2	J3	Control

* Denotes mystery habituation

5.2.4 Procedure

In this study, each participant completed one session that lasts approximately 30 minutes. For each session, the first five minutes was spent on introducing the study and getting demographic information based on the questions below:

1. What is your age?
2. What is your gender?
3. What is your highest degree attained?
4. How long have you been playing videogames?
5. How often do you play videogames?
6. What is your most frequently played game? Genre?
7. How many games have you designed?
8. Have you ever designed a videogame?
9. If so, have you designed a videogame outside of school setting?

For the remaining 25 minutes, each participant played a number of approximately five-minute-long game segments from one of the preselected sets of segments (described in the Materials section). These game segments were chosen at random from 30 preselected game segments from ten different games. Two of the games were rich with persistent mystery, four of the game were rich with transient mystery from story-based games, two of the game were rich with transient mystery from non-story based games and finally the remaining two were control game with no mystery present. The goal of the study was to record between 18 sessions played for each of the four conditions listed in the Materials section.

To balance the number of participants for each variable, I randomly assigned the first game (and subsequent games if the participant opted to switch games after the end of the session) but I also kept track of the games played and reseeded the random number generator. By the end of the study, I had recorded 78 sessions from 26 participants. Two of the conditions had 20 sessions (control and transient: story-based) while the other two had 19 sessions (persistent and transient: non story-based). At the end of the segment, the participants responded to the Interest/Enjoyment subscale of the Intrinsic Motivation Inventory to gauge the participant's enjoyment. At the end of the questionnaire, the participants were given two options: 1) Play a new segment from a different game (unknown to the participant at the time) or 2) Watch two 30-second advertisements and continue to play the same game after the advertisement ends. A diagram detailing this procedure is shown in Figure 35 below.

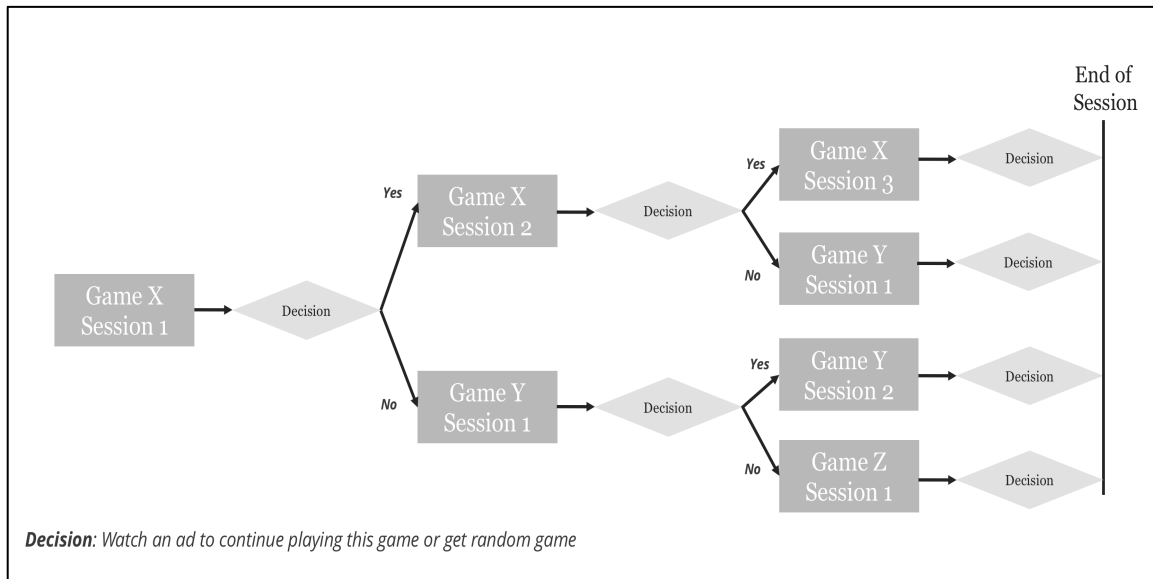


Figure 35. Study Procedure

It is important to note that the advertisement measure in this design (discussed in the previous paragraph) is not related to the concept of mystery in advertisement studied in other chapters. The advertisement was a random advertisement pulled from the internet regarding a commercial product unrelated to the games or the study, like a soda or cleaning product advertisement. Regardless of the choice, the participant played for another five minutes (same or different game) and asked to choose from the same two options again. I repeated this process until the participant has played 3 games segments. Even after the third segments, I still gave the participants the option of watching an advertisement or playing a new game, but I concluded the study afterwards regardless of their selection. This means the participants indicated their willingness to watch an ad and continue playing the same game after the third segment without knowing that the study will conclude regardless of their choice. That provided the behavioral measurement of watching the advertisement for the third segment, similar to the first two segments.

5.3 Results

In this section, I will organize the results in this study by the focused questions and their corresponding hypotheses. Part of this section will focus on the mystery types (persistent and transient) and explain to what extent the empirical results validated the findings from

Chapters 3 and 4. This section will also provide additional insight acquired through data analysis as they relate to player motivation and player curiosity as well as how they were operationalized in the study design. The 78 game sessions executed for this study provide 19-20 data points for each of the four conditions identified in the study design, shown in Table 10 below. Reaching 19-20 data points for each condition was an important goal to establish enough of a sample size for meaningful analysis.

Table 10. Number of Sessions per Condition

Condition	Control	Persistent	Transient Story	Transient Non-story	Mystery Habituation
Number of sessions	20	19	20	19	0

Mystery habituation sessions are only available if the participant opts to watch an ad and continue playing a non-story based transient mystery game (as indicated in Table 5 above), which did not happen during this study. A more detailed look at the breakdown of those sessions and conditions categorized per game is shown in Table 11 below. Table 11 highlights the number of sessions recorded in this study broken down by both the game they were based on and the condition they mapped to. In this table, each game contains 3 different segments and for each session, I specify the condition it was classified under as well as the number of participants playing that segment. The condition for all segments of a game is the same with the exception to mystery habituation as described in the Materials section above. Also, the number of sessions played is much higher in the first segment than the second segment and again higher in the second segment than the third segment since players had to opt-in and watch an advertisement in order to continue playing the same game.

Table 11. Number of Sessions per Game

Game	Game Segment	Condition	Number of Sessions Played
Gone Home	Segment 1	Persistent	6
	Segment 2	Persistent	2

	Segment 3	Persistent	1
SOMA	Segment 1	Persistent	6
	Segment 2	Persistent	3
	Segment 3	Persistent	1
Never Alone	Segment 1	Transient Story	8
	Segment 2	Transient Story	2
	Segment 3	Transient Story	0
Left 4 Dead 2	Segment 1	Transient Story	10
	Segment 2	Transient Story	0
	Segment 3	Transient Story	0
Metro Last Night	Segment 1	Transient Non-story	4
	Segment 2	Transient Non-story	1
	Segment 3	Mystery Habituation	0
Counter Strike	Segment 1	Transient Non-story	4
	Segment 2	Mystery Habituation	0
	Segment 3	Mystery Habituation	0
This War of Mine	Segment 1	Transient Non-story	5
	Segment 2	Transient Non-story	0
	Segment 3	Mystery Habituation	0
Rocket League	Segment 1	Transient Non-story	5
	Segment 2	Mystery Habituation	0
	Segment 3	Mystery Habituation	0
Subway Surfer	Segment 1	Control	10
	Segment 2	Control	1
	Segment 3	Control	0
Temple Run	Segment 1	Control	9
	Segment 2	Control	0
	Segment 3	Control	0

Overall in this section, I will break down the results into categories that address the focused questions and their set of hypotheses. The first category is concentrated on the player curiosity and how it is impacted by the player's prior experience as well as

mystery types. The second category is concentrated on the player motivation and that is impacted by the player's prior experience as well as the mystery types. The third and final category is concentrated on the impact of player curiosity on player motivation.

5.3.1 Player Curiosity

This section of the results is concentrated on the first two focused questions and their related hypotheses. The first two focused questions dealt with how much curiosity would be caused by transient vs persistent mystery, transient mystery in story-based vs non-story-based games and the effects of prior experience on curiosity. For each section below, I will state the hypotheses and the results addressing each hypothesis.

5.3.1.1 Result #1 Mystery and Curiosity

For Result #1, I examined the first three hypotheses. The first hypothesis was that player curiosity in games with persistent mystery will be higher than other types of mystery (including no mystery). The second hypothesis was that player curiosity in games with transient mystery will be higher than games with no mystery. And the third hypothesis was that player curiosity in story-based games with transient mystery will be higher than non-story games with transient mystery. Using a Kruskal-Wallis test, there was a **significant** effect of the type of mystery in the game session on participants' curiosity level as measured by their choice to watch an ad and continue playing that game at $p = 0.01$. This result indicates that the choice of watching an ad to continue playing the same game was significantly impacted (with a very low p value) by the type of mystery presented within that videogame. The results for the different mystery types is shown below in Figure 36.

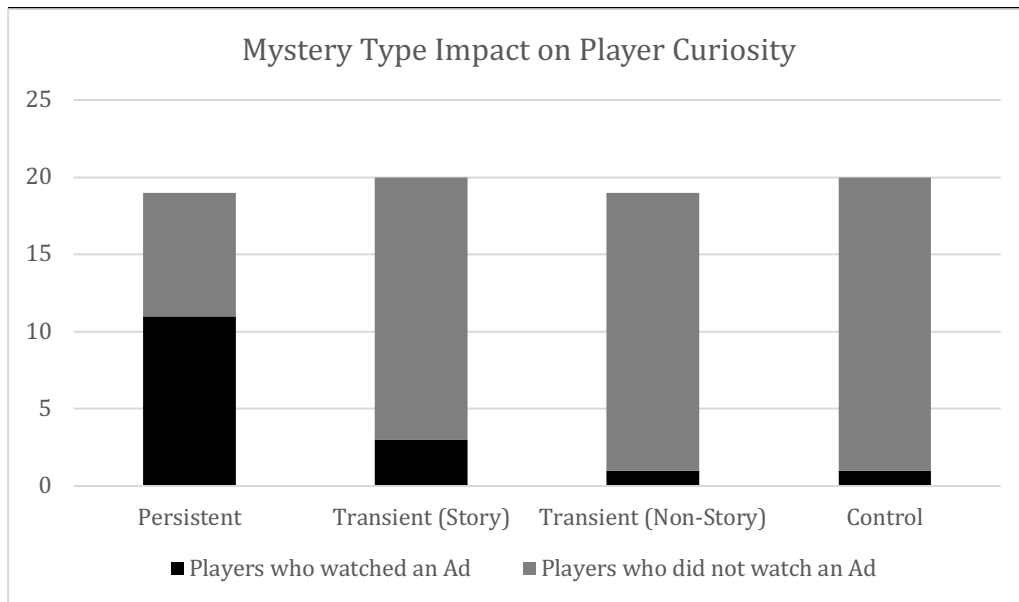


Figure 36. Mystery Type Impact on Curiosity

Also Figure 37 below further breaks down the curiosity levels based on each game selection. This result indicates that persistent mystery increases the player curiosity to continue playing more than the other conditions, followed closely by transient mystery in story-based games. This also shows that transient mystery in non-story game as well as games with no mystery at all (control condition) do not increase the curiosity level of videogame players.

