HERITAGE AT PLAY: DESIGNING ROLEPLAYING GAMES TO ENHANCE MUSEUM EXPERIENCE

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ETHICAL DECLARATION

I hereby declare that I am the sole author of this thesis and that I have conducted my work in accordance with academic rules and ethical behaviour at every stage from the planning of the thesis to its defence. I confirm that I have cited all ideas, information and findings that are not specific to my study, as required by the code of ethical behaviour, and that all statements not cited are my own.

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ABSTRACT

HERITAGE AT PLAY: DESIGNING ROLEPLAYING GAME TO ENHANCE MUSEUM EXPERIENCES

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This research explores the transformative potential of role-playing games (RPGs) to enhance museum experiences by embedding cultural heritage into gameplay. Focusing on the Izmir Archaeology and Ethnography Museum, the study examines how RPGs can cultivate meaningful museum experiences. By integrating tangible artifacts with intangible narratives, the research aims to craft play experiences that resonate with diverse audiences, fostering a deeper understanding of cultural heritage and museums. The study employs a research through design methodology, emphasizing an iterative design process and playtesting to explore the design of a computer role-playing game (CRPG) encompassing the museum experience. Design challenges include ensuring meaningful gameplay experiences informed by instructional museum content, designing complex gameplay elements for audiences with varying game familiarity, and elevating informal learning in a cultural heritage context. By investigating game design and game-based learning methodologies, the research leverages design practices to explore a multidisciplinary design space. The research leverages design

practices to explore a multidisciplinary design space, treating RPG design for museums as a design situation to generate applicable knowledge through design activity. The findings reveal both theoretical and practical implications for the use of RPGs in museum settings. The study demonstrates how RPGs can contextualize museum artefacts, foster curiosity and engagement with heritage narratives, and provide a meaningful learning experience. The research contributes to the growing field of game-based learning in cultural heritage, offering insights into the design process and evaluation of serious games for museums.

Keywords: Game design, museum experience, game-based learning, cultural heritage, role-playing games.

ÖZET

MİRAS OYUNDA: MÜZE DENEYİMİNİ GELİŞTİRMEK İÇİN ROL YAPMA OYUNLARI TASARLAMAK

Türkmen, Doruk

Tasarım Çalışmaları Doktora Programı

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Bu araştırma, rol yapma oyunlarının (RPG'ler), kültürel mirası oyun deneyimine entegre ederek müze deneyimlerini geliştirme potansiyelini incelemektedir. İzmir Arkeoloji ve Etnografya Müzesi'ni odak noktası olarak alan çalışma, RPG'lerin anlamlı ve etkileyici müze deneyimleri oluşturmadaki rolünü araştırmaktadır. Somut eserleri soyut anlatılarla birleştirerek, araştırma, çeşitli müze ziyaretçileri için anlamlı bir oyun deneyimi tasarlamayı, kültürel mirasın daha derin bir şekilde anlaşılmasını ve farkındalığını artırmayı, ayrıca müze kurumuna olan ilgiyi güçlendirmeyi amaçlamaktadır. Araştırmada tasarım yoluyla araştırma metodolojisi benimsenmiş, iteratif bir tasarım süreci ve oyun testi odaklı bir yaklaşım kullanılmıştır. Bu bağlamda, müze deneyimini kapsayan bir bilgisayar rol yapma oyununun (CRPG) tasarımı ele alınmıştır. Çalışma sırasında bir dizi tasarım zorluğu ortaya çıkarılmıştır; bunlar arasında, müze içerikleriyle zenginleştirilmiş anlamlı ve amaçlı bir oyun deneyimi sunma, farklı seviyelerde video oyunu ve RPG bilgisine sahip bir kitle için karmaşık oyun unsurları tasarlama ve kültürel miras bağlamında gayriresmî öğrenmeyi artırma

gibi unsurlar yer almaktadır. Oyun tasarımı ve oyun tabanlı öğrenme metodolojilerini inceleyen araştırma, disiplinler arası bir tasarım alanını keşfetmek için tasarım pratiğinden yararlanmıştır. Çalışma, RPG'lerin müze bağlamında tasarımını bir sorun olarak değil, bir tasarım durumu olarak ele alarak, tasarım eylemi yoluyla uygulanabilir tasarım bilgisi üretme zihniyetini benimsemektedir. Araştırma bulguları, müze ortamlarında RPG kullanımına ilişkin hem teorik hem de pratik çıkarımlar sunmaktadır. Çalışma, RPG'lerin müze eserlerini bağlama oturtma, kültürel miras anlatılarına merak ve katılımı artırma, ayrıca anlamlı bir öğrenme deneyimi sağlama potansiyelini ortaya koymaktadır. Araştırma, kültürel miras bağlamında oyun tabanlı öğrenme alanına katkıda bulunarak, müzeler için ciddi oyunların tasarım süreci ve değerlendirilmesi üzerine önemli bilgiler sunmaktadır.

Anahtar Kelimeler: oyun tasarımı, müze deneyimi, oyun tabanlı öğrenme, kültürel miras, rol yapma oyunları.

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Doruk Türkmen

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CHAPTER 1: INTRODUCTION

This study explores the potential of role-playing games (RPGs) to enhance museum experiences by incorporating cultural heritage into gameplay. Centred on the Izmir Archaeology and Ethnography Museum, the research examines how RPGs can create educational, meaningful and engaging experiences for visitors. The project seeks to connect traditional museum practices with modern game-based learning research, harnessing the power of storytelling and game mechanics to make awareness of archaeological artifacts and their narratives. By combining tangible heritage with intangible knowledge, the study aims to create meaningful experiences that appeal to various potential museum audiences, promoting a more profound understanding and appreciation of cultural heritage.

The investigation employs a research-through-design approach, focusing on iterative design processes and playtesting to design a computer role-playing game (CRPG) that encompasses the museum experience. The research identifies several design challenges, including creating purposeful gameplay experiences based on educational museum content, designing complex gameplay elements for people with diverse video game and RPG backgrounds, and improving informal learning in cultural heritage settings. By exploring game design and game-based learning methodologies, the study utilised research on design practices to investigate a design space influenced by multiple disciplines. The research conceptualises the design of RPGs for museums as a design situation, rather than a problem, to generate applicable design knowledge through the act of design itself.

This conceptualisation was made concrete as a video game prototype called Neolithic Quest. Neolithic Quest is an RPG set in the Neolithic Izmir. Gameplay elements were designed to manifest inherent attributes of selected artefacts preserved and displayed in Izmir Archaeology and Ethnography Museum's Mind of Civilization collection. These artifacts embody the tangible and intangible heritage from Izmir's Neolithic past. The design decisions for the Neolithic Quest's gameplay elements were made to manifest these tangible and intangible aspects of the heritage in the play experience. Through presenting the game as a prototype to playtesters, implications of the design decisions were assessed and analysed as learning outcomes.

1.1. Design Situation and Research Statement

Cultural and educational institutions like museums have undergone a transformation, moving beyond their traditional role as repositories of historical artifacts to become spaces for learning. This evolution has resulted in a more socially conscious approach that highlights the narratives and hidden information associated with exhibits. Museum visitors now play a crucial role in shaping the institution's activities, actively participating in content creation, and bringing historical elements into life. This change has promoted experiential and informal learning, providing more engaging and learner-centred experiences than conventional educational methods. Informal learning is characterised by its spontaneity, motivational nature, and focus on the learner, which sets it apart from the structured approach of formal education. In the museum setting, this learning approach encourages visitors to transition from passive consumers of culture to active producers, incorporating their existing knowledge and personal experiences.

In heritage museums, the way visitors engage with the content is shaped by various elements, including their personal interests and how the museum presents its artifacts. This visitor-oriented approach portrays cultural heritage as an ongoing dialogue, resulting in a more impactful and lasting educational experience compared to conventional learning environments, if this approach is encouraged. In this understanding of how heritage is disseminated in museums, design plays a big role in creating the means for dialogue between the museum and its visitors. During this dialogue, museums strive to communicate the tangible and intangible aspects of the heritage content to their visitors. In the use case of this research, Izmir Archaeology and Ethnography Museum (IAEM), tangible attributes are explicit, but the intangible knowledge remains obscure, waiting to be uncovered.

Game-based learning has been a prevalent research area in museum studies that deal with the dissemination of heritage. Numerous publications have documented the design of serious games for museum settings. However, these games tend to approach the situation in a superficial way, isolating the nuances of gameplay with the content from the museum. Hence, this research calls for an approach to explore the intersection of video games, design research, and museum experience through practice-based research philosophy.

The research explores this design situation through the research and design process of a CRPG that is conceptualized as a tool to enrich the engagement and learning of cultural heritage disseminated in IAEM. It investigates game design methodologies that are based on robust design theories and practices. Framework and models are reviewed as guidelines towards multiple levels of abstractions of the design process. Combining these guidelines with game-based learning methodologies lays a foundation for design process of a CRPG that aims to integrate the heritage content in an intrinsic way. By adopting research through design methodology, applicable design knowledge is generated through the design activity itself, with an iterative and reflective research and design process.

1.2. Research Aims and Questions

Following the statements above, this thesis aims to:

- To employ research through design methodology to design a role-playing game (RPG) for the exploration of cultural knowledge.
- To investigate the possibilities of engagement and learning in role-playing games to enhance museum experience.
- To evaluate a set of existing frameworks for the design of video games for cultural heritage.
- To extend the concept of "magic circle" to elaborate on play in museum contexts.

To achieve these aims, the following research questions are addressed:

1. How can computer role-playing games serve as a medium for the exploration and dissemination of heritage knowledge and enhance learning experiences in museum settings?
2. How can game design and game-based learning methodologies facilitate the manifestation of heritage content in museum collections?
3. How can practice-based design research contribute to the design of game-based learning experiences?

1.3. Research Overview

The research employed a practice-based approach, utilizing the iterative development and critical evaluation of multiple game prototypes to generate research questions and applicable design knowledge. RPGs in the museum context were investigated in the

past, however, with a gamification approach rather than a holistic, full-fledged roleplaying experience that integrated the heritage content directly in the gameplay. This thesis reviewed the concepts of play and games to understand how playing games in the museum context can be explored through a design perspective. Contextual and contingent structures of games were leveraged in the design process to probe into how play can move between distinct but related contexts to transform meanings between each other. This revelation could only be done through a practice-based approach since reflection is crucial in any design activity, especially in an interdisciplinary one.

A thorough design exploration was conducted through inquiry, investigation, and implementation phases. Inquiry of the IAEM content and what the museum intends their visitors to experience. Data from expert interviews and auto-ethnographic accounts of the museum content and experience generated possible design materials to be investigated further. Since game's genre was predetermined for exploration purposes, commercial RPGs with tabletop and computer modalities were analysed in the investigation phase. Gameplay elements were decided and implemented in the subsequent phase. Game design and game-based learning methodologies were reviewed and utilized to guide the implementation process on various levels of abstraction.

Through iterative cycles of design and reflection, the prototype was implemented as conceptual tool to be playtested to be evaluated. This phase consisted of a scenario where the player plays the game before visiting the museum to establish awareness and motivation towards the museum content. It investigated how formal and dramatic elements of an RPG resonated with players in achieving cognitive, and affective learning, and possibly meaning making.

1.4. Thesis Structure

Chapter 2, Background and Theoretical Foundations, reviews the relevant literature for play and games; game studies, game design research and game design practice; roleplaying-games; serious games, games for learning, and game-based learning.

Chapter 3 focuses on the Methodology, detailing the research philosophy and strategies relevant to practice-based design research. It makes the case for validity of design knowledge for action research involving design activity and game design

research. Research aims are established to frame the design explorations, and the evaluation of the design artifact.

Chapter 4 presents the Inquiry and Investigation phases of the design process for the Neolithic Quest prototype. It starts with inquiry on the context of use to generate design materials. An overall conceptual frame is created to guide the design process. Modalities of RPGs are investigated to make connections with the museum context.

In Chapter 5, the Implementation and Evaluation phases of the design process is documented. The knowledge gained from the previous phases are synthesised in the implementation section which documents the design activity and process for the prototype. It also discusses challenges encountered during the design and prototyping phase and the practicalities of integrating museum content into existing roleplaying elements. Findings and reflections from the playtesting and interview sessions are analysed thematically. These themes emerged from heuristics for evaluation of both the players' learning and understanding of gameplay. The chapter concludes with presenting the analysis of the playtest and interview sessions.

Chapter 6 documents the discussion of the analysis presented in Chapter 5. Through interpretation of the testing results in the light of the design process of Neolithic Quest and the aims of the research, practical suggestions were made to improve the design of the subsequent iterations.

Chapter 7 concludes with a summary of the research contributions, emphasising the significance of the study. It addresses the limitations of the research, including contextual challenges, and their implications for the findings. Furthermore, the chapter proposes directions for future research, focusing on the scalability and adaptability of the proposed framework across diverse museum contexts. Additionally, it suggests opportunities for interdisciplinary collaboration among game designers, educators, and cultural institutions to further enhance the integration of serious games in the preservation and dissemination of cultural heritage.

CHAPTER 2: BACKGROUND AND THEORETICAL FRAMEWORK

This chapter presents a literature review to establish a theoretical framework for building a robust design process. The review encompasses the research on key concepts such as play and games, game-based learning, roleplaying games, and game design methodologies.

2.1. Play and Games

Creating novel definitions of or redefining the concepts of play and games serves no purpose for this research. Instead, exploring the relationships between these concepts to understand the possible connections and opportunities that scholars, philosophers, and designers have already made is a reasonable endeavour. These connections and opportunities ultimately provide the design materials.

2.1.1. Play

The concepts of play and games present a complex challenge to understanding their relationships. It is possible to view play as encompassing games and as an element within them, as noted by Salen and Zimmerman (2004). Despite the challenges posed by language and the fluid nature of these concepts, preliminary distinctions can be made. Play is considered a spontaneous activity free from structured rules, whereas games are activities or entities defined by a set of rules. This viewpoint serves as a foundational perspective for the analytical exploration of play and games.

According to Gregory Bateson (2006), play is an act of meta-communication, a logical contradiction in which players' signs express contradictory meanings simultaneously, a form of communication about communication. Participants who are actively engaged in play, and the observers know that “this is play”. Their actions and their interpretations carry that signal, even though the actions resemble “real-world” activities. This sophisticated level of communication, which is also highlighted by Salen and Zimmerman (2004), is a significant aspect of play that provides opportunities for designing games. This kind of communication is relevant in unstructured play; however, in structured settings with formal rules, such as games, it is no longer a necessity as the boundaries of the playing field are clearly defined by these rules, thereby reducing ambiguity and subjective assessments (Neitzel, 2008).

Sutton-Smith (2005) acknowledges the difficulty in defining play, attributing it to a wide range of cultural ideologies and perspectives. By analysing and categorizing hundreds of play theories into seven "rhetorics," Sutton-Smith aims to contextualize play within broader cultural value systems. He differentiates between "ancient" ideologies of play, which have been integral to cultures for millennia, and "modern" rhetorics that have emerged over the past two centuries. This approach highlights the diverse roles of play in social development, embracing its ambiguity and focusing on the varied conceptualizations across disciplines and cultures.

In his famous book Homo Ludens (1980) Johann Huizinga sets out to describe the characteristics of play rather than offer a totalizing definition. He summarizes his description through the following quote:

> *"Summing up the characteristics of play we might call it a free activity standing quite consciously outside 'ordinary' life as being 'not serious', but at the same time absorbing the player intensely and utterly. It is an activity connected with no material interest, and no profit can be gained by it. It proceeds with its own proper boundaries of time and space according to fixed rules and in an orderly manner* (Huizinga, 1980, p. 13)*"*

One of his biggest influences on game studies is the play's separation from ordinary life. For him this separation is one of the most important aspects of play, a metaphor that designates a space defined by rules where play starts and real-world halts. This notion was conceptualized as "magic circle" by Zimmerman and Lantz (1999), a place where "players are enclosed within the artificial context of a game - a 'magic circle' - and must adhere to the rules in order to participate". Although some studies (Consalvo, 2009; Raessens, 2014) interpreted and critiqued Huizinga's rendition as a complete separation from life, Zimmerman advocate's Huizinga's approach as not an ultimate separation from everything else in life (Zimmerman, 2012). The concept of magic circle has been criticized and built upon for many years since its conception, and it is significantly relevant (not the way Huizinga articulated) for this research. It is elaborated further in Section 2.1.3.

Roger Caillois (2001) expands and complements Huizinga's contributions by establishing qualities of play: it must be performed voluntarily, is uncertain, is unproductive, is separate from life, is governed by rules and is fictitious. His significant contribution to the study of play is the four categories of play: agôn (competition), alea (chance), mimicry (imitation), and ilinx (vertigo). He also added two axes in which games can exist: paidia (playfulness) and ludus (formal, rule-based game behaviour). The model can be helpful in situating and understanding games, however, putting paidia and ludus at extreme ends of a spectrum creates a certain difficulty in placing specific games in the model (Egenfeldt-Nielsen, Smith, & Tosca, 2008), This decision asserts that rules are merely limitations (Juul, 2003) rather than frames that would shape play. This division between playfulness and rule-based game behaviour is not to be taken at face value, as what constitutes a game is a much more complex issue.

For Thomas Malaby, play is a term that is historically and culturally specific to Western modernity, shallowly examined previously (2007). It is commonly used to signify a form of activity that is separable from everyday life, safe, and pleasurable. However, Malaby argues that these features are not intrinsic, they are "always cultural accomplishments specific to a given context" (Malaby, 2007, p. 96). Play is a way of engaging the world, and it can be present in various activities, not just games. He then suggests that play should be understood as a relative distinction between different modes of experience, rather than a distinct activity (Malaby, 2007). All this means that, for Malaby, games should be reframed from the ground up, leaving the preconception of play having immutable, universal properties emerging in every single game. Games are not inherently separate from everyday life, can have important consequences, can be productive of pleasure, but they can also evoke other emotional states (Malaby, 2007). Malaby's definition of games, and arguments on magic circle are further elaborated in subsequent sections.

Regarding framing play, Miguel Sicart in his recent book (2023) builds an argument for play through Maria Lugones' playfulness and world-travelling theory (1987). For Lugones, play is characterized by a loving attitude and a focus on world travelling. She argues that play is not just about contest, winning, and battling, as Huizinga (1980) and Caillois (2001) suggest, but rather about the capacity to travel across different worlds and construct different selves. Lugones emphasizes the importance of openness

to surprise, self-construction, and reconstruction, as well as uncertainty and a lack of self-importance in play. She sees play as a relational way of lovingly travelling to others and becoming entangled with them. In her philosophy, play is a mode of exploring boundaries, creating new forms of agency, and acknowledging and relating to others in a joyful and fun manner (Lugones, 1987).

Sicart interprets Lugones' outlook on play "as a form of relating to other forms of agency, human and nonhuman, biological and computational." (Sicart, 2023, p. 28) This relationship is to acknowledge the existence of other agents, any performed actions that have effect on us, even for competitive play, and take pleasure in curiosity and productivity of those agents. While somewhat convoluted, Sicart's argument is for play as a negotiation with other entities that at play, such as other players, elements, rules, and the game environment itself. Negotiation is a crucial aspect of play, as it allows players to adapt to changing circumstances and find creative solutions to challenges.

2.1.2. Games

In the opening remarks of "How to Define Games and Why We Need to" the author Jonne Arjoranta (2019) references a claim made by Bergonse (2017, p. 237): few attempts have been made to define what a videogame exactly is. Arjoranta then builds an argument on why it is important to define games and videogames, and why Bergonse's claim is false. According to Arjoranta, Bergonse's claim fails to consider that there are a high number of definitions made by both scholars and established game designers (Stenros, 2017), and this is the reason exactly why we need to make definitions of games and videogames. For Arjoranta definitions are tools for analysis or persuasion and that they should be useful for the specific purpose at hand. They are contingent on the cultural and historical context in which they are made (Malaby, 2007). There is no final definition of games and that new examples and practices around games require new definitions.

In a similar manner, Stenros analysed 63 different definitions of games and identified 10 contested points of interests (2017). He conveys that there is a common discourse amongst game scholars and designers, and even though ideas about games change over time, there is a trend in defining games. Stenros does not grant the reader a new definition; however, he provides 10 points of interest to guide further discussions.

These points are rules, purpose and function, artifact or activity, separate yet connected, the role of the player, (un)productive, competition and conflict, goals and end conditions, construction of the category, and coherence. These points emerge because of how definitions arrive at different outlooks for a specific game element. For instance, the question of "Are games a negotiated activity or a systemic artifact?" is an ongoing debate (Stenros, 2017, p. 504). Definitions mostly define games as activities or artifacts, they rarely make a homogenous one (Stenros, 2017). Is the meaning of play in the play activity, or in the artifact? Stenros identified a trend towards definitions taking a "game is an artifact" stance about video games (Stenros, 2017). This does not mean that analogue games are not artifacts, or playing video games does not constitute a play activity. Idiosyncrasy of definitions, according to Stenros, helped cultivate a field of game studies, even though most are thoroughly inclusive and vague (2017) Let's start out exploration from two definitions that, according to Stenros, have achieved hegemony amongst game definitions.

> *"Game is a system in which players engage in an artificial conflict defined by rules, that results in a quantifiable outcome"* (Salen and Zimmerman, 2004, p. 80).

> *"A game is a rule-based system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels emotionally attached to the outcome, and the consequences of the activity are negotiable* (Juul, 2005, p. 36).

The two definitions above, strive to encompass various aspects of gaming. Their authors both construct their definitions after a thorough analysis of several previous contributions, carefully dissecting and examining these works to identify their core characteristics. Salen and Zimmerman's definition efficaciously captures several key aspects:

- Game as system: The authors frame games as a set of interconnected components working together and by doing so they establish them as systems. This is crucial because it highlights the complexity and structure inherent in games.
- Active participation: They place players at the heart of the game. It's not just about the rules or the system itself; a game requires active participation, highlighting the interactive nature of games.
- Artificial conflict: The challenge in games is intentionally designed for driving player engagement. The term artificial also connotates a kind of separation from real-world, allowing safely acting on the game from the players part.
- Framework of constraints: Games operate within a framework of constraints. Rules are fundamental to creating an understandable, and navigable environment for players. They define the boundaries of the game world and what is possible within it, guiding player behaviour and the unfolding of the game's narrative or strategic possibilities.
- Quantifiable outcomes: Games have clear endpoints or ways to measure success, failure, or progression. This could be as straightforward as a score, a win/loss condition, or a more nuanced metrics of achievement. While quantifiability is crucial for providing goals, motivation, and a sense of closure or accomplishment, many contemporary games have divergent elements to achieve unique experiences not tied to quantifiable outcomes.

This definition is broad, potentially overlooking the nuances of games with qualitative experiences such as exploration, creativity, or social interaction over conflict and quantifiable outcomes. An outcome-based perspective may not account for games that thrives on the experience of playing process, and the constant change of states (Malaby, 2007) such is the case of RPGs. Conversely, viewing games as systems benefits this project immensely. RPGs have distinct systems and gameplay modalities that inform and feed each other for the emergence of a holistic player experience. These systems have been elaborated in Section 2.3.2.

Jesper Juul touches upon a higher number of aspects, making his definition even broader but more nuanced at the same time:

- Games as system: In the same lane as Salen and Zimmerman, Juul highlights games as systems, more specifically a rule-based one, that is governed by a set of predetermined rules that create a framework within which the game operates.
- Multiple outcomes: Juul acknowledges that games can have multiple potential outcomes, which are not only measurable but can vary significantly in nature or value.
- Complexity of values: Through the statement “where different outcomes are assigned different values”, Juul recognizes the complexity of games beyond winning or losing, suggesting that various outcomes can be evaluated differently based on the game's context or the player's values.
- Active participation: Underscores the interactive and participatory nature of games, where player actions have a direct impact on the game's direction and outcome.
- Emotional investment: By mentioning emotional investment, Juul differentiates games from other rule-based activities by the personal stake and emotional involvement of the player.

Juul focuses on the interpretative side of game’s outcome as opposed to Salen and Zimmerman, while acknowledging games as rule-based systems. Players actively engage with the game’s rules to influence the outcome according to their own knowledge and interpretation of the game’s systems. Juul is aware of the personal investment and emotional attachment the players have towards the gameplay through their struggle to overcome the challenges the game provides. The gameplay experience and the outcome of the game might have different meanings for different players depending on the context.

Regarding gameplay, it is important to review Costikyan’s contributions to game studies and game design. Greg Costikyan in his seminal article "I Have No Words & I Must Design" aims to demystify what makes a gameplay “good” (2002). His approach to this topic is through game design, however, in the pursuit of breaking down gameplay into identifiable components, he also provides a definition for games: “interactive structure of endogenous meaning that requires players to struggle toward a goal” (Costikyan, 2002, p. 24). For Costikyan the necessity of decision-making and facing challenges forms the core of the gaming experience, making the struggle to achieve goals a central theme. Goals guide player actions and provide purpose within

the game's context, which is derived from the games structure that is governed by the rules. Similar to Salen, Zimmerman, and Juul, Costikyan acknowledges the existence of conflict, rule-based structure, and player engagement. What Costikyan adds to the discourse is the notion of "endogenous meaning" that emerges from the game that is exclusive to the internal context the game creates and distinct from real-world meanings. While Juul acknowledges player's effort to influence possible outcomes and their varied value, hinting at exclusive meaning for the players, Costikyan advocates the meanings emerging directly from a game's design. This notion is discussed and expanded in Section 2.1.3 to elaborate on the relationship between meaning, context, and magic circle.

In his article "Beyond Play: A New Approach to Games," Thomas M. Malaby (2007) offers a comprehensive rethinking of games from an anthropology perspective, emphasizing their dynamic and processual nature. Malaby defines games as "semi bounded and socially legitimate domains of contrived contingency that generate interpretable outcomes" (Malaby, 2007, p. 96). This definition highlights the relative separability of games from everyday life, determined by cultural contexts, and their inherent unpredictability. Malaby identifies four types of contingencies in games—stochastic, social, performative, and semiotic—each contributing to the games' capacity to produce new practices and meanings as they are played. This processual view challenges traditional formalist and normative assumptions that games are inherently separate, safe, and pleasurable activities (Malaby, 2007). Malaby's discourse on the concepts commonly attributed to games being highly contextual is a big contribution to this study.

Jane McGonigal, pays tribute to Bernard Suits through these words:

> *"Bernard Suits, the late, great philosopher, sums it all up in what I consider the single most convincing and useful definition of a game ever devised: Playing a game is the voluntary attempt to overcome unnecessary obstacles"* (McGonigal, 2011, p. 22).

McGonigal, through language metaphors, hypothesizes that we are afraid of where the reality ends, and where the games begin (p. 20). McGonigal argues that that reality, as it is structured, fails to fulfil the fundamental human need for happiness, meaningful engagement, and community; video games are uniquely capable of satisfying these needs by providing structured, goal-oriented environments where players experience joy, purpose, and social connection. Instead of seeing games as mere entertainment or escapism, McGonigal suggests that they offer important lessons for improving real life. She advocates for using game design principles to "fix" reality, making it more engaging and fulfilling for individuals and society as a whole.

McGonigal's definition of games are through a taxonomy of defining traits: a goal, rules, a feedback system, and voluntary participation (p. 21). The goal is the specific outcome that players work to achieve. It provides a sense of purpose and directs their efforts throughout the game. Rules create limitations on how players can achieve the goal. They push players to think creatively and strategically by restricting the easiest or most obvious ways of reaching the objective. The feedback system tells players how close they are to achieving the goal. Feedback can take many forms, such as points, levels, a score, or progress bars, and helps maintain motivation by showing players that their efforts are moving them closer to the goal. Voluntary participation requires all players must willingly accept the goal, the rules, and the feedback system. This ensures that the game feels safe and enjoyable because everyone involved agrees to the structure of the activity (2011).

McGonigal's definition is very useful in thinking about essential traits of games rather than common ones. These traits should not be treated as exhaustive; games are idiosyncratic in the sense that most designers approach these traits differently. Feedback system for instance, can be clearly diegetic, and at a macro scale: Consequences of players actions can be relayed to the players through environment, objects, and storytelling, and should not be read only as user interface elements.

To delve deeper into how games generate meaning and context, and how these elements contribute to the educational impact of games in a museum setting, it is essential to explore the concepts of meaning, context, and the "magic circle". This exploration will illustrate how the boundaries between game worlds and the real world

can enhance the learning experience, creating a dynamic interplay that is both engaging and educational.

2.1.3. Meaning, Context, and "Magic Circle"

Two crucial attributes for this thesis, meaning and context, emerge from the interplay between the concepts of play and games. Scholars have approached these concepts from various perspectives. This section reviews these perspectives to grant an understanding of how play occurs through the structure of games, how meaning emerges, and how the magic circle forms.

Katie Salen and Eric Zimmerman relay "meaningful play" as a core concept in their seminal publication Rules of Play (2004). They build their argument through their interpretation of the lines imparted by Huizinga:

> *"[Play] is a significant function-that is to say, there is some sense to it. In play there is something at play which transcends the immediate needs of life and imparts meaning to the action. All play means something."* (Huizinga, 1980; as cited in Salen and Zimmerman, p. 32)

These lines, according to the authors, point to play's participation towards the creation of meaning. They establish that all play inherently possesses meaning. This intrinsic meaning transcends the immediate needs of life, elevating play beyond physiological or psychological reflex. Even in its simplest forms, play carries a significance, a "sense," that hints at its deeper connection to human experience. Through this revelation, they form the concept of meaningful play as the most significant aspect of experiences emerging from play: "the goal of successful game design is the creation of meaningful play." (Salen and Zimmerman, 2004, p. 33)

They define meaningful play in two distinct yet interconnected ways: descriptive and evaluative. Descriptive meaningful play perspective centres on the fundamental mechanism by which meaning is generated through play in all games. It posits that meaningful play emerges from the relationship between player action and system outcome**.** Every action a player takes within a game's system triggers a corresponding

response, and the relationship between these actions and outcomes is where meaning resides. (Salen and Zimmerman, 2004, p. 34)

Evaluative meaningful play, on the other hand, occurs as all games generate meaning through this action-outcome relationship, some games offer more meaningful play than others. The evaluative definition helps us distinguish these levels of meaningfulness. It states that meaningful play occurs when the relationships between actions and outcomes are both discernible and integrated into the larger context of the game (Salen and Zimmerman, 2004, pp. 34-35). Discernability refers to the clarity with which players can perceive the immediate outcome of their actions. If an action produces no noticeable effect, its meaning within the game diminishes. Integration, on the other hand, connects these individual actions and outcomes to the broader game experience. A game achieves integration when the consequences of an action resonate throughout the system, affecting future possibilities and choices (Salen and Zimmerman, 2004, pp. 34-36).

Costikyan refers to the meaning that originates from within a system as endogenous meaning (Costikyan, 2002, p. 22). In the context of games, endogenous meaning refers to the significance or value that game elements acquire solely within the context of the game. This meaning is independent of any real-world value or significance those elements may have. Costikyan gives the example of Monopoly money as an example of endogenous meaning. Monopoly money, as a game element and a physical artifact, does not have any value outside of the game's context (Costikyan, 2002). It only matters to the players who agree to play and adhere to the rules of the system of Monopoly. Similarly, a hand gesture representing a "rock" only *means* rock when playing rock-paper-scissors; and identify as such only when "in opposition to the concepts of 'paper' or 'scissors'" (Salen and Zimmerman, 2004, p. 46). The gesture of rock is just a fist outside of the context of rock-paper-scissors, it would not even make *sense* to anyone observing another person holding a fist, unless someone holds their fist like the rock gesture (with the fingers perpendicular to the ground), signalling their intention to play the game. However, the success of the intended meta-communication this gesture consists of depends on the others observing the gesture and interpreting it as a call to play rock-paper-scissors. We, as players, have an artificial conflict over rock in rock-paper-scissors and money acquire value in Monopoly because it matters to us, hence it becomes meaningful (Stenros and Montola, 2024, p. 13).

For Salen and Zimmerman design is the "process which a *designer* creates a *context* to be encounter by a *participant*, from which *meaning* emerges" (2004, p. 41; emphasis by the authors). The concept of meaningful play extends beyond individual game elements, encompassing the entire context created by game designers. This context, which takes the form of spaces, objects, narratives, and behaviours according to Salen and Zimmerman (2004), allows players to assign significance to otherwise ordinary actions or objects within the game's framework. The designers' role in crafting this context is crucial, as it enables players to derive meaning from their interactions and experiences within the game world. Hence, it is logical to discuss context before delving in to the concept of magic circle.

2.1.3.1. Context

Paul Dourish's perspective on context, particularly relevant to play, games, and meaning, is rooted in an interaction and phenomenological approach (2004). He rejects the notion of context as representational, stable, and separable. Instead, Dourish argues that context is dynamically created and sustained through interactions. It is not pre-existing information, but a relational property defined by its relevance to specific activities. Context is occasioned, meaning it is specific to each activity instance, evolves with it, and is constantly negotiated among participants. Context and activity are mutually constitutive, emerging and maintained through social interaction. Dourish also references the work of Etienne Wenger (1998) to explain the concept of practice in his discussion on context:

> *"By turning our attention from 'context' (as a set of descriptive features of settings) to 'practice' (forms of engagement with those settings), we assigned a central role to the meanings that people find in the world and the meanings of their actions there in terms of the consequences and interpretations of those actions for themselves and for others"* (Dourish, 2004, p. 25)

Sicart acknowledges Dourish's perspective, however, prefers to use the term context due its colloquiality (2014, p. 106). But how do we engage with a context that a designer creates?

This perspective is highly relevant for studying games and play. Players engaging with a game interacts with the rules, the objects, the narrative, and other players to construct their own meanings. The meanings are not resident in the game nor the player themself, according to Sellers, meanings emerge through the interactions between the player and the game (Sellers, 2018, p. 129). Sellers' "game+player system" approach is explained in Section 2.2.2., however, his view of a game being a "whole experience" is important to note in this discussion: "The whole of the game+player system arises as an emergent effect of the interactive loops between the player and game" (Sellers, 2018).

To synthesise Sellers' and Sicart's ideas, meaning emerges from engaging with the game's context. This context is designed to be interpreted to achieve a particular experience intended by the designer. This playable experience is the result of the interaction between the player and the game's system, involving a back-and-forth of resistance and appropriation (Sicart, 2015). This resistance and appropriation Sicart mentions arises from a rule-based system. The design of the rules of a game is key in creating a context that shapes what is meaningful for the player.

"Rules establish spaces of meaning by constraining possibilities and resignifying objects" (Stenros and Montola, 2024; p. 3). The constitutive rules of chess restrict the moves of pieces, at the same time make the whole idea of a Chess piece possible, making it meaningful to move a piece (Stenros and Montola, 2024, p. 15). Without these rules, outside of the chess' context, the chess piece King is a piece of wood without its deontic powers, however, keeps its recognition as a "cultural object relating to chess" (Stenros and Montola, 2024, p. 13). Stenros and Montola borrows the idea of institutional facts from John Searle (1995): "all social reality that has no deontic properties outside the context of the game counts as endogenous meaning." (Stenros and Montola, 2024, p. 13). For Searle social institutions such as marriage, money, and games are systems of constitutive rules (Searle, 1995, p. 27-28), which assign status to objects, establish institutional facts, and regulate activities, as well as making them possible (Stenros and Montola, 2024, p. 12). Searle establishes the core of constitutive rules through a formula: X counts as Y in context C (Searle, 1995, p. 28). In the context of games, the formula can be demonstrated as objects, components, or behaviours receiving endogenous meaning:

- "this piece of wood X has the endogenous meaning Y of being the white king in the context C of the magic circle of this chess game." (Stenros and Montola, 2024, p. 116);
- behaviour of crouching in a corner out of sight (X) counts as camping[1] (Y) in the context (C) of the game Counter Strike: Global Offensive (Valve, 2012);
- Dexterity Saving Throw (X) counts as means to avoid getting hit (Y) in the context (C) of the game Dungeons and Dragons 5th Edition (Wizards of the Coast, 2014).

Rules are what frames the context of games. Our interpretation of the rules as participants shapes how we experience the game. As reviewed in Section 2.2.1.2, player make decisions according to the interpretation of their own mental models, hoping to overcome the challenges by manipulating the rules (Sellers, 2018, Cook in Fullerton, 2019). From the designer's perspective, they are the decisions made to be engaged by the player for the emergence of an intended experience. To reiterate the question in page 17, how do we engage with a context that a designer creates?

2.1.3.2. The Magic Circle

The concept of magic circle has been a subject of significant scholarly debate within the field of game studies (Stenros, 2012). This concept has gained recognition within the study of games as a separation between the "real" or "ordinary" world and the game environment, and play and non-play (Stenros, 2012; Calleja, 2012). The concept of the magic circle, as it is understood in contemporary game design and game studies research, was initially traced to Huizinga (1980) and subsequently developed and defined by Salen and Zimmerman (2004).

Johan Huizinga writes in his book Homo Ludens about the occurrence of play in the ordinary world, which is cited Salen and Zimmerman (2004, p. 95) to articulate their development of the concept of magic circle, and also by Stenros and Calleja to build their argument on the criticism of the concept:

"All play moves and has its being within a play-ground marked off beforehand either materially or ideally, deliberately or as a matter of course. Just as there is no formal difference between play and ritual, so the 'consecrated spot' cannot be formally

[1] Camping: "a practice by players who wait for an enemy or player to appear at a spawn point to kill that player." (Rogers, 2014, p. 414)

distinguished from the play-ground. The arena, the card-table, the magic circle, the temple, the stage, the screen, the tennis court, the court of justice, etc., are all in form and function play-grounds, i.e., forbidden spots, isolated, hedged round, hallowed, within which special rules obtain. All are temporary worlds within the ordinary world, dedicated to the performance of an act apart." (Huizinga, 1995, p. 10)

Huizinga suggests that all forms of play occur within specific areas, whether these are physical or conceptual. These areas are set apart from everyday life and have their own rules. Huizinga compares playing in these areas to rituals, as both take place in "consecrated spots". He views the temporary realm devoted to the act not specifically as a physical location, but as something that could be conceptually defined. What is significant in the passage is the fact that Huizinga acknowledges how rules *obtain* temporary worlds. Play creates order, and deviation from the rules spoils the game, makes it worthless (Huizinga, 1995, p. 10). This metaphoric attribute of play occurring in a temporary world within the ordinary conveyed by Huizinga has been acquired in games studies (Stenros, 2012).

On its very basic level, magic circle is conceptualized as a shorthand for "the idea of a special place in time and space created by a game" by Salen and Zimmerman (2004, p. 95). They explain that to play a game is to enter the magic circle or create one with initiation. It is the "frame" that manifests when a relationship between the artificiality of the game and the reality of our world forms. This frame can have physical, such as the boundary line of a football pitch, and psychological representations, such as rules governing the play (Salen and Zimmerman, 2004, p. 94). In the formulation of the magic circle, the boundary of play is ambiguous, while the boundary of a game is formal (Salen and Zimmerman, 2004, p. 95). For the authors, the name magic circle is appropriate because something magical happens during play; special meanings are attributed around objects and behaviours, and a new reality inhabited by the players is created where the rules of the game have authority (Salen and Zimmerman, 2004, p. 96). From the players' point of view, they adopt a lusory attitude (Salen and Zimmerman, 2004, p. 97; see Suits, 1978). The lusory attitude is the state of mind required to enter the magic circle of play. It is the attitude toward playing a game by adopting the rules to overcome unnecessary obstacles through inefficient means, for the pleasure of play itself (Salen and Zimmerman, 2004, pp. 97-98). Similarly, Aarseth and Costikyan underlines games requiring "nontrivial effort" (Aarseth, 1997, p.1) and

“struggle” (Costikyan, 2002) from the players, which is not true for other forms other media. The temporary world of a game is an open system and a closed system depending on how they are framed: As rules it is closed; as play it open or closed; as culture it is open (p. 96, 97).

Criticism and further discourse on magic circle reveal a multifaceted concept that is continually being redefined and expanded. Stenros (2012) and Calleja (2012) have reviewed the discourse to improve the understanding of the concept from their perspectives. Stenros defends the magic circle as a useful conceptual tool, although with some refinements. He acknowledges that the concept has faced criticism, particularly for its perceived rigid division between play and the real world but argues that it remains valuable when understood as both a psychological and social boundary. Stenros suggests that the magic circle represents a mental shift into a playful mindset, as well as a socially negotiated space where different rules apply. He distinguishes between the physical space of play and the psychological and social contracts that create a temporary world for play to occur. Ultimately, he offers a more flexible view of the magic circle, emphasizing its role as a metaphor that helps us understand the separation, negotiation, and interaction between play and non-play. For him, the way Salen and Zimmerman (2004, p. 95) defined the concept is unfortunate (see Stenros, 2012, p. 4). They have used the word closed and separate to define the concept, however, in their overall discourse, they acknowledge the contextual openness and permeability of magic circle. Stenros proposes a model that separates the psychological "bubble" of playfulness, the social contract of the magic circle, and the cultural or physical site where play occurs (2012). His constructionist view of magic circle is like a negotiation between different views to arrive at a point which acknowledges the concept as a useful tool and metaphor for discussing games and play.

Calleja's work challenges the utility of the magic circle concept, especially in the analysis of digital games (2012). He argues that the metaphor of the magic is problematic because it creates a false dichotomy between the real world and play. Calleja critiques the application of this concept to digital games, emphasizing that digital games blur the boundaries between the game world and reality, making the idea of a distinct separation implausible. He points out that the magic circle fails to account for the complex interactions between players' personal, cultural, and social realities

and the digital game environment. Calleja advocates for moving beyond the magic circle and finding more nuanced approaches that reflect the interrelatedness of play and life (2012).

Marinka Copier (2005) critiques the metaphor of the magic circle itself, arguing that it misleadingly suggests an easy separation between play and non-play. She emphasizes that the space of play is not a predefined area but is constructed through negotiation among players and between players and game designers. Copier acknowledges the role of the designer in the formation of the magic circle. Thomas Malaby (2007) offers a harsher critique, questioning the existence of any clear boundary between play and everyday life. He challenges the notion that play is always safe, pleasurable, and free from real-world consequences. Malaby suggests that games, while relatively separate from ordinary life, are still deeply embedded in social and cultural contexts, with significant material and social implications. His discourse stems from his outlook on games as dynamic, socially constructed processes rich in contingency and meaning. The properties that were attributed to play and games such being safe, pleasurable, and separate from ordinary life are not inherent, but cultural accomplishments that vary based on context and practice. Mia Consalvo (2009) has argued that the magic circle upholds a structuralist conceptualization of games and that it emphasizes form at the cost of function. Especially the context of play is lost, and often context is key in deepening the understanding of instances of play. Players always bring outside knowledge when they play a game. Consalvo, on a similar stand as Malaby, explains that "games are created through the act of gameplay, which is contingent on acts by players. Those acts are always, already, contextual and dynamic" (Consalvo, 2009, p.415). Consalvo's usage of contextual in this regard points to the player context, rather than the artificial context that is created by the designers.

Stenros and Montola discuss magic circle from the perspective of constructionist ludology, and Searle's idea of constitutive rules (2024). The concept magic circle is not a disconnected realm, completely separated from everyday life. "The separating quality of the magic circle is not about *isolation* but about *transformation*." (p. 116; emphasis made by the original authors). Magic circle through Searle's lens of constitutive rules is "a transformative boundary that contains endogenous meaning" (Stenros and Montola, 2024). Constitutive rules grant the original meaning X an additional layer of meaning Y in the context C. This additional layer is the endogenous

meaning which the players focus on, disregarding the original meaning while in the magic circle. The magic circle represents a social contract, and a defined space created by constitutive rules. Physical actions players perform in play can impact the outside world, although the contract may modify how external society governs these actions (Stenros and Montola, 2024).

The magic circle cannot be a rigid, impenetrable, completely separated temporal space, because the entry to the circle is voluntary, and games are still deeply embedded in social and cultural contexts, with significant material and social implications (Malaby, 2007). If this separation was as absolute and concrete as it was interpreted initially, play would not have such strong personal, social, or cultural impressions; players would leave behind any meaning constructed, and every skill and practice gained in the realm of play. If a person can learn through gameplay (Gee, 2003), it means that magic circle as the boundary, the frame, or the attitude is permeable. It also means that games are highly contextual, as every person brings their own characteristics, culture, and expectations in the act of play.

In Section 4.3, the concept of magic circle is reiterated briefly and utilized as an applicable design knowledge towards the prototyping of the game. It is a very convenient metaphor and tool for thinking about games in informal institutions such as museums as they have their own boundaries and contexts.

2.1.4. Digital Games

Rafaello Bergonse (2017) seeks to define what constitutes a videogame by establishing a set of necessary and sufficient conditions. He highlights the difficulty of defining the medium due to its vast variability, ranging from simple mobile games to complex, persistent online worlds. Additionally, videogames are often viewed through the lens of traditional games, which can obscure their unique characteristics. Bergonse attempts to create a precise definition of what constitutes a videogame by identifying its essential properties: a visual output on an electronic display, strong interaction between player and machine, a fictional context that gives meaning to interactions, and emotional attachment between the player and the outcomes of their actions. By focusing on these essential properties, Bergonse attempts to create a definition that is both comprehensive and specific to the medium: videogames are defined by this

unique mode of interaction between the player and machine, within a fictional context, and driven by the player's emotional investment (2017).

While Bergonse (2017) seeks to establish an essentialist definition of videogames, Salen and Zimmerman (2004) explore the broader implications of digital technology on game design and player experience. The authors (2004) argue that the qualities of games remain consistent across both digital and non-digital media, but digital games bring specific characteristics that differentiate them. Digital games are treated as systems made up of physical elements like hardware and software, but they also exist within larger cultural and experiential systems. The authors identify four key traits of digital games: immediate but narrow interactivity, manipulation of information, automated complex systems, and networked communication. These traits, while present in non-digital games, are more robustly expressed in digital games. Salen and Zimmerman emphasize that the computer or digital platform is just one element of the game system and should not be viewed as the end goal of game design. Instead, the focus should be on designing meaningful experiences for players by leveraging the unique capabilities of digital technology. Ultimately, they argue that the core challenges of game design, such as creating engaging and meaningful play, are universal and apply regardless of the medium (2004).

Thomas Malaby (2023) examines how digital games blend elements from other media and analogue games to create immersive environments that feel natural to players. He introduces "hypomediacy," a design approach where the medium is concealed, allowing players to engage with the game's infrastructure without being aware of its underlying mechanics. This contrasts with "hypermediacy," which draws attention to the medium itself. Malaby argues that digital games internalize processes like randomness and rule enforcement into their code, shifting these elements from explicit to implicit, which changes how players interact with the game. By embedding these structures into the background, digital games create a new type of engagement, where players' actions in the game world can influence their perception of reality outside of it (2023).

Analog games' structure is explicit, a player needs to understand the underlying procedures to play the game. Whereas in digital games the narrow interactivity and immediate feedback of the system (see Salen and Zimmerman, 2004) provides the

means to generate a mental model for the player without the need to know how exactly they function (Upton, 2015, pp. 118-119). Malaby argues that by removing the need for explicit rules and human negotiation, digital games allow players to operate within frameworks that feel natural, making them powerful tools for shaping social actions and perceptions, both within and beyond the game. Through this remark, Malaby sees the potential of digital games to increasingly align with institutional projects, making them powerful tools for shaping social action (2023). Contemporary CRPGs preferring the hypermediated design is discussed briefly in Section 4.3.3.

Implicit structure of video games creates a unique representational situation. Juul (2007) addresses this uniqueness through the perspective of rules and fiction, and Aarseth (2007) through the relationship between fiction and simulation. Juul delves into the concept of abstraction in video games, exploring how games create fictional worlds while limiting player actions within them. Abstraction defines the boundary between what is represented in the game's fiction and what is implemented in its rules. It shapes how players engage with the game world and contributes to defining game genres, with abstraction levels playing a critical role in determining the kind of interactions players can perform. Juul also describes a similar phenomenon in his book Half-Real: Video Games between Real Rules and Fictional Worlds: "To play a video game is to interact with real rules while imagining a fictional world, and a video game is a set of rules as well as a fictional world" (2005, p. 1).

Espen Aarseth explores the complex relationship between fiction and simulation in video games, challenging the conventional view that game worlds are merely fictional (2007). He argues that video games form a distinct ontological category from traditional fiction in literature or film, where interactive elements are often misinterpreted as purely fictional. Aarseth emphasizes that games involve real interactions, allowing players to test game systems, explore causalities, and engage in strategies, unlike purely fictional narratives. This interactive quality makes game elements like virtual bullets or labyrinths more real than their fictional counterparts in films or books, as they exist in the simulated environment and respond to player input. The distinction between fiction and simulation in games is crucial, especially as games increasingly feature realistic simulations of physics, environments, and interactions. Aarseth concludes that game worlds are composite structures, blending real, fictional, and virtual elements to create complex interactive experiences. This mix makes video

games unique in representing and allowing player interaction with their worlds. The balance between abstraction and realism in game design is essential for maintaining meaningful play in a world that is not entirely fictional but includes real and virtual elements (2007).

Video games represent a complex and evolving medium that blends interactive elements, fictional worlds, and rule systems to create experiences. The unique characteristics of digital games, such as their ability to internalize rules and automate complex processes, allow players to engage with them in ways that feel both natural and intuitive. By balancing abstraction with realism, video games transcend traditional boundaries of media, offering not just entertainment, but also a powerful means of shaping perceptions and behaviours. This combination of interaction, simulation, and fiction sets video games apart as a distinctive and impactful form of cultural expression Digital games are particularly complex constructs, blurring the boundaries between the technical and human, the cultural and the mechanical (Sicart, 2015), and they become assemblages of play (Taylor, 2009).

2.2. Game Studies, Game Design Research, and Practice

The emergence and recognition of game studies as an academic field is associated with Espen Aarseth's editorial introduction to Game Studies journal in 2001 (Kultima, 2015; Kuittinen and Holopainen, 2009; Mayra, 2008; 2009). He declared that "Year One of Computer Game Studies as an emerging, viable, international, academic field." (Aarseth, 2001). Aarseth also declared how game studies should exist as an independent academic structure because it cannot be reduced to any of the existing fields, while acknowledging the multitude of contributing disciplines due to the current academics interested in the discipline coming from other fields of research. He lists such fields as anthropology, sociology, narratology, semiotics and film studies as relevant examples (2001).

Since the declaration from Aarseth, academic interest in games has grown significantly, with diverse studies emerging from various scholarly fields and the establishment of numerous game research conferences and academic forums (see Melcer et al., 2015). According to Mäyrä (2008), this diverse and multidisciplinary nature of game studies presents both opportunities and difficulties for the field's

community. This diversity and complexity have been a central focus within the discipline.

David B. Nieborg and Joke Hermes (2008), define game studies as an interdisciplinary academic field that focuses on the study of games, particularly digital or video games, as cultural, social, and technological phenomena. The field draws from a variety of disciplines, including media studies, cultural studies, sociology, psychology, narratology, and ludology, to examine not only the mechanics and rules of games (ludology) but also their narratives, aesthetics, and the experiences of players (Nieborg and Hermes, 2008). Similarly, Diane Carr and colleagues (2004) embraces the fact that game studies require an interdisciplinary approach, integrating insights from narratology, film theory, social semiotics, psychology, and media studies to analyse various aspects of digital games, particularly in terms of interactivity, narrative, and player experience.

Franz Mayra (2008) and Stefan Björk (2008) sought to identify and describe proper research methods and questions concerning game studies. Bjork found common concepts in the academic game studies literature and proposed a research model namely games, gamers, and gaming (2008). Mayra argues that the focus of game studies lies in the interaction between the game and player, informed by their various contextual frames; study of games, study of player, and study of context of the previous two (2008). Both views provide tangible frameworks for a deeper understanding of games. Bjork pointed out that the threefold model of games, gamers, and gaming is not a separation of game studies field, but a way of explaining different choices and possibilities without a need for external frameworks. His stance is parallel to Aarseth's: "game studies should contain media studies, aesthetics, sociology etc. But it should exist as an independent academic structure" (2001). Bjork strives to provide different viewpoints particular to games for "making discussions within game research more precise" (2008, p. 67). Mayra defines game studies as "a multidisciplinary field of study and learning with games and related phenomena as its subject matter" (2008, p. 6).

Sebastian Deterding examines the evolution of game studies as an interdisciplinary field (2016). He argues that game studies have contracted into a multidisciplinary field rather than the broad interdisciplinary it set out to become. Deterding suggests two

potential futures for game studies: either fully embracing its role as a field focused on the cultural study of games or shifting towards a more design-oriented approach, emphasizing applied research in areas like game design (2016). Previously, Deterding evaluated game studies up until 2014 were dominated by designers and humanities scholar (2016). Even though design field has dominated game studies research, design, in the context of game studies is not discussed as often as the conceptualizations of game and play (Kultima, 2018). Game design, especially through a practice perspective, gained little attention (Kerr, 2017).

Game design research has been carried out by game design textbooks that became "canon" in the field of game studies (Kultima, 2015). Kultima argues that the views on game design, both research and practice, has been misunderstood by the community due to the differing epistemic needs of the industry and academia (2015). The author briefly discusses Rules of Play (Salen and Zimmerman, 2004) and The Art of Game Design: A Book of Lenses (Schell, 2020), two popular game design textbooks that have different approaches towards the subject. Both sources are written by designers, for designers, with subjective accounts of design cognition, activity, and processes. Kultima conveys her cautiousness against subjective accounts being "imperfect from the academic perspective as they are lacking in systematic view and epistemic transparency, leading into an embrace of subjectivity." and such subjective accounts might end up being criticised in academic environment (2015).

However, Kultima sees game design as a pluralistic practice, guided by the designer's values (2015; see Kultima, 2009). She highlights the importance of empirical research on game development, noting that studies based on interviews, ethnographic research, and designers' conceptions of culture add valuable insights into the practice of game design. She suggests that integrating general design theories into game design research can provide a more structured approach and help develop methodologies that address the dynamic, transformative nature of game design (2015).

Jussi Kuittinen and Jussi Holopainen (2009) examines the nature of game design by comparing it to established theories in design research, focusing on Herbert Simon's problem-solving approach (2008) and Donald Schön's reflective practice model (1983). They argue that game design is a situated activity, influenced by multiple contextual factors, and cannot be fully understood by treating it as a linear or static

process. The authors suggest that understanding the design as a dynamic and evolving process is key to improving methodologies for game design (2009). They conclude that game design should be studied through design models that examines design activity and processes such as Löwgren and Stolterman's three-layer abstraction model (2007), and Lawson's model of design activities (2010). In their view, this approach will open possibilities for improved methodologies and better understanding for game design activities. They also suggest game design should be treated as a situated phenomenon due to its complex and unique multilayered issues (2009). It can be argued that game design stands in a unique place in design activity and process due to aspects such as embrace of uncertainty (Costikyan, 2015), variable and quantifiable outcomes that are valued differently (Juul, 2005), player agency, and requirement of non-trivial effort (Aarseth, 1997). Research on game design as a practice needs to be done in the context of actual game design projects.

2.2.1. Game Design Methodologies

Game design practice is a pluralistic, dynamic, and context-driven activity that involves multiple layers of decision-making, creativity, and collaboration (Kultima, 2015). Situatedness of game design needs a robust design research approach to further the understanding of the activity. Game design methodologies constructed by designers and researchers provide ways of thinking about the design of a game, both in terms of game as an artifact and the design process. O'Shea and Freeman cover key points and issues regarding the conceptualization, application, and evaluation of game design frameworks (2019). They consider frameworks as "a set of concepts that assist in the analysis of a design or that provide perspectives on a set of design issues" (O'shea and Freeman, 2019, p. 3). I have evaluated design models and methods in a similar manner as frameworks. The methodologies reviewed in this section are not exhaustive; they were selected due their applicability in making design decisions regarding the creation of the serious game in question.

2.2.1.1. Frameworks and Models

Mechanics, Dynamics, and Aesthetics (MDA) is a framework devised by Robin Hunicke, Marc LeBlanc, and Robert Zubek as a formal approach to understanding games, helping to bridge the gap between game design, development, criticism, and research (2004), and one of the most well-known and applied frameworks (Schell, 2020). They argue that the MDA framework can help designers and scholars iterate on

the game creation process by breaking down games into components. It emphasizes the interdependencies within a game's systems, aiding developers in understanding how changes in one area affect others.

The most important contribution of the framework to game design methodology is that it treats game design holistically and sees each element as a lens. For the authors, mechanics are the rules and systems that define how the game functions at a technical level, such as data representation and algorithms; dynamics refer to how the mechanics interact with player inputs over time, creating real-time behaviours and outcomes; aesthetics covers the emotional responses evoked in players during gameplay. From a designer's perspective, the game system is designed to elicit a certain experience when interacted with by players. Players interact with the mechanics of the game through the resulting play experience. In this case, dynamics can be said to be the element where the design decisions of the designer shape the behaviour and actions of the players, ultimately the aesthetics.

MDA is a useful tool when thinking about how design decisions can facilitate a certain player experience. It provides a holistic look towards designer and player perspectives considering the complex emotional responses of players relating to game mechanics and dynamics. However, the framework does not delve deep in the dynamics element. Dynamics, according to their own definition, is very significant for generating specific experience as it is where actual play happens. Dynamics could be elaborated further other than its relationship with the feedback loops of the system (see Hunicke et al., 2004).

Patterns in Game Design framework by Staffan Bjork and Jussi Holopainen is "a tool for understanding and creating fames" (2004, p. 3). There are two aspects that makes this framework a valuable tool: the design patterns and the action-oriented component. The initial framework provides over 200 game design patterns to help designers make design choices or analyse games with a design perspective. They borrow the terminology for "pattern language" from Christopher Alexander (1997). Alexander makes the following description for patterns: "Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice" (1997, px). These patterns allow for

practical usage of codified design knowledge for recurring problems. Bjork and Holopainen, however, stress the problem-solving orientation of Alexander's conceptualization and indicate its inaptitude for game design purposes (Bjork and Holopainen, 2004, p. 34). They chose not to define patterns based on recurring problems; the patterns should support design work, rather than aiming to remove unwanted effects from the design of a game. Their iteration of the concept should offer a good model for organizing gameplay knowledge that could be utilized in both game design and analysis. Thus, they describe game design patterns as "semiformal interdependent descriptions of commonly reoccurring parts of the design of a game that concern gameplay" (2004, p. 34). I have utilized this aspect of their framework as a way to establish a vocabulary for analysis of RPGs (Section 4.2), and synthesis of said analyses in the design of serious games (Section 4.3) through association of game design patterns with museum content.

The second aspect worth investigating is the action-oriented component framework "based on the assumption that playing a game can be described as making changes in quantitative game states, where each specific state is a collection of all values of all game elements and the relationships between them" (2004, p. 8). This framework lays the foundation for their game design patterns library. Describing every element of the framework is not in the scope of my work, however, it provides a way to think about pattern associations with museum content. The framework is divided into four components: holistic, boundary, temporal, and structural.

> *The holistic components describe how the activity of playing a game is separated from the other activities, the boundary components limit the possible actions of the player within the game, the temporal components describe the flow of the game, and the structural components define the physical and logical elements necessary for containing and manipulating the game state.* (2004, p. 8)

Patterns in the initial library assembled by Bjork and Holopainen contains around 200 patterns, while the Wiki the authors have maintained over the years currently have 623 patterns (as of 12.07.2024). There is also website that runs a graphical presentation of all the patterns in the wiki showcasing connections between each pattern (Lee, 2020).

One contribution to this project regarding patterns is Bjork and Zagal's description of RPG design areas and association of possible patterns with RPGs and the design areas they describe (2018). Analysing RPGs by breaking the gameplay into design areas has been very rewarding in terms of making better design decisions that reflect the characteristics of RPGs. This is actually what Bjork and Holopainen aimed for the usage of their pattern library: "Each pattern describes a part of the interaction possible in games, and together with other patterns they describe the possible gameplay in a game. We use the term game design patterns instead of gameplay patterns to stress that these are patterns of interaction which are intended by the game designers, and that the patterns aim to support not only analytic work but also creative design work" (2004, p. 4).

A holistic view of the game design process is suggested by Tracy Fullerton in her book Game Design Workshop (2019). The "playcentric" approach is built on the premise that players must be involved in the design process in all the stages. Fullerton suggests "player experience goals" is the first and the most important step to involve the player in the design process (p. 12). These are not gameplay features or mechanics, but goals for the game designer themselves to reach a certain type of experience the player will have during play. They are "descriptions of the interesting and unique situations in which you hope players will find themselves" (p. 12). Fullerton immediately establishes her design process methodology as iterative; a process which involves designing, testing, and evaluating in cycles to improve the player experience in each iteration (Figure 1). This kind of iterative cycle is crucial due to the dynamic and emergent nature of games, as the player experience emerges from the interrelations between formal (players, objective, procedures, rules, resources, conflict, boundaries, and outcome) and dramatic (challenge, play, premise, character, and story) (p. 47). This approach is akin to Katie Salen and Eric Zimmerman's statement that is games are "second-order design problems" (2004, pX). A designer creates formal and dramatic elements, however, does not directly control the player experience, it emerges through play activity. Therefore, Fullerton emphasizes putting players in the heart of the design process; she even places players as a formal element. It should be kept in mind that game design is individualistic (Quinten et al., 2017) and pluralistic (Kultima, 2009). Depending on the context, stakeholder interventions, platform and many other variables, the design process needs to adapt changing situations. Fullerton's approach

is a basic and foundational guidelines that can be treated as a plastic model that can be shaped accordingly. The iterative cycle can be strengthened by applying Donal Schön's reflective practice philosophy (1983; see sections 2.2 and 3.2 for an overview), embracing the designer's individuality and values, while keeping it playcentric.

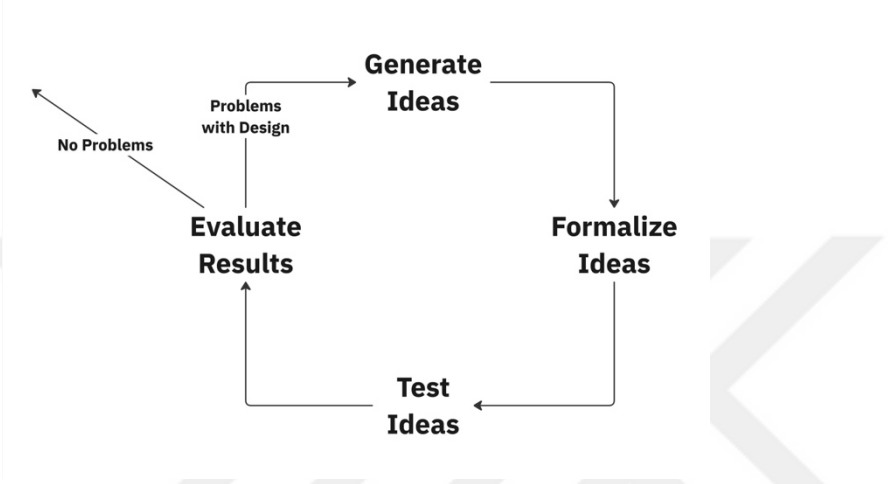


Figure 1. Iterative design process diagram from Fullerton, redrawn by the author of the thesis.