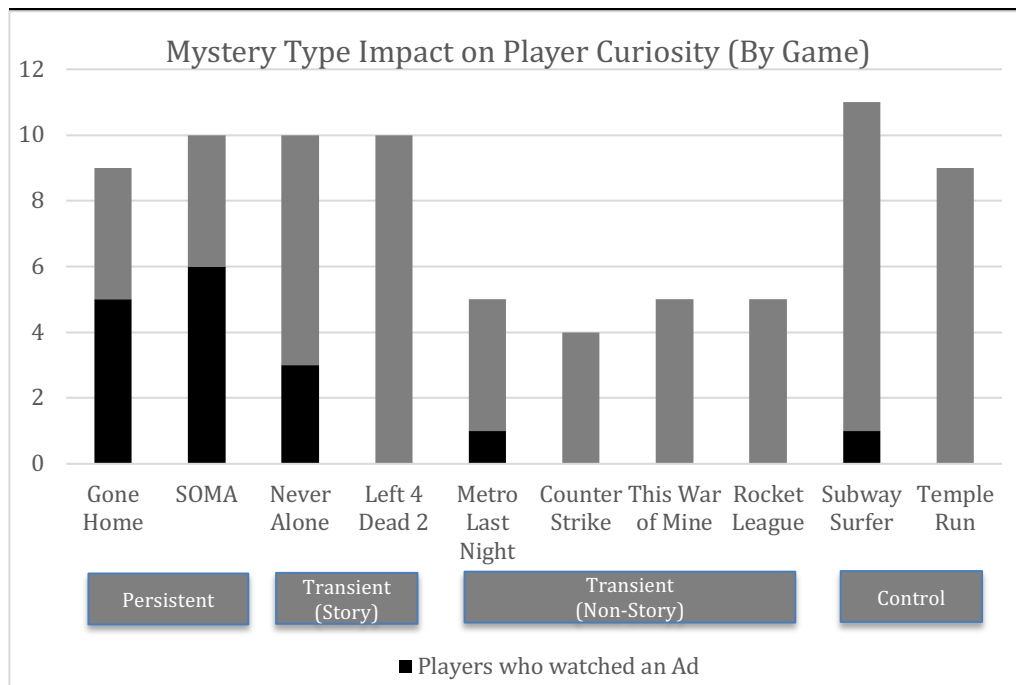


Figure 37. Mystery Type Impact on Curiosity (By Game)

While the Kruskal-Wallis test showed a significant effect that the type of mystery had on player curiosity, additional validation was done using post-hoc multiple-comparison tests to identify the significance of each mystery type individually. This was done because the Kruskal-Wallis test does not differentiate between the different conditions, it only shows that there was a significant difference somewhere in the test results. Table 12 below shows the results for the post-hoc Dunn test on each mystery condition. Tukey HSD, Scheffé and Bonferroni & Holm tests were also performed yielding the same results for significance. The results of the post-hoc tests show that there is significant difference of the impact of mystery types on player curiosity only between persistent mystery condition and the other three conditions. The post-hoc tests also show that there was no significant difference between the other three types of mystery condition (transient in story-based games, transient in non story-based games and control games with no mystery)

Table 12. Dunn Test of Mystery Types Impact on Curiosity

Mystery Condition Comparison	Dunn Test p Value	Dunn Test Inference
Persistent vs. Transient (story)	0.001	Significant
Persistent vs. Transient (non-story)	0.00007	Significant
Persistent vs. Control	0.00007	Significant
Transient (story) vs. Transient (non-story)	0.46	Insignificant
Transient (story) vs. Control	0.46	Insignificant
Transient (non-story) vs. Control	1	Insignificant

Based on the results for this section, here are the conclusions on the set of hypotheses:

- **Hypothesis #1 was validated** by the results of this study, which showed player curiosity was at a higher level playing games with persistent mystery.
- **Hypothesis #2 was not supported** by the results of this study, which showed no significant difference of player curiosity between games with transient mystery and control games with no mystery.
- **Hypothesis #3 was not supported** by the results of this study, which showed no significant difference of player curiosity between story-based games with transient mystery and non story-based games with transient mystery.

5.3.1.2 Result #2 Player Experience and Curiosity

This section examines the fourth hypothesis, which is prior experience by videogame players will reduce their curiosity playing that game. This was operationalized by the players' choice to watch an ad and continue playing the game after one session with that game ends. Figure 38 below highlights the effect of game experience on the player curiosity, which shows players' curiosity levels were higher when they don't have prior experience playing the same game, with the y-axis being the number of players. Using a Kruskal-Wallis test, there was a **significant** effect of previous experience playing a game on participants' curiosity level as measured by their choice to watch an ad and continue playing that game at $p < .00001$. This result indicates that players were much more likely

to watch an ad and continue playing the game if they have not played the game before, highlighting their curiosity level to see what the game has to offer.

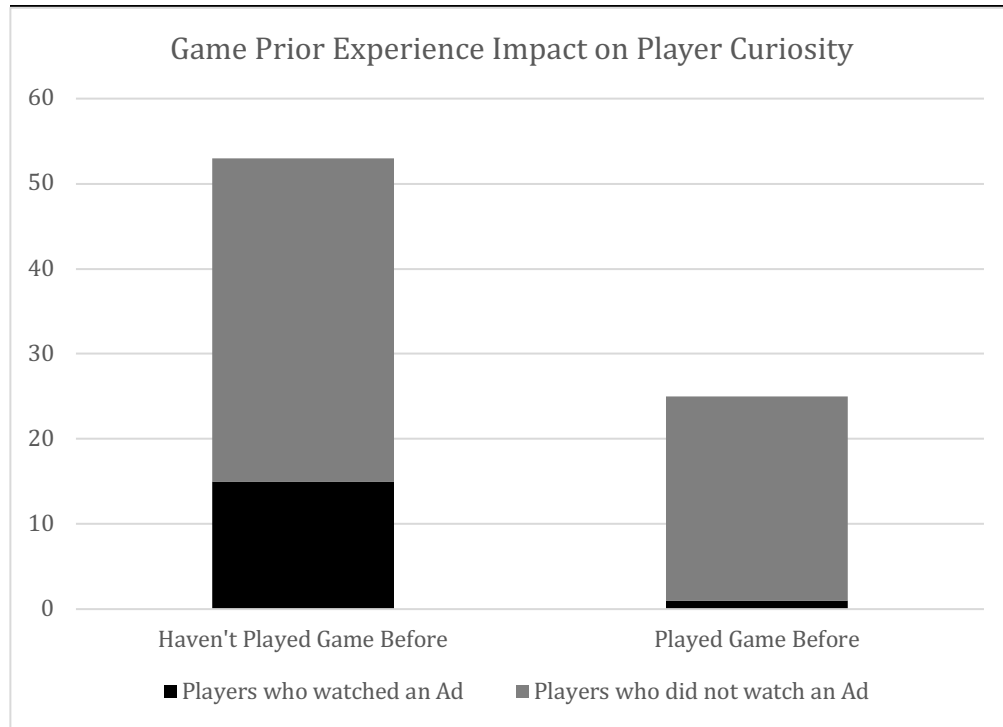


Figure 38. Game Experience Impact on Curiosity

Based on the results for this section, here are the conclusions on the fourth hypothesis:

- **Hypothesis #4 was validated** by the results of this study, which showed that the curiosity levels were diminished when the players have played the game before, therefore reducing the gap between the known and unknown.

5.3.2 Player Motivation

This section of the results is concentrated on the third and fourth focused questions and their related hypotheses. The third and fourth focused questions dealt with how much motivation would be caused by transient vs persistent mystery, transient mystery in story-based vs non-story-based games and the effects of prior experience on curiosity. For each section below, I will state the hypotheses and the results addressing each hypothesis.

5.3.2.1 Result #3 Mystery and Motivation

This section examines the fifth, sixth and seventh hypotheses. The fifth hypothesis was player motivation in videogames with persistent mystery will be higher compared to videogames with only transient mystery as well as videogames without any mystery. The sixth hypothesis was player motivation in videogames with transient mystery will be higher compared to videogames without any mystery. And the seventh hypothesis was player motivation in story-based videogames with transient mystery will be higher compared to non-story videogames with transient mystery. The results of this study measures player motivation as measured by the participants' IMI score (Intrinsic Motivation Inventory Interest/Enjoyment Subscale). Using a Kruskal-Wallis test, there was a **significant** effect of the type of mystery in the game session on participants' motivation in the game session as measured by their IMI score at $p = 0.006$. This indicates that participants' IMI score was impacted (with a very low p value) by the type of mystery present within the game they played in the study. Figure 39 below, highlights how those IMI scores are reported for each mystery type.