2.2.1.2. Interaction and Core Gameplay Loops

Games have been defined as systems in the literature (see Section 2.1.2). The player being a part of this system as a formal element (see Fullerton, 2019); an element which interacts with the rest of the system to elicit a certain experience. Mechanics being defined as rules and systems that govern the functions of a game by Hunicke et al. (2004, see the review of MDA framework above) is also a very broad understanding. I have chosen to see mechanics as Miguel Sicart's description: "methods as invoked by agents, designed for interaction with the game state" (2008). Through Sicart's description, we can understand that mechanics are not rules or systems, but ways of possible interactions a player can have with the game's system, constrained by the rules. "Rules establish spaces of meaning by constraining possibilities and resignifying objects, but all the above types of rules function differently: they are created, altered, broken, and valued differently" (Stenros and Montola, 2024, p. 3). This definition from the authors is how I see player's adhering to the rules and find ways to interact with them. Constraints created by the rules is what gives players their agency in the game

system to make meaningful decisions (Sellers, 2018). In this section I have discussed how player's interaction with the game creates interaction and gameplay loops that forms the player experience.

Michael Sellers (2018) uses the term "game+player" to describe how the play experience emerges: "when player and game together" (p. 97). He builds his view of game systems through this understanding of an interaction loop between the player and the game, both parts of a larger system. Through the diagram in Figure 2., Sellers illustrates both the player, and the game have internal states. These loops are the player's mental model constructed through the interactions with the game's internal loops (p. 122). Behaviours of the player and the game are not random; they must be based on internal states and logic (p. 127). Sellers describe the interactive loop happening during gameplay with the following statement and through Figure 2:

"[T]he player's and the game's behaviours are the result of their internal state. Based on their state, each selects actions to take, which then affect and perturb the other's state. This drives new behavioural responses in return. The player provides input to the game via their behaviours, which changes the game's state. The game processes this and provides feedback responses that are input for the player, changing their internal state" (Sellers, 2018, p. 127).

Sellers explain this loop as the essence of interactivity. As it occurs in iterations during gameplay, it is called a core loop that is "what the players do at any given time" (p. 156) and what is particularly engaging about a game. Players form intentions depending on their mental model; an understanding of game. This mental model is a culmination of the game internal system reflected in the player's mind (p. 129). As a player plays a game, they learn important ideas that are perceived as worthwhile and attainable, which also test their understanding based on their actions. Mental model is like the concept of "conceptual model" by Donald Norman (2013). Norman explains conceptual model at its very basic level as "an explanation, usually highly simplified, of how something works" (2013, p. 25). It doesn't need to be fully accurate but must be practical for the user to form an effective mental image of the system's workings. Even though Norman's focus is on physical devices with or without digital screens, this can be true for digital games. A mental or conceptual model is formed depending on the design choices that have been made during the creation of the game.

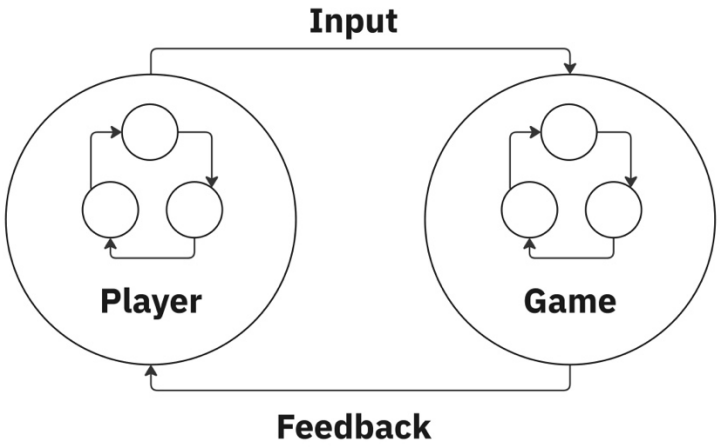


Figure 2. Sellers' interactive loop, or game+player system. Redrawn by the author of the thesis.

Sellers advocate that the mental model of the player updates with positive feedback when a player "did something right" (p. 129). While this can be true for interactions with utilitarian artifacts such as social media platforms, or application for banks, playing a game is a non-trivial effort (Aarseth, 1997). Products that are designed to be "used" are designed to be fool proof. Games on the other hand, have uncertain outcomes. Player's mental model updates regardless of an instance of success or failure, with varying effects on the understanding of the game. This phenomenon is also explained through the flow theory by Mihaly Csikszentmihalyi (1991). An individual experiencing a flow state is immersed in a complex task that involves some level of uncertainty, rather than a routine or memorized activity. They have clear objectives to pursue and receive immediate feedback on their progress. This state of flow occurs when the person is faced with a challenging endeavour that requires focus and skill, while also having well-defined goals and obtaining prompt responses to their actions. (Sellers, 2019, pp. 152-154; Csikszentmihalyi, 1991). A flow experience would not be possible with only positive effects emerging from the game.

From a design perspective, the interaction and the core loop of a game, and their reflections in the mental model of the player depends on the design choices made in creating the formal and dramatic elements (Fullerton, 2019), and the way these elements interact with each other to form the game's internal model. Miguel Sicart

explains that the emerging play experience is the consequence of a negotiation between the player and the game as the design object (Sicart, 2014; 2015). The structural elements of games enable players to identify activities, objectives, and challenges, and subsequently act upon them to achieve their experiential goals. The interaction with a game system can be conceptualized as the establishment of an encounter (Deterding, 2009) between the freedoms of play and the constraints of interacting with designed systems. Engaging with a game represents a continuous dialectical challenge of submission (adhering the rules) and rebellion (utilization of mechanics to overcome the challenges created by the constriction of the rules), wherein players seek to achieve their objectives through available actions (Sicart, 2014). The ludic experience manifests at the intersection between play and designed structures (Sicart, 2015). At the high-level scale, game designers design the interaction loop to elicit a certain experience. Evidently, another loop emerges between the play experience (game+player whole in Sellers' words) and the designer (Sellers, 2018). Sellers illustrate this loop, which he calls the designer's loop, through a diagram showcased in Figure 3.

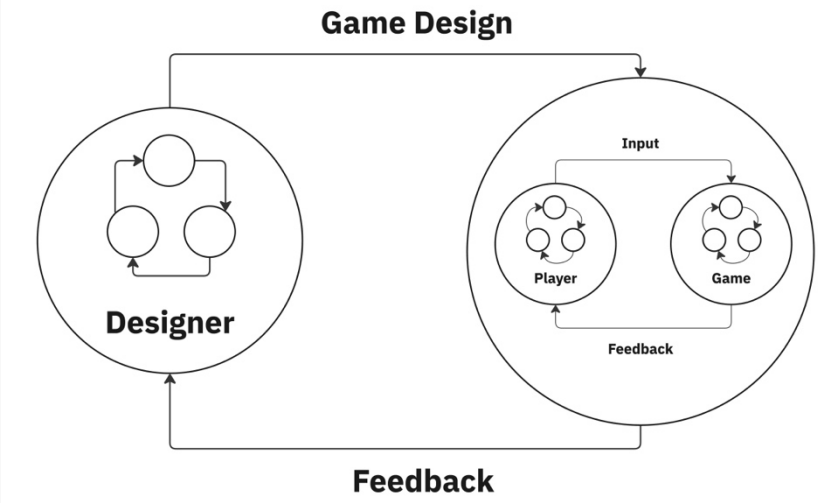


Figure 3. The designer's loop. Redrawn by the author of the thesis.

Michael Sellers (2018), Daniel Cook (2012; Fullerton, 2019), and Miguel Sicart (2015) strived to elaborate on game loops from a design perspective. Well-designed game loops are the reasons why players actually care to participate in these interactions. I have reviewed the three approaches from these authors and synthesized

them to arrive at a design decision to involve heritage content towards making Neolithic Quest. This synthesis is explored in Section 5.1.

Sellers devotes a whole chapter in his book to how interaction loops facilitate arousal and engagement by borrowing from psychology and cognitive science (2018, pp. 121-168). There are two important aspects that I have taken from his approach. First is his explanation of how players update their mental model in an interaction loop while playing a game (Figure 2; p. 127), second is his illustration of core loops that adds a secondary loop on the initial interaction loop (Figure 4; p. 131). The goals and intentions of the player is the start and the end of the loop. In the conversation between the player and the game (Sicart, 2015), the understanding of the game, the mental model of the player, is the most crucial aspect in terms of emerging experience. Depending on the possible actions of the players, how those actions receive feedback, and what kind of new and additional information the player receives affects how the mental model is updated, and the nature of intents and goals formed by the players (Sellers, 2018, p. 131). Sellers also borrow from Norman's concept of *affordances* (Norman, 2013) to explain how players perceive the next possible action depending on how the game calls that action, which he explains must be obvious. However, in game design, affordances can be less obvious depending on the context (interface, mechanics, or meta-game) compared to utilitarian digital products. Nevertheless, affordance is an important notion to think about concerning second-order design spaces (see Salen and Zimmerman, 2004).

The second concept worth mentioning is the core loop, a simplified version of the interaction loop, which however, adds the layer that of "Progression and reward" (Sellers, 2018, p. 156). Progression can be a simple feedback on the new game state, or new abilities to execute possible actions. Both incites the player to form a new intention or goal. Progression can mean very different things depending on the context, and game genre. In a platform game with basic mechanics, it is the level the player is in, and the new challenges it brings. In the context of a CRPG however, it could mean a drastic change in the game state for which the player needs to adapt their goals and future actions. Aside from formal elements, dramatic elements such as storytelling and visual representation of the game world can affect the intensity of the player's reaction towards these changes.

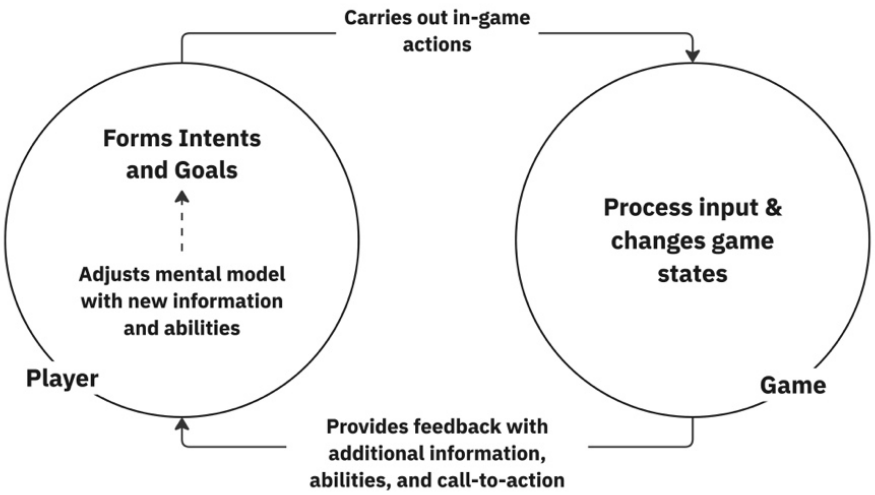


Figure 4. Interaction loops from Sellers. Redrawn by the author of the thesis.

For Sicart, loops represent the repetitive sequences of actions within a game, involving player input, system processing, and feedback (2015). Sicart defines game loops as core components that consist of game mechanics (like actions a player performs), system processing (evaluation and computation), and feedback mechanisms. Even though Sicart's definition of loops have the same components as Sellers', he treats game loops as a level of abstraction towards game design research. Levels of abstraction refer to a conceptual framework used by Sicart to analyse games at different levels of detail or focus. The idea is to break down complex systems, like games, into distinct layers or perspectives to make them easier to study and understand. In game design, Sicart applies levels of abstraction to help analyse various aspects of gameplay, from the most detailed, granular elements (like mechanics) to broader, overarching structures (like game design patterns or metagames). Game loops sit at the middle of the abstraction levels and provide an overview of how mechanics relate to system processes. They allow for an analysis of game mechanics and the assessment of the results of actions based on rules (Sicart, 2015). In other words, game loops provide the designer to see the effects of game mechanics on actual play experience.

Sicart cites Daniel Cook's identification of interaction loops in digital games (Cook, 2012, web). Cook's most recent elaboration on the concept is featured in Fullerton's Game Design Workshop book (Fullerton, 2019, pp. 153-159). Cook identifies

interaction loops as descriptions of "how a player interacts with a game and how the game in turn responds to the player" (Fullerton, 2019, p. 153). Interaction loops consist of following steps:

1. The player starts with a **mental model** that prompts them to…
2. Make a **decision** to…
3. Apply an **action** in order to…
4. Manipulate the game **rules** and in return…
5. Receive **feedback** that…
6. **Updates** their mental model. Or, in other words, they start to learn how the systems of the game work. (Fullerton, 2019, p. 153)

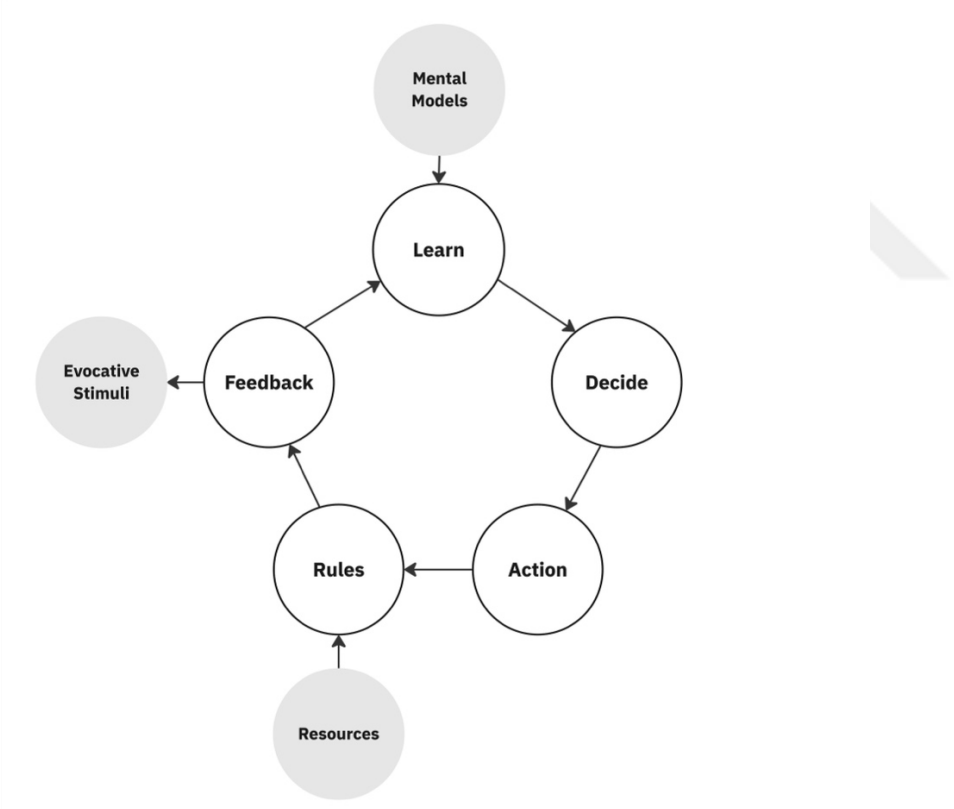


Figure 5. Cook's diagram of Interaction Loops. Redrawn by the authors of the thesis.

Cook's focus is on players acquiring skills necessary for playing and mastering the game. However, depending on the game, interaction loops can illuminate valuable

information about a game's design. An interaction loop can start and end in seconds, for example in a platformer or an action game, or it can take hours in a narrative focused game for a player to see the feedback on their actions. Cook's iteration of a game loop also features the concept of mental model, which is updated through learning. This means learning is inherent in gameplay, and this phenomenon is tied to the design of mechanics (possible actions or verbs that elicit meaningful decisions (Sicart, 2008; 2015), rules (see Section 2.3.2.2.), and a positive or negative feedback that a player should care about.

2.3. Role-playing Games

2.3.1. Definitions and Forms of RPGs

Zagal and Deterding (2018) argue that the pursuit of defining RPGs is difficult due to how it is situated across different media, and how different social groups refer to the term. By gathering various definitions from across disciplines and doing a comparative analysis of common characteristics of existing forms of RPGs they arrive at a definition themselves, with emphasis added by the author of this thesis:

> *"Role-playing games is a word used by multiple social groups to refer to multiple forms and styles of play activities and objects revolving around the rule-structured creation and enactment of characters in a fictional world. Players usually individually create, enact, and govern the actions of characters, defining and pursuing their own goals, with great choice in what actions they can attempt. The game world usually follows some genre fiction theme and is managed by a human referee or computer. There are often rules for character progression, tasks, and combat resolution."* (Zagal and Deterding, 2018, p. 46)

This is a very extensive definition that contains characteristics of tabletop role-playing games (TTRPG), computer role-playing games (CRPG), massively multiplayer role-playing games (MMORPG), and live action role-playing games (LARP) without stretching it to include all the possible divergences. This research will be concerned with CRPGs, however, the origin of what most social groups consider an RPG is TTRPGs, and it is imperative to determine how gameplay is carried out and perceived

by the actors (both the players and referee/game master). Due to the interpretative nature of TTRPGs, Jesper Juul classifies them as "borderline cases" according to the classic game model he derived from the definitions made by the year 2005 (Juul, 2005, p. 44).

2.3.1.1. Tabletop Role-playing Games

If one takes Dungeons & Dragons (D&D) Fifth Edition (Wizards of the Coast, 2014) as a case for understanding gameplay of RPGs, at its basic level it is a set of rules that frames the possible actions of player characters (PCs) that interact with the game world to a collaborative storytelling experience. It governs what kind of PCs can be created by the players, how those characters interact with and manipulate the world, and how they can resolve conflicts such as combat and dialogue. The Dungeon Master (DM) – the concept of Game Masters (GMs) (Tychsen et al., 2006) - oversees the rules and guides players through the world and the story by interpreting their actions. The use of polyhedral dice in D&D introduces an element of chance into the game, influencing outcomes in combat, skill checks, and other actions. This mechanic not only adds unpredictability to the gameplay but also emphasizes the importance of strategy and risk management. The dice system has become a defining feature of RPGs, influencing the design of combat and skill systems in both tabletop and digital RPGs (Mackay, 2001). Players can affect the outcome of an action through their PC's abilities and capabilities. The staple characteristic of TTRPGs is that whatever the result of an action the DM interprets and appropriates the action, describes it to the players, and they must imagine them. This emergent narrative is shared even though every player can imagine it differently. The result is an altered sense of reality where they are immersed in a world where "preexisting associations become temporarily deactivated" (Green and Brock, 2000). The structure of D&D, with its intricate rules and emphasis on character development, paved the way for the development of subsequent RPGs.

A TTRPG session takes place as a conversation among players and the game master, the purpose of which is to (a) establish particular events, as factual with the fictional context, (b) resolve conflicts about those events, and (c) ensure that all participants have a mutual comprehension of the details of the game-world (White et al., 2018). This conversation can loop constantly during gameplay, with variation depending on the current play mode, such as combat, exploration, or social interaction. While this is common in most TTRPGs, a GM-less game's conversation would very likely be

considerably different. Fiasco (Morningstar, 2010), for example, revolves around players using dice to establish scenes, telling the story collectively. Depending on things going bad or good, another set of dice is rolled to resolve scenes with random repercussions (Morningstar, 2010).

Traditional pen-and-paper RPGs, such as D&D, evolved alongside live-action role-playing games (LARPs) and the earliest computer role-playing games (CRPGs). These developments were driven by advances in computing technology, which enabled more sophisticated game mechanics and narrative structures. The shift from tabletop to digital formats expanded the reach and intricacy of RPGs, ultimately leading to the creation of renowned games like "Ultima" and "Wizardry" (Hitchens and Drachen, 2008).

The late 1990s and early 2000s brought further transformation to the RPG landscape, brought about by the advent of the internet. This paved the way for massively multiplayer online role-playing games (MMORPGs), such as "World of Warcraft," which provided players with the opportunity to immerse themselves in expansive virtual worlds, interact with thousands of others, and engage in complex social dynamics. MMORPGs built upon the fundamental aspects of earlier RPGs but introduced persistent worlds and continuous character progression, significantly altering the gaming experience (Mortensen, 2015).

The impact of RPGs extends beyond the realm of gaming, pervading popular culture and media. The genre's commitment to storytelling, character development, and player agency has generated a distinct and lasting form of interactive entertainment. The continuous innovation within RPGs exemplifies the genre's adaptability and sustained appeal, thereby securing its position within the broader spectrum of digital and analogue games (Wada, 2017).

Play experience of various TTRPGs were explored in Sction 4.2.1.1. through a design lens with the purpose of ascertaining how those experiences emerge from gameplay elements. These elements however are described in this chapter as common characteristics.

2.3.1.2. Computer Role-playing Games

CRPGs emulate the interaction between the GM and players in a virtual setting through computational action resolution. For instance, the popular CRPG series Baldur’s Gate

(Bioware, 1998) uses the Advanced Dungeons & Dragons 2nd Edition (Gygax and Cook, 1989) ruleset and as the player acts on the world through their characters, a virtual dice is rolled in the background to determine the outcome of the actions. The player has the power to affect the outcomes through the abilities of the PC they have created and the entity they have acted upon. CRPGs are often differentiated from tabletop games by their single-player capability, complex and involved pre-scripted storylines, and lack of character role-playing in the sense of empathizing, embodying, and acting out a character (Hitchens and Drachen, 2008). However, this does not mean that single-player CRPGs are not engaging at all. Their appeal comes from the narrative engagement of meticulously crafted game worlds, characters, and stories; their core gameplay experience according to Schules, Peterson, and Picard (2018). Zagal and Altizer however, sees character progression systems as the major appeal of CRPGs (2014). They have been influential in the evolution of video games and are often called “RPG elements” in video games that are in genres other than CRPGs. First-person shooter games for instance, have been integrating level up systems to engage players with a sense of progression that is mostly associated with CRPGs.

One of the most important features of CRPGs is the absence of a Game Master. Since there is no one interpreting player actions and deciding how to resolve the consequences of those actions according to the rules, the entire game experience must be designed down to the finest detail. For this reason, the gameplay and experience of CRPGs are very different from TTRPGs. While TTRPG players interact with the game world as permitted by the game master, in CRPGs in digital form, the game designer's initial design decisions restrict these interactions (Hitchens, and Drachen, 2008). The representation of the game world is not based on what the players and the Game Master imagine, as in TTRPGs, but on the visual design decisions made by the game’s designers. The possible interactions are therefore directly linked to how these visual representations are related to the game mechanics. Tychsen uncovered the difference in this experience by analysing the similarities and differences between TTRPGs and CRPGs in the way information flows and is accessed, and how story is controlled (2006).

The transition from TTRPGs to CRPGs has fundamentally altered the way narratives are experienced, shifting from collaborative storytelling to more linear or branching storylines controlled by the game’s algorithms (Tychsen et al., 2006). Some games

strived to emulate the rich storytelling aspects of TTRPGs, while adapting the rule-structured character creation and enactment of characters to a single player rather than a group of friends sitting around a table.

Figure 6. A: Baldur's Gate (Bioware, 1998). B: Diablo 2 (Blizzard Entertainment, 2000). C: The Elder Scrolls 5: Skyrim (2011, Bethesda Softworks). D: The Witcher 3: Wild Hunt (2015, CD Projekt).

In Baldur's Gate series (Figure 6.A; Bioware, 1998), players create a character with quantified characterization options adapted from various editions of Dungeons & Dragons (D&D) depending on the game. The player then controls their character, interacting with the virtual environment depicted from an isometric perspective, receiving quests, meeting non-player characters (NPCs), possibly recruiting them as party members, combating enemies, and gaining experience points to level up and develop their characters. The game's design is intentionally an emulation of D&D, having the player control a party of characters, and through them make decisions that affect the narrative. While the aspect of direct control over the narrative is lacking, the game emphasized a rich and exciting story as its main player attraction. Other games followed the path of Baldur's Gate series with mechanical and executional twists. Fallout (Interplay Productions, 1997) and Fallout 2 (Interplay Productions, 1998) that

take place in a post-apocalyptic setting and have mechanics and rules that reflect the theme. Divinity: Original Sin I (Larian Studios, 2014) and II (Larian Studios, 2017) are fantasy themed CRPGs with turn-based combat incorporating environmental and elemental hazards affording players to strategize accordingly, while the story being on a somewhat whimsical side. Baldur's Gate and the two series mentioned above can be considered as CRPGs that evoke a certain "classic" gameplay experience, with complex rulesets, combat, and story. Competency in these games rely on understanding the mechanics of characterization and capitalizing them during combat, and other areas. There are other subtypes of CRPGs that integrate dexterity and reflexes as a measure of skill while incorporating RPG elements such as quantitative attributes and character development. These subtypes are called Action RPGs (two games with distinctive experiences would be Diablo series, and Witcher series). There are also other subtypes with considerable impact on the genre are Japanese RPGs (JRPGS), Roguelikes, and Strategy RPGs (SRPGs) (Schules, Peterson, and Picard, 2018).

The type of CRPGs this thesis is concerned with is the single-player digital role-playing games that focus on strong narratives in a hand-crafted world that the PC(s) inhabit. These games usually strive for diegetic consistency in every aspect of gameplay. Attributes, skills, and abilities of characters; items, and the equipment players can find; agents populating the world; all these aspects are designed in coherency. In Section 4.2.1.4, I did a comparative analysis of a few CRPGs that I thought could provide concrete outputs. As a result of these analyses, I examined the game elements specific to RPGs that could benefit the design of Neolithic Quest, and what these elements could be combined with in the context of museum experience and learning.

2.3.2. Understanding RPGs

RPGs have unique combinations of gameplay elements that make up their distinct play experience. In the following sections, prevalent elements and components of RPGs were be reviewed. These components were chosen to reflect various formal and dramatic elements (Salen and Zimmerman, 2004) that elicits the roleplaying experience in both tabletop and computer modalities

2.3.2.1. Storytelling, Narrative, and the Game World

Refers to fictional or non-fictional worlds the game takes place that is internally consistent, which may or may not resemble our world, and is imagined for the purposes of storytelling and narrative (Schrier et al., 2018). These worlds present lenses that allow viewing familiar aspects of our own world that may have been transformed, or accentuated (Wardrip-Fruin, 2014). The act of constructing and designing a believable fictional world is called worldbuilding (Dowd et al. 2013, p. 21), and it is a major component in designing RPGs. In RPGs, worldbuilding involves designing "raw material and constraints that shape the possible roles and provides a playground in which to experience and enact these roles" (Schrier et al., 2018, p. 350). The world can be perceived as a platform where narratives arise, allowing individuals to engage and participate in their surroundings. In some RPGs, especially TTTRPGs, the designer and the players both practice in worldbuilding; designer in framing and fleshing out the world, while players discuss their characters' place in the world with the game master, helping in shaping the game world. In other cases, the game world is fleshed out to the detail, the storyline and the possible sequences are pre-planned, and the players act according to its diegetic framework.

Worldbuilding also involves constructing the storyworld which forms the "diegesis" (Genette, 1990). This world is the sensual world where the story takes place. The storyworld is ultimately interpreted by the players, however, it is the designer's duty to construct the stories that provide the setting, characters, events that shape the narrative, while making sure the world have its own logic and consistency (Schrier et al., 2018). For instance, in the CRPG Dragon Age: Origins (2009), magic is regulated by a faction called Templars, and the magic users are in constant conflict with them. Its game world reflects this story element through its structure. The existence of a magic academy that condemns magic users who cannot graduate to death or "tranquilization" so that they do not succumb to demon possession. This world pushes the player constantly to make decisions regarding the political and social conflicts between mages and Templars. Every element of the world and the game; its characters, settlements, weapons, spells, quests, character classes, and actions reflects, and respects this "reality". This is a crucial constitution for worldbuilding, that immerses players in the game world, enabling them to "willingly suspend their disbelief"

towards otherwise unbelievable places, characters, and times (Dowd et al., 2013, p. 21).

2.3.2.2. Rules

Rules are deemed essential in nearly all game definitions, with some positing that a game is defined by its rules. While there is no consensus that a game equates to its rules, there is significant agreement that rules are integral to games (Stenros and Montola, 2023, p. 3). Rules structure play. Bernard Suits (1978) argues that rules define both objectives and methods, specifying players' goals and permissible actions. These rules restrict players to using "less efficient" means to achieve their ends. Rules are closely related to mechanics, which are the means for interacting with the game world, constrained by the game rules (Sicart, 2008). Salen and Zimmerman (2004, p. 122-123) concur that rules limit player actions, describing them as explicit, unambiguous, shared, fixed, binding, and repeatable. They note that some games, like RPGs, question and violate these characteristics (Salen and Zimmerman, 2004, p. 125).

From a formal perspective, rules alone do not constitute the experience of a game (Salen and Zimmerman, 2004, p. 121). RPGs are essentially rulebooks composed of descriptions, restrictions, options, and procedures. Thus, a comprehensive approach is needed to understand rules in the context of RPGs. Jaakko Stenros and Markus Montola's The Rule Book: The Building Block of Games (2024), explores various categories of rules through constructionist ludology, which views games as “social institutions constituted by their rules.” The following showcases these rule categories and their association with TTRPGs and CRPGs:

Formal rules: They are foundational elements defining a game’s structure and boundaries, determining player interactions within the game world and with each other. In TTRPGs, formal rules encompass everything in the rulebooks, structuring possible player actions and constraints. Through rule-framed player decisions, a specific experience emerges in gameplay. A logical rule design approach aligns rules with the experiences a game’s theme promises (Hallford & Hallford 2001). For instance, Mörk Borg has rules for a “Misery” that befalls characters at dawn, determined by a dice roll, with the game ending on the 7th Misery, reflecting the “impending doom” theme (Nilsson and Nohr, 2020). In Fate, the system is setting-agnostic, with mechanics designed for varied settings and themes. Main player actions

in Fate are broadly categorized: Overcome, Create an Advantage, Attack, and Defend (Evil Hat Productions, 2013). The Game Master can craft diverse worlds, yet player abilities remain consistent per the game's design. Formal rules in CRPGs are technical implementations, differing fundamentally from traditional game rules. These rules are consistently enforced constraints, not open to interpretation. Players navigate within these constraints to overcome game challenges. Despite expansive, meticulously represented worlds, players cannot attempt anything they wish. In the Pathfinder CRPG series, adapted from Pathfinder TTRPG rules, interactions are constrained by design. Not every door can be opened, and PCs cannot harm NPCs protected by game code. Some spells can hit them, but they take no damage, rendering such actions inconsequential.

Internal Rules: Gameplay's subjective nature allows players to shape their experiences based on personal preferences or goals, even if these rules are not recognized or enforced by the game's formal structure. Such personal engagement and customization are evident in both TTRPGs and CRPGs, where players might follow specific character behaviours or decisions not dictated by formal rules to maintain narrative consistency or personal enjoyment. For instance, a player might choose to play a benevolent, rational character without receiving any formal penalties or rewards. This creation of personal rules in RPGs can stem from interpreting formal rules and the narrative world. RPGs, through their collaborative narrative, provide a unique perspective on constructing personal interpretations within shared worlds (Stenros and Montola, 2024, p. 70). This subjective interpretation, called diegesis (see Section 2.3.2.1), is built from the endogenous meaning of the game world (Stenros and Montola, 2024). While TTRPGs' formal rules allow open personal interpretations and internal world construction, CRPG player goals can be more limited by the game's design.