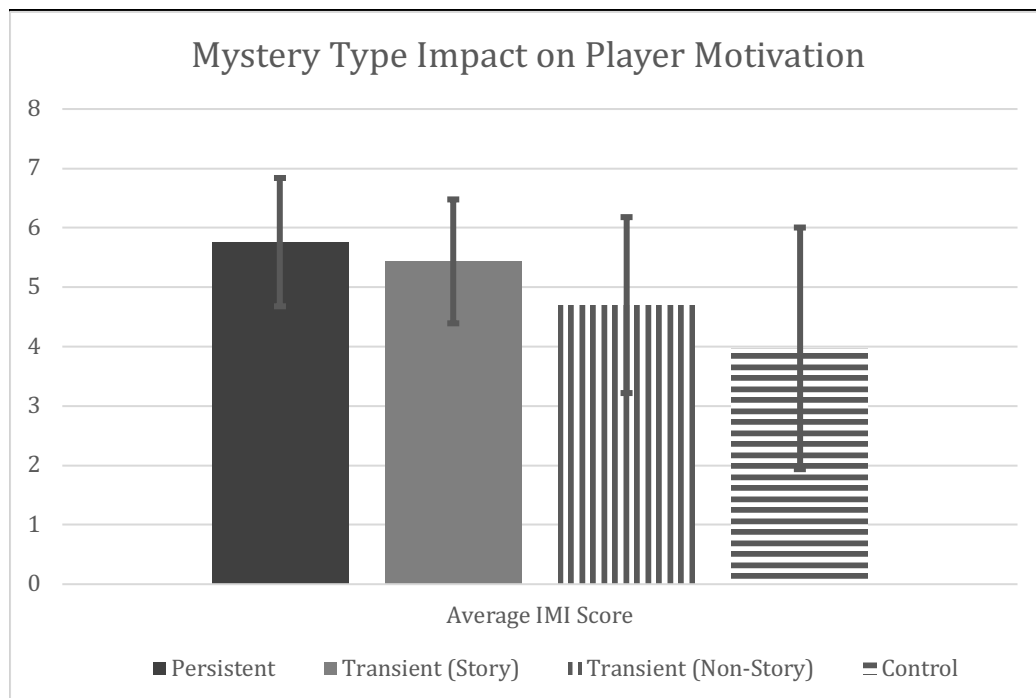


Figure 39. Mystery Type Impact on Motivation

Also Figure 40 below further breaks down the motivation levels based on each game selection. This result indicates that persistent mystery increases the player motivation to continue playing more than the other conditions, followed closely by transient mystery in story-based games and two of the non story-based games. This also shows that transient mystery in non-story game as well as games with no mystery at all (control condition) do not increase the motivation level of videogame players.

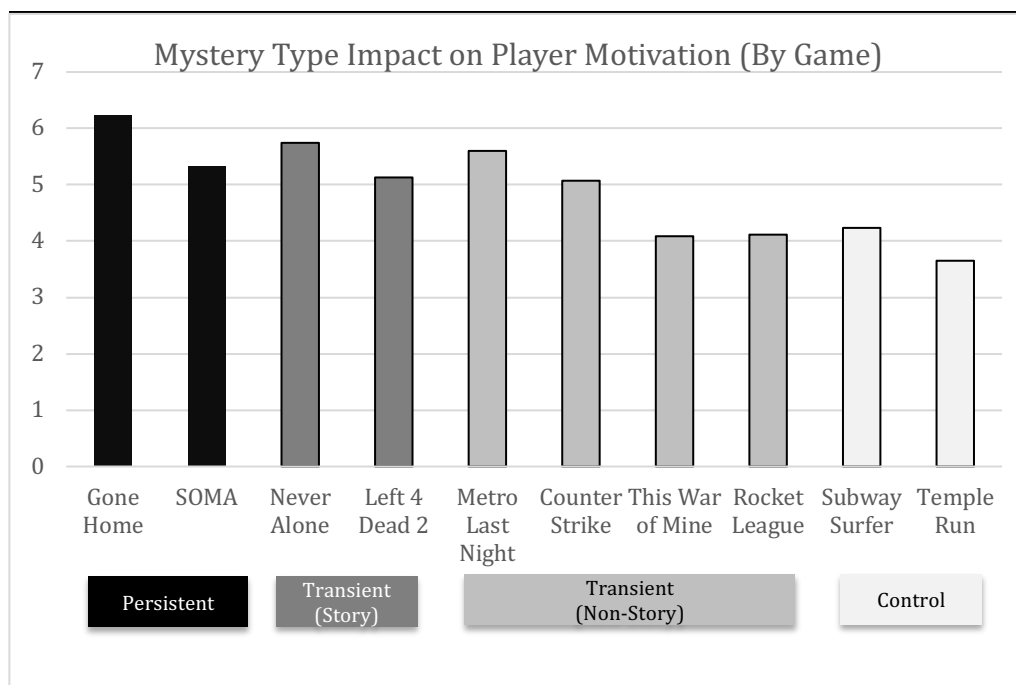


Figure 40. Mystery Type Impact on Motivation (By Game)

Analogous to the results from player curiosity, additional validation was done using post-hoc multiple-comparison tests to identify the significance of each mystery type. Table 13 below shows the results for the post-hoc Dunn test on each mystery condition. Tukey HSD, Scheffé and Bonferroni & Holm tests were also performed yielding the same results for significance. The results of the post-hoc tests show that there is a significant difference of the impact of mystery types on player motivation only

between the persistent mystery condition and control and between transient (story) and control.

Table 13. Dunn Test of Mystery Types Impact on Motivation

Mystery Condition Comparison	Dunn Test p Value	Dunn Test Inference
Persistent vs. Transient (story)	0.44	Insignificant
Persistent vs. Transient (non-story)	0.02	Significant
Persistent vs. Control	0.001	Significant
Transient (story) vs. Transient (non-story)	0.13	Insignificant
Transient (story) vs. Control	0.01	Significant
Transient (non-story) vs. Control	0.34	Insignificant

Based on the results for this section, here are the conclusions on the set of hypotheses:

- **Hypothesis #5 was *partially validated*** in the results of this study, which showed player motivation in games with persistent mystery was higher than control games with no mystery. However, there was no significant difference between player motivation of games with persistent mystery versus games with transient mystery, except for non story-based games.
- **Hypothesis #6 was *partially validated*** in the results of this study, which showed player motivation in story-based games with transient mystery was higher than control games with no mystery. However, there was no significant difference between non story-based games with transient mystery and control games without any mystery.
- **Hypothesis #7 was *not supported*** in the results of this study, which showed no significant difference of player motivation between story-based games with transient mystery and non story-based games with transient mystery.

5.3.2.2 Result #4 Player Experience and Motivation

This subsection examines the eight hypothesis, which was player motivation will be higher playing videogames where they have prior playing experience as measured by the

IMI score. The diagrams in Figure 41 below, highlights the data for this result. Using a Kruskal-Wallis test, there was **not a significant** effect of previous experience playing a game on participants' motivation in the game session as measured by their IMI score ($p = 0.6$). This result indicates that experience in playing the game from the session has no significant impact on the player motivation as indicated by their IMI score.

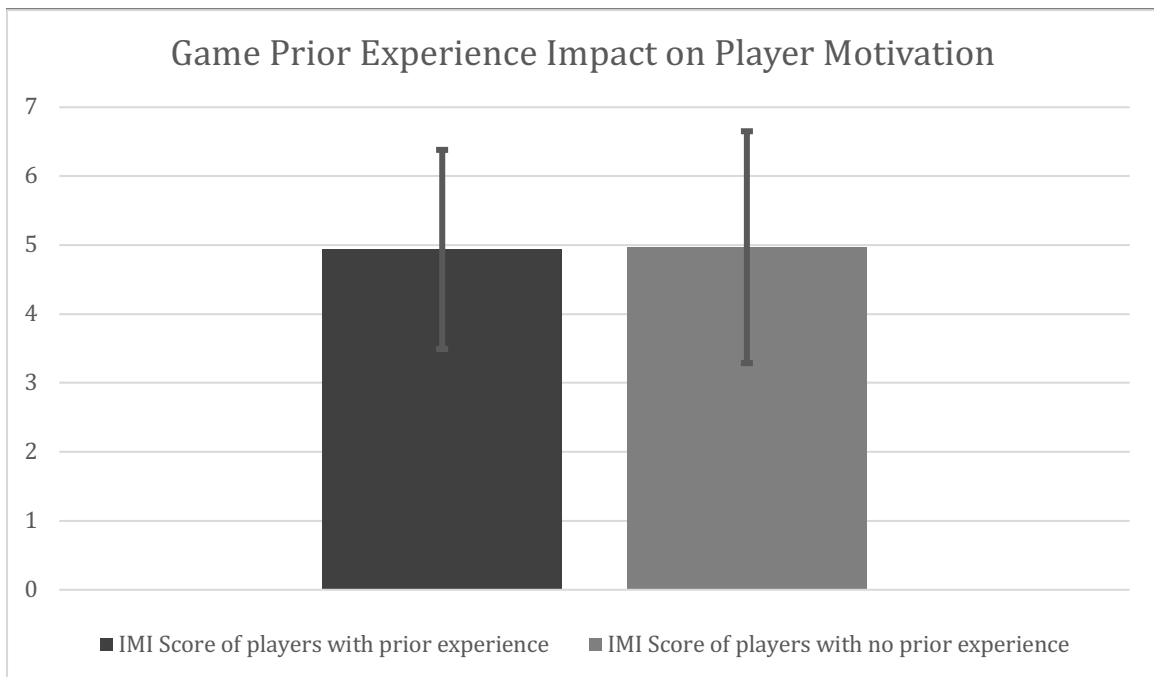


Figure 41. Game Experience Impact on Motivation

Based on the results for this section, here are the conclusions on the eighth hypothesis:

- **Hypothesis #8 was not supported** in the results of this study, which showed that the motivation levels were not significantly affected when the players have played the game before.

5.3.3 Player Curiosity Impact on Player Motivation

This section of the results is concentrated on the fifth focused question and its related hypotheses. The fifth focused question dealt with the association between player curiosity and motivation.

5.3.3.1 Result #5 Motivation and Curiosity

For result #5, I examined the ninth and final hypothesis of this study. The ninth hypothesis was that player curiosity is a good indicator of player motivation. Using a Mann-Whitney U test, there was a **significant** difference in the IMI rating for participants who watched the ad and participants who did not watch the ad with a U value of 224, Z-score of -3.36 and $p = 0.0008$. This means that participants who displayed high levels of curiosity by watching an ad to continue playing the same game reported a higher level of motivation through their IMI score. The results, shown in Figure 42 below, indicate player curiosity is a good indicator of their motivation playing a videogame.