Social Rules: Social rules are the unwritten norms that guide player interactions within a game, emerging from a shared understanding of appropriate behaviour. These rules, varying across communities and cultures, are enforced through social pressure rather than game mechanics, making them flexible and context-dependent. Stenros and Montola highlight social rules related to TTRPG gameplay, genre, and story rules (Stenros and Montola, 2024, p. 90), which are implied by the game but interpreted by players. These rules arise from the consensus among players about the game's genre

and story, guiding their behaviour. For instance, a game with a serious, political tone discourages silly actions to maintain the intended experience. In contrast, genre and story rules in single-player CRPGs function as internal rules, as only one player interprets and acts within the game world.

External Regulation: External regulation encompasses societal rules and laws affecting gameplay beyond the game's internal rules, including legal restrictions and societal norms. These regulations highlight that games are influenced by broader social, legal, and cultural contexts, impacting design, play, and societal perception. Stenros and Montola discuss how consent, legal regulations, commercial control, and moral judgment shape and constrain gameplay. Participation in a game implies informed consent (Stenros and Montola, 2024, p. 117), establishing domains of meaning where players adhere to constitutional rules transforming ordinary meanings into those within the game's "magic circle" (see Section 2.1.3). In RPGs, players consent to formal rules to create shared narratives, also developing internal and social rules based on formal guidelines.

2.3.2.3. Players and Characters

The relationship between players and the fictional personas they inhabit in various forms of RPGs, such as tabletop, live-action role-play (larp), and digital role-playing games (CRPGs and MMORPGs) is a complex phenomenon (Bowman and Schrier, 2018). One key theme is the fluid nature of identity, where players alternate between their real selves and their characters, exploring different facets of their personality in a controlled, fictional environment. The concept of multiplicity highlights how the human mind can simultaneously manage multiple identities, allowing players to experiment with new versions of themselves without fully losing touch with reality (Turkle, 1995; Rehak, 2003). This process can foster a deeper understanding of self through character enactment, where players use their avatars or characters to practice social behaviours or explore aspects of their psyche, such as confidence, leadership, or empathy (Banks, 2015; Bowman, 2010).

Character creation and development in RPGs provide an opportunity for players to engage in identity experimentation (Bowman and Schrier, 2018). Depending on the type of game, this can range from selecting a character’s appearance in a digital environment to writing complex backstories in larps or tabletop RPGs. Some

characters may evolve through interaction with other players, ultimately gaining distinct personalities and motivations separate from the player's own identity (Bowman, 2010). Players often explore different types of identities, including idealized versions of themselves, oppositional figures, or even taboo personalities, which can challenge social norms or personal comfort zones. This spectrum of identity play allows players to both reflect on their real-world identity and practice new skills in a safe, fictional context (Bowman, 2010; Beltrán, 2013).

2.4. Serious Games, and Game-based learning

The term *serious games* is credited to Clark Abt (1987). The term rapidly became established in academic circles, despite the misleading and contradictory coupling of the words *serious* and *game* (Egenfeldt-Nielsen, Smith, and Tosca, 2024). In general, the term serious games is used to denote games built with goals beyond entertainment, although some authors make strong associations between this concept and game-based learning (the production and implementation of games for learning) (Sorensen and Meyer 2007).

Martens, Diener, and Malo (2008) argue that the existence of educational goals is insufficient to categorize a game as game-based training, which they prefer to use instead of the term serious games. They propose a conceptual model that places game-based training at the convergence of games, simulations, and learning, with each element contributing roughly equally. While this framework offers valuable insights for understanding serious games, its rigid categorization may be subject to criticism (Hiriart, 2019).

Similarly, it is equally difficult to differentiate between games that incorporate educational components and those that do not. Numerous scholars argue that learning is a fundamental aspect of all games, intrinsically connected to the gaming experience (Juul, 2005; Ritterfeld and Weber, 2006). To progress in a game, players must master its interactive systems and apply their newly gained knowledge and skills to overcome the challenges presented (see Cook's interaction loop in Section 2.2.1.2 for an examination on how players learn skills through gameplay). During this process, players engage in interactions that incorporate established learning principles, which are supported by research in cognitive science (Gee, 2004).

For this thesis project, I have established the convention to use game-based learning to refer to the concept and practice, and serious game or games for learning to refer to the game artifact regardless of medium. One term that is significant to discuss for the purposes of exclusion is gamification. The term emerged from the digital media industry and has gained widespread adoption since 2010 (Deterding et al., 2011). It aims to enhance engagement, motivation, and user activity outside of gaming contexts. Deterding et al. defines gamification as "the use of game design elements in non-game contexts" (2011, p. 10). Their approach towards gamification is based on the theory of play and games, resulting in a comparison of "playfulness" and "gamefulness". Through gameful design, their proposal for an alternative term for gamification, elements characteristic of games, such as levels, badges, and leaderboards, can be applied in contexts other than games. While this definition is very broad, they strive to narrow it down by declaring non-game contexts "*explicitly* intend to exclude is the use of game design elements *as part of designing a game*, since that would simply be game design, not "gamification" (Deterding et al., 2011, p. 12; emphasis by the authors).

The design of serious games is a complex undertaking, as these games are required to fulfil two apparently conflicting objectives: serious games should possess a similar level of appeal as commercial games designed solely for entertainment, while simultaneously providing players with a learning experience relating to educational domains beyond the game itself (Czauderna and Guardiola, 2019). Creating effective serious games requires the integration of two distinct fields: game design and instructional design, each with its own unique background and methodologies (Czauderna and Guardiola, 2019; Becker, 2011). To successfully develop serious games, it is essential to blend these two disciplines, essentially adopting a structured approach that combines both game and instructional design principles (see Buchanan, Wolanczyk and Zinghini, 2011).

Depending on the context, and content, the design of a serious game can change drastically. Context and content also inform the possible learning outcomes, which in turn makes the design process of game-based learning even more complex (Plass, Homer and Kinzer, 2015). A review of game-based learning in museum and cultural heritage context is important to ascertain what kind of design methodologies can be utilized to match with possible learning outcomes of such a context.

2.4.1. Museum and Cultural Heritage Context

There is a growing interest in play and games in museums (Kidd 2018). This growth is influenced by research on integrating play and learning in museums (Paliokas et al. 2016), co-creation and participation in museums (Wang and Nunes 2019), and the increasing tendency towards digitisation of museum collections (Parry 2007). There has been a high number of games developed and documented for museums (Paliokas et al. 2016) revealing multiple design challenges and opportunities.

Ćosović and Brkić, 2020 (2019) identified advantages and disadvantages of game-based learning in cultural heritage museums according to the research published by 2019. Through their review of literature, they conclude that even though a list of advantages and disadvantages can be made, they could not find a unified framework that could be used for the design of serious games in the cultural heritage domain. Wang and Nunes (2019) advocate that a museum can elevate their visitors' experience by adopting the following informal educational roles: promoting awareness, changing habits, and contextualizing visits. These educational roles need to be matched with the gameplay, purpose, and scope of the game (Djaouti el al. 2011). A more engaging learning experience can be achieved by allowing the visitor to discover the information and knowledge, do something with it, share it, and reflect on it (Wang and Nunes 2019).

Museums, as cultural and educational hubs, have evolved from mere historical archives to active learning environments (Stanković Elesini et al., 2023; Crowley et al., 2014). This transformation has led to a more socially engaged role, emphasizing the stories and contexts behind exhibits (Penrose, 2020). Visitors are now central to museums' operations, actively contributing to the content and bringing historical elements to life (Stanković Elesini et al., 2023). This shift has fostered experiential and informal learning, offering a more engaging, learner-focused experience than traditional education methods (Chiovatto, 2020). Werquim (2010) defines informal learning as spontaneous, motivational, and centered around the learner, contrasting with the structure of formal education (Nelson et al., 2020). In museums, this approach encourages visitors to move from passive cultural consumers to active cultural producers, integrating their prior knowledge and experiences (Wang and Nunes, 2019).

To enhance visitor experiences, museums are increasingly incorporating interactive technologies (Russo et al., 2009). These technologies, combined with physical museum collections, create enriching and contextually deep learning experiences (Van Winkle, 2014). The Contextual Model of Learning (Falk and Dierking, 2016) provides a framework for understanding museum learning, considering personal, socio-cultural, and physical contexts. It accounts for visitors' motivations, prior knowledge, social interactions, and the museum's physical environment. This model views the museum visit holistically, from the initial idea of visiting to recalling the experience long after (Falk and Dierking, 2016).

The literature on preserving tangible and intangible cultural heritage reveals a significant evolution in how heritage is defined and approached. Early efforts primarily focused on tangible heritage like monuments and sites, as exemplified by the Venice Charter of 1964 (ICOMOS, 1964) and UNESCO's 1972 convention (UNESCO, 1972). However, there has been a gradual recognition of intangible elements and social/cultural values, as reflected in the Burra Charter (1979-1999) and UNESCO's 2003 Convention for the Safeguarding of Intangible Cultural Heritage (UNESCO, 2003). This shift has led to a more holistic understanding of heritage, moving away from prescriptive lists towards recognizing heritage based on cultural significance and community values (Vecco, 2010).

The interconnectedness of tangible and intangible heritage has become increasingly apparent in recent years. Scholars argue that tangible heritage embodies intangible values and practices (Kirshenblatt-gimblett, 2004), while intangible heritage provides context and meaning for tangible objects (Ito, 2003). This realization has led to calls for more integrated approaches that document both tangible and intangible elements together (Carboni and De Luca, 2016). However, preserving intangible heritage presents unique challenges, including its vulnerability to social changes due to reliance on oral transmission, difficulties in applying traditional preservation methods to living practices (Bouchenaki, 2004), and the risk of losing context and embodied knowledge in digitization efforts (Alivizatou, 2019). The role of digital technologies in heritage preservation has grown significantly, with increasing use of multimedia, virtual/augmented reality for documentation and dissemination (Bekele et al., 2018). While digital preservation is seen as crucial, particularly for intangible heritage, it is still a developing field (Isa et al., 2018). Concerns have been raised about the potential

flattening of complex cultural practices in digital formats (Alivizatou, 2019). To ease such concerns, heritage must remain relevant and continuously recreated to survive. These developments reflect a broader shift towards process-centric rather than object-centric approaches (Kettula & Hyvönen, 2012), considering heritage as part of broader social and cultural systems, and emphasizing heritage as a dynamic, living phenomenon rather than static artifacts.

Cultural heritage museums play a crucial role in shaping and presenting cultural heritage (Eklund, 2020). The visitor's interaction with heritage content is influenced by various factors, including their own motivations and the museum's presentation of heritage (Wang and Nunes, 2019). This approach encourages visitors to engage deeply with heritage, fostering cultural heritage as an ongoing conversation. Interactive experiences with artifacts enhance learning and comprehension, leading to a more meaningful and enduring educational impact compared to traditional learning settings (de Rijcke and Beaulieu, 2011;(Guzin, R. and A., 2017). Overall, this shift towards interactive and informal learning in museums represents a significant advancement in how cultural heritage is experienced and understood.

Museums preserving and disseminating cultural heritage are frequently engaging with interactive media to enhance storytelling and knowledge transfer through experience (Dal Falco and Vassos, 2017). The research of Løvlie et al., 2021 (2021), De Kock and Gomez Maureira (2019), and Elesini et al. (2022) are in the form of documenting the design and development of museum games that reveal useful results. Elesini et al. (2022) found that stimulating elements of the mobile game motivated the visitor to actively participate in the personal experience with the museum environment.

De Kock and Gomez Maureira (2018) found that narrative and role-playing elements have high potential for contextualization of museum visits with successful evaluation results such as deepened knowledge on a certain culture. They acknowledge the problem of decontextualized artifacts in the museum, and the design goal of their game was to “promote an understanding of the everyday cultural context of artefacts” (De Kock and Gomez Maureira, 2018, p. 546). According to their evaluations, the game succeeds in many areas of serious game design, particularly in its use of role-playing, narrative, and social interaction to engage players and promote deeper learning. Its ability to contextualize museum artefacts through interactive storytelling is a clear

strength. However, the reliance on QR codes to advance the narrative and the game state is cumbersome, and a non-diegetic approach that can break the immersion for some players. While players can select distinct characters that provides different perspectives on the narrative, there are no tangible role-playing opportunities. Lastly, according to their report, participants felt like the artifacts had no role in the gameplay; the game was about solving the mystery rather than learning about the artefacts themselves (p. 553).

Lastly, Lovlie et al. report that digital interactions with physical artifacts need to be augmentations rather than distractions and designing novel ways to interact with physical artifacts through digital technology is a significant challenge to overcome (2021). In their article, Løvlie and colleagues, document the design of two games that deal with heritage content in the museum. Both tackle the challenge of critical play (see Flanagan, 2009) in museum context by providing visitors possibilities for reflecting on sensitive topics and expectations of museum as an institution (Løvlie et al., 2021, p. 2). By utilizing smartphone usage in the museum, the game, similar to De Kock and Gomez Maureira (2018), aim to link the digital experiences to physical artifacts. Rather than using QR codes, which are outliers in terms of the visual aesthetics of the museum artifacts, to prompt action in the game, they have used a platform called Artcodes to design their own codes that would reflect the material culture depicted in the game. Twitto, the first game documented in the article, allows players to design their own propaganda material with custom content (Løvlie et al., 2021). This way players go into a mindset of learning by doing, experience creating propaganda material, and have a deeper understanding on the cultural heritage content.

2.4.2. Game-based Learning Methodologies

Game-based learning methodologies utilize the principles of game design and play to create engaging and effective learning experiences. By incorporating elements such as interactivity, storytelling, and problem-solving, these methodologies aim to enhance motivation, contextualization, and active participation in learning. This section explores the theoretical foundation, practical applications, and potential challenges of game-based learning, particularly within the context of cultural heritage and museum experiences.

Mortara et al. (2014) highlight the versatility of serious games in transmitting cultural content, addressing various educational objectives regarding cultural heritage learning; cultural awareness, historical reconstruction, artistic/archaeological heritage awareness and architectural/natural heritage awareness. They argue that serious games offer an innovative method to make cultural knowledge accessible, allowing learners to interact with and explore remote or fragile artifacts and sites in ways traditional methods cannot achieve. Their taxonomy above provides categories that acknowledge diversity of heritage content. However, some of the definitions seems too narrow or too broad, disregarding the potential of their own methods for naming the categories. Another contribution of the authors is association of game genres with specific cultural content (pp. 320-322). Finally, according to their research, affective domain from Bloom's taxonomy of educational objectives (Bloom et al., 1964; Anderson and Krathwohl, 2001) is the most suitable with cultural heritage, conveying that empathy with characters, and the beaty and values of nature are persuasive elements (Mortara et al., 2014, p. 324). However, they do not provide empirical evidence towards such claim.

Adapting or devising an encompassing methodology to drive the design process of serious games is crucial. Tsita and Satratzemi present an early design process of a cultural heritage serious game with the purpose of enhancing understanding of cultural heritage (2019). Knowledge on cultural heritage subject that is to be disseminated through the game is filtered with storytelling to create possible in-game scenarios. These scenarios and the virtual world are then integrated with game mechanics depending on the genre, become game activities such as quests, levels, missions, and rewards. The structure of these activities, as well as their learning content, are informed by learning theories. The authors' approach also involves an AI powered evaluation method (Tsita and Satratzemi, 2019, pp. 442-443). This methodology is a very-well made overview of the design process for a cultural heritage serious game that focuses on how heritage content becomes gameplay elements. However, according to the authors, game mechanics are treated as something to integrate so that the product becomes a game rather than an interactive experience (Tsita and Satratzemi, 2019, p. 442). Through their description, the outcome seems closer to a gamification experience than a full-fledged serious game; also evident in their chosen game activities that are limited with missions, level, rewards, and such. This methodology can be adopted and

adapted into a process guideline by treating game mechanics and gameplay activities a central element, informed by learning content and learning theories.

Erik Champion proposes the culturally significant presence theory, built on cultural presence term used to explain and evaluate cultural learning in virtual heritage projects (2020). He defined culturally significant presence as “the awareness that one is in the presence of a culturally significant framework of values and meanings, expressed through artifacts, site, behaviour, shared and protected activities, or through the transmitted and preserved expressions of language” (2020, p. 10). The focus is on the meaningful representation of cultural artifacts, practices, and values within a coherent and identifiable cultural framework that helps players understand not just the "what" of a culture, but the "why" behind it. Culturally significant presence requires three components: culturally significant artifacts and practices; an overarching framework of a singular, identifiable cultural viewpoint; and awareness by the participant of both the culturally significant and the overarching cultural framework and perspective (p. 1). From a game design perspective, Champion suggests that core gameplay can simulate day-to-day activities, and game mechanics can be designed to challenge the assumptions and unconscious behaviours of players regarding cultural heritage understanding (p. 21).

Another contribution to designing serious games for cultural heritage from Champion is the design process he devised to help designers and heritage experts. The process is outlined as:

1. Identify cultural, historical, or archaeological facts, artifacts, or interpretations that are significant, transformative, or hidden, especially those central to the cultural heritage conveyed in the game.
2. The design process must consider the game's intended location and usage, whether in a museum, classroom, or home. The setting affects design goals, objectives, and target audience.
3. The game must have a core challenge that engages players. The challenge should be aligned with the cultural context of the game and should be something that helps advance the player’s understanding of the culture.
4. The next step is to define what the player typically does in the game. These actions should be directly related to the cultural or historical theme of the game.

5. Designers need to think about how the game progresses and what mechanics drive that progression. In a game focused on cultural significance, the mechanics should help players understand the cultural context.

6. A well-designed game should progressively increase in complexity, presenting new challenges to maintain player interest. As players advance, their acquired cultural knowledge should become essential for success, promoting deeper engagement and reflection on the cultural content.

7. The game should provide rewards and feedback that are connected to the cultural or historical context. Rewards could be new cultural insights, artifacts, or knowledge, while feedback could help players understand the significance of their actions within the cultural framework. This ties the player's progress to the educational and cultural goals of the game.

8. The game's end state should provide players with a moment of reflection, where they can consider what they've learned about the culture or historical period. The end of the game might provoke thoughts or feelings related to the cultural experience they've undergone, helping solidify the educational objectives of the game (pp. 3-4).

This process is similar to interaction and gameplay loops reviewed in Section 2.2.1.2., with added consideration for cultural heritage contexts. Player's construction and update of mental models can be considered parallel to player's understanding of cultural heritage. Cultural heritage learning can be achieved intrinsically through the integration of gameplay loops with carefully selected heritage content that is reflected on game mechanics and elements.

This proposed intrinsic structure of a serious game above, is the focal point of two design approaches from David Schaller (2014), and Laurance Hanes and Robert Stone (2018). Schaller proposes two approaches to serious game design in museum context: extrinsic gameplay, and intrinsic gameplay. Extrinsic gameplay refers to a situation where the game is populated with museum content, without integrating with game attributes. Basically, separating gameplay and content, formal elements of the game, such as rules and mechanics, "operates on a different plane than the content" (Schaller, 2014, p. 3). An example would be a matching game that requires players to memorize the placement of game tokens, populated with the images of specific content from the museum. Characteristics of the content represented in the game does not matter or

effect the gameplay in any way. Intrinsic gameplay on the other hand "marries gameplay and content" (p. 3). The inherent attributes of the content from the museum, such as tangible and intangible aspects of an artifact, are integrated into the gameplay. Players who are engaging with the game are required to learn and understand these attributes, to make meaningful decisions through the game.

Schaller acknowledges the advantages and disadvantages of both approaches to gameplay. Extrinsic gameplay is easier to design, and implement, and cost-effective to produce. It is more flexible as the gameplay is generic, it can be adapted to other content very quickly. This aspect also results in a less risk as it relies of familiar and proven gameplay formats. However, it also carries the risk of play being disconnected from the content, as they might focus on the extrinsic motivations such as points and leaderboards. Intrinsic gameplay offers the advantage of deeply integrating content with the game mechanics, ensuring players engage meaningfully with the material. This approach is particularly beneficial in educational contexts, as it fosters a deeper cognitive connection between the content and player actions, making learning an active part of the gameplay. Players are required to make thoughtful decisions based on the content, leading to a more immersive experience: "a game which challenges the player to understand the content, not just the gameplay, in order to succeed" (Schaller, 2014, p. 6). Additionally, intrinsic gameplay can create unique and memorable experiences, as the gameplay is designed specifically around the content, making the game feel more purposeful and engaging.

However, intrinsic gameplay comes with several challenges. It is often more expensive and time-consuming to develop due to the need for tailored mechanics that align with the content. This complexity can result in a steeper learning curve for players, which may hinder engagement, especially for casual audiences. There is also the risk that if the integration between content and gameplay is not smooth, the game may feel forced or less enjoyable. Overall, intrinsic gameplay approach provides more possibilities in terms of integration of museum content. Specifically, the intangible heritage content that is hidden or not explicit enough in a museum, needs special care to bring it forward for the visitors to contextualize and understand their significance.

Laurance Hanes and Robert Stone proposes a model that utilizes the intrinsic gameplay approach in serious game for heritage (2017; 2018). They outline a comprehensive

framework for manifesting heritage content in both serious and commercial video games, particularly in the context of educational history and heritage games (Figure 7). The proposal covers a wide range of aspects. Potential learning outcomes involve both intended learning outcomes, that are explicitly designed by the creators of the game or interactive experience, and unintended learning outcomes, that refer to knowledge or skills that players acquire incidentally while engaging with the content and unintended learning outcomes. These outcomes are designed to address cognitive, affective, psychomotor, and meaning-making capabilities the player might develop through gameplay.

Instructional content refers to the specific heritage and historical information that is embedded in a game; it is the central to the framework, as it is the foundation for what players learn or experience during their interaction with the game. The framework breaks instructional content down into two major dimensions: heritage-historical and tangible-intangible-natural-analytical, each helping to categorize and organize the type of information presented. One of the strengths of this framework is its inclusion of different instructional content. In the use case of this project, analytical heritage could be focused on to provide archaeological knowledge to players in an intrinsic way, that is combined with tangible and intangible heritage knowledge implemented through game mechanics diegetically. Focus refers to how the instructional content is treated in the game, whether they are included or omitted, which specific heritage elements are emphasized, and if some gameplay aspects need to be falsified to improve engagement.

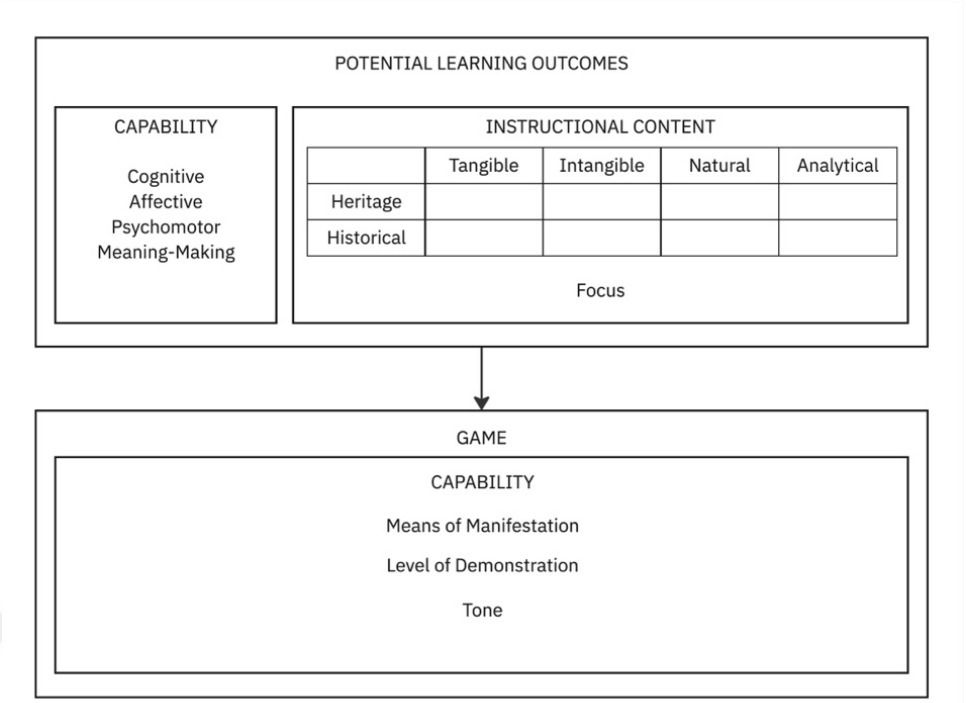


Figure 7. Heritage Manifestation Model by Hanes and Stone. Redrawn by the author of the thesis.

The heritage knowledge must be manifested in the game, informed by the potential learning outcomes. These are low-level design decisions, meaning they are the formal and dramatic elements (see Salen and Zimmerman, 2004) that the player interacts with. The authors propose three characteristics for manifestation: means of manifestation, level of demonstration and tone. Four means of manifestation are identified: verbal, graphical, aural, and mechanical. These are not exhaustive as they are dependent on the capabilities being addressed, the focus on the types of instructional content the game is manifesting, and the designer's intuition and design decisions. Verbal refers to textual or speech presentation of heritage. These can be narrations, or dialogue between characters, or plain informative screens. Means of graphical manifestation could be any way to visually represent the heritage. Aural is if the heritage is represented through sound and music, and how. Mechanical is the most peculiar means of manifestation and relates the most with the intrinsic gameplay approach (see Schaller, 2014). Inherent characteristics of the heritage content needs to be carefully analysed and turned into game mechanics and elements that suits with game's genre, context of use, capabilities addressed, and the instructional content. Level of demonstration refers to how literally or abstractly the heritage content is presented.

Demonstrative (literal, realistic) and abstracted (symbolic and metaphorical) are two ways they have identified, even though there might be levels in the middle or out of this spectrum they describe. Finally, tone refers to the level of affect used in the manifestation of the content. This characteristic is the least developed and can only be understood through their analysis of a commercial video game using the framework.

Hanes and Stone do not showcase how this framework can be applied in the design of a serious game for cultural heritage. I have utilised this approach in the conceptualisation of Neolithic Quest through a provisional scenario and a limited number of artifacts in a published article (see Türkmen and Savasta, 2024). The framework provides one of the pillars which the implementation method stands on and I have explored its application in Section 4.3.

One final methodology that I would like to review from Plass, Homer, and Kinzer (2015). They present a comprehensive framework for understanding how games can serve as powerful tools for learning by integrating multiple perspectives—cognitive, motivational, affective, and sociocultural. The authors argue that games are unique learning environments, requiring a holistic approach to design and research that considers these diverse foundations. They emphasize that game-based learning is distinct because it promotes engagement through structured gameplay while encouraging cognitive processing, emotional involvement, and social interaction. They propose that game-based learning can be explained through various existing models of learning, such as behaviourist, cognitivist, and constructivist approaches, depending on the game design. The authors also propose the idea of a loop with three elements: a challenge, a response, and feedback (like Cook's and Seller's interactive loops; see Section 2.2.1.2. for a review). This loop is at the heart of the game-based learning process, with feedback either generating new challenges or prompting players to provide different responses. The way these elements are designed reflects the underlying learning theory used to inform the game. For example, in behaviourist games, challenges are presented with a limited set of responses and corrective feedback, while constructivist games might allow players to create their own challenges and receive feedback through peer interaction (pp. 261-262). Game design features are at the heart of the game-based learning experience, rather than learning theories or content wrapped around gamification elements.

CHAPTER 3: METHODOLOGY

The research and design process were framed as an action research approach. It aims to contribute to design research paradigms, and game design practice in the context of museum experience and learning. The project also collaborates with museum practitioners to better understand the needs of the context of use, which is the Izmir Archaeology and Ethnography Museum. This collaboration is a key requirement for design projects that aims to investigate and contribute to multiple disciplines. Finally, the action research cycle of planning, acting, observing and reflecting, is very well fitting with the iterative nature of design, especially game design practice. Underneath the frame of action research, three well established design research strategies will inform the distinct, but not so disparate, phases of research.

3.1. Research Philosophy

This project stands at the intersection of multiple disciplines; game design, museum learning, roleplaying games, and design research. Investigation of the possible relationships between these disciplines through a practice-based research strategy calls for a review of design research philosophies and approaches to facilitate generation of applicable design knowledge in the relevant fields.

This study applies a constructivist research philosophy — the research questions and knowledge emerge through the design process of the resulting artifact, coupling subjective thought with construction of an object it is thought about (Rodriguez Ramirez, 2009). It stands at a viewpoint that acknowledges the complexity and messiness of video games (Bogost, 2009), and unpredictability/uncertainty of design situations (Schön, 1983). The aim is to generate a deeper and informed understanding of the design process and the resulting artefact (Frayling, 1993).

The choice of the practice-based research approach was made because of the exploratory nature of this study, in which there is no established problem with a single, absolute solution. Instead, the aim is to investigate the ways in which game design can interact with museum learning and experience, the design knowledge that can emerge, and how it can be applied to future research and practice. As a result, the epistemological foundations established by Schön (1983, 1992) and Cross (1999, 2001) and the constructivist perspectives on design practice (Rodriguez Ramirez,

2009) provide a similar foundation for the research and design process, in which they are intertwined, informing, and enhancing each other.

Practice-based research is characterized by the deliberate decision to initiate design research via open-ended research objectives or inquiries, rather than a hypothesis to be examined. This method of practice is characterized as "problem framing rather than problem solving" (Schön, 1983). This form of practice requires reflection, which leads to an emergence of understanding through the design process. The reflective conversation between the designer and the materials at hand (Schön, 1992) offers ways of framing the problem that are contingent upon the context and circumstances. The problem at hand is dependent on the domain in which the designer chooses to explore or experiment on. Thus, the potential solutions constructed rely on the designer's tacit knowledge and how they view the initial problem. Schön explains this phenomenon as the reflective conversation with the materials of a design situation, in which the designer "invents the moves by which he/she attempts to find solutions" (1992, p. 11).

Thus, design is not a linear process; it is an experimentation and exploration of different ways in a design space (Kruger and Cross, 2006). It is this reflective practitioner approach that is the most significant factor in design's ability to explore solutions for the so-called wicked problems (Rittel and Weber, 1973) through conversational exploration. This approach is sometimes ambiguously referred to as a designerly way of thinking, acting, and knowing (Cross, 2001; Buxton, 2007; Moggridge, 2007). Designerly ways of knowing refers to the unique ways in which designers acquire and apply knowledge in their practice. It is a form of knowledge that is distinct from scientific or analytical knowledge. Designerly ways of knowing involve intuitive, creative, and reflective processes that designers use to understand and solve complex design problems. This type of knowledge is based on the designer's experience, skills, and understanding of the context in which they are working. It is characterized by a focus on the creation and manipulation of artifacts, as well as the ability to think and act in a holistic and interdisciplinary manner. Designerly ways of knowing are essential for designers to navigate the uncertainties, ambiguities, and constraints inherent in the design process (Cross, 2011).

3.1.1. Question of Design Knowledge Validation

Building upon the foundation laid by Schön and Cross, it is logical to "position practice-based research with respect to what is considered valid knowledge and then what research methods best suit the acquisition or production of such knowledge." (Coulton and Hook, 2017). Schön (1983) challenged the positivist outlook of the design science movement, which set out to base design on solving well-formed problems, and instead offered a constructivist approach. An approach that situates knowledge the designer possesses and cultivates as "practice implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict." (Schön 1983, as cited in Cross, 2001, p. 4). Cross advocates that design is a discipline; fundamental principle of this discipline is that there are distinct forms of knowledge that are unique to the perception and proficiency of a designer, regardless of the diverse professional branches of design practice (Cross, 2001). The forms of design knowledge according to Cross are:

- Inherent in the activity of designing
- Inherent in the artifacts of the artificial world
- Inherent in the processes of manufacturing the artefacts (2001, p. 5)

Thus, being simultaneously as a researcher and a designer, the knowledge that I seek to gain and contribute emerges through the act of designing, the analysis of design artifacts, and the design process, reflection, and iteration. The knowledge that can be produced, intended or otherwise, through the actions of a designer is the result of investigation made by the designer themselves. The body of knowledge the designer imparts on the design activity results in a designed artifact that carries the qualities of the designer's insights. The reflection they make on that artifact through the same body of knowledge produces a knowledge that is an interpretation of the previous design iteration. As mentioned previously, is the knowledge produced through the subjective insights of the designer a valid knowledge?

Rodriguez Ramirez advocates that by adopting a Constructivist research philosophy, a researcher can eliminate the possibility of a "critical deliberation" of the subjective knowledge produced through design (2009, p. 6). For the author, this epistemological question of producing valid knowledge through the act of designing and reflection emerges from the duality of motivations; a designer who wants to design, and a

researcher who wants to know more about the world in the same mind. He turns to phenomenology to argue that the subjective thought and the intention of the designer residing in the object of thought cannot be separated, even though they are different entities (Rodriguez Ramirez, 2009). Then makes a connection through the constructivist view, which defends this coupling of subjective thought and object of that. Constructivism focuses on the "meaning-making activity of the individual mine" (Schwandt, 1994, as cited in Rodriguez Ramirez, 2009, p. 6). This view acknowledges the worldview of the designer/research as valid as any other person. To put it in another way, constructivism in the context of design practice acknowledges the cultural backgrounds and motivations of the research is as important as the object data gathered (Coulton and Hook, 2017; Rodriguez Ramirez, 2009). While Ramirez's discussion on design and epistemology is significant, his main argument is to ascertain the epistemology of research through design methodology. At the end of the day through the involvement of different philosophical views and research methods from other disciplines, Ramirez concludes that research through design can produce valid knowledge if the designer states their motivations clearly, describe design decisions clearly, involve stakeholders, experts, users, or other designers in the process, and analyse produced designs and document the findings clearly (2009, p. 12).

This project adheres to the recommendations of Cross for concentrating on building "designerly ways of knowing, thinking and acting" by drawing upon the traditions of other research cultures when appropriate (Cross, 2001, p. 5), which Ramirez did by involving post-modernist and constructivist epistemology to address research through design method's validity. Thus, this project employed practice-based research methodology, informed by a holistic action research strategy and Frayling's design research approaches.

3.2. Research Strategy

Through the establishment of an ongoing dialogue between practice and theory, this research project aims to explore, reflect, and evaluate the design of computer role-playing games as instruments for enriching museum experiences and learning through cultural heritage manifestation. It can be identified as subjective and interpretive due to its exploratory nature, considering the involvement of the researcher as a participant with personal values and existing experience in design discipline, not as an independent agent extracting data solely through analysis and observation.

Since the project aims to examine the design possibilities at the intersection of multiple disciplines, it aims to obtain question guidelines and design outputs through open-ended research objectives. The design spaces at the intersection of these disciplines will be explored through an iterative and reflective design process that aims to generate prototypes, test them, and generate research questions as a result of these tests. Instead of creating a research strategy that seeks a positivist and quantifiable output, due to the close relationship of game and museum contexts with human beings and culture, the project embraces the messiness of games in particular and treat the relationship between games and museums as a design situation.

The motivation for the project lies in the curiosity of situating a certain game genre that has inherently complex qualities in an informal cultural setting and exploring the dynamics of possible contextual interactions. As mentioned above (see Section 3.1), RPGs have a certain quality in terms of involving a diegetic framework that depicts a world and enables players to take roles in those worlds. For the purpose of designing a game that belongs to a particular culture and expresses a certain modality, while situating the game in an informal setting, the design process needs to be systemically structured.

To understand and explore the relationships between the disciplines of game design, museum experience and game-based learning, the researcher must fulfil both observer and designer roles in this study as these two forms of engagement with the social contexts in which the research takes place are interdependent and reinforce each other. (Hiriart, 2019). For the reasons stated above, a combination of research strategies is selected to address the research aims. Action-research method is selected to provide a general structure and frame to the research endeavor. Design research methods that have been developed and discussed over the years by design practitioners and researchers such as Frayling (1993), Archer (1995), Jonas (2007), Zimmerman et al., (2007), and Gaver (2012). In the following sections, these research strategies are investigated, and connections are made with the research aims in the light of their opportunities and qualities.

3.2.1. Action Research and Design Practice

Action research is a research method that involves active participation and collaboration between researchers and practitioners to address real-world problems

and improve practice (Swann, 2002). It is suited for studying change processes in social contexts (Blichfeld & Anderson, 2006). McNiff (2010, p. 5) explains:

> *"Action research is about two things: action (what you do) and research (how you learn about and explain what you do). The action aspect of action research is about improving practice. The research aspect is about creating knowledge about practice. The knowledge created is your knowledge of your practice."*

This research project aims to elevate and improve the practice of the researcher and the designer. While in the process of practicing, in this case the act of designing, it also aims to look for opportunities and explore them for creating knowledge; design knowledge that ultimately improves design in the context and field that is under investigation. Thus, action research is suitable for exploring the design space in the context of enriching museum experience and learning, as the research seeks to create applicable knowledge in designing games for museum settings.

Action research in creative disciplinary practices may be linked to the approach known as practice as research (Barret & Bolt, 2010). This form of inquiry has gradually gained acceptance in academia, despite ongoing confusion and inconsistencies regarding its epistemological assumptions, logical outcomes, methods of study, and forms of presentation (Hiriart, 2019). Cal Swann suggest that action research and the action of designing are very close (Swann, 2002, p. 56). The author even draws attention to the similarities between the outline of established design process and description of action research cycle (Zuber-Skerritt, 1992);" The design process is research process." (Swann, 2002, p. 55).

While action research is utilized as a research approach that frames the project, design research methods that have been developed and discussed over the years are investigated to guide the design process at a low-level, research about design, research for design, and research through design. Over the years different authors and practitioners provided descriptions and critiques on this subject, in various contexts and design fields.

As Frayling (1993) explains, when considering research within the realm of art and design, it is important to differentiate between two types of research: *Research* with big "R" represents the production of new knowledge, while *research* with a small "r" involves the utilization of existing knowledge in a design activity (emphasis added by the author of the thesis for adding distinction between two concepts with the purpose of re-using them throughout the text). This provides researchers with a structure to discuss and differentiate between the intent and outcomes of their activities. As Frayling (1993) points out, common stereotypes of artists, designers, and scientists often suggest a clear separation between these activities, even though they are actually deeply interconnected; "Research is a practice, writing is a practice, doing science is a practice, doing design is a practice, making art is a practice, doing science is a practice, doing design is a practice, making art is a practice". While there is a common ground between these practices, there are also idiosyncrasies. Research into art and design is about historical, aesthetic, or perceptual research which goes into researching into "a variety of theoretical perspectives on art and design". (Frayling, 1993, p. 5). Research through art and design can be materials research, development work, and action research. Research for art and design, which Frayling disregards as small "r" research, is about research that the end product is an artifact "where the thinking is… embodied in the artifact" and "gathering of reference materials" (Stenros and Montola, 2024).

For Bruce Archer, research activity is "a systematic enquiry whose goal is communicable knowledge." (1995, p. 10). He sets out to distinguish the relationships between different practice and research activities, and deliberately uses practice to describe research in the context of practitioner action. Research about practice, similar to Frayling, can be about analysis of art or design activities, history, materials, processes, and methodologies. Research for the purposes of practice is conducted according to the principles of its field to investigate a practitioner activity to contribute to said activity. Archer expresses that "when research activity is carried out through the medium of practitioner activity that the case becomes interesting." (1995, p. 11). He calls such explorations as action research and defines it as "systematic enquiry conducted through the medium of practical action; calculated to devise or test new, or newly imported, information, ideas, forms or procedures and generate communicable knowledge" (Archer, 1995). This kind of research, research through practitioner action, even though being subjective and situations-specific, it can act on the real world

with all of its complexity and can advance practice and provide material for further research if the research is methodologically sound, the qualifications are clearly stated and the record is complete". (Archer, 1995, p. 12).

Frankel and Racine (2010) authors a literature review on design strategies offers a range of perspectives on design research and provides a taxonomy aimed at reducing the confusion. They view the design strategies of research for design, research about design, and research through design have a triadic relationship that is based on informing each other. Their synthesis of the literature review is close to the views of Frayling and Archer, but unlike Archer they associate research for design with action research. According to Archer, research through design is a design research strategy more in line with the aims and structure of action research. Nevertheless, their research is highly instrumental for understanding different perspectives of design.

Research through design is an approach that gives more importance to the construction of knowledge through practical engagement in the activity of designing. This is similar to the idea of Action Research (Rodriguez Ramirez, 2009). I believe with a suitable research method and through established theoretical perspective research about design and research for design can also produce *Research,* contrary to what Frayling (1993) expressed. Thus, this project utilizes all design research approaches during the research and design process towards various means. However, the main concern is research through design which scrutinizes the design activity in the hopes of producing applicable design knowledge for the setting and context in question. The communicable knowledge this project aims to present is not the knowledge that needs to be repeated or copied exactly (Cross, 2007), but a knowledge that a design practitioner can utilize through their own field, with a similar context, so that the knowledge contributes to opening up new design spaces that can be explored further. Below is a synthesis of the views from different sources of design strategies.

Research into/about/of design (RaD): Study of design established design artifacts, theories, or models to determine their characteristics, commonalities, and underlying principles. The outcome of this strategy can be conclusions to be applied to further studies for the purpose of designing artifacts. It can be considered as a precursor to research for design, and is somewhat a broad strategy compared to the other two design research strategies.

Research for design (RfD): Study of design principles and methods with the purpose of aiding further design. This form of study could be seen as research to enable design (Frankel and Racine, 2010). It provides information, implications, and data that designers can apply to achieve an end-result in their design projects. It includes prescriptive research methods for specific and feasible design solutions. This approach can be considered a precursor to research through design, and it is narrower scope than research about design.

Research through design (RtD): Research through design is an approach to scientific inquiry that takes advantage of the unique insights gained through design practice to provide a better understanding of complex and future-oriented issues in the design field. RtD is embedded in the design process and is concerned with informing a research question while also being concerned with the end product of the design. RtD leverages design's capacity as a reflective practice, whereby it continually reconsiders and reframes problematic circumstances by means of creating and evaluating artifacts that serve as proposed solutions. By bridging the gap between theory and practice, RtD enables designers to contribute to both academic knowledge and practical applications in their field.

A significant outcome of these reviews would be that even though these strategies or categories may seem disparate and comprehensively defined, all in all they are approaches and guidelines for conducting systemic design research. Next section deals with establishing research through design methodology in game design practice.

3.2.2. Design Research through Game Design Practice

As established in the previous sections, RtD is conducted specifically through the act of design. It is a practice-based research strategy to embed the theoretical framework and design principles that has been established for the research project, possibly through research about and research for design phases, into a design artifact and puts it into practice. Godin and Zahedi suggest that RtD can potentially contribute to areas of design epistemology (study of designerly ways of knowing), design praxiology (study of the practices and processes of design), and design phenomenology (study of the form and configuration of artifacts) (2014).

As mentioned before, design practice is a domain that seeks to address complex challenges (Schön, 1983), which can also be seen as “messy” real world situations.

According to John Law (2007), messiness makes up a large portion of the world we inhabit, cleaning the mess for research purposes puts the said research in a lab, eliminates the possible iterative redefining of the problem the "mess" created in the first place. Coulton and Hook suggests that games are also designed to be played in the real world and thus a practice-based research approach is well-equipped for game design research (2018). Ian Bogost also embraces the messiness of videogames and suggest that we should not be tidying up this mess (2009). Whether a designer agrees with Bogost or not, it is important to note that videogames are played in complex societal and contextual situations (Malaby, 2007), and at the same time, they are complex artifacts. The design process contains a constant uncertainty, which results from tackling messy real-world situations or wicked problems. Cross explains the uncertainty of design activity through the following excerpt:

> *"The uncertainty of design is both the frustration and the joy that designers get from their activity; they have learned to live with the fact that design is ambiguous. Designers will generate early tentative solutions, but also leave many options open for as long as possible; they are prepared to regard solution concepts as necessary, but imprecise and often inconclusive*." (Cross 2006, p 33)

Drawing from its creative nature, design is not a linear process that moves from point A to point B, but rather an iterative one where designers repeatedly move forward and backward, exploring various pathways within a design space (Kruger and Cross, 2006). According to Schön (1992), the "seeing-moving-seeing" pattern allows designers to recognize more in the outcomes of their moves than they initially anticipated or described. This is because the created artifact provides designers with new knowledge that they did not possess before its creation. This knowledge is gained through the act of reflection, which involves looking back on the design result in relation to the initial configuration (Schön, 1983; 1992).

Thus, design is an exploration of uncertainty, experimentation towards framing problems and possible solutions (Quinten et al., 2017). To help designers with the process of exploration, prototypes can be employed. According to Lim, Stolterman,

and Tenenberg (2008, p.7:2), prototypes are defined as “the means by which designers organically and evolutionarily learn, discover, generate, and refine designs.” Prototypes can be thought of as low-fidelity artifacts that are used to investigate specific aspects of the design space while temporarily setting aside other aspects. Lim, Stolterman and Tenenberg (2008) argue that prototypes are often regarded as means to stimulate the generation of design solutions. Here the prototypes can be seen as sketches that allow reflection on, and reconfiguration of design materials (Agustin, et al., 2007). Sketches offer a range of possibilities for prototyping, as various materials can generate different ideas based on their properties (Lim, Stolterman and Tenenberg, 2008). Buxton's emphasis on the main component of sketching becomes a prerequisite for prototyping, where the ambiguity of materials (Buxton, 2007) is utilised to discover opportunities and problems not previously considered. Thus, in design research, prototypes serve as a catalyst for inspiration during the exploration phase.

Design strategies mentioned in Section 3.3. are utilized throughout the project. They are not subsequent phases in the research but approaches and ways of thinking and acting. They inform each other in in various steps in the research and give structure to the design process.

3.2.3. Research Aims

The project was launched with open-ended research aims.

- To employ research through design methodology to design a role-playing game (RPG) for the exploration of cultural knowledge.
- To investigate the possibilities of engagement and learning in role-playing games to enhance museum experience.
- To evaluate a set of existing frameworks for the design of video games for cultural heritage.
- To extend the concept of "magic circle" to elaborate on meaningful play in museum context.

Through those aims, research questions were generated through interpretation and reflection of the design process. Research through design methodology (RtD) provides opportunities to produce knowledge not only for further design research, but also to contribute to the disciplines and values embedded in the design artifact. RtD method

was specifically chosen as the main approach to investigate the implications of theorical principles on game design practice. For this project, role-playing games (RPGs) and their possible role in exploration of cultural knowledge is the design situation in question. In this respect, relevant literature for RPGs, game-based learning in museums, and game-based learning models were reviewed. Also, opportunities of RtD methodology in game design practice were investigated.

3.2.4. Design Explorations

The aim of design explorations is to create experimental prototypes to probe into the possibilities of RPGs in a museum setting. I have broken up the process into three phases that are not exclusively sequential, reflecting the iterative nature of design practice. Inquiry deals with finding out the possible learning outcomes for the game, educational roles of the museum, and establishing design goals. Investigation documents analysis of RPGs through game design patterns, and gameplay and interaction loop approaches. Finding characteristic and defining traits for a specific game genre through established perspectives provided a robust way to implement them in a serious game. Finally, Implementation documents a thorough synthesis of all the knowledge and materials gathered. Key concepts from the reviewed methodologies are utilized as guidelines towards a final prototype. The design process has been divided into three levels of abstractions: high, mid, and low. In Figure 8 the flow of the phases of design explorations and how Inquiry and Investigation informs implementation. A detailed explanation of the abstractions was explored in Chapter 5.

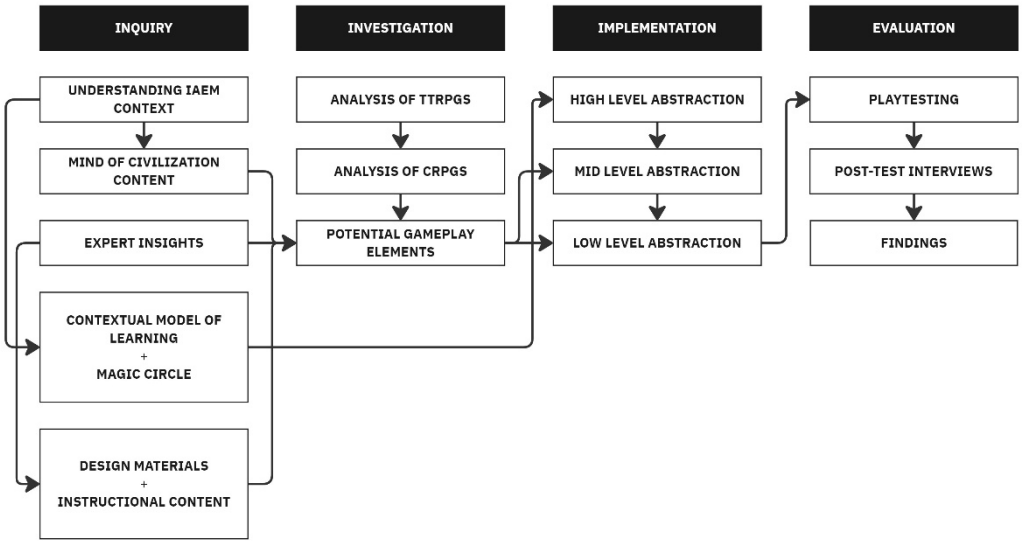


Figure 8. Diagram of the design explorations flow.

Design explorations, as its name suggest, were carried out with a sense of curiosity towards the knowledge embedded in the design. The design situation is highly contextual and complex. Rather than seeing the current situation as a problem, the explorations strive to do research on design artefacts that reside in similar contexts, try to understand them, and learn from them. Then the design materials are ascertained by establishing a mindset of doing research for design activity. As the design explorations and the process become hands-on, new research opportunities are explored through the design activity.

3.2.5. Playtesting and Analysis

Playtesting is a critical process in game design and development, used to evaluate whether a game meets design goals and provides an engaging player experience. It involves observing player behaviours, gathering feedback, and identifying issues for improvement. Research emphasizes its importance in shaping player experience goals, addressing design issues, and ensuring iterative improvement (Choi et al., 2016). Playtesting is an important part of the iterative design process, playcentric game design process as Fullerton calls it (2019). For Fullerton, playcentric design process is iterative, with constant testing, evaluating, and revising. The purpose of playtesting Neolithic Quest is to verify if design decisions reflect the intended gameplay experience. During design explorations, informal testing by designers is common (Quinten et al., 2013). However, to fully understand the impact of game design decisions, formal playtesting with participants unfamiliar with the process is essential (Fullerton, 2019).

The playtest sessions comprised two phases. Initially, participants played a prototype of Neolithic Quest on the same Android smartphone using the Figma prototyping application to ensure uniform visual design. The phone screen was recorded during gameplay to document play, and participants were asked to verbalize their thoughts using the "think-aloud protocol" for insights into their understanding and experience (Knoll, 2018). This protocol, a usability tool, allows verbalization of thoughts, feelings, and intentions, providing qualitative insights into player cognition and decision-making, focusing on improving game design, usability, and player experience while identifying gameplay issues, interface challenges, and emotional engagement. Although real-time observation or post-test analysis reveals player actions, understanding cognitive processes and emotions can be challenging. The think-aloud

protocol helps researchers comprehend player thoughts, despite potentially disrupting natural play behaviours.

The second phase involved a post-test interview immediately after gameplay, using semi-structured questions. This flexible qualitative method combines pre-determined questions with the exploration of emergent themes, ideal for gathering in-depth data (Edwards and Holland, 2013). It maintains consistency across participants while adapting to their unique perspectives, offering a richer understanding (Galletta, 2013). Since player experience is subjective, semi-structured interviews help researchers understand and reflect on participant thoughts, with unexpected reflections generating new design insights.

Thematic analysis (TA) is a qualitative research method used for identifying, analysing, and interpreting patterns of meaning within data. Unlike other qualitative methods that are tied to specific theoretical frameworks, TA is flexible and can be applied across various theoretical and epistemological paradigms. This flexibility allows researchers to tailor the method to their specific research needs without being confined by rigid methodological constraints. Braun and Clarke's seminal 2006 paper on thematic analysis is particularly influential, providing clear guidelines and establishing TA as a distinct and widely used method within qualitative research (Braun and Clarke, 2006).

Playtest and post-playtest interview results are analysed through the thematic analysis method with a grounded approach. As the data gathered is about the design of an artifact, there are connections that the designer are expecting to see, Thus, the interview questions are based on the heuristic analysis method for evaluating serious games to elicit responses that are about and for the design (Quinten et al., 2013). Finally, the results from the playtest sessions are reflected upon to provide practical suggestions to the design of Neolithic Quest.

CHAPTER 4: INQUIRY AND INVESTIGATION

This chapter can be regarded as research for design and research about design in Frayling's terms (Section 3.2). It documents the understanding of the context of use, which is the Mind of Civilization collection of Izmir Archaeology and Ethnography Museum. Auto-ethnographic accounts of a museum visit were documented. Insights from museum experts were also incorporated as guidelines towards defining instructional content and subsequent transformation of the content to gameplay elements.

4.1. Inquiry

Inquire is the first step for the design explorations. This phase consists of understanding the contexts involved in the design process. The inquiry phase is a crucial initial step in the design exploration process, serving as the foundation for all subsequent stages. A first-person impression of the museum experience was gathered to understand the possible materials for designing the gameplay of Neolithic Quest. These impressions were also gathered to guide the interviews done with museum experts.

4.1.1. Museum Context

It is important to provide a first-person perspective of a thorough museum visit to understand the experience the museum provides, its learning affordances, and any impressions a visitor would have. It is also inevitable to note that it is impossible to document a museum visit that is all objective; all visitors have varying degrees of motivation, prior knowledge, and personal goals towards visiting a cultural institution (Falk and Dierking, 2016). A researcher and designer with the goal of embarking on the act of designing for an institution forms certain biases and they affect the overall experience that emerges from the visit. Thus, to determine the design goals in the most effective way, museum experts responsible for the designing and managing the exhibitions was consulted to find out the desired experience to emerge from the visits, and the educational roles the museum upholds. Through a personal visit, first impressions, "hunches" in Moggridge's terms (2007), were established towards what design materials can emerge from the museum's affordances. Those impressions were utilized as inquiries. This research strategy can be called research for design, as its aim is to do research to enable design. The design process commences with the museum

visit, as visiting a museum with the motivation for engaging design starts the seeing-moving-seeing pattern for reflective practice.

Izmir Archaeology and Ethnography Museum (IAEM) is in the campus of İzmir Culture and Arts Factory (ICAF) in Alsancak neighbourhood. The 140-year-old Alsancak Tekel Factory, which is an important element of İzmir's industrial heritage, has seen an extensive restoration and reconstruction through the efforts of the Ministry of Culture and Tourism of the Republic of Türkiye. The old factory complex has transformed into "a new meeting place for residents and visitors of all ages and a new generation culture and art center that will shape the cultural and artistic landscape of the city" (Izmir Culture and Arts Factory, 2023). The campus holds the Archaeology and Ethnography Museum, the İzmir Painting and Sculpture Museum, the Atatürk Special Library, the Alsancak Public Library and the Turkic World Music Special Library. The Ministry of Culture and the Municipality of İzmir, organizes cultural events such as workshops, concerts, and seminars, to involve the residents and visitors of İzmir in the cultural production.

The official website of ICAF describes IAEM as:

> *Archaeological artifacts are displayed on the ground and first floors of the 7,240-square-meter, two-story building, and ethnographic artifacts on the second floor. The museum, which displays gold, metal, marble, terracotta, stone and glass works from the region, as well as historical textiles and unique manuscripts, invites visitors of all ages to take a pleasant historical and cultural journey through the past centuries, with thematic exhibitions reflecting the museology understanding of the new generation. (ICAF)*

For its visitors, IAEM offers two distinct experiences: The archaeology museum, located on the ground and at the first floor, preserves, and displays artifacts found in and around the city of Izmir from various prehistoric and historical eras. The ethnography museum, located at the top floor, preserves, and displays ethnographic artifacts from the recent history of Türkiye.

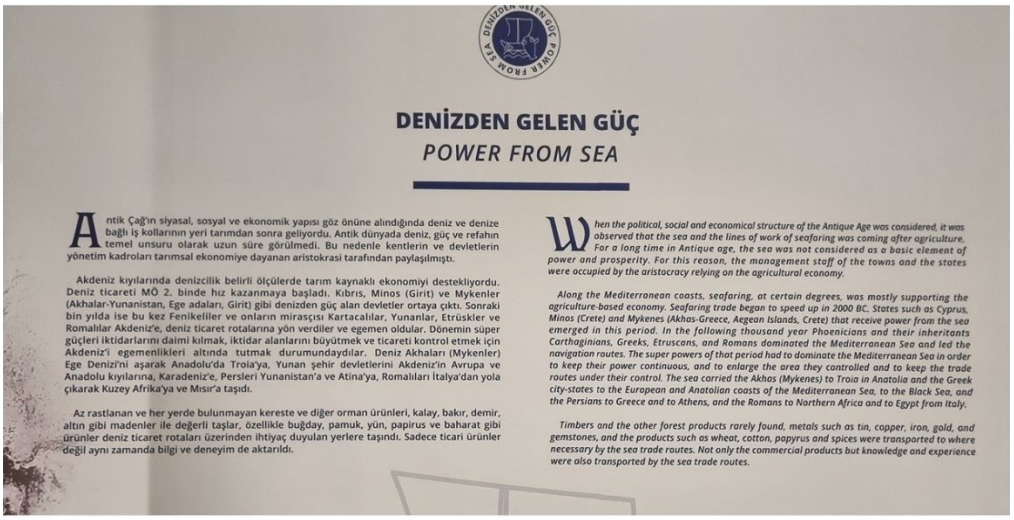
The museum complex has eleven thematic exhibitions across the two museums. Artifacts in the archaeology museum is distributed amongst seven exhibitions: The Spirit of Fun, Legacy Created from Marble, The Power Coming from the Sea, Symbols of Death, The Mind of Civilization, The World Between Knowledge and Myths, and Harmony of Materials and Production. While the ethnography museum is divided into four exhibitions: Culture Embroidered Motifs, Sound of the Street, Struggle and Victory, A Day at the Townhouse.

4.1.2. Impressions from a Museum Visit

For an already motivated and interested visitor, it takes about 2 hours to tour all the exhibitions in both the archaeology and ethnography museums. Each exhibition has similar affordances in terms of navigation and information. An entrance that is clearly designed to impress while providing general information about the museum through a manifesto. These manifestos provide the necessary context for the exhibition and also establish expectations for the visitor (Figure 9).

The labels for the artifacts in each exhibition feature a consistent design, with the names of the artifacts, the regions in which they were discovered, the time periods to which they belong, and the materials from which they are made. In some cases, illustrations are included to provide context on how the artifacts were used. However, some of the information on the labels may require prior knowledge of the subject matter or external sources to fully comprehend. For instance, in the Mind of the Civilization exhibition, there are Microliths that date back to the Mesolithic Age. Microliths are small stone tools that were used during prehistoric times. They were primarily used for hunting and other purposes related to survival. The information on the labels at the museum provides some insight into these artifacts, but additional research is needed to fully understand their significance. Unfortunately, there is no additional source of context available in the museum to provide further information about the use or meaning of microliths. Tangible aspects of Microliths are well preserved and disseminated, however, the intangible aspects, such as their function, formation, and significance in society is not clear to the visitors. In this case, this lack of intangible heritage dissemination can provide opportunities for design materials to be turned into gameplay elements, for the purpose of exploring these aspects for the players (Figure 9).

A



DENİZDEN GELEN GÜÇ

POWER FROM SEA

Antik Çağ'ın siyasal, sosyal ve ekonomik yapısı göz önüne alındığında deniz ve denize bağlı iş kollarının yeri tarımdan sonra geliyordu. Antik dünyada deniz, güç ve refahın temel unsuru olarak uzun süre görülmedi. Bu nedenle kentlerin ve devletlerin yönetim kadroları tarımsal ekonomiye dayanan aristokrasi tarafından paylaşılmıştı.

Akdeniz kıyılarında denizcilik belirli ölçülerde tarım kaynaklı ekonomiyi destekliyordu. Deniz ticareti MÖ 2. binde hız kazanmaya başladı. Kıbrıs, Minos (Girit) ve Mykenler (Akhalar-Yunanistan, Ege adaları, Girit) gibi denizden güç alan devletler ortaya çıktı. Sonraki bin yılda ise bu kez Fenikeliler ve onların miraşçısı Kartacalılar, Yunanlar, Etrüskler ve Romalılar Akdeniz'e, deniz ticaret rotalarına yön verdiler ve egemen oldular. Dönemin süper güçleri iktidarlarını daimi kılmak, iktidar alanlarını büyütmek ve ticareti kontrol etmek için Akdeniz'i egemenlikleri altında tutmak durumundaydılar. Deniz Akhaları (Mykenler) Ege Denizi'ni aşarak Anadolu'da Troia'ya, Yunan şehir devletlerini Akdeniz'in Avrupa ve Anadolu kıyılarına, Karadeniz'e, Persleri Yunanistan'a ve Atina'ya, Romalıları İtalya'dan yola çıkarak Kuzey Afrika'ya ve Mısır'a taşıdı.

Az rastlanan ve her yerde bulunmayan kereste ve diğer orman ürünleri, kalay, bakır, demir, altın gibi madenler ile değerli taşlar, özellikle buğday, pamuk, yün, papirus ve baharat gibi ürünler deniz ticaret rotaları üzerinden ihtiyaç duyulan yerlere taşındı. Sadece ticari ürünler değil aynı zamanda bilgi ve deneyim de aktarıldı.

When the political, social and economical structure of the Antique Age was considered, it was observed that the sea and the lines of work of seafaring was coming after agriculture. For a long time in Antique age, the sea was not considered as a basic element of power and prosperity. For this reason, the management staff of the towns and the states were occupied by the aristocracy relying on the agricultural economy.

Along the Mediterranean coasts, seafaring, at certain degrees, was mostly supporting the agriculture-based economy. Seafaring trade began to speed up in 2000 BC. States such as Cyprus, Minos (Crete) and Mykenes (Akhas-Greece, Aegean Islands, Crete) that receive power from the sea emerged in this period. In the following thousand year Phoenicians and their inheritants Carthaginians, Greeks, Etruscans, and Romans dominated the Mediterranean Sea and led the navigation routes. The super powers of that period had to dominate the Mediterranean Sea in order to keep their power continuous, and to enlarge the area they controlled and to keep the trade routes under their control. The sea carried the Akhas (Mykenes) to Troia in Anatolia and the Greek city-states to the European and Anatolian coasts of the Mediterranean Sea, to the Black Sea, and the Persians to Greece and to Athens, and the Romans to Northern Africa and to Egypt from Italy.

Timbers and the other forest products rarely found, metals such as tin, copper, iron, gold, and gemstones, and the products such as wheat, cotton, papyrus and spices were transported to where necessary by the sea trade routes. Not only the commercial products but knowledge and experience were also transported by the sea trade routes.

B

Figure 9. A: Informative design example from the exhibition Power from Sea. B: Manifesto of Power from Sea.