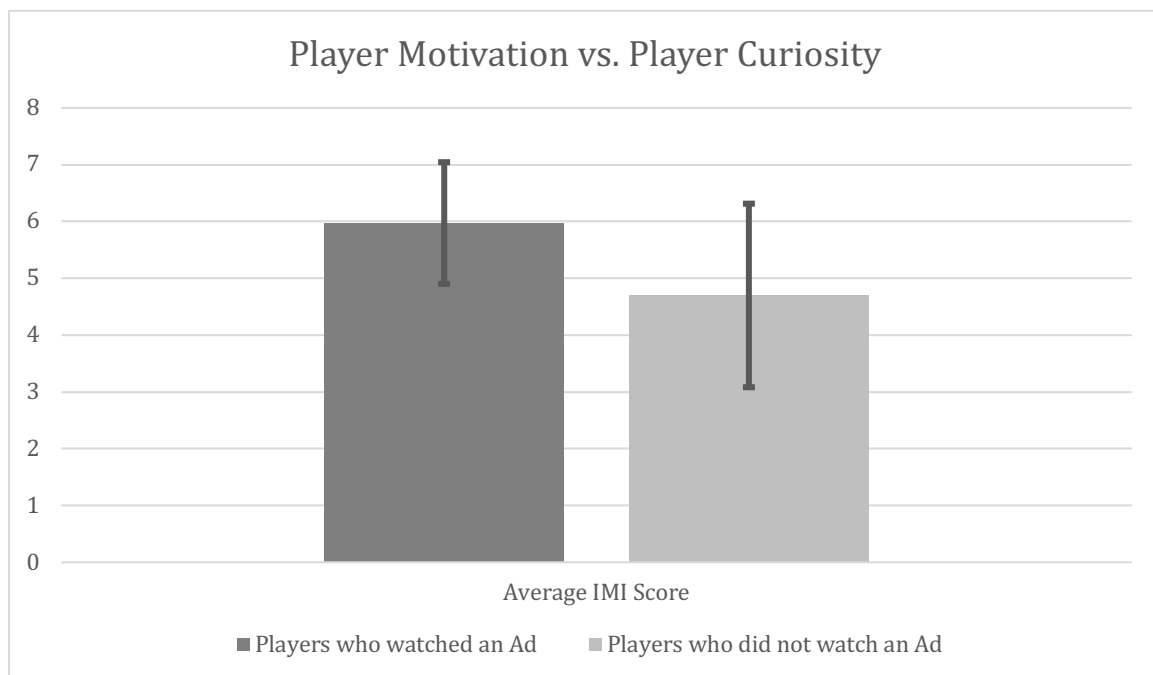


Figure 42. Player Curiosity and Motivation

Based on the results for this section, here is the conclusion on the ninth hypothesis:

- **Hypothesis #9 was validated** in the results of this study, which showed that player curiosity is a good indicator of player motivation.

5.4 Discussion

This study was focused on finding out how players experience mystery in videogames, specifically the impact of mystery on player motivation and curiosity. To find the impact of mystery on motivation and curiosity, I established in Chapters 3 and 4 two classifications (player-centered and designer-centered) of mystery in videogames, persistent and transient. Persistent mystery manifests in videogames through the fantasy element of videogames and transient mystery manifests through the playability element of videogames. That designer-centered classification was further categorized by the videogame designers in Chapter 4 as intended (persistent) and unintended (transient) mystery. Also, I further described in Chapters 3 and 4 that mystery is the gap between the known and unknown where player curiosity is a phenomenon that exists when that gap is optimal. I will outline in the following subsections the conclusions that emerged from the results section above.

5.4.1 Player Curiosity

Previous research, as discussed in Chapter 2, defined mystery as information complexity as perceived discrepancies or inconsistencies in our knowledge which causes a state of uncertainty, hence causing player curiosity. In this section, I describe the results and conclusions specific to the player curiosity. As discussed above, player curiosity is the product of optimal mystery in videogames. As shown in the diagram below from Chapter 4 (Figure 43), that mystery can be intentionally designed through the fantasy element (persistent) or unintentionally through the gameplay (transient). However, what I further conclude is that player curiosity is at higher levels when it manifests through optimal persistent mystery than transient mystery or no mystery. This means that the fantasy element in videogames produces higher and more optimal levels of player curiosity than

the playability element. This could indicate that transient mystery is harder to optimize to produce higher levels of player curiosity but since the games chosen for this study were commercially successful, it is safe to assume that they had a reasonably optimized playability element. It could also be argued that this dissertation's operationalization of transient mystery was not sufficient to capture all of the relevant factors that impact it and further research into this is needed. Furthermore, Chapter 4 concluded that transient mystery is not intentionally designed rather it is a byproduct of the game mechanics, making it difficult for designers to optimize further if it is possible to do so. However, this remains an area that is counterintuitive with common sense suggesting that playability elements that produce transient mystery constitute a big part of the design process of videogames.

Another conclusion for player curiosity is that a player's prior experience with a game can decrease their curiosity levels substantially. This is a very intuitive conclusion, especially for videogames with persistent mystery since past experiences can reduce the gap between the known and unknown in the game considerably. This drop in player curiosity from prior experience playing the game could be reduced by creating alternate storylines and randomizing the fantasy element. However, since persistent mystery is rooted in the long-term and overarching storyline, it is difficult for videogame designers to design around it.

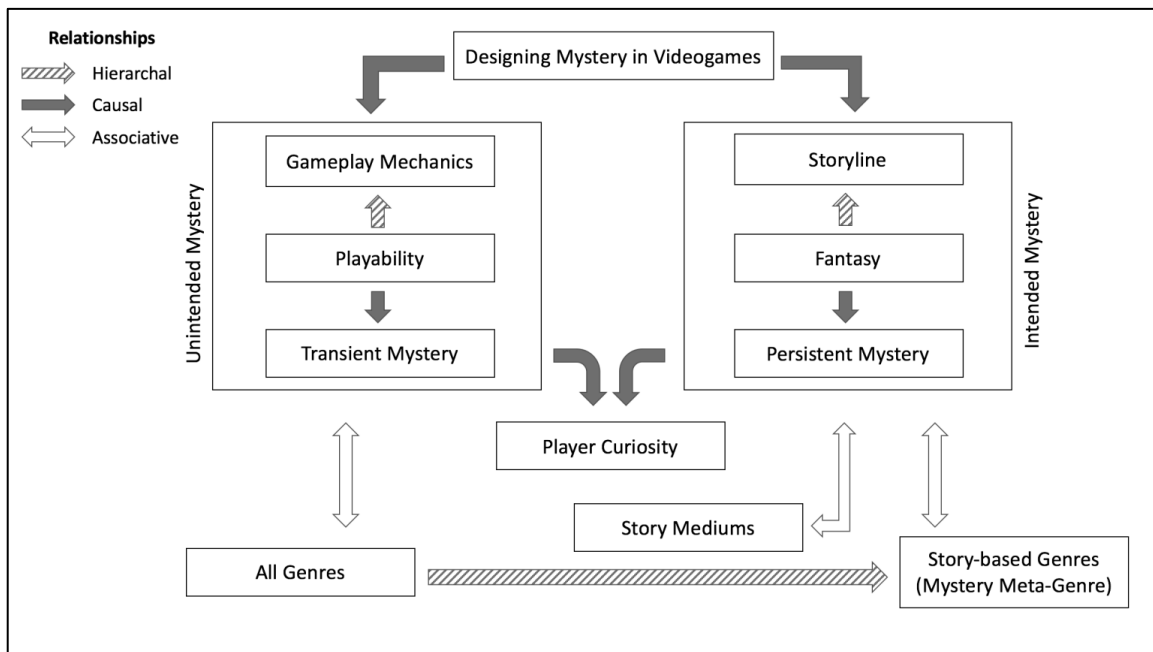


Figure 43. Mystery and Videogame Design

5.4.2 Player Motivation

In this section, I describe the results and conclusions specific to the player motivation. For player motivation, player prior experience did not have an impact on their motivation levels playing the game. This indicates that even if the gap between the known and unknown, as described in the related research in Chapter 2, was reduced through prior game experience, it had no effect on their intrinsic motivation. Previous literature, in Section 2.2, defined intrinsic motivation as the desire to perform a task “because we want to.” In this study, players indicated higher levels of intrinsic motivation when playing games which included persistent mystery, followed by story-based games with transient mystery. Non-story games with transient mystery and games with no mystery showed lower motivation levels. Below, I will examine each of these insights in detail and discuss the larger impact of this study.

In Figure 44 below (from Chapter 3), I concluded that both persistent and transient mystery in story-based games can enhance and increase player motivation and enjoyment compared to videogames with no mystery. For the purposes of this study, I assume that player motivation and player enjoyment are synonymous. This should be a

safe assumption because the tool I used to capture motivation was the Interest/Enjoyment subscale of the Intrinsic Motivation Inventory. Though transient mystery within story-based games produces higher levels of motivation, transient mystery within non story-based games does not enhance the player motivation. This is a strong validation of the impact of persistent mystery and story-based transient mystery on player motivation and enjoyment and it also indicates that story-based videogames with optimal mystery can help improve and enhance the player experience.

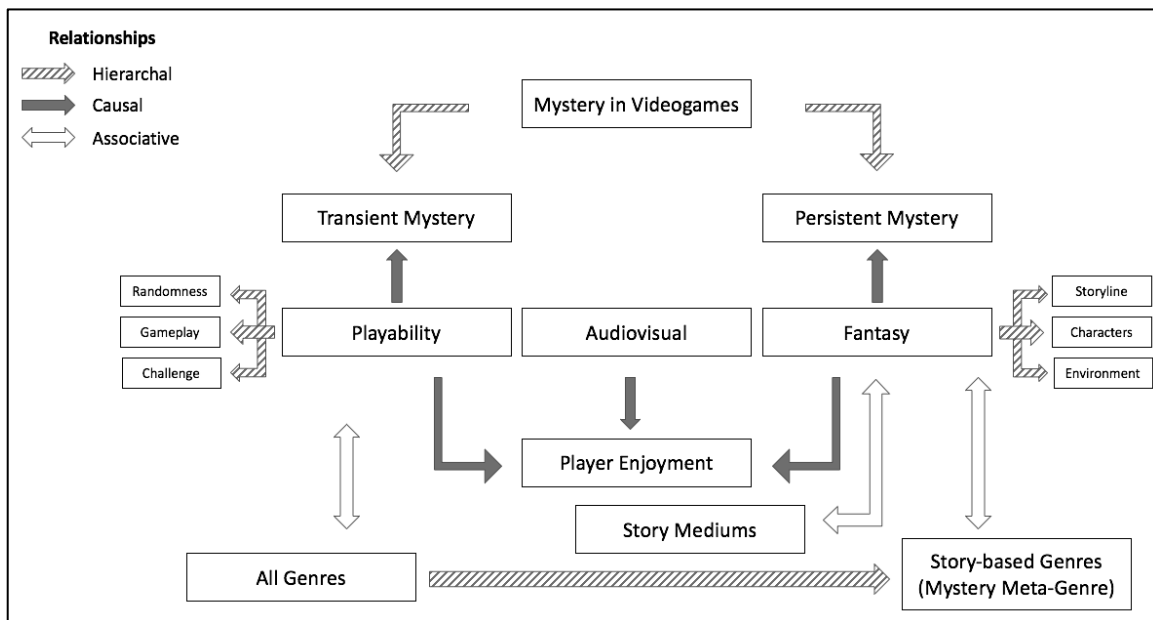


Figure 44. Player Enjoyment and Mystery in Videogames

5.4.3 Curiosity and Motivation

In this section, I describe the results and conclusions specific to the impact of player curiosity on player motivation. Results from this study have showed that player curiosity is a good indicator of player motivation. This indicates that the higher levels of player curiosity while playing a videogame implies higher levels of enjoyment. This is another strong validator of the importance of mystery on player motivation and enjoyment and how it can further enhance the player experience.