The display of artifacts at the exhibition is truly impressive. However, it is evident that there are some missed opportunities for a deeper understanding of the artifacts and meaning-making from the visitor's perspective. Despite this, the exhibitions do provide some context, and the informative posters spread across the exhibition space offer valuable insights**,** if the visitor is willing to read them.

Regarding modern museum experience methods such as interaction design and digital storytelling media (Dal Falco and Vassos, 2017), the museum is lacking tremendously. At the time of writing (10.02.24) QR codes were installed on the displays, possibly to provide additional information about the artifacts, however the system was not working. For instance, there is a short video that depicts the life at the Neolithic village

of Yeşilova in the Mind of Civilization exhibition. The video does not contain any commentary, and verbal or textual supplementary information. It depicts some intangible heritage content such as leatherworking, crushing wild seeds, lighting fire, and making stone tools. However, due to the short duration of the video and its substance, the cultural knowledge gained is superficial.

By making several subsequent tours of the museum complex, the archaeology section has been selected as a case for designing the game. Archaeological artifacts have less familiarity, thus provides more opportunities for gameplay design in terms of the richness of informational content (Expert A interview). Archaeology section's experience has been more fulfilling, and lacking at the same time, leaving a feeling of unsatisfied curiosity towards seeing artifacts with immense cultural weight. There is evidence of a unique narrative in each exhibition, however, they are very implicit.

The emergence of these satisfactory museum experiences is explained by Pekarik et al. (1999) as object, cognitive, and introspective experiences. The object experience relating to seeing "the real thing" and the thing being "outside of the visitor". The cognitive experience denotes the intellectual stimulus required to interpret and assimilate the cognitive contents of an exhibit or exhibition, with the aim of acquiring knowledge or enhancing one's understanding. The introspective experience is a reaction that is prompted by an object or an exhibition, which leads one to reflect inwardly and have a personal, private experience. This may involve imagining different times and places, contemplating the meaning, recalling personal memories, or feeling a sense of spiritual connection or connectedness (Pekarik et al., 1999). There is another aspect that is social experience, however it is not applicable in this auto-ethnographic account.

A

B

C

D

Figure 10. A: Manifesto of Mind for Civilization exhibition. B: Display for stone tools dated Palaeolithic and Mesolithic periods. C: Information labels for Hand Axes, Microliths and Cores. D: Close up of displays for Microlith and Cores.

4.1.3. IAEM and the Contextual Model of Learning

The challenge of comprehending the motivations of museum visitors, their activities within the museum, and the meanings they derive from these experiences is significant, considering the vast array of museums and the distinctiveness of each. To undertake this challenge, Falk and Dierking consider the totality of the museum experience, from the time the thought arises in someone's mind that visiting a museum might be a good idea, until they actually visit, and even after, they may recall the experience for days, weeks, or even years (2016).

Contextual Model of Learning (CML) conceptualizes museum visits as an interaction between three overlapping contexts: the personal context, the sociocultural context, and the physical context. With their attention to the "totality of the experience", time can be considered as the fourth context, or "dimension" as the authors suggest (Falk and Dierking, 2016, p. 29).

Personal context suggests that each museum visitor brings their unique personal context, shaped by individual experiences, knowledge, and preferences. This context includes their familiarity with museums as institutions and the specific museum they are visiting, as well as their learning style, developmental level, interests, attitudes, and motivations for visiting. These factors influence their expectations and experiences during the visit and what they enjoy and appreciate about it. Visitors arrive with a personal agenda that includes their pre-defined interests, beliefs, and expectations for the visit. Understanding personal context variables can help us better understand who visits museums, how they behave and learn during their visit, and how they develop personal narratives of their visit that can influence their memories and learning for months or even years.

Visits to museums also occur within a sociocultural context, which consists of the visitor's cultural background and the institution's cultural values. Cultural differences among individual visitors may affect their experiences in museums. Museums are created by people with cultural values that influence their decisions on what to keep, preserve, and communicate to visitors. The sociocultural context can provide insights into who visits museums and why they make certain decisions. Museum visitors are not only shaped by cultural factors but are also significantly influenced by social interactions within the museum. Visitors often come in groups or meet other museum

staff or visitors. The museum experience varies depending on the age, number, and knowledge of companions, crowd levels, and interactions with volunteers and staff. Understanding these social context factors helps to explain differences in behaviour, such as those between family and all-adult groups, or between school field trips and family visits by children.

The museum is a physical space that visitors enter voluntarily. Its architecture, atmosphere, and exhibits all contribute to the physical context, which impacts how visitors navigate through the museum and what they retain. For instance, adding carpeting and benches can alleviate visitor fatigue, while architectural features can either facilitate or hinder accessibility for individuals with disabilities. The distinctions between art, science, and history museums, or between historic homes and aquariums, are often determined by the physical context, including the building's design, exhibits, and overall ambiance. The physical context also encompasses pre- and post-visit interactions, such as watching TV shows, visiting websites, reading books or magazines, etc.

All museum visits, as well as the meaning brought to and taken from them, occur at the intersection of these three contexts (Falk and Dierking, 2016, p. 26). These contexts evolve throughout a person's life, meaning their experience at museums also change over time. For this reason, CML incorporates time as a dimension. Museum experience emerges in a very long timespan: before visit, during visit, and after visit. A museum is responsible for their visitors' experience before they decide to visit and after they leave, not only their experience inside the institution.

The four contexts and the time dimension forms the framework of the IAEM experience. It allows to look at the museum as a holistic experience. The experience a museum wants to create depends on how it addresses the visitor's own needs and interests. A potential visitor's identity, prior experience, interest, and knowledge effects their decision to visit or not to visit the museum. Falk and Dierking explain that "the actual decision to visit a museum occurs when the prospective visitor believes that there is strong confluence between the specific needs and desires, she possesses at that particular time and place and her perceptions of what a particular museum affords in terms of opportunities." (2016, p. 42). While specific needs and desires significantly affects the decision to visit a museum, there are also various factors in

effect such as the cost of a single visit, whether the museum is an indoors or outdoors institution, or whether there is a better activity at the date and time in question. These factors count into determining the value of a potential visit. For this project, the most significant factors are the affordances the museum have, and how those affordances can manifest in a video game so that a richer museum experience can emerge through a confluence of the potential visitors' interests, prior experiences, knowledge, and identities. To determine such affordances the auto-ethnographic account of a visit was combined with views of museum experts.

IAEM as an institution has an online presence throughout different medium. On ICAF's website, a general description of IAEM is provided (see Section 4.1.1). There is also a list of the thematic exhibitions. However, there are no explanation on what these exhibitions afford. A visitor needs to infer the experience from its name. Still, during a visit, a visitor can explore the museum on their own pace according to their interests, needs and prior knowledge. ICAF's social media accounts consists of event announcements organized in the campus, and artifact photographs from IAEM. The photographs are shared with captions, which seems to be structured to pique the viewer's interest, without providing much concrete information such as the name of the artifact and the exhibition it belongs to. Promoting a more precise and deliberate awareness towards the exhibitions and affordances can help catch the attention of the potential visitors with diverse interests, background, and needs. As a result, their decision towards visiting the museum can be affected positively.

During the visit, IAEM offers the visitor a free exploration experience. At the entrance of the museum there is a diagram showing the names of the thematic exhibitions and the floor on which they are located. As on the website, there is no information about the exhibitions in this diagram except the names of the exhibitions and the emblems specially designed for the exhibitions. If the name of an exhibition catches the visitor's interest, he or she can go directly to that exhibition or decide to visit the whole museum starting from the ground floor. The exhibitions in the museum are very diverse. From "The Spirit of Fun", which describes daily life and entertainment in the Roman and Hellenistic periods, to "Harmony of Materials and Production", where production techniques and materials are exhibited and explained, the museum tells the story of Izmir's rich archaeological heritage. Although the thematical rather than chronological organization makes it easier to make connections between the artifacts, there are still

some obstacles for a visitor who expects a deeper learning experience rather than just a good time.

In the physical context, the museum's exhibitions, as mentioned earlier, feel like they want to offer an immersive experience. At the entrance of every exhibition, there is a manifesto of the exhibition, with sculptures, informative illustrations or diagrams, and other elements that communicate visually, both to attract attention and to initiate storytelling, in line with the theme of the exhibition. This manifesto conveys the theme of the exhibition and what it offers to the visitor. Through the design choices of the exhibition, the museum conveys how important the works are. However, if a visitor wants to gain a deeper understanding on the artifacts, the information provided by the museum may not be sufficient for this purpose, unless they are already familiar with the theme of the exhibition, the period it describes, or archaeological knowledge. For example, in The Mind of Civilization exhibition, there is a showcase of stone tools from the Palaeolithic and Mesolithic periods. As in other exhibitions, these stone tools are displayed with informative labels that include the name of the artifact, the place where it was excavated, the era it belongs to, and material information. In the case of the artifact "Hand axes", although the title of the work gives the opportunity to make an association, the artifacts titled "Microlith" and "Core" create difficulties in establishing a context for a visitor without prior knowledge. Since there is no explanation or illustration of these terms in any part of the exhibition, the work can only be remembered as a "stone tool" (see Figure 10).

Sub-themes have also been established in all the exhibitions. These sub-themes help to provide context for several of the exhibition displays. In The Mind of Civilization, the display of Microlith belongs to a sub-theme called "Technology That Comes with Stone Tool". Although the manifesto of this sub-theme talks about the possibilities of stone tool technology in prehistoric times, it does not include explanations of terms such as Microlith and Core, making it difficult to reconcile the forms of the works in this showcase with the ways in which they were used. Although there is an illustration depicting the Palaeolithic and Mesolithic periods in the background of the showcase, it fails to convey why the forms of these two artifacts are the way they are, how they were used and produced, and most importantly, what impact they had on society. In conclusion, while the museum does a very good job of preserving the tangible heritage,

it falls short in preserving and transmitting the stories and narratives behind the artifacts; the intangible heritage.

This is evident in all the exhibitions in the museum in one way or another. While different solutions have been tried to create stronger narratives, there may be more ways of meaning-making and learning in individual contexts. While this may seem negative, it opens a lot of possibilities for this project. Since an auto-ethnographic view is not enough to come up with design materials, it is also necessary to consider the learning outcomes and experience that the museum is aiming for. For this, an interview was conducted with museum experts who have a role in making design and structural decisions at the museum.

4.1.4. Expert Interviews

Semi-structured interviews with two museum experts were conducted. The first interviewee was an archaeologist who also had a decision-making role in the museum. The interview was designed to find out the intended museum experience and the learning opportunities IAEM affords. The first interviewee will be called "Expert A" to protect their identity.

Expert A describes the experience of IAEM as influential and impressive. The physical design of the museum is intentionally thematic; collections are curated to reflect a common theme rather than a chronological journey amongst different collections. Expert A explains the reasoning behind the decision as a better way for the visitors to make connections between the artifacts. They also advocate it as a more personalized museum experience; due to high number of artifacts and collections, the visitor can select a collection according to their interest to allocate their time and energy. This my might help them to gain an affection towards museum visiting in general and visit again IAEM another time but a different collection, or another museum with a similar or different focus. Through this thematic approach, Expert A advocates that the visitor can opt to skip a certain collection if it does not interest them (they give the collection about death as an example that might repel some visitors due to its sensitive topic).

A thematic approach also helps with connecting the physicality of an artifact with its function. She says if one is not informed about an artifact, they cannot deduce its function just by looking at the artifact and its label. They say it loses the context. In result it becomes unimpressive and forgettable. If a visitor is impressed, they will

become regulars of the museum. They say that if a previous visitor visits another museum and recalls what they saw in IAEM, it is a success in terms of museum's intentions. They say self-discovery and self-improvement is important.

The illustrations behind certain exhibited artifacts in the prehistory collection relays the information on how they are used and where. Even though they do not articulate it this way, the illustrations aim to convey the intangible aspect of the artifacts. Expert A gives the example of a spoon with a hole in its handle; they are crafted this way so that a mother can feed the child than hangs the spoon around their neck so that it does not get lost during a possible relocation due to environmental effects. The problem here is that this information is not conveyed anywhere in the museum. It creates a discrepancy between the intentions of the institution and execution.

Expert A also uses the very common idiom from the Turkish language that can be roughly translated as "making people think while doing something else", in this case looking at the artifacts. They describe this as a "cause and effect relationship". For Expert A it is very important for a visitor to establish a bond with the artifacts. She says it is a bond from the past to the future. While she does not relay how this is achieved, it can be deduced as an intended museum experience.

It was also discussed during the interviews that it would be right to take a joint decision for the exhibition where the game would be designed. As a result of individual visits and impressions, it was observed that The Mind of Civilization exhibition, where artifacts from prehistoric times are preserved and exhibited, could serve as a case for this project. Similarly, Expert A suggested that this exhibition could be very suitable for a game. The reason for this is that prehistoric times need more awareness than stories like Rome and Ancient Greece, which are much more popular and have already been covered in different media. To get more information about prehistoric ages, Expert A suggested that it would be appropriate to interview an expert on prehistoric ages.

Interview with Expert A revealed the following points regarding the intended educational roles and museum experience of IAEM:

- Provide agency to the visitors and personalize their experience through thematic exhibitions.

- Allow visitors to discover the meaning of artifacts in an exhibition by making connections between the theme and function of the artifacts.
- Become an influential cultural institution by creating an impressive experience and provide contextualization to visitors for their next cultural experiences.
- Make space for cultural production through activities.
- Promote awareness of the significance of İzmir's rich archaeological history.

This study focuses on the Mind of the Civilization collection that preserves prehistoric artifacts from Palaeolithic Age to Iron Age. The decision to focus on this collection was made together with the museum archaeologists. The exhibition's manifesto declares the aim as following the traces of Izmir's prehistoric inhabitants and discovering how they lived. Throughout the interview, Expert A recommended designing the game around the Neolithic period, which is crucial turning point in archaeology, and in the case of IAEM, contains a very rich archive. Thus, this iteration of the game will focus on Neolithic period artefacts and their impacts.

To summarize, there are significant opportunities in designing a game to be played in this exhibition setting. Firstly, according to Expert A, prehistory is one of the least popular subjects, which can benefit from more awareness making. Secondly, lack of interaction with the artifacts diminishes the significance of the already unrecognized period of such heritage, thus, a game can act as a facilitator in this sense. Lastly, tangible knowledge of the artifacts is preserved and conveyed extensively, however, intangible knowledge remains implicit.

4.1.5. Design Materials and Perspective

To determine the gameplay elements and consequently the design materials, the affordances of The Mind of Civilization exhibition needed to be assessed. In terms of the personal, sociocultural, and physical contexts and how these contexts inform each other through time revealed possible ways for the game to intervene into the overall museum experience. This intervention can be explained visually through a conceptual map (Figure 11). In this map, three contexts mentioned above inform each other and the overall experience. There are learning opportunities and outcomes from the experience that emerges before a visitor decides to visit the museum, during their physical visit, and after they leave the museum. These opportunities and outcomes emerge from the museum visit, the video game, and their interactions during a visit.

As reviewed in Section 2, serious games are capable of promoting awareness for cultural heritage, providing motivation for museum visits, transferring experience to knowledge, change or create new habits for the players, and providing opportunities for contextualization and meaning-making (see Section 2.4).

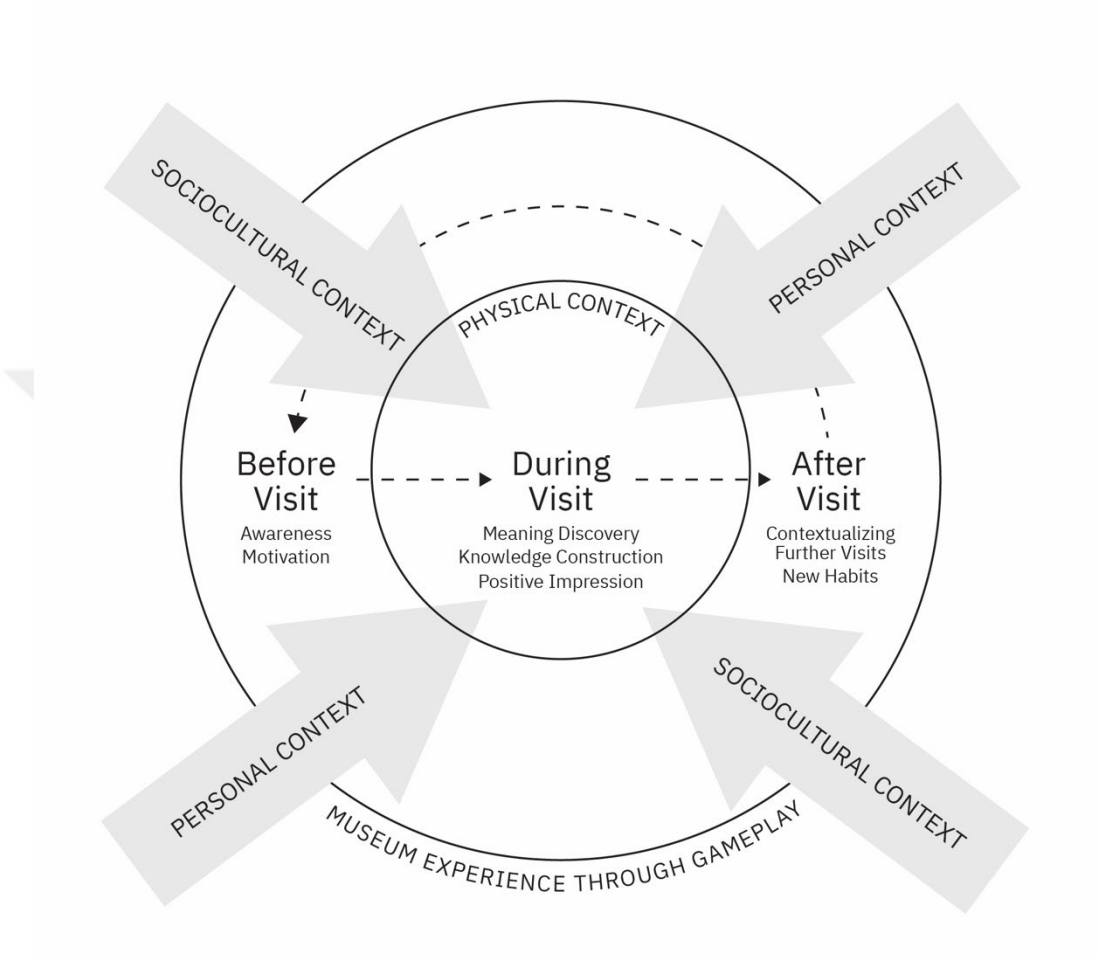


Figure 11. Conceptual map of the holistic museum experience through gameplay that is informed by the museum and the game context. The inner and outer circles represent the "magic circles".

In the map, the most significant aspect that interests the practice of game design is the assumption that a "magic circle" forms through the artificial context the game establishes when played during a museum visit. However, it is also evident that if someone plays the game before a museum visit, the magic circle can expand, or move, the artificial context that is formed through the cultural framework the museum affords. Thus, the gameplay can be facilitated to act as an awareness raising and

promotion material towards the museum affordances. This way, there is a potential that a player can become a museum visitor. However, to achieve this the game needs to be engaging while creating the appropriate cultural framework, without swaying away from the museum's educational roles and intended experiences (Türkmen and Savasta, 2024).

Eric Champion's (2020) theory of culturally significant presence (see Section 2.4.2) aims to frame video games as cultural learning tools. His workflow of designing games that aim to communicate cultural heritage or history stresses the:

importance of selecting the most culturally significant elements, the importance of thematic mechanics (the system rules to move the game states forward or, conversely, methods to trigger the player's psychological states), the importance of continual but changing challenges, and increased rewards as feedback. (Champion, 2020, p. 3)

Thematic mechanics is an interesting discourse and can be associated with Schaller's intrinsic mechanics concept (see Section 2.4.3) which is utilized in the actual design of the game (See Section 5.1). Specific for communicating cultural heritage is his emphasis of selecting culturally significant elements. It is important to determine what sort of cultural knowledge was to be cultivated and transferred to the player and how it was cultivated. The cultural knowledge emerges from the exhibition content that are cultural or archaeological facts or interpretations that are found significant, hidden, or otherwise engaging to explore (Champion, 2020, p. 3). In the next section The Mind of Civilization exhibition is scrutinized to find the heritage content that can inform the gameplay.

4.1.6. The Mind of Civilization Exhibition Content

The Mind of Civilization (MOC) exhibition conserves and displays prehistoric artifacts that were excavated in and around İzmir. The exhibition welcomes visitors with a manifesto explaining the purpose of the exhibition. According to this manifesto, the human presence in Izmir can be traced back 300 thousand years to 14 thousand years ago. Although there was no settlement during this period, Yeşilova Mound, which was established at least 8500 years ago, is accepted as the first settlement in the city. The aim of the exhibition is to allow visitors to discover the lives of people who lived in Izmir in prehistoric times through the artifacts on display.

The timeline at the entrance of the exhibition, showing the prehistoric and historical periods, attempts to create context by depicting the characteristic features of the prehistoric periods, especially the use of tools. In addition, the timeline indicates roughly how many years BC are associated with the epochs mentioned. Navigation through the exhibition is designed to be nearly linear. After encountering the Manifesto, the narrative of the exhibition begins with artifacts dating back to the Palaeolithic era, which is the first of the prehistoric periods, followed by the Mesolithic era. Then there is an exhibition design that is divided into sub-themes, generally proceeding chronologically, but disrupting this chronological flow in contextually appropriate places.

The sub themes in the exhibition provide opportunities for the visitors to make connections between the artifacts and their functions as Expert A suggested. When, and if, associated with the artifact information displayed, sub-themes can provide necessary context for meaning making opportunities. For determining engaging cultural heritage content to manifest as gameplay elements, sub themes of MOC are summarized below:

- Technology that comes with the stone tool
- Change in Primitive Society
- Source of Life; Water and Fire
- Symbols of Elegance and Beauty
- Symbol of Power
- A Combination of Talent and Knowledge: Craftsmanship
- Shaped in Women Hands; Ceramics

As the above themes and their interpretations suggest, the Mind of Civilization (MoC) exhibition has a great potential to create a deep understanding of life, technology, and culture in prehistoric times. It tells the story of how humans used tool technology to change their environment for their own purposes, how they tamed fire, grain, natural materials, and animals, and how these developments laid the foundation for modern human life. However, the emergence of these narratives depends on visitors' ability to make meaningful interpretations and connections between the exhibition's theme, the narrative of the sub-themes, the formal characteristics of the artifact, and the archaeological information about the artifact. These connections depend on the

identity of the visitor, i.e. his or her interests, existing and prior knowledge and experience, and how well the museum can nurture the interests of the visitor. As Falk and Dierking emphasize, personal, sociocultural, and physical contexts need to inform each other in line with the museum's goals and visions (2016). Accordingly, in order to identify design goals and materials, it would be appropriate to examine the narratives and themes revealed by the MoC exhibition.

As a result of the examination of the sub-themes mentioned above, the topics that can be processed and that can be the right choice for a game design for research purposes can be listed as follows:

- Tool usage and tool making
- Hunting
- Agriculture
- Animal domestication
- Pottery making
- Weaving and textile
- Settlements
- Trade
- Art
- Social structure
- Religion and rituals

When these subjects are treated together, or at least inform each other, the resulting narrative can be very effective in establishing a cultural framework. However, as with any design project, the scope of the game must be realistically defined. For this reason, it would be best to choose a subject that arouses curiosity for the player and is worthy of transmission for the museum. A scenario was created to create a game prototype based on the chosen subject and the artifact or artifacts that can best explain and convey that subject. First, however, a framework for the game design process needs to be established, and design goals need to be set to shape and guide this framework. In the next section, these design goals are explored.

4.1.7. Establishing Design Goals

Following the establishment of educational and experience goals of IAEM, and the potential heritage content in the MoC exhibition to be translated into and manifested as gameplay elements, I have defined several initial design goals.

- Design Goal 1: To create a single player RPG experience that emerges through interactions with manifestations of archaeological and heritage content in IAEM
- Design Goal 2: To make significant and engaging narratives from Izmir's rich archaeological heritage explicit.
- Design Goal 3: To create awareness towards IAEM's impact on heritage preservation.
- Design Goal 4: To provide opportunities for exploration and learning of cultural knowledge.
- Design Goal 5: To motivate players to visit IAEM.

4.2. Investigation

In this phase design materials regarding the museum content mention above were investigated to be turned into gameplay elements. The investigation consists of analysis of specific TTRPGs and CRPGs chosen to reflect a variety of gameplay styles and experiences, also game design and game-based learning models and frameworks. The outcomes of these analysis were synthesised in the form of design decisions and were prototyped and evaluated in the next phase.

Game prototypes were produced in iterative cycles of design, evaluation, and refinement. As reviewed in Section 3.3.2., prototypes are means of discovering, and refining designs, as well as learning about them. Doing design sketching to explore certain aspects of gameplay can also be considered as prototyping. In this section, characteristics, gameplay loops, and structures of computer role-playing games (CRPGs) and table-top role-playing games (TTTRPGs) were explored. The results of these explorations were turned into sketches for further design explorations.

4.2.1. Determining Gameplay Elements

As reviewed in Section 2.3, RPGs have complex structures, with different systems interacting with and informing each other. Revealing these systems depends on analysing the formal elements: elements that form the structures of a game (Fullerton, 2019, p. 57). What kind of elements form the structure of a particular game depend on

many parameters. Modality, genre, and intention are among the many variables that can determine the formal elements, and ultimately the player experience. To establish a ground for gameplay elements, characteristics of RPGs are determined through various definitions and analysis of RPGs.

4.2.1.1. Analysing RPGs

The inference is that role-playing game is a word, not a game genre, is discussed in Section 2.3. Thus, this section discusses the common characteristics of RPGs amongst the discussions and ultimately approaches them through a design perspective. The main concerns are the two forms of RPGs: TTRPGs and CRPGs. While these two forms share commonalities in terms of player experience, their formal elements differ due to their approach in creating these experiences. For instance, in TTRPGs, the actions of player characters are governed by a gamemaster that acts as a referee that moderates the rules, but also a storyteller who interprets the actions of players in accordance with the game world that forms the diegetic framework. CRPGs on the other hand, emulates this experience by replacing the gamemaster with a game engine and other automated systems that governs the actions of players and resolutions of those actions (Tychsen, 2006). Due to this difference in interaction between the gamemaster or game engine and players, the design decisions are made accordingly.

In the following sections two TTRPGs and two CRPGs are analysed through two different categories: 1. Gameplay loops and flows. 2. Associations of game design patterns and RPG design areas. These analyses are then synthesised to reveal design decisions made for a certain kind of experience. The two TTRPGs are Dungeons & Dragons 5th Edition (Wizards of the Coast, 2014) and Quest (Adventurer's League, 2019) which are fantasy themed modern TTRPGs with distinct intentions in terms of experience.

4.2.1.1.1. RPG Design Areas and Patterns

Patterns in Game Design framework by Bjork and Holopainen (2004) were selected to provide necessary vocabulary for designing formal elements. Design patterns aim to capture common and recurring solutions to common and recurring problems in a design space (Alexander, 1977). This approach provides necessary vocabulary and a tool to assess what game mechanics and elements can be integrated with learning objectives. Bjork and Holopainen emphasize the need for a "language" to talk about

different aspects and elements of gameplay. They have provided over 200 patterns that designers might employ in their designs as tools to “control what will occur in the game” (Bjork and Holopainen, 2004, p. 1).

Björk and Zagal (2018) identified three RPG design areas through the lens of design patterns. They explored patterns in the design areas of characterization, action resolution and combat, and character development. The patterns have connections with each other and the associated design areas. These connections describe parts of the interaction possible in games, and the possible gameplay in a game (Björk and Holopainen, 2004). For instance, when designing characters with relations to museum content, we might think of how the game world might inform the design of possible skills, attributes, or equipment the player characters gain and use in the game. Consequently, these decisions will affect how player interactions with the game world will be resolved (Türkmen and Savasta, 2024). This approach provided ways to think about what kind of patterns can be associated with learning outcomes and museum content to design gameplay elements.

In this section I have utilized RPG design areas and game design patterns to analyse TTRPGs and CRPGs. The analyses were vital to ascertain the design decisions behind gameplay experience and elements. The three design areas leave out some game design areas significant for RPGs that are particularly concerned with visual design, sound design, scripting-writing etc. (Björk and Zagal, 2018) Evidently, the emerging gameplay experience is affected by the aesthetic qualities of the game, however, focusing on the mechanics and formal structures of the games at this stage is critical.

Björk and Zagal (2018), under the three design areas, associates and describes design patterns that were conceptualized and defined back in 2004 in the book Patterns in Game Design (Bjork and Holopainen, 2004). They have picked patterns that explain the defining characteristics of RPGs, however, they do not provide a thorough analysis of a single RPG to demonstrate the utilization of the patterns and design area associations. This means that novel patterns or the patterns Bjork and Holopainen originally defined back in 2004 can emerge through the analyses. TTRPGs and CRPGs were analysed through the design areas mentioned above, rather than an analysis of a game independently. These two games are analysed below to provide output on different approaches to RPG design.

Also, the presentation of these three design areas through the inclusion of patterns solely by categorization and written description makes it challenging to discern the relationships between the patterns and the design areas. To address this issue, I believe that a conceptual map would be a more appropriate means of visually illustrating these connections. Throughout this chapter, and any subsequent chapters when it is implied, patterns are emphasized using *Italics,* e.g., *Equipment.* Brief descriptions of the patterns used in this project can be found in Table 1. For detailed analysis and usage of the patterns please refer to the original sources.

4.2.1.1.2. Characterization of Player Characters

The make-believe world of an RPG game is inhabited by *Agents*, who pursue various objectives within the game. In an RPG, players typically assume the roles of these *Agents* – their objectives and traits – and control some or all their actions within the *Game World*. These player-controlled and enacted game world *Agents* are referred to as *Player Characters (PCs).* Many RPGs allow for *Player-Created Characters*, whereby players fashion their own *Characters* and have the option to decide on their *Attributes* and *Skills, Equipment*, and in-game world aspects, such as the Characters' names, races, background, quirks, and traits. Often, players are given the chance to choose different *Functional Roles* – for example, through "classes" like mage or thief in Dungeons and Dragons (Gygax and Arneson, 1974). These *Functional Roles* simplify character creation by providing players with ready-made templates or archetypes to work from: usually players have a general idea of what a “knight” or a “spaceship pilot” is capable of. Additionally, *Functional Roles* streamline character creation and play between multiple players in a group. *Functional Roles* often grant specific choices or exclusive abilities to certain types of *Agents*. Characterization as a design area has encompassing impact on all the other design areas. Especially for TTRPGs with specific themes and settings such as D&D5th Edition (Wizards of the Coast, 2014) and Quest (Sottek, 2018) –the two TTRPGs that were analysed in this section— *PCs* are inhabitants in the *Game World*; thus, their *Abilities*, *Characteristics*, and *Actions* are designed as to support *Diegetic Consistency and Thematic Consistency*.

Table 1. Game Design Patterns and their resources that were mentioned or utilized in this thesis.

Pattern name	**Source**	**Description**
Game World	Björk and Holopainen, 2004, p. 55	The environment in which the gameplay or parts of the gameplay takes place is determined by the spatial relationships of the game elements.
Agents	Björk and Holopainen, 2004, p. 355	Entities in games that take the roles of players but are controlled by the game system.
Player Character	Björk and Zagal, 2018, p. 327	Player Characters Agents in the game world that are controlled and enacted by players.
Player-Created Characters	Björk and Zagal, 2018, p. 327	Players create the Characters they play and can make some choices regarding their Attributes and Skills, their Equipment, and in-game world features, such as the Characters' names.
Attributes	Björk and Zagal, 2018, p. 328	
Characters	Björk and Holopainen, 2004, p. 222	Abstract representations of persons in a game.
Scenes	Lee, 2020	A gameplay period diegetically localized in time and space.
Storytelling	Björk and Holopainen, 2004, p. 213	The act of telling stories within the game.
Roleplaying	Björk and Holopainen, 2004, p. 252	Players have characters with at least somewhat fleshed out personalities. The play is centered on making decisions on how these characters would take actions in staged imaginary situations.
Functional Roles	Björk and Zagal, 2018, p. 328	Gameplay where responsibility for different types of game actions can be divided between participants.

Table 1 (continued). Game Design Patterns and their resources that were mentioned or utilized in this thesis.

Abilities	Lee, 2020	Actions that agents can do which allow players to affect game states.
Privileged Abilities	Björk and Zagal, 2018, p. 328	Abilities that let agents perform actions not readily available to others.
Inventories	Lee, 2020	The space containing game elements carried by diegetic characters.
Equipment	Lee, 2020	Game items that can be equipped.
Skills	Lee, 2020	Representation of how likely diegetic agents are to succeed with a type of activity that can be improved through experience.
Game Masters	Lee, 2020	Facilitators of game worlds, and of players' interactions with these worlds.
Exploration	Björk and Holopainen, 2004, p. 306	The goal of learning the layout of the Game World, or locating specific parts or objects in it.

4.2.1.1.3. Action Resolution and Combat

Action resolution in role-playing games (RPGs) refers to the rules and processes used to determine the outcomes of actions attempted by *Characters* within the game. Actions attempted by *Characters* and their resolution are dependent on the Characterization possibilities the rules offer, such as *Attributes*, *Skills, and Abilities,* are capabilities of *Characters* as *Agents* inhabit the *Game World*. The result of the action also involves the use of *Randomness*, often represented by *Dice* rolls or other mechanisms. The primary goal is to simulate the consequences of a *Character's* choices and actions, whether they involve *Combat*, *Skill Checks*, or other in-game activities, thereby shaping the narrative and progression of the game world.

In TTRPGs, action resolution is influenced by character *Attributes, Skills*, and modifiers specified by the game rules. The Game Master (GM) has a crucial role in interpreting the results and narrating outcomes. The GM may adjust the difficulty of

actions based on circumstances, leading to more flexible and narrative-driven play. TTRPGs can be "rules-heavy" (with detailed mechanics) or "rules-light" (focusing more on storytelling) (Bjork and Zagal, 2018). For instance, games like Dungeons & Dragons (see Section 4.2.1.3.1. for a review; 5th Edition, Wizards of the Coast, 2014) emphasize a structured system with numerous modifiers, while games like Fiasco (Morningstar, 2010) might rely more on collaborative storytelling and simple conflict resolution.

CRPGs use software to automate the resolution process, instantly calculating the results of actions based on programmed algorithms. This allows for more complex systems with detailed calculations that would be cumbersome to manage manually in TTRPGs. The underlying rules and algorithms may not be visible to players, leading to "theorycrafting" (Torner, 2018), where players deduce the mechanics through experimentation. This opacity adds a layer of mystery and encourages exploration of game systems. CPGs can incorporate more intricate simulations, such as real-time combat or environmental interactions, due to the computer's ability to process numerous variables quickly.

Randomness in RPGs play a significant role in creating its core gameplay experience. In can be inferred that the main function of Randomness is to introduce a layer of uncertainty, making outcomes unpredictable. When a character attempts an action, the Dice Roll, whether they are physical or virtual, adds an element of chance, regardless of the character's skill level. The most important implication, and I believe provides the highest impact on the player experience, is narrative emergence and the influence on Storytelling. As the outcome is always interpreted by the Game Master and the other players, the result becomes something more than a situation of “success versus fail”. Successes and fails receive their own narrative, whether they have implications for the overall Storytelling, or only added flair in the Scene. One interesting aspect of Randomness is how it balances the player skill and character skills. Even though a player decides what action to attempt, their decision only plays out through the quantitative projection of Characteristics. There is always a chance of failure, and the player needs take into account what their Character is capable of in particular situations.

4.2.1.1.4. Character Development

Character development in role-playing games (RPGs) refers to the progression and evolution of player characters over time, encompassing changes in their abilities, skills, narrative roles, and in-game status. This progression is a fundamental aspect of RPGs, as it provides a sense of growth and accomplishment for players (Zagal and Altizer, 2014).

Character development in RPGs encompasses the progression and growth of *Player Characters*, reflected through changes in their *Abilities, Skills*, and narrative roles. In TTRPGs, this development often involves accumulating *Experience Points (XP)* and levelling up *(Character Levels)*, which grants *New* or *Improved Abilities, Skills,* and *Attributes*. Some games emphasize skill-based growth, allowing *Characters* to enhance specific abilities through use. Narrative growth is also a significant factor, where a character's personal story, relationships, or role within the game evolves through *Role-playing.*

In CRPGs, Character Development is typically automated, with the game tracking *XP*, *Skill* progression, and *Equipment* upgrades. CRPGs can offer more precise development, such as continuous *Skill* improvement based on actual use, seen in games like The Elder Scrolls series (see The Elder Scrolls V: Skyrim, Bethesda, 2011). Additionally, narrative choices and moral decisions can shape character growth, impacting the story and character interactions. *Loot* and *Equipment* play a crucial role in CRPG development, providing tangible progression through better gear and resources.

Designing Character Development also involves challenges like balancing increase in power with difficulty, ensuring meaningful progression, and integrating narrative and mechanical growth. Some RPGs incorporate character decline, where conditions such as madness or moral corruption leads to weakened capabilities, or increased challenge. The development process aims to provide players with a rewarding sense of growth, encouraging engagement with both the mechanics and the story, making it a defining feature of the RPG genre.

During the design process of Neolithic Quest, decision to focus on a very small segment of a museum visit were made. Character Development of TTRPGs were analysed to reveal the relationships between Characterization, Action Resolution, and

Character Development. However, Character Development of CRPGs are not analysed to make the investigation phase of CRPGs more concise and to the point.

4.2.1.2. Analysing TTRPGs

Tabletop role-playing games make up the foundational modes of play for RPGs. In the following sections, Dungeons and Dragons 5th Edition, and Quest are analysed. These analyses were done through the perspective of game flows and game design patterns. Design patterns provide the necessary vocabulary to understand the relationship between gameplay elements and design areas, and to communicate design decisions in the implementation phase. Gameplay flows were foundations for moving the gameplay of Neolithic Quest between contexts and achieve intrinsic learning in an RPG.

4.2.1.2.1. Dungeons and Dragons 5th Edition

Dungeons and Dragons 5th Edition (D&D 5E) is a fantasy themed TTRPG (Wizards of the Coast, 2014a). Its rulebook The Player's Handbook (PHB; 2014a) consists of all the rules the players need to know to play, while the Dungeon Master's Guide and Monster's Manual are for the dungeon master to referee and narrate the game sessions. At the heart of D&D 5E is the *Player Characters (PCs).* The *Storytelling* revolves around the concept of going on adventures. The *Game World(s)* of D&D are "places of magic and monsters, of brave warriors and spectacular adventures" (Wizards of the Coast, 2014a, p. 5). Thus, the game is about players creating characters that team up with other characters. They go on adventures presented by the Dungeon Master (DM; *Game Master* of D&D), the storyteller and referee of the game. The game is played through the enactment of these *Characters* by the players, their interaction with each other, the DM, and the *Game World.* Because the heart of the game is *PCs*, *Roleplaying* aspect of the game is indeed tied to what kind of *Characters* are created, thus I have analysed Characterization of Player Characters design area of D&D 5E to act as a foundation for analysis.

Before going through character creation, it was important to mention "The Three Pillars of Adventure" described in PHB that provides a frame for what players can do in the game three broad categories: Exploration, social interaction, and combat (Wizards of the Coast, 2014a, p. 8). These are important aspects as the options and rules for *Characters'* capabilities are designed so that the players can decide their *Actions* with varying intentions. PHB reserves the first six chapters for character

creation options. Following Sarah Bowman (2022), I have analysed characterization design area through both the character sheet for D&D 5E and Quest. Character sheets are crucial for setting player's expectations of play experience as they emphasize what is important about the game the player needs to know to engage and provide verbs that the players will likely enact during play (Bowman, 2022).

In D&D 5E players create *Agents* that inhabit the *Game World* in the form of *PCs*. The *Game World* frames what kind of *Characters* can be created in the game. D&D 5E takes place in a medieval fantasy world with sword and sorcery, hence character creation possibilities, characters' capabilities, rules of the game, and overall mechanics and aesthetics (Hunicke et al., 2004) reflect the theme and setting. Players choose a race[2] (Bowman, 2022), a *Functional Role* in the form of a class, *Equipment,* starting *Abilities* and/or *Privileged Abilities,* ability scores (*Attributes*), *Skills,* personality traits and background, and other character details such as flaws, bonds, and spoken languages. Every option they take have profound effect on *Roleplaying;* players make decisions depending on the character options they picked. Most of these options also modify or become *Statistics* during *Action Resolution*, so the players have the option to make their choices accordingly so that they synergize well to give statistical advantage; which the RPG community usually calls "theorycrafting" (REF).

Every *Character* belongs to a race, one of many intelligent humanoid species in the D&D world. The chosen race significantly shapes a character's identity by defining general appearance and natural talents from culture and ancestry. Your character's race provides specific racial *Abilities*, *Equipment* proficiency, *Skill* proficiency, or *Privileged Abilities*. These often complement the *Abilities* and *Attributes* of certain classes.

Ability scores are *Attributes* that describe the physical and mental capabilities of *Agents: "*Strength, measuring physical power; Dexterity, measuring agility; Constitution, measuring endurance; Intelligence, measuring reasoning and memory; Wisdom, measuring perception and insight; Charisma, measuring force of personality" (Wizards of the Coast, 2014a, p. 173). Biggest impact of ability scores is on the *Statistics* during action resolution, and other *Attributes* such as *Skills*, *Hit Points*, and

[2] According to Bowman, race is a misnomer. It should be called species, since race connotates a different meaning outside of the game's context.

Privileged Abilities. During action resolution, ability scores "offer mechanical advantages to actions relative to the scores" (Bowman, 2022) They also effect *Roleplaying* aspect of the game immensely; a *Character* with high strength can appear as muscle-bound and act with confidence, while a low intelligence *Character* can be forgetful and not very articulate during social interactions.

Classes are *Functional Roles.* They are "the primary definition of what your character can do. It's more than a profession; it's your character's calling. Class shapes the way you think about the world and interact with it and your relationship with other people and powers in the multiverse" (Wizards of the Coast, 2014a, p. 45). Classes are staple features of RPGs from every medium. Classes in D&D provide *Privileged Abilities* for the *Characters;* thus, they are the foundation for affording different play styles for the players. Twelve classes of D&D offer *Roleplaying* possibilities on every aspect of the game: exploration, social interaction, and combat. A Wizard can detect magic in an environment to search for clues on how to proceed, while a Ranger can utilize their connection with nature traverse a forested area. A Bard can charm other *Agents* during a social interaction, while a Barbarian can choose to intimidate them. A Rogue's approach to combat is more cautious due their *Skills* and *Abilities* affording that kind of strategy, while a Fighter tends to be direct with their *Actions.*

Other notable characterization options that players can directly choose are mostly for *Roleplaying*, with varying effects on *Statistics*. Players makes decisions on their *Character's* physical *Characteristics* such as their skin, hair, or eye colour, their height and weight which is based on their chosen race, and their age, which is also dependant on their race. *Character Alignment** broadly describes the characters' moral and personal attitudes towards the world and society. One characterization option thathave effects on both *Roleplaying* and *Statistics* is the choice of background. A character's background reveals where they came from, how they became an adventurer, and their place in the world. Sample backgrounds provided in PHB offers concrete benefits to the characters: Proficiency in certain *Skills* and/or *Equipment*, spoken languages, and suggestions on personality traits. A Soldier, for instance, is proficient in athletics and intimidation, and carries an insignia reminiscent of their profession, granting a social status that can affect certain aspects of gameplay. Backgrounds are the most malleable characterization options in D&D; players can work with the *Game Master* before a

campaign* to come up with customized backgrounds to suit their *Characters'* image in their heads.

Figure 12. Character sheet of Dungeons and Dragons 5th Edition.

Rules of D&D 5E are frames to enable *Roleplaying* experiences through quantitative structures that have interpretative qualities. Depending on the Game World, which might be totally imagined from the ground up by a Game Master, or a designed

campaign by a third-party, rules can be bent and shaped according to the intended experience. Game Masters usually seek out the preferences of the players and shape the Roleplaying experience accordingly. Game Masters can always create new classes, races, or other aspects of gameplay to enrich the players' – and theirs—enjoyment. For instance, if a player wants to play as a character that has amnesia, the *Game Master* can withhold information from the player and gradually reveal their past through carefully crafted story and events, giving power to the player in terms of creating a shared narrative. Thus, the quantitative aspects of D&D 5E briefly described above are both enablers of *Roleplaying*, and formal structures that provide affordances for overcoming challenges.

As the players engage with the *Game World* through their *Characters*, the gameplay flows and loops in a particular way. The Player's Handbook describes how the game flows in the How to Play section (Wizards of the Coast, 2014a, p. 6): 1. The Dungeon Master (DM) describes the environment. 2. The players describe what they want to do. 3. The DM narrates the results of the adventurers' actions. This is a simple explanation of the interaction loop (Daniel Cook in Fullerton, 2019; Adams, book) that reiterates constantly during a game session. It can also be thought as an information flow between the players and the Game Master (see Section 2.3.2.4.). The How to Play description above occurs during exploration, social interaction, and combat, in different iterations depending on the rules that needs to be accessed, and the state of the game. However, the game has a larger and more encompassing loop when all the systems in the game are considered.

The description of the environment conveyed or narrated by the *Game Master* can be thought as *Scenes.* As the *Game Master* describes the *Scene*, the players imagine them in their minds. *Scenes* present options for the players to interact with. These options open new possibilities for players to pursue, giving them personal and collective goals and intentions. We can call this phase *Exploration* as the players explore scenes through their *Characters'* perspective. *Player Characters'* characteristics provide opportunities to interact with the objects and Agents in the Scenes. These opportunities could be verbs for Actions, such as the investigation or acrobatics *Skill*. *Characters* with high investigation could see it as an opportunity and approach the *Scene* like a "detective". On the other hand, an acrobatic *Character* could look for clues on higher ground or hard to reach places. *Privileged Abilities* such as spells and some *Equipment*

can also provide similar opportunities. When a player decides on a course of action, they describe their action to the *Game Master* and they interpret it according to the rules, game and story state (See Section 2.3.2.4, and most important the intended experience in their mind. If it is a trivial or impossible task, the *Game Master* declares the action as success or failure. However, if there is chance for the action to be successful or failure, then the action needs to be resolved through *Randomness*, specifically *Dice* rolls.

PHB describes this flow of information between the players and Game Master in the How to Play section as:

> *"Sometimes, resolving a task is easy. If an adventurer wants to walk across a roam and open a door, the DM might just say that the door opens and describe what lies beyond. But the door might be locked, the floor might hide a deadly trap, or some other circumstance might make it challenging for an adventurer to complete a task. In those cases, the DM decides what happens, often relying on the roll of a die to determine the results of an action."* (Wizards of the Coast, 2014a, p. 6)

Decision to roll a die depends on the situation and the *Game Master's* intentions on what kind of adventure they want the players to experience. They might say to the player that wants to open door "the door is locked but you are an experience thief, you manage to pick the lock with no struggle", or if they want to make things interesting, they might ask for a dice roll. After the action is resolved, whether pre-determined or through *Randomness*, the *Game Master* updates the game state and describes the environment to restart the loop.

The quote above is the description of the core rule of D&D 5E (Wizards of the Coast, 2014a, p. 7). This core rule is associated with the *Action Resolution* pattern and design area from Bjork and Zagal (2018). In D&D 5E the outcome of an *Action Resolution* does not solely depend on *Randomness;* Characteristics of PCs have direct impact on what they can do in a Game World and how likely they are to succeed. The outcome relies on the roll of a 20-sided *Die* (d20) and the addition of a modifier number

depending on the type of action and ability score of the relevant Ability Score (*Attribute*). Depending on the Ability Score, the modifier can add or subtract from the roll, suggesting a *Character's* capability in the action. Three main rolls in the game are Ability Checks (can be called Skill Checks when a skill is directly referenced in the action), Attack Roll, or Saving Throw. When a player gets 1 on a Die, they automatically fail. The basic principle of *Dice* rolls in D&D 5E can be explained through a diagram as in Figure 13. Black boxes refer to associated game design patterns, while white boxes are descriptions specific to D&D 5E. I have described the rolls through the player's perspective --same rolls apply to actions of *Enemies* or other *Agents* as well.

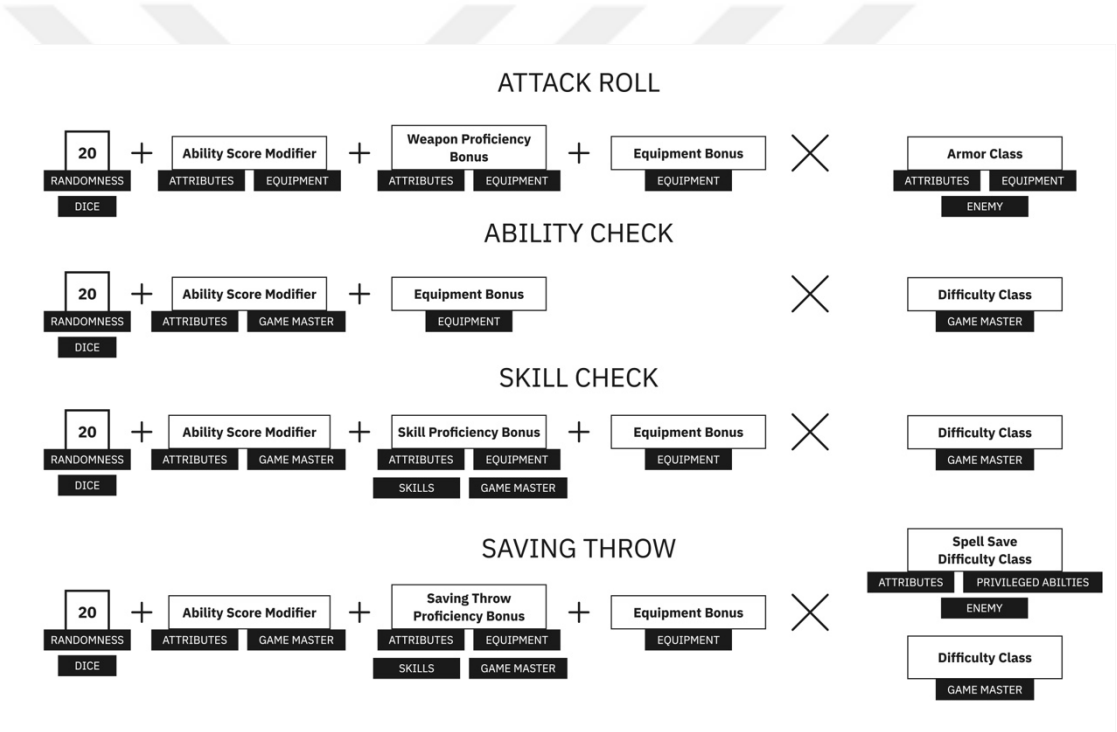


Figure 13. Quantitative breakdown of four main *Dice* roll mechanics in Dungeons and Dragon 5th Edition.

D20 is the universal *Die* to roll to determine the success of an action. On every kind of roll, relevant Ability Score Modifier is added to the *Die* result. An Attack Roll occurs when an *Agent* decides to hit another *Agent* or an object to deal *Damage* with a weapon or spell that needs to be aimed. If the PC is proficient in the weapon or the spell used in the attack, the proficiency bonus is added. In some cases, an *Equipment* might have a bonus to increase the chance to hit. If that is the case, this bonus is also

added. The result is then compared against the Armor Class of the *Agent*. Armor Class depends on the Attributes and the Equipment of the Agents. Getting 1 or 20 on a d20 during an Attack Roll is an automatic failure or success respectively, regardless of the added modifiers. While rolling a 1 is just a missed attack, 20 doubles the Damage Dice the player can roll. Below is an example of a roll explained through simulated *Statistics* and how those *Statistics* are calculated (Figure 14).

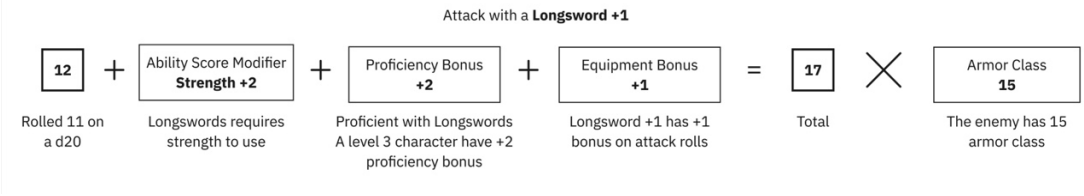


Figure 14. Example attack roll in D&D 5E.

In the case above, the player successfully hits the *Enemy*, then *Damage Dice* are rolled to determine how much *Damage* the *Enemy* takes. Rules on dealing *Damage* involves rolling specific dice different kind of weapons, attacks, and spells. These *Dice* are d4, d6, d8, d10, and d12, named as the same convention as d20. Usually, the more impactful and higher requirement an attack is, higher number of sides it has. Probability of dealing either high or low damage increases, establishing a risk and reward kind of experience. Attack Rolls frequently occur during *Combat* but can also happen during *Exploration*. In that case, the *Game Master* can decide to initiate *Combat* due to obvious aggression. Attack Rolls, as it can be seen in Figure 14, are strictly governed by the relevant rules, without any intervention by the Game Master aside from the narrative interpretation of the outcome.

Ability and *Skill Checks* on the other hand are dependent on the *Game Master's* ruling. When a player attempts a task, the *Game Master* decides which ability will be used in the roll, depending on the description of the action by the player. If the *Action* indicates a *Skill*, *Game Master* asks for a *Skill check*. If not, a relevant *Ability Score* is chosen. Player rolls a d20, adds the relevant ability modifier and any bonuses from Equipment if applicable. The outcome is compared against the Difficulty Class determined by the *Game Master*. In PHB, there is a table that showcases "common" *Difficulty Classes*, ranging from "Very Easy (5)" to "Nearly Impossible" (30) with increments of 5 that correspond to the values in between (Wizards of the Coast, 2014a, p. 174). The *Difficulty Class* is decided by the probabilities of the 20-sided dice and the added

bonuses. For a player to reach 5 on an ability check would be very easy with added bonuses, whereas to reach 25 would require both the player to be lucky and character to be skilful. Figure 15 showcases example *Ability* and *Skill checks*.

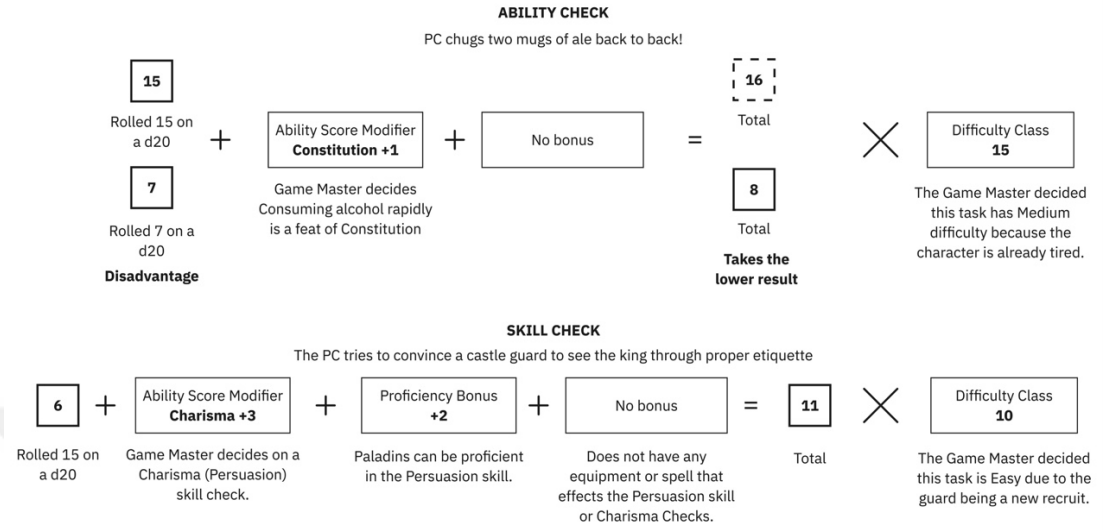


Figure 15. Examples for Ability Check and Skill check in D&D 5E.

In the examples above it is evident that Attributes and Characteristics of PCs have "hard" consequences towards the resolution of an action attempt. While Randomness has a direct effect on Action Resolution, it exists to provide uncertainty for actions that might have "meaningful consequence for failure" (Dungeon Master's Guide; Wizard of the Coast, 2014b, p. 237). For instance, in the *Ability Check* example above, the total roll is 8 against a DC of 15. The Game Master in this situation has ruled that the player needs to roll with a disadvantage, meaning they roll twice and takes the lower result after adding relevant bonuses. This rule can be mandated by the *Game Master* if they think the PC is at a disadvantage, such as the PC being tired while attempting the task. Or the rules can dictate an advantage or disadvantage. While the PC failed at their attempt, the Game Master can narrate the scene as "*Character* chugs a full mug of ale, and then another! They try to persevere, but the exhaustion gets them, and they pass out on the tavern floor!" It could be direct success as the task is basically drinking, however, In the *Skill Check* example, the *PC* rolls a very low number on the *Die*, however, because of his proficiency in the attempted task, they succeed. Players can choose only attempt tasks that they are competent in, or they can be reckless and not limit themselves. Design decisions for D&D 5E's Action Resolution fuels the *Roleplaying* and *Storytelling* aspects of the game, while giving control to the players

by providing hard consequences on their actions through Characterization options and affordances.

The kinds of rolls mentioned above are the three core ones in the game. They occur constantly throughout a session, during exploration, social interaction, and combat. While exploration and social interaction requires a similar approach towards the *Scenes* depicted by the *Game Master*, combat is a distinct mode of play in D&D 5E. *Combat* can occur in the minds of the player and the *Game Master*, imitating exploration of the Scenes, however, some groups prefer to play using grids or hexes that simulate *Combat* in a physical manner (Dungeon Masters Guide; Wizards of the Cost, 2014b, p. 250). This depends on the group's preference; D&D 5E rules are designed to be played with either method. *Combat* is the mode of play that a PC's *Characteristics* have the biggest consequences. It involves removing the opposing *Agents* by getting their *Hit Points* to zero through *Damaging* them with *Abilities* and *Privileged Abilities* that are affected by other *Characteristics*. The *Game Master* can also provide objectives other than "killing" the *Enemies*, such as incapacitating.

The *Combat* in D&D 5E has roots in wargaming (see Section 2.3). Thus, it has rules for positioning, distance, movement, cover, and tactics related actions. *Characteristics* of *Agents*, as well as relevant *Ability* or *Skill* checks, involved in the combat determine if one side is surprised and the order of combat. Players describe their positions in the battlefield verbally or physically on a map. Then everyone rolls initiative (Equals to Dexterity ability plus any bonuses) to determine the order of combat. Combat is *Turn-Based*, played in rounds, which represents 6 seconds in the game world. Each Agent takes a turn in each round. All *Agents*, whether *PCs* or *NPCs*, can move, make one action, make a circumstantial bonus action, make a circumstantial reaction, and a simple interaction. The outcome of the *Combat* depends on how the *Agents* use their Actions economically to dominate the opposition. Figure 14 showcases what the rules afford and frame as action possibilities. It also demonstrates how complex the *Combat* encounters are in terms of dependency on the rules.

D&D sessions can also incorporate battle mats, figurines, and props to illustrate *Combat Scenes*. This makes *Combat* more strategic, pushing players to consider where to position their PCs, so that they can use their *Abilities* efficiently and avoid *Enemy Abilities*. Therefore, rules *Movement* is opaque, *Agents* can move in increments of 5

feet for instance, which the total distance they can Move depends on certain Characteristics. There are also rules for Death *Consequences* that deals with the death of PCs. These rules deal with what happens when *Hit Points* of *Player Characters* are reduced to zero. In D&D 5E rules, the players are given another chance based on *Randomness* to avoid death. Some *Privileged Abilities* and certain *Items* bypass the *Die* roll. In the event of certain death, the *PC* can be revived by other *PC* or certain *NPCs*. However, when a *PC* has died for certain, the player also leaves the table and does not participate in further sessions. This event is usually presented in the story to sustain the *Diegetic Consistency* of the gameplay narrative. If the *DM* allows, the player can create a new character to continue playing with their friends.

Combat and other interactions with uncertain outcomes can be called Encounters. Dungeon Master's Guide also names these as such (2014b, p. 81) and lists three possible outcomes:

> *"An encounter has one of three possible outcomes: the characters succeed, the characters partly succeed, or the characters fail. The encounter needs to account for all three possibilities, and the outcome needs to have consequences so that the players feel like their successes and failures matter."*

Partly succeeding might sound ambiguous, however, there can be instances of a character being successful at a task but losing something in return. For example, successfully intimidating an NPC to gain information, but losing the trust of another important *NPC* that was in the *Scene*. Whatever the outcome would be, Encounters carry the goals and intentions of a *Character*, or the Party collectively. Thus, with Exploration and *Combat* established, two phases of the core game loop can be established: Exploration through interactions with *Scenes*; these interactions provide goals and intentions; when the outcomes are uncertain an Encounter occurs; Exploration continues with new or updated premises (Figure 16).

While this loop explains the interaction loop between players and the Game Master that drives the gameplay forward, there is another aspect, and a RPG design area, that needs to be considered. Character Development, as explored briefly in Section

4.2.1.2.3., is the change in Characters' *Abilities*, *Skills*, and powers as part of the gameplay. According to Zagal and Artizer, this aspect of D&D is the one that had the most praise and has often referenced as a foundational appeal of RPGs (2014). Character Development can naturally occur in the game world such as learning a *New Ability* from an *Agent*, or on the meta level by gaining *Experience Points* resulting in increase of *Character Levels* that allows access to *New Abilities*, *Improved Skills*, and *Improved Abilities*. In D&D 5E the main method of *Character Development* is through the accumulation of *Experience Points* (EXP) by defeating *Enemies* or completing *Quests* and reaching certain EXP thresholds that results in increase of *Character Levels* (Wizards of the Coast, 2014a, p. 15).

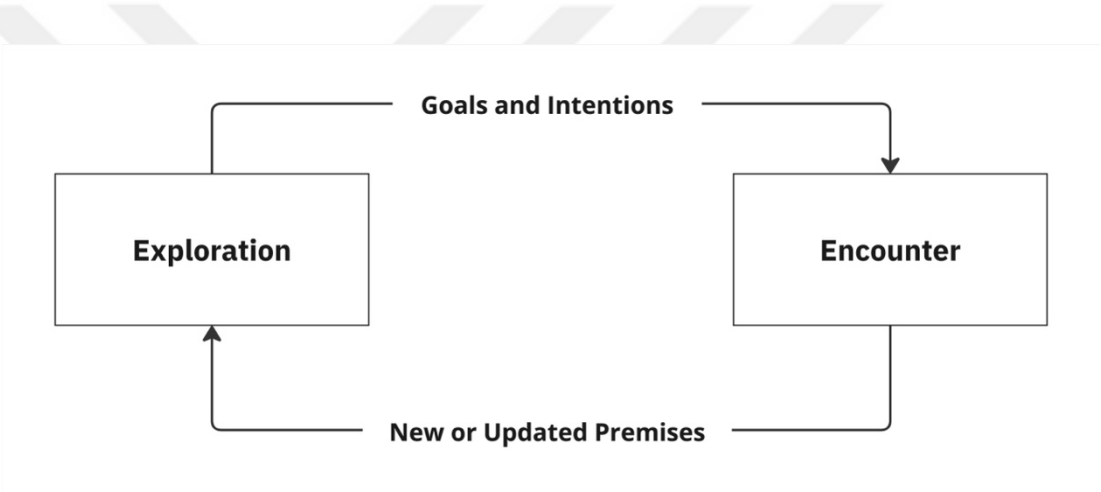


Figure 16. Core loop of D&D 5E consisting of Exploration and Encounter phases.