Figure 45 below shows how curiosity and motivation are associated with the taxonomy established in Chapters 3 and 4 by creating an overall taxonomy for mystery in

videogames. A tabular representation of this final taxonomy is also shown in Tables 14 and 15 below. Table 14 focuses on the manifestation of the types of mystery (persistent and transient), showing how each taxonomy factor is related to persistent and transient mystery. Table 15 shows the relationship between curiosity and motivation: how they are correlated as well as how they are related to prior experience. Player motivation is a byproduct of how players experience mystery through the fantasy and playability elements (and their factors). Player curiosity is rooted in the resulting manifestation of mystery in videogames (persistent or transient). Since that manifestation of mystery is caused by the same videogame elements that affect player motivation, player curiosity is also a good indicator of player motivation.

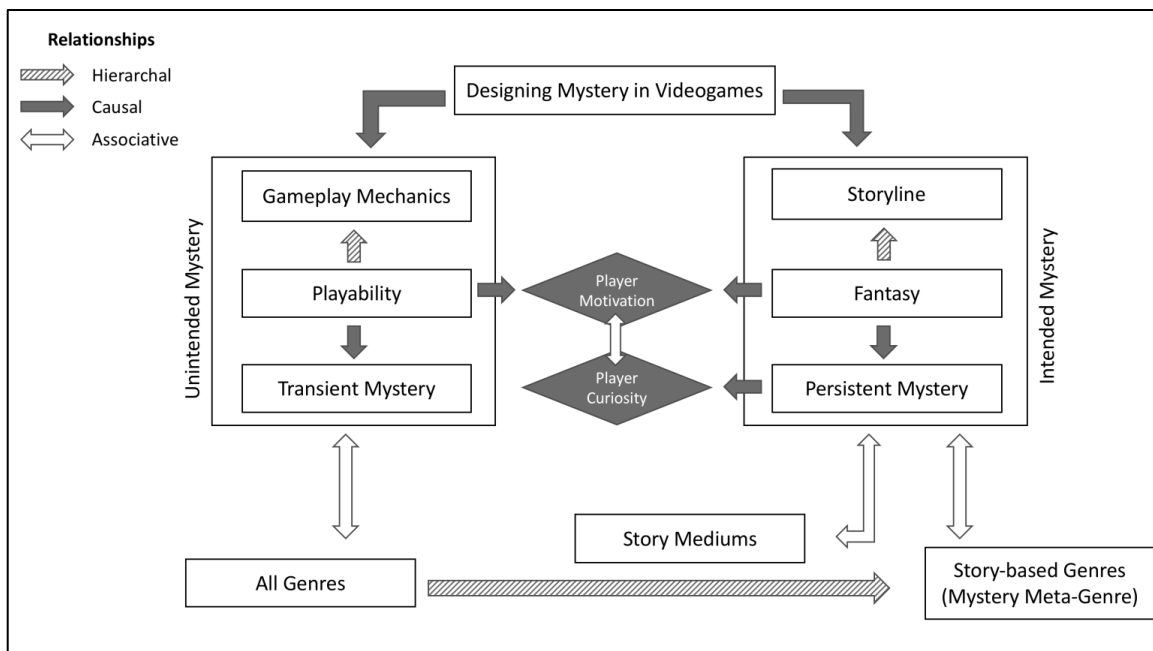


Figure 45. Taxonomy of Mystery in Videogames

Table 14. Taxonomy of Mystery in Videogames

Taxonomy Factor	Persistent Mystery	Transient Mystery
Mystery Type	Long-term	Short-term
Design Process	Intentional	Unintentional
Design Elements	Fantasy	Playability
Design Factors	Storyline, Characters, Environment	Challenge, Randomness, Gameplay
Motivation	Positive Impact	Positive Impact (Story- based Games)
Curiosity	Positive Impact	No Impact
Videogames Genres	Story-based, Mystery Meta Genre	Any Genre
Story Mediums	Comparable Manifestation	Does not Manifest
Fundamentality in Game Design	Only in Story-based Games	Not Fundamental
Player Interaction	Passive Audience	Active Solver
Recognition and Resolution	Obvious, Prolonged	Subtle, Immediate

Table 15. Taxonomy of Mystery in Videogames (Motivation & Curiosity)

Taxonomy Factor	Motivation	Curiosity
Correlation	Significantly Correlated	
Player Prior Experience	No Impact	Negative Impact

Moreover, while this study established a clear separation of data from both participant pools, CDM Pool and GameDev mailing list, there was no significant difference in their experience of mystery in videogames. Essentially, the data doesn't show any significant difference in how those two pools of participants displayed different

behavior of curiosity and motivation regardless of the mystery type or videogame genre in the study.

5.5 Summary and Future Work

In this study, I sought out to validate some of the findings from Chapters 3 and 4 as well as provide more insight into how mystery affects player curiosity and motivation. The most prominent finding of this study was to validate that persistent mystery can help enhance both player curiosity and motivation. This was evident from the results through both participant behavior and self-reporting. This finding provides more clarity and insight to how videogame designers can utilize optimal mystery within their design to produce higher levels of curiosity and motivation which in turn can help them design a better videogame experience. Additionally, I provided some validation to how transient mystery, in story-based games, can also enhance motivation as well (but not curiosity). The impact of this finding is less profound since transient mystery is not intentionally designed but rather is a product of the gameplay mechanics.

Future research can take two parallel paths to further the gaming community's understanding of the impact of mystery on the videogame player experience. The first path can focus on classifying persistent mystery further into the different genres and game types. This classification should provide more insight into how each type of game can optimize persistent mystery and enhance the player experience differently. This path can also examine transient mystery within story-based games and determine the different attributes of those games which impact player curiosity and motivation. The second path can focus on how videogame designers can utilize these findings into designing better games with higher levels of optimal mystery. This path is essential because while this study concludes that optimal mystery enhances the player experience, it doesn't provide a detailed roadmap for videogame designers on how to leverage and incorporate this finding into their design process.

6. Chapter Six: Conclusions and Reflections

6.1 Summary of Findings

The research presented within this dissertation focused on mystery in videogames. In doing so, I have examined and analyzed a wealth of existing knowledge from the academic community and identified the gaps in the knowledge that need to be addressed. I have found that there was an opportunity for this research to contribute to the knowledge base with respect to how mystery is designed within videogames and experienced by videogame players, specifically the impact of mystery on player motivation and enjoyment. In short, this research was designed to conduct a critical analysis of mystery in videogames. The research questions for this dissertation were:

1. How do players experience mystery in videogames?
2. How do game designers consider mystery when designing their games?
3. What is the relationship between player-centered and designer-centered views of mystery in videogames?
4. What is the impact of player-centered and designer-centered elements of mystery on player motivation?

In the Introduction chapter, I set the goal of establishing a taxonomy of mystery in videogames which would provide a detailed classification of how mystery is designed by videogame designers and experienced by videogame players. This taxonomy was established using a qualitative analysis by utilizing a Grounded Theory design. Also, to corroborate this taxonomy, I set out to develop an instrument of validation using empirical data from a quantitative in-lab study.

6.1.1 Taxonomy of Mystery in Videogames

Established through Chapters 3 and 4 and later validated in Chapter 5, this section focuses on the taxonomy of mystery in videogames. Shown in Figure 46 below (a copy of Figure 45 from Chapter 5), the taxonomy indicates both how mystery is designed

(videogame elements causing mystery manifestation) within videogames and how mystery is experienced by videogame players (motivation and curiosity). As this taxonomy depicts, mystery is either intentionally designed (right side of the taxonomy) or unintentionally manifested through the gameplay (left side of the taxonomy).

Intentionally designed mystery manifests through the fantasy elements of videogames (storyline, characters and environment). This type of mystery I identified in this dissertation as persistent mystery, as it is long-term and persists through long stretches of the game. Unintentional mystery is manifested through the playability elements of videogames (mechanics, randomness and challenge). This type of mystery I identified in this dissertation as transient mystery, as it is short-term and usually dissipates quite quickly for the player. Both of these types of mystery have a positive impact on the levels of player motivation. Also, for player motivation, transient mystery has a larger impact if manifested within story-based games than videogames with no mystery. Additionally, persistent mystery has a positive impact on player curiosity by introducing a gap between what is known and what is unknown within the gameplay. Because persistent mystery is long-term and rooted in the fantasy element of the game, it has a greater impact on player curiosity than transient mystery. Also, player curiosity is a good indicator for player motivation; as curiosity levels of players playing a videogame increases, so does the player's motivation.

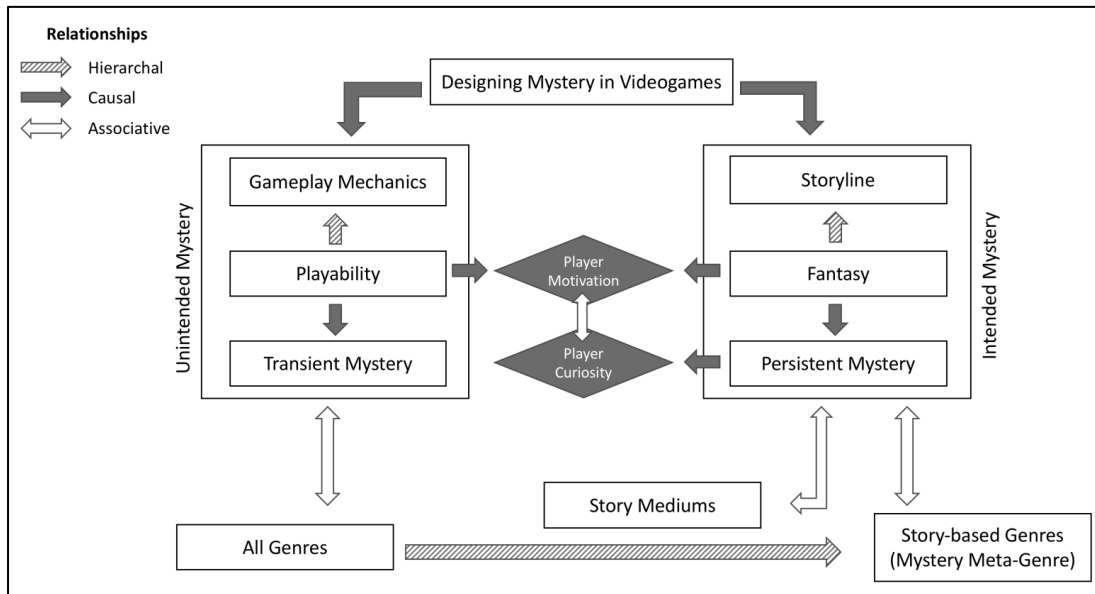


Figure 46. Taxonomy of Mystery in Videogames

Additionally, transient mystery can manifest in all genres because it only requires playability elements like challenge, mechanics and randomness. Because persistent mystery is manifested through the fantasy elements of videogames, it is found primarily within story-based genres. Moreover, because that fantasy element is also present in other story mediums like film, literature and advertisement those story mediums can also manifest persistent mystery. These findings were formulated during the qualitative analysis in Chapters 3 and 4 and later validated through quantitative analysis in Chapter 5.

6.2 Designer-centered Mystery in Videogames

This section focuses on designer-centered mystery in videogames, in other words, how videogame design incorporates mystery in videogame. While there exists some previous literature on mystery in videogames, little of that has focused on designer-centered mystery. Consequently, much of the findings of this research should be adding to the knowledge base in the videogame design community. The most notable of these findings is while mystery can manifest as both persistent and transient in videogames, persistent mystery is the only type that is intended by the videogame designer. In large, designers

do not intentionally incorporate playability factors into their design, like randomness or unknowns within the gameplay to trigger mystery. However, designers do incorporate persistent mystery into their design, often in the very early in the design process.

Consistent with that finding, mystery is related to the fundamental elements (fantasy, playability and sound) of videogame design. Since persistent mystery only manifests through the fantasy elements (storyline, characters and environment), it is only fundamental to those games with a rich set of fantasy factors. Additionally, transient mystery is manifested through playability factors (gameplay mechanics, randomness and challenge), and those factors are usually present with any game genre. As far as sound, I found little to no evidence showing the impact of sound on mystery in videogames. Overall, since designers do not view transient mystery as part of their design process, transient mystery, while related to fundamental elements of videogames, cannot be one of them. This implies the presence of mystery in videogames is not necessary for the player experience, even if it enhances it.

Persistent mystery, however, is not a binary state so designers must optimize the levels of mystery that is manifested in their game design. Optimal, in this context, is the ideal levels of mystery that provided the best gap between the known and the unknown for videogame players, not too big to produce confusion or too small to produce boredom. As discussed in previous chapters, mystery is defined as information complexity or the gap between the known and unknown. If that gap is too small, then that will negatively impact player curiosity because they get bored. If that gap is too large, it will also negatively impact player curiosity because they get frustrated. Videogame designers seek to achieve an optimal level of mystery that produces the highest levels of player curiosity. Designers often utilize playtesting to achieve optimal mystery, where a group of players test the gameplay throughout the creation of the game. While playtesting is from the viewpoint of the player, so it does not discriminate between persistent and transient mystery, designers can only tweak the intentional mystery in their design (persistent mystery). Alternatively, designers can achieve optimal mystery within their design creating a mechanism of dynamic adjustment of mystery throughout the gameplay

based on the player's experience, again only applicable to persistent mystery because it is intentionally designed.

Another finding of mystery in videogame design is which videogame genres can cater to the manifestation of mystery. While all videogame genres possess playability elements like gameplay mechanics, challenge and randomness, they can all incorporate transient mystery. However, intentionally-designed mystery is only applicable to persistent mystery which manifests in those games which include rich fantasy elements like storyline, characters and environment. In this research, I classify those genres as one overarching genre, called the mystery meta genre or more specifically persistent mystery meta genre.

6.3 Player-centered Mystery in Videogames

Most of the previous literature which focused on mystery in videogames examined the player-centered aspect of mystery. Previous research defined mystery in videogames as information complexity within games. Information complexity was defined as the gap of the known and unknown presented to the player and how that gap can be optimized to avoid players being bored and frustrated. One of the findings of this research is that optimal mystery leads to player curiosity which is rooted in how players experience mystery. Because player curiosity is based on the videogame's indeterminism, a player's previous experience with a particular game has a negative impact on their curiosity. Essentially, the player experience can close the gap between the known and unknown thus impacting how optimal is mystery for them.

Unlike how designers view mystery in videogames, players experience mystery in both persistent and transient forms. However, persistent mystery is more impactful on the player experience because it is rooted in long-term curiosity. Persistent mystery, which manifests through the fantasy element (and its factors like storyline, characters and the environment) can trigger high levels of curiosity because a storyline filled with unknowns, unknown characters and a suspenseful environment are all critical to a mysterious fantasy experience. In contrast, transient mystery can still trigger curiosity, but only on a short-term basis. This can be manifested through a player interaction with

difficulty, a gameplay with randomized events and different levels of control in the gameplay.

6.4 Mystery and Motivation

Measuring and understanding the impact of mystery on player motivation is a critical factor in this research. More specifically, this research examined the impact of mystery on intrinsic motivation, that is, inherent motivation to perform a task simply because we want to. This is a different type of motivation than extrinsic motivation which is usually associated with external reward or punishment. Previous literature, as discussed in Chapter 2, emphasized a strong relationship between mystery and motivation, essentially asserting that a player's curiosity is a primary factor of their motivation. Fundamentally, previous research claimed that incompleteness of knowledge base or inconsistencies in the player's experience would provoke curiosity and, thus, increase intrinsic motivation. This claim was supported by theories of motivation in the field of psychology like Cognitive Dissonance theory, Reiss' 16 Human needs, and Maslow's Hierarchy of Needs. These theories provided more insight to how missing and inconsistent information can be a strong driver and motivator for individuals.

In performing this critical analysis of mystery in videogames, I found that different levels of mystery can impact a player's curiosity. A bigger gap between the known and the unknown can produce confusion for the player, while a smaller gap can produce boredom. However, achieving the optimal gap between the known and the unknown enhances a player's curiosity. I also found that a higher level of player curiosity is a good indicator of their motivation. Essentially, the more curious a player is about playing a videogame, the more motivated they were to play it. This finding was very much in line with assertions of previous research. A notable exception was that while player curiosity was diminished when a player had played a game before, it did not impact their motivation to play the game. This exception seems to be more significant in those games with mystery manifesting through playability factors like gameplay mechanics, challenge and randomness. This implies that curiosity through persistent

mystery is a better indicator of player motivation than curiosity through transient mystery.

6.5 Mystery in other Story Mediums

To establish a more complete picture of mystery in videogames, this research also examined how mystery manifests in other story mediums like literature, film and advertisement. Understanding how mystery is manifested and experienced in other story mediums is important to further understand what mystery really means for the end user (videogame player, book reader, movie and advertisement watcher). While previous research provided a good insight into how mystery is incorporated in those other mediums, there was a gap in the knowledge base related to how those mediums manifest mystery differently than videogames. This research has provided more insight and understanding to fill some of that gap.

One of the findings regarding mystery in videogames and other story mediums is that those mediums treat consumers as spectators rather than demanding them to actively participate in the unfolding of mystery. Essentially, these story mediums can only manifest persistent mystery and not transient mystery, since there is no gameplay producing transient mystery. Also, these story mediums usually incorporate several main actors, while videogames have only one controllable protagonist at a time (in most games). Even though videogames can have multiple characters, the player typically only plays as one character at any given moment.

More specifically to literature, mystery can be controlled more easily than in videogames, film and advertisement, because the author controls where the reader can pay attention to. In the latter types of mediums, it is more difficult to control the attention of the player or viewer because there are usually many other factors at play like shot angles and sound. However, these mediums can leverage that to their advantage and manifest mystery through those events, especially through sound and shot angles. Conversely, one attribute of mystery that videogames does not share with the other three mediums is mystery recognition. This is a key finding since mystery has to compete with all of the other attributes of videogames that are not present within those other mediums

like challenge, randomness, and gameplay mechanics. Additionally, in videogames, player have to actively pursue and resolve mystery instead of watching it unfold during the narrative of film, literature and advertisement.

Similar to findings about the manifestation of mystery in different videogame genres, only persistent mystery can manifest in those other story mediums. While those other story mediums can embody the fantasy element (the main factor of persistent mystery), they do not embody playability elements like challenge, randomness or gameplay mechanics which produce transient mystery. Essentially, transient mystery can only manifest in videogames and not those other story mediums. This is critical to map videogame design to writing a novel or directing a film or an ad, because designing persistent mystery in videogames is analogous to literature, film and advertisement because they all rely on the storyline.

6.6 Impact on Videogame Research

In reviewing the overall findings of this research, it should have significant implications for both the gaming and research communities. This dissertation examined the previous research done in the area of mystery in videogames and through quantitative and qualitative research provided essential findings that fill in gaps not addressed by the existing literature. These findings culminated in a taxonomy that describes, in detail, how mystery is designed in videogames and experienced by videogame players.

This dissertation can provide clarity to designers on how they can think about mystery, both the intentionally designed and unintentionally designed kinds. Also, through this work, researchers can have a better grasp of how designers optimize mystery through their design process by understanding the different curiosity triggers in different games. This knowledge is focused on the different fundamental elements of games and how those are related to mystery. This research also provides more insight into how mystery manifestation differs between different genres and introduced a new genre classification for story games with considerable mystery, the Mystery Meta Genre. This dissertation also provides more insight into how mystery manifests differently in other story mediums and how that relates to mystery manifestation in videogames.

Similar to the contributions of mystery from the designers' perspective, this dissertation provides a better understanding of how videogame players both view and experience mystery. Researchers can now have a better idea of how short-term and long-term mystery are both presented within games and experienced by the players. This experience is rooted in how players can recognize mystery, the different recognition factors and how those factors are related to the fundamental elements of videogames. Furthermore, researchers can utilize the knowledge of how different types of mystery enhance or diminish both player curiosity and player motivation to further study the impacts of mystery on the player experience. This impact is dependent on the player's profile, specifically prior experience playing a particular game. Additionally, this dissertation demonstrated that there is a strong correlation between the player's curiosity and their motivation. Researchers can utilize this knowledge for research on motivation in videogames and how curiosity can play a big role in the player's experience. Additional research on mystery, curiosity and motivation can use this knowledge to understand how the three concepts are related as well as a foundation for future work.

This research also has significant implications for academic research focused on serious games. The field of serious games has been researched extensively for decades but there are still areas of knowledge that need to be further advanced, in particular, how to design better serious games that can produce higher levels of intrinsic motivation. From my research, serious game researchers can have a better understanding of how the mystery element of videogames can be designed in videogames, enhanced by different game elements and recognized by the player. As shown in this dissertation, optimal mystery in videogames improves the player experience, particularly their motivation which is an area that serious games usually struggle in. This means that serious games researchers can use and build on this knowledge as they research how to make educational games more motivational.

6.7 Impact for Game Design

Similar to the impact on the research community, this dissertation has significant implications for game design because it provides insight into how videogame designers

can create more motivational games by better incorporating mystery in their videogame design. Designers should now understand how optimal mystery is manifested in videogames through different fantasy and playability elements. This is critical because, as this research shows, more optimal mystery can lead to higher levels of player curiosity and motivation. Moreover, designers now have a referenceable taxonomy into the different types of mystery that manifest in games, whether intentionally incorporated as part of their design process or unintentionally produced because of their design elements. Designers can use this taxonomy to improve their design process by focusing more on the fundamental elements (fantasy and playability) of videogames that further enhance player curiosity and motivation.

This dissertation equips videogame designers with the knowledge necessary to make design decisions which enhance persistent mystery. Those decisions are based on the different elements of videogame design that have been shown to positively impact persistent mystery, primarily fantasy. Designers now have a clear reference for how different factors of fantasy (storyline, characters and environment) enhance long-term mystery. They can focus on those factors to leverage their positive impact on both player curiosity and motivation. That focus can be in the form of optimizing information complexity within the storyline by leveraging playtesting and dynamic adjustment. This dissertation has shown that optimizing mystery in the form of information complexity positively impacts both curiosity and motivation.

For transient mystery, the findings of the study require further interpretation and analysis, specifically in relation to the designer intention to manifest transient mystery through the playability element and its factors (challenge, gameplay and randomness). However, regardless of the designer intent, this dissertation has shown that transient mystery has a positive impact on player motivation. This finding should encourage videogame designers to leverage the playability element and its factors more in their design process. One way this could be managed is through optimizing randomness in the gameplay, which this dissertation shows can increase transient mystery for the player. Another way would be by creating optimal challenge within the gameplay with sufficient amounts of information complexity to manifest more transient mystery for the player.

While this dissertation doesn't explore how to optimize randomness and challenge, it provides a clear relationship between them and transient mystery.

6.8 Future Work

While the findings in this research have addressed the goals described in the Introduction, there are still areas to further explore for the research community. Future research can focus on providing more insight to mystery in videogames by examining areas like a deeper understanding of the design process of videogames. While this research studied how designers unintentionally produce transient mystery in their design, further evaluation on how that happens and how to improve it should take place. Even if transient mystery is unintentionally manifested in videogame design, it still exists within the gameplay. Future work can focus on how to incorporate transient mystery as part of the overall videogame design process. Also, future work should focus on the process of optimizing mystery through the methods discussed in this research (playtesting, dynamic adjustment) but other methods as well. Another area that wasn't covered in depth in this dissertation is other elements and factors that are fundamental to videogames and their impact on player motivation and curiosity, especially those dependent on interpersonal videogame attributes like competition, collaboration and cooperation. Online gameplay, which is more prominent now than ever, places the player in competition or cooperation with other players. This style of gameplay should produce additional core attributes to consider beyond the ones identified in this research.

Another area of focus for future work can be on categorizing persistent mystery further into the different genres and game types. This classification should provide more insight into how each type of game can optimize persistent mystery and enhance the player experience differently. Also, future work should examine transient mystery within story-based games and determine the different attributes of those games which impact player curiosity and motivation. Finally, future work should focus on how mystery impacts motivation and curiosity when coupled with variations of other videogame attributes like challenge, sound, graphics, rules, goals, etc.

Finally, future research can focus on the measurement of mystery. While this dissertation concentrated on the presence and classification of mystery in videogames as well as its impact on player motivation and curiosity, it did not examine different metrics for mystery levels. This dissertation assumed optimal mystery within the games studied based on the games' commercial success and critic reviews. Future work can research how to measure the gap between the known and the unknown in videogame design. This type of insight is very relevant and significant as it would provide more clarity on how optimal mystery can be achieved.

Appendix A.

All Codes for Player-Centered Mystery

accomplish tasks	zombie videogames	player losing
action adventure games	first person shooter games	players filling in the gaps left by mystery
active mystery solver	frustrating levels of mystery	plot twists
assassin's creed game	fundamental element	poor design in games
battlefield game	future games	prince of persia game
boring and not challenging	game of thrones	racing games
branching storylines	gone home game	random gameplay
brute force mystery	graphics in games	realistic gameplay
call of duty game	halo	reload ammo
camera angle	hidden visual cues	repeating level attempts
campaign gameplay	historical games	repetitive gameplay
cannibalism	immediately recognizable mystery	rescue a hostage
capture attention	inside game	role-playing games
challenge	instant gratification	scary games
characters	intrigue audience	scooby doo game
clear objectives	jak and daxter game	seek information about advertisement
collecting clues	keep trying to solve puzzle	seek other players' help
collecting objects and tools	killing opponents	seeking outside help
control objects and environment	known objectives to advance	society building games
control or manipulate characters	lack of mystery in videogames	solving puzzles
crash royal game	limbo game	spectator mystery solver
cutscene video	madden games	sports games
deactivate bombs	mission brief	storyline
difficulty progressing levels	mobile games	strategy games
expected mystery	move objects in game	subtle and hidden
exploring with mystery	multi-player gameplay	swapper game
fantasy	mystery games	take down a chopper or tank
faster than life game	mystery in advertisement	the picture of dorian gray
feeling stupid	mystery in film	transient mystery
fiction literature	mystery in games	typoman game

fifa game	mystery in literature	undertail game
unpredictability	new advertisement	unexpected introduced variables
unresolved mystery in games	new videogames	uniqueness of game design
videogames dislike	no win situations	unknown objectives to advance
walking simulator games	open world games	unknown overall point
war games	persistent mystery	unknown what is next
weapon - machine gun or tank	playability	unknowns within gameplay
who done it	player enjoyment	unlocking doors

Appendix B.

Focused Memos for Player-Centered Mystery

Memo #1

Memo about Mystery manifestation (Transient vs. Persistent)

Transient mystery (short-term mystery) is usually produced by short term **puzzles** or **unknown objectives** designed to make it more difficult for the player to advance throughout the gameplay. This type of **mystery** is what makes **videogames** unique from other **mediums**. Often transient mystery is a result of **randomized gameplay** to remove determinability.

Persistent mystery (long-term **fantasy** mystery) can also be expressed as long-term mystery. This type of mystery usually manifest in the form of **major story unknowns** or unveiling **plot twists**. This type of **mystery** is very much like the one that manifests in **film** and **literature**.

Some participants have declared that **transient mystery** can have a consequential impact on **persistent mystery**, an example of that is how **short term mystery mechanics** can lead to **long term story** changes in **Skryim**. Another example is **Dishonored**, where the choice between killing or peacefully tranquilizing your enemy can influence the development of your **character** and the direction of the **story**.

Mystery is subtle and to a degree hidden. Players do not consciously recognize **mystery** without thinking about it. Lacking or overwhelming **mystery** is easier to detect and recognize than **optimal mystery**.

Memo #2

Memo about the different Fundamental Elements of Videogames

Looking at core and **fundamental elements of games**, a few were brought up a few times during the interviews. So far **playability**, **fantasy**, **challenge**, **competition**, **audio/video** and **mystery** (some implied this was part of the **fantasy** and **playability**).

1. **Playability** being the idea that you can play a game over and over multiple times and it remains enjoyable. This really can encompass **transient mystery**, **challenge** and **competition**.
 - a. **Challenge** being the **level of difficulty** for the player. There are many properties of challenge that we can go into, specifically **levels of challenge** - balancing act between **trivial** and **frustrating** games to achieve **optimal** difficulty.
 - b. **Mystery** has been brought up a few times as **fundamental element** as a whole. Some have argued that between **playability** and **fantasy**, both **persistent** and **transient mystery** is fully

represented. Games that lack **mystery**, allow the player to determine the **formula**, which causes less challenge, and **surprise** reducing **player curiosity** and **enjoyment**.

- c. **Competition** where players compete against non-AI entities.
- d. **Gameplay** mechanics and control

2. **Fantasy** being the **storyline**, **characters** and **environment** around the **gameplay**. But it also includes how these things are being introduced to the player (**content and cadence**), which is why some implied that **mystery** could be included with **fantasy**.

3. **Audiovisual** visual and audio stimuli are considered very critical to the success of a game.

Memo #3

Memo about Player Enjoyment in Videogames

Persistent mystery as a result of overall storyline with unfolding major **unknowns** and **plot twists** seem to overall produce higher levels of **enjoyment for players**. Even at a level where the **overall storyline** remains mysterious and not all the questions are answered at the conclusion of the gameplay, players still indicate that if done right that will raise the **level of enjoyment**, not lower it.

Transient mystery is also identified as a **core element of gameplay** but sometimes resulting in **frustrating and difficult scenarios** (often **no-win scenarios**) that lead to players **abandoning** the game. When **players enjoy transient mystery**, it often results in **instant gratification** versus long-term enjoyment.

Memo #4

Memo about Randomness and Mystery in Videogames

Participants quickly pointed out that **randomness** can't be utilized realistically or effectively for the overall **story** but it can certainly apply to **short-term gameplay**. This implies that **randomness** can cause **transient mystery** not **persistent mystery**. Examples that were brought up were **shooting games** like **Call of Duty** or **Halo** as well as **arcade games** like **Tetris**. Some participants referred to the **relationship** between **randomness** and **transient mystery** as consequential or analogous. Other participants warned that **randomness** could cause **bad gameplay** especially since they are less controlled than **transient mystery** through designed unknowns in gameplay.

Memo #5

Memo about Mystery in different Videogames Genres

With **persistent mystery** being the product of a complex and mysterious storyline, genres that don't contain a rich storyline usually can't sustain persistent mystery. Examples of those genres are **sports games** (like *Fifa*), **strategy games** (like *Inside*), **racing games** (like *Midnight Club*), some **first person shooter games** (like *Call of Duty*). These games instead have to rely on short-term mystery (or **transient mystery**) that relies for the most part on **randomized gameplay** or **gameplay unknowns**.

- An example of **randomized gameplay** would be randomizing the race track for the racing game, which team you will play in a sports game or what will a power up picked up in a shooting game can do.
- An example of **short-term unknowns** can manifest in **strategy games** with **gameplay puzzles**.

Genres that do encompass a **rich storyline** with plenty of opportunities for **surprises and unknowns** can better manifest **persistent mystery**. An example of those would be **role-playing games** (like *Prince of Persia*), **mystery games** (like *Undertail*), **historical games** (like *Assassin's Creed*), etc.

- The allure of a game like *Assassin's Creed* or *Prince of Persia* is all about the **mysterious story, full of unknowns** where it's the player's objective and quest to discover throughout the game.
- A **mystery game** like *Undertail* encompasses **persistent mystery** where everything about the gameplay is **unknown** and as a player you have to discover the **storyline, characters, heroes and villains**.

Memo #6

Memo about Mystery in different Story Mediums (Videogames vs. Film/Literature/Advertisement)

There are multiple actors in **films, literature and advertisements**; where in **videogames** it is usually the player and only player.

Videogames players are **actively** engaged in resolving mystery (even if they can't change the outcome but sometimes can) where **film/advertisement/literature** watchers/readers are spectators and just along for the ride. There are specific types of **fictional stories** where there are decisions that are made by the reader which affect subsequent events but those are rare (*Goosebumps* book series). **Mystery in videogames** can possess both **persistent** and **transient mystery** where **other medium** can only leverage **persistent mystery** since there is no **active involvement** by the user. A few participants mentioned that those other mediums could possess short-term mystery but not one that would require resolution by the audience.

*Videogames with good **playability** can still be **enjoyable** on repeated play even when persistent (or sometimes **transient mystery**) is lost, where **films**, **literature** and **advertisement** lose their allure for the most part if mystery is gone to re-watch or re-read.*

***Videogames**, **film** and **advertisement** have an advantage over literature because they can leverage **shot angels** or **video manipulation** to enhance **mystery**.*

***Literature's** advantage is the author **controlling** what and how you tell the reader, where it is difficult to control that aspect with **film**, **advertisement** or **video games**.*

***Mystery in advertisement** leverages **transient mystery** more, just because they don't usually have enough time to leverage **persistent mystery**. Although there are some powerful ads that leave the audience unsure of specifics to go seek them out later, which can be interpreted as **persistent mystery**.*

Appendix C.

All Codes for Designer-centered Mystery

a lot of mystery	dialog cues	mystery books	professor layton game
action adventure games	documentary games	mystery films	randomness in gameplay
actively resolving mystery storyline	Dynamically adjusting design	mystery games	reason behind unknowns
adventure of mystery	environment element	mystery in games	recognizability of mystery
alien isolation game	fantasy games	mystery in videogame design	reporter genre
animal crossing game	fill-in the unknown gaps	new characters introduced	rpg games
call of duty game	force mystery element	open ended storyline	rules
causes of randomness	fps games	open world games	sign and tell game
challenge element	fundamental elements of videogames	outlast game	silent hill game
characters element	gameplay element	passively watching mystery storyline	sly cooper game
clues within game	goals	pattern within randomness	solving mystery
conflict	gone home game	persistent mystery	sound element
connecting the dots	halo game	player captivated	storyline element
control element	hidden mystery	player curiosity	subtlety of mystery
creating your own story	horror games	player engagement	thrills within gameplay
dead space game	how to play the game	player enjoyment	transient mystery
design element	knowns within gameplay	player immersed	unknowns within gameplay
design of storyline unknowns	knowns within storyline	player interaction	unknowns within storyline
design process	life is strange game	player intrigue	unlockable characters
designer intended mystery	little mystery	player investment	visual elements

designer unintended mystery	many potential ideas	player performance	watch dogs game
designing mystery	mario kart game	playtesting	win/lose stats
detective genre	mechanics element	plot-twists	witcher 3 game
determinability of gameplay	multiplayer gameplay	pokemon game	zelda game
determinability of storyline	mystery advertisement	poorly executed mystery	zombie games

Appendix D.

Focused Memos for Designer-centered Mystery

Memo #1

Memo about Designing Mystery in Videogames

*Designers who felt mystery was purely of **persistent** nature, i.e. part of the **storyline** rather than the **gameplay mechanics** insisted that mystery needs to be developed at the very beginning at the design process. They asserted that mystery is a **core** part of the **storyline** and to do it any other time was not efficient.*

*Alternatively, those designers that felt mystery can be **transient**, i.e. manifested through **gameplay mechanics** insisted that they do tackle mystery throughout the **design process**, not just at the beginning. In fact, they asserted that sometimes it is better to tackle transient mystery after the story has unfolded and the designers finished creating the narrative. They still agreed, that unlike **transient mystery**, **persistent mystery** requires early attention.*

*While a third faction argued that while mystery can be **manifested transiently**, it is purely **accidental** and **unintended** by the **designer**. They asserted that **mystery** through game **randomness** and **gameplay mechanics** is **unintentionally designed**.*

Memo #2

Memo about Adjusting Mystery in Videogame Design

*Participants seem to favor **designing mystery** in such a way that it **dynamically adjusts** based on the **player's performance**, still speaking to **persistent mystery** only.*

Designers claimed, if you lower the mystery when people don't get it, but not when the player is still actively engaged.

*Even if designers keep saying that **dynamically adjusted mystery** is a good idea, they haven't seen it done. So it might be what they want but not how they have been **designing mystery**. Their explanation is because you never know the player doesn't get it because they **mystery** is not in the roles but in the **storyline**. Not believing in mystery can manifest **transiently** is being mentioned yet again.*

Some **designers** said this **adjustment** happened through **play-testers**. They did mention that this approach feels like that the **play-testers** are designing the game, but contend it is the best way. Also, play-testers do not represent every player that will play the game.

For a designer, **dynamically adjusting** mystery is very expensive. The storyline must be more open-ended. You might need to give more room, time for the player to make their own decisions. However Transient mystery (while not accepted as intentional by some) is something you can dynamically adjust (if referred to as gameplay unknowns) – unanimously agreed upon thought.

Memo #3

Memo about Fundamental Elements in Videogames Design

Designers have unanimously agreed that **mystery** is **not a fundamental** or **core** element in videogames.

Mystery is **fundamental** and **core** to games with **storylines** but not **fundamental** to all games, sticking with the theme that mystery is only designed as part of the storyline.

Goal, conflict, win/lose state, rules and mechanics, quantifiable outcome are the **fundamental** elements of games.

A few designers insisted that **interpersonal** attributes like **competition** and **cooperation** are well within the **fundamental requirements**.

Designers, unanimously, think that **story, goals, sound/visuals** and **gameplay** are **fundamental** elements of videogames.

An element that doesn't get highlighted by the rules and mechanics is not fundamental to that game.

Memo #4

Memo about Mystery and Curiosity in Videogame Design

Designers proclaimed that mystery is a secret that a player uncovers slowly. It is uncanny but it is not quite right. They asserted that mystery triggers **curiosity**.

***Curiosity** happens when the **gap** between the **known** and the **unknown** is just right. If the gap is too big, it becomes **frustrating** and if it is too small, it becomes **boring**. Ideally that provides an **incentive** to the player to keep playing.*

***Transient** mystery might trigger **curiosity** but it isn't mystery, because it is **accidental**.*

Memo #5

Memo about Mystery Element versus Mystery Genre

*When talking about mystery in videogames, participants frequently revert to **mystery games** or **mystery genre** versus **mystery** in **videogames**. This seemed like such a critical point to single out, it warranted its own memo.*

Mystery in videogames can be anything - unknowns, short term, long-term, etc. But Mystery games, can only be mystery driven through the storyline.

Memo #6

Memo about Persistent vs. Transient Mystery in Videogame Design

*It seems that videogame players appreciate both **persistent** and **transient** mystery but videogame designers only acknowledge and design for **persistent** mystery. So much so, videogame designers only spoke positively about transient mystery when asked about it as players.*

*Similar to Memo #1, the idea of **intentionally** designed mystery vs **unintentionally** designed:*

*- **Intentionally** designed include storyline, plot twists, randomness established and **persistent** mystery*

*- **Unintentionally** designed include **transient** mystery, **randomness** outcomes, **unknowns** within gameplay.*

*Another thought is designers never recognized considering **transient** mystery in their **design**, but when asked about it they responded as players and recognized it (like our players did).*

*Mystery comes at a **fictional** level or **story** level. Fiction is the setting and characters but it is not a story. Mystery in videogames comes with some sort of a story line.*

For **designers**, mystery is a lot more complex and creative than what is represented by **transient** mystery. **transient** mystery might trigger **curiosity** but it isn't mystery. Designers claim **transient** mystery is too mundane.

Randomness are there to keep things interesting for the player but there is no bigger logic to it, so it is not mystery.

Randomness (if not completely random but from a set of options that could drive anticipation) can be considered short-term mystery.

What separates **transient** mystery from mundane unknowns in videogames is the anticipation it prompts and curiosity it raises with the player.

Memo #7

Memo about Mystery in Videogames and Other Story Mediums

Mystery in the story of a **book** is less **appealing** because it is **telling** the reader rather than **videogames**, **film** and **advertisements** where you can **show** the watcher or player.

However, essentially, **mystery** in video games is so much **similar** to mystery in **books** and **film**. Especially considering **persistent** mystery – the more agreed-upon type of mystery **manifestation** for **designers**.

Biggest difference between mystery in **videogames** and other **story mediums** is games have **roles** and **mechanics** and other mediums do not. This makes it harder for other mediums to be fully **immersive**. When someone is highly involved and invested in videogames, they are **immersed** and **engaged**, those who watch a movie or read a book are a lot less **invested** then less **immersed**.

Mystery is also more **visible** in other mediums not games, because in videogames there are so many other things fighting for your **attention** but other mediums direct your focus and **attention** to the whatever is intended.

As a designer, you must **think** about what the player can do and how that **advances** the game. That includes providing the player with the **proper context** to make those **decisions**. The player is basically playing a character where in a book or film the director/author can shape those **decisions** more closely by just taking them there.

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