Players then consult to their class's chart to find out what kind of improvements their class can access to. This method requires DMs to track the amount of EXP they need to award to players which can become tiresome and feel somewhat diegetically incompatible. Another method is by awarding players *Character Level* increase is through milestones (Wizards of the Coast, 2014b, p. 261). A milestone can be reached by getting to a certain point in story, or when players accomplish something significant in the game world. This method can be used to achieve *Diegetic Consistency*. Regardless of the method chosen, D&D 5E provides a motivation to succeed for the players as the *PCs* can grow like real people, resulting in a visceral experience (Ewalt, 2013). Each class has a specific table showcasing what *Abilities* or *Privileged Abilities* a *Character* will gain or improve, their new Proficiency Bonus, and available Spell slots for classes that can cast spells. In D&D 5E the maximum *Character Level* is 20,

hence *Campaigns* are designed to take in a specific pace which PCs gain levels accordingly.

Player Characters can also become more powerful through gaining *Loot*. *Loot* can be *Equipment* such as weapons, *Armor*, tools, and other useful items. *Weapons* have direct effect on Action Resolution in *Combat*, increasing the chances of success in Attack Rolls, and dealing *Damage*. *Armor* on the other hand decreases chances of getting hit and sometimes reducing certain kinds of *Damage*. Tools give new capabilities to PCs when they want to utilize *Skills*. The PCs can also gain resources in the shape of currency. In D&D 5E's default setting, PCs can gain copper, silver, gold, electrum, and platinum. There is also a simple exchange rate between these units. Each unit is one tenth of the next one, with gold being the most common. PCs can trade in gold to buy new *Equipment,* and other services such as resting at an inn, procure transportation, or anything the *Game Master* comes up within the *Diegetic Consistency.*

Character Development is the third phase in the core loop of the gameplay. However, it shouldn't be considered the subsequent phase after Exploration or Encounter: a PC can find gold during exploration which will aid in their development. This phase can be called "Progression" to be fit in the overview of gameplay flow and loop. While the design area is named Character Development, gaining new *Abilities* or *Loot* effects players' approach towards Exploration and Encounter, granting a feeling of progression in the game. The loop does not move in a single direction, progression can occur during an Encounter or Exploration, without looping back to either exploration or encounter. Thus, the overview of the core loop would look like Figure 17. This overview had become the foundation for the analysis of Quest, and the CRPGs.

To summarize, D&D can be considered a rule heavy TTRPG, even though its 5th edition is more streamlined than its predecessors. There are many interrelating systems at play that were not covered in this section such as magic, travel, and deities. These systems have both mechanical and narrative outcomes. These systems and their utilization during gameplay are what makes the experience of playing TTRPGs rich and unique. For this project, this analysis of D&D 5E provides a way of thinking about how structural design decisions can be affected by the theme and setting, and how those decisions affect Storytelling and Roleplaying. Even though the implementation

and interpretation of the rules comes down to the decisions of dungeon masters, the design of an TTRPG creates the affordances that reflects the intentions of the game, and the experience emerges from play. In the next section a "rules light[3]" TTRPG named Quest was analysed in the same manner.

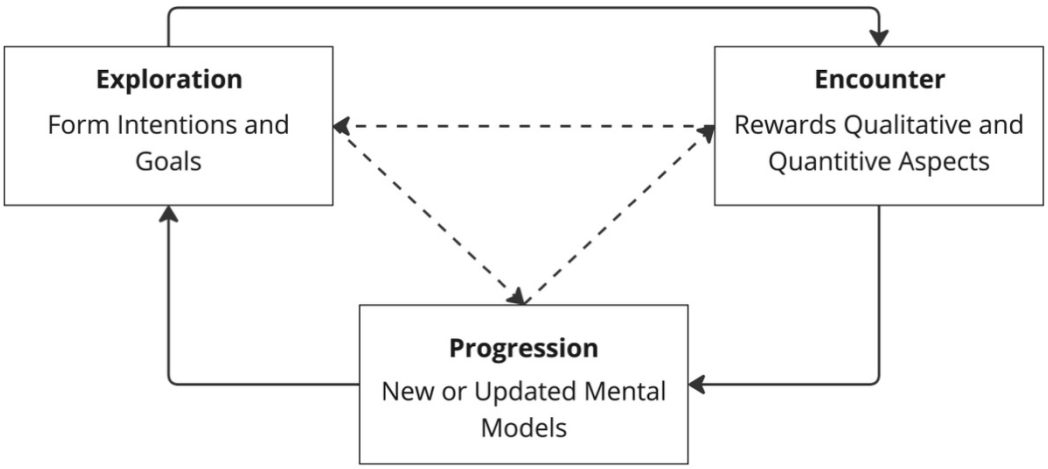


Figure 17. Core loop of Dungeons and Dragons 5th edition. Dashed connection denotes less frequent occurrence.

4.2.1.2.2. Quest

> *"Welcome, friend.*
>
> *This is a special place: a retreat from your worries and obligations. Now, close your eyes, take a deep breath, and open your mind.*
>
> *Ready?*
>
> *Let's begin."* (Quest, The Adventure Guild, 2018, p.1)

The above quote is the introduction for the game book of the TTRPG Quest by The Adventure Guild (2019). Like the analysis of D&D 5E, I have investigated the

[3] Rules light refers to TTRPGs consisting of few rules which focus on storytelling and roleplaying compared to TTRPGs with complex rules, hence "heavy" (Björk and Zagal, 2018).

gameplay loop and the three design areas, through the lens of game design patterns. Compared to The Player's Handbook (Wizards of the Coast, 2014a), Quest game book has a more approachable feel, evident by the spacious design choices (Figure 18). Also showcased in Figure 18, like D&D 5E, the game loops in a way that resembles a dialogue between the Guide (Quest's name for the *Game Master*) and the players. Even though they are similar, unique design choices of Quest creates an experience that is also distinct from D&D 5E.

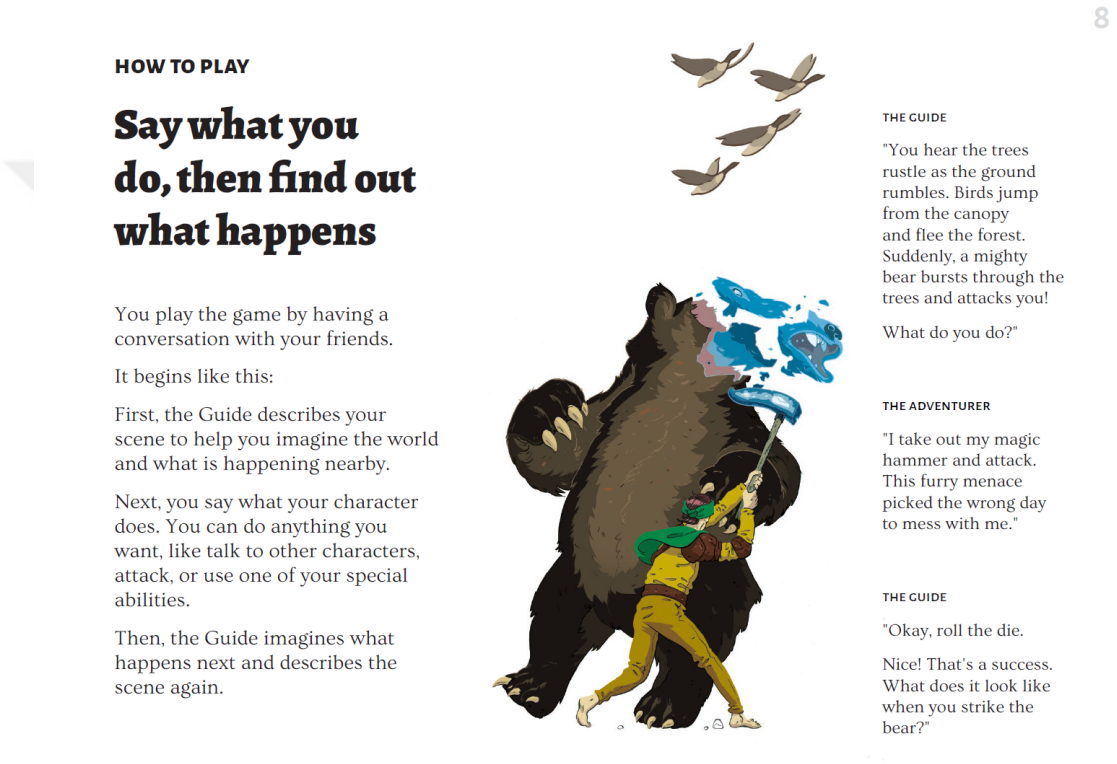


Figure 18. Quest Game Book design showcases its design philosophy.

In a similar manner, Characterization and Action Resolution design areas shapes how the game is experienced. The character sheet for instance, is very minimal compared to D&D 5E. It provides a frame for *Storytelling* and *Roleplaying* in terms of the *Characters'* place in the *Game World*, assisting the player through a more verbal, first-person approach towards character creation. While D&D 5E's character sheet is mainly for record keeping of *Attributes*, *Skills*, *Inventory*, and *Abilities*. This approach shows how Quest places itself as a *Roleplaying* and *Storytelling* focused game. Only the first 20 pages of the game book is reserved for "hard" rules of the game, the rest is

Characterization options, recommendations for running game for *Game Masters*, and the treasure catalogue.

As in D&D 5E, there are *Functional Roles* in Quest, named simply Roles. There are 8 roles with brief descriptions, providing players reasons to "why they should play as" a certain role. Then the book introduces an Ability catalogue for each role with clear descriptions of what each *Ability* does. These are *Privileged Abilities* that make up the identity of each role (Sottek, 2019, p. 22). And these *Abilities* are the only *Actions* of the players that are governed by the rules, apart from *Movement* and attacking which are explored further below. There are no *Skills* like in D&D 5E that provide "verbs" for the players, or Ability Scores that turn into *Statistics* during Action Resolution. What is distinct in Quest compared to D&D 5E is that there are only 2 attributes: *Hit Points* (HP) and Adventure Points (AP). *Hit Points* works as intended, a PC is incapacitated when it reaches zero. Adventure points on the other hand work as resources for using *Abilities*, where each *Ability* have varying costs. Using *Abilities* in Quest is more abstract than in D&D 5E. A player in D&D 5E can use a certain number of *Privileged Abilities* per day before their *Character* must rest, making it rather *Diegetically Consistent*. In Quest, AP is a quantitative resource that refills at the end of a session, players earn 5 AP "as a reward for spending time with friends" (Wizards of the Coast, 2014, p. 15), or by the ruling of the *Game Master* when certain conditions are met –which are also created by the *Game Master*. This approach makes Quest a game that strives to keep a balance between immersion and meta level decisions, putting the feeling of "playing a game with friends" first.

The concept of *Abilities* in Quest is *Privileged Abilities* when thought through the lens of design patterns (Table 1). A Character can do "anything" in Quest, however, *Abilities* are "ways to take control of a scene. Some are exceptionally powerful and can dramatically affect your story" (The Adventure Guild, 2019, p. 15). These Abilities are provided for the players as cards so that players can have access without recording them by themselves. They range from *Actions* that provide mechanical advantages to the players, to massive alterations to the *Storytelling* and narrative. These design decisions afford a play experience that balances narrative power between the *Game Master* and players; if a player decides to change the weather in the current Scene, the *Game Master* needs to update the game state accordingly. To strengthen the feeling of playing together, the creator of the game designed *Abilities* that pushes the players to

act or narrate an aspect of the *Ability* at the table such singing a lullaby. Compared to *Privileged Abilities* in D&D 5E, Abilities in Quest have *Storytelling* and *Roleplaying* repercussions by design. These design decisions, even though they take advantage of the same patterns, create a distinct experience. There are fewer mechanical components than D&D 5E, and even less effect of those components on *Statistics*.

Action Resolution of Quest is also on the minimal side. As there are no *Attributes* that provide *Statistical* advantages on *Dice* rolls, outcomes of actions are determined exclusively through *Randomness*. "You roll the die in Quest to let fate decide what happens next. The Guide will ask you to roll when you try to do something risky, or when a bit of chance makes things fun." (The Adventure Guild, 2019, p. 13). Unless stated otherwise in the *Ability* descriptions, to determine the success of the roll, the result of the *Dice* roll is always compared to a fixed table (Figure 19). Aside from Success, which has the widest number range, every result has positive or negative repercussions. The *Game Master* decides what are the setbacks or added fortunes. In case of getting Tough Choice, the *Game Master* has the player choose a setback, sharing the *Storytelling* power with the player. Even though the repercussions vary on Dice rolls for Abilities, success means getting 11 or higher on the *Dice*. While having a predetermined table for *Dice* rolls create a faster and simpler gameplay, it might take away the feeling of "triumph" in terms of *Character Attributes* or *Skills* affecting the results of player Actions. For instance, the success of an Action that has to do with brute force would be the same for every Role in Quest, unless an Ability is used. The rulings of *Game Master's* come into play in cases like this. If a player depicted their *Character* as "flimsy", the *Game Master* would not even allow the player to take down a door by kicking it for instance. Even though rolling the *Die* might return interesting and funny moments, getting a 20 would break the immersion. However, it all comes down to what kind of experience the *Game Master* intends to deliver, because there are no hard rules for kicking down doors in Quest compared to D&D 5E, every player can attempt anything. *The Game Master* cannot alter the difficulty of an *Action*. *Combat Scenes* are also affected by this design decision.

Figure 19. Dice results table of Quest.

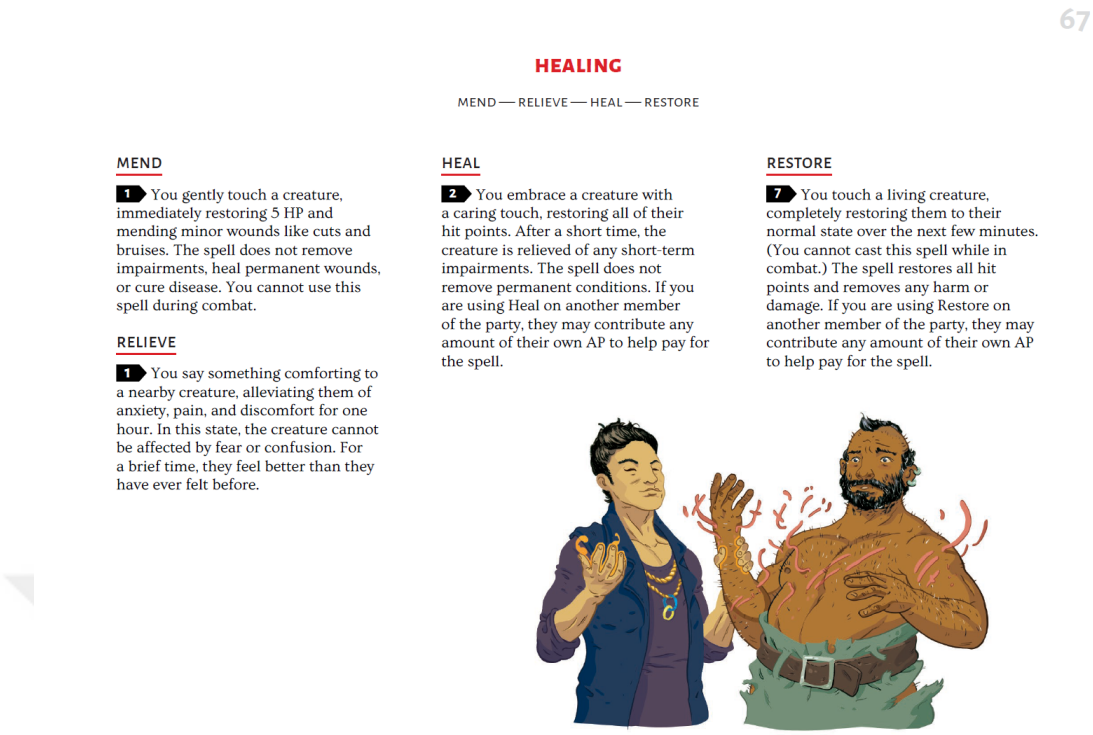
In terms of gameplay loop, Quest follows the footprints of D&D 5E. Exploring *Scenes* results in players getting clues on what to do, generating goals, opportunities, and intentions for the players. When the players act or attempt a task, an encounter occurs, and it is resolved by the decisions of the players and *Game Master'* interpretations. While the Encounters might play out similarly in both games, Abilities (both *Privileged Abilities* such as spells and features, and common) and *Skills* in D&D 5E are mostly designed to overcome challenges by providing *Statistical* advantages towards Dice rolls. In Quest, the designers ask the players to think creatively when encountering the *Scene*; they can even change the *Scenes'* foundations such as the "Shift Season" Ability that alters the season in a specific part of the Game World.

Combat in Quest is played in turns. The game calls them Action Scenes. Players can "move around and do one thing" during their turn (The Adventure Guild, 2019, p. 11). When compared to D&D 5E *Combat* rules are very light. There are no initiative rolls: *Game Master* decides whose turn it is based on the narrative. There is no speed attribute or rules for grid-based *Movement*: An *Agent* can be in reach with, nearby, in range of, or too far from another Agent. Players ask the *Game Master* about their *Character's* situation, and act accordingly. For instance, if a *Character* likes to move towards another agent, they move along the four "possibilities" mentioned above.

When a player is in reach of an *Enemy*, they can attack with a melee weapon; when they are in range they can attack with a range weapon. If they attack an Enemy, they roll a d20, and compare it with the basic roll table. There are no *Damage Dice*; Every common weapon does 2 damage, while unarmed attacks deal 1 Damage. The players need to use their *Abilities,* or magic items to deal more than 2 damage. Due to the design of the *Abilities,* the Combat Scenes can be quite chaotic despite simple rules governing them. Quest's design strives to create *Combat* experience that revolves around *Storytelling* rather than tactical decisions.

NPCs have two Attributes: *Hit Points* (Hp) and Attack Rating. *HP* works the same as the *PCs*, and Attack Rating is how much damage they can deal each turn with attacks. *The Game Master* can give certain features described in the rule book to *NPCs*, or they can invent something unique (The Adventure Guild, 2019, pp. 122-125). If it fits the story, an *NPC* can have *Abilities* available to *Player Character* roles. Overcoming challenges posed by *NPCs* depends on the clever and creative use of *Abilities*, while keeping tabs on APs.

Character Development in Quest reflects the simplicity of the rules, while adding a "modern" feel towards gaining power. Each *PC* Role has a Learning Path. These can be thought of as a Role's area of expert or school. For instance, The Doctor have Healing, Alteration, Necromancy, Harm, Perception, and Examination as Learning Paths. At the start of a game, a player chooses 6 abilities from the catalogue. They must be chosen according to the learning path depicted in the catalogue. In the example Figure 20, the Doctor can choose the *Ability* Heal only if they have also picked Mend and Relieve. They can choose 3 other abilities from the other Learning Paths, as long as they follow the order depicted in each path from left to right. This design decision is akin to what video games have been affording for their players to achieve a hierarchy for gaining power, commonly called skill or ability trees.



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HEALING

MEND — RELIEVE — HEAL — RESTORE

MEND

1 You gently touch a creature, immediately restoring 5 HP and mending minor wounds like cuts and bruises. The spell does not remove impairments, heal permanent wounds, or cure disease. You cannot use this spell during combat.

RELIEVE

1 You say something comforting to a nearby creature, alleviating them of anxiety, pain, and discomfort for one hour. In this state, the creature cannot be affected by fear or confusion. For a brief time, they feel better than they have ever felt before.

HEAL

2 You embrace a creature with a caring touch, restoring all of their hit points. After a short time, the creature is relieved of any short-term impairments. The spell does not remove permanent conditions. If you are using Heal on another member of the party, they may contribute any amount of their own AP to help pay for the spell.

RESTORE

7 You touch a living creature, completely restoring them to their normal state over the next few minutes. (You cannot cast this spell while in combat.) The spell restores all hit points and removes any harm or damage. If you are using Restore on another member of the party, they may contribute any amount of their own AP to help pay for the spell.

Figure 20. Page from the Quest game book illustrating learning paths and descriptions of *Privileged Abilities* available to the Doctor *Functional Role*.

Because there are no Character Levels or Experience Points in Quest, the Game Master decides when to award New Abilities to the PCs. The game book recommends that New Abilities are granted at the end of sessions; each or every other session. If the Game Master wants to have more control, they can have them learn new abilities when they complete certain goals, much like milestones in D&D 5E. Maximum *HP* of Characters does not increase over time, it is always 10, while their APs can go beyond 10 if they are good with conserving their Ability usage. Through this design decision, the game forces the player to depend on their Abilities, rather than static Attributes that provide mechanical advantages.

In terms of *Inventory* and *Equipment*, as mentioned before, every common weapon does the same Damage. There is no Armor that prevents or reduces Damage taken. The PCs can gain *Loot* in a similar manner with D&D 5E, finding them in Scenes, or as rewards for overcoming Encounters. New Equipment can be items from the treasure catalogue with varying rarity and quirks. These Equipment can deal more damage or have varying effects on *Scenes.* There are no rules for currency in Quest: Characters

receive basic items, services, and commodities without paying for them such as modest meals, rooms at an inn, inks, strings, and small tools. When they want to buy something valuable, they need to trade it with something in return. They can even offer their services if they do not have anything tangible to trade for.

While Character Development is simple by design, the game offers alternative ways to develop *PCs*. The players can choose a single Ability from a different role if it fits the story, and there is an interesting reason to do so. A player can also combine two roles and learn up to 25 Abilities total while following the Learning Path orders. If the players want to try a free style custom play, they can even play with "No Roles", picking abilities from any Roles, again by following the Learning Paths.

4.2.1.3. Comparative Summary

Both Dungeons and Dragons 5th Edition (D&D 5E) and Quest are fantasy themed TTRPGs that provide immersive storytelling and roleplaying experiences. However, they diverge significantly in their design philosophies, mechanics, and the experiences they offer to players. A thorough analysis revealed how design decisions inform distinct styles of play. Associations of game design patterns with rules, mechanics, and procedures also show the relationships between quantitative and qualitative aspects of gameplay elements.

At the centre of both games' gameplay is the information flow between the Game Master and the player. This information flow results in a collaborative storytelling experience, emerging from the players' reactions to the Scenes described by the Game Master. The distinction between these experiences comes from the affordances provided to the players by the game's design. Players interact with the Game World through their Characters. The possible *Actions* the Characters have, the manner those *Actions* are resolved, and the ways new or improved *Actions* are gained steers the players toward a certain kind of interaction with the Game World. Investigating Characterization of Player Characters, Action Resolution and Combat, and Character Development design areas have revealed the distinction between the designed experiences.

Both games have similar core loops: Players explore Scenes described to them by the Game Master, providing possibilities for Actions. Players describe what they want to do informed by their Characters capabilities and goals. When there is a chance of

failure, or the Game Master interprets the possible outcome as interesting, they ask for a Dice roll. Depending on the result, the Game Master updates the Scene, and the loop reiterates. The players can gain tangible or abstract resources from exploration or encounters to develop their Characters.

D&D 5E is characterized by its intricate, rule-heavy system, offering detailed mechanics that cover every aspect of gameplay—from character creation to combat and character progression. The game's complexity is evident in the extensive Player's Handbook, which not only defines a wide range of abilities, skills, and attributes but also provides a framework for a highly tactical, strategy-oriented experience that stems from its strong connection to its wargaming roots.

In contrast, Quest adopts a more minimalist approach. Its rulebook is intentionally streamlined, focusing on accessibility and ease of use. The game forgoes complex mechanics in favour of a more narrative-driven experience, where the emphasis is placed on storytelling and creativity rather than detailed rule adherence. The simplicity of Quest is reflected in its minimal character sheet and the absence of detailed attributes and skills, opting instead for broader, narrative-based abilities.

In D&D 5E, character creation is a deeply involved process where players select from a variety of races, Functional Roles, and Abilities, each with specific mechanical benefits and Roleplaying implications. The game's design encourages a balance between narrative and tactical decision-making, where character attributes significantly impact Action Resolution, particularly in combat.

Quest, on the other hand, simplifies character creation by offering fewer Functional Roles with clearly defined Privileged Abilities that focus more on Storytelling than mechanics. Characters in Quest are not burdened by a multitude of Attributes and Skills; instead, they rely on two primary resources: Hit Points and Adventure Points. This design choice fosters a more fluid and flexible gameplay experience, where players are encouraged to think creatively and use their abilities to influence the story in significant ways.

The design of the *Attributes*, *Skills*, and *Abilities* in D&D 5E can act as "verbs" for enactment of PC *Actions*. Even though players can do basically "anything", Attributes such as Dexterity and its related Skills Acrobatics, Sleight of Hand, and Stealth have connotations towards Actions that can be taken in a Scene. Quest on the other hand

does not provide such tangible associations. The malleable nature of the rules might make it harder to come up with ways to interact with the scenes, players are free do the whatever they want. D&D 5E have rules for even some of the basic Actions players can take especially in Combat such as dashing, hiding, readying an Action, helping a friend, grappling an Enemy, and dodging the next Attack. Players of Quest can also make these Actions; however, the Game Master makes the ruling depending on the context and the descriptions the players make.

D&D 5E's Action Resolution is a blend of narrative description and mechanical execution. Players roll dice to determine the success of Actions, with the outcomes heavily influenced by their characters' Attributes and Skills. The game's reliance on modifiers and detailed rules for action resolution adds a layer of tactical depth, where players must carefully consider their choices and the probabilities of success.

Quest simplifies action resolution to a single d20 roll compared against a universal table of outcomes. Unlike D&D 5E, where attributes play a crucial role, Quest's action outcomes are more reliant on Randomness and the narrative context provided by the Game Master. This simplicity speeds up gameplay but may reduce the sense of triumph associated with skilful play in D&D 5E.

Combat in D&D 5E is a structured, turn-based system with detailed rules for initiative, movement, and action economy. It often requires tactical thinking and careful management of character resources. The complexity of D&D 5E's combat system allows for a wide variety of strategic approaches, making it a central aspect of the gameplay experience. Privileged Abilities and Equipment deal varied Damage by utilizing Dice that simulates different range of probabilities, providing options for The system has hard rules for unit-based Movement allows for positioning of Agents, therefore encouraging enactment of combat scenes through physical materials such miniatures, props, and grid-based battle mats simulating tactical combat.

Quest's combat, referred to as Action Scenes, is far more abstract and narrative driven. There are no initiative rolls, and movement is described in broad terms, allowing the Game Master significant flexibility in determining the flow of combat. The lack of damage variability and the focus on storytelling over tactics make Quest's combat feel more like an extension of the narrative rather than a distinct phase of play.

Character Development in D&D 5E is closely tied to Experience Points (EXP) and level progression. As characters gain levels, they unlock New Abilities, improve their skills, and gain additional hit points, which adds a sense of progression and power growth over time. This system encourages long-term play and character investment. Character Development is strongly connected to the initial Characterization decisions a player makes, restricting some development paths and encouraging careful planning.

Quest takes a different approach, eschewing levels and EXP for a more flexible, narrative-driven advancement system. Characters gain new abilities as determined by the Game Master, often at the end of sessions or upon achieving significant narrative milestones. This method keeps character development tied to the story, reinforcing the game's emphasis on collaborative storytelling rather than mechanical optimization. While not as restricting as D&D 5E, players still need to consider the Learning Paths for their chosen Roles, although without the limitations of Attributes.

D&D 5E offers a rich, complex experience that blends narrative with deep mechanics, catering to players who enjoy tactical gameplay alongside immersive roleplaying. It is well-suited for groups that appreciate detailed character customization and a structured approach to both storytelling and combat. Quest, however, is designed for players who prefer a more relaxed, narrative-focused experience. Its simplicity and emphasis on storytelling make it ideal for groups looking for a game that prioritizes creativity and collaborative storytelling over mechanical depth. Synthesis and discussion of this analysis revealing possible gameplay elements for Neolithic Quest is done in Section 4.3.

4.2.1.4. Analysing CRPGs

In the previous section I have analysed TTRPGs D&D 5E and Quest to understand and reveal how design decisions result in distinctive experiences. Each game analysis had its own sections, with a comparative summary at the end. This is due to the nature of the gameplay elements of TTRPGs residing on written rulebooks, connecting design areas in a textual way. However, in the case of CRPGs, design areas are manifested as visual representations. Characterization is often in the form of informative character creation screens, acting as the gateway into the Game World, mechanics, and affordances. Action Resolution is usually opaque (hypomediate; see Malaby, 2023), with calculations being done in the background and giving the player visual and textual

feedback on the results. *Combat*, if it exists in a game, is a different mode of play, sometimes occurring in a separate temporal state. Character Development can happen in multitude of ways depending on the design of the system; a common way is to design specialized screens to inform and provide options for character's progression paths. However, like TTRPGs, design areas have very close relationships in terms of the designed experience they provide. For the reasons above, CRPGs were analysed in a more contextual and comparative way; design areas were investigated across different games. If investigating a design area of a particular game would result in a tangible and applicable knowledge, it was included in the analysis.

I have picked three main games to base my analysis on. These games are Pillars of Eternity II (PoE II; Obsidian Entertainment, 2018), Disco Elysium (ZA/UM, 2019), and Roadwarden (2022). They are relatively recent, garnered reasonable success and critical acclaim, provide a diverse perspective on modern digital RPGs, and does not require psychomotor skills such as high reflexes or input memorization to play. Their approach to RPG design is eclectic in terms of modality, rules, systems, visual representation, and storytelling. Some feature combat as a core gameplay, others utilize character attributes in resolving challenges and conflicts in other ways. Their approach to time is also varied; some use turn-based systems, while others treat the gameplay as real-time, or a combination of two. Below is a brief description of these four games. The associations of the game elements with design areas and design patterns are explored in related sections below. The four games are not the only ones I have investigated. Depending on a specific game's approach to one of the design areas suits the current discussion, they are included in the analysis.

PoE II is a fantasy RPG and is the sequel to Pillars of Eternity (PoE) released in 2015 (Obsidian Entertainment, 2015). PoE's philosophy was to be a "spiritual successor" for classic CRPGs such as Baldur's Gate (Bioware, 1998) and Planescape Torment (Black Isle Studios, 1999). The Game World of PoE II is represented in isometric view; *Agents* are in 3D, while the environment is prerendered 3D or 2D images (Figure 21), reminiscent of the games it is inspired by. It tells an epic story of characters chasing a god across multiple locations. The game's modality strongly resembles the game's mentioned above; main character has a pre-established goal, meets companions on the way to achieve this goal, makes decisions while interacting with the world, gets stronger through this journey, and reaches the end of the story. The game balances

freedom of exploration with a structured narrative, offering players an open-world archipelago setting. This enables exploration through a combination of overland travel and naval mechanics, adding a layer of resource management and survival elements as players navigate the Deadfire (the name of the *Game World*) region. The game's emphasis is on creating a strong narrative through meaningful choices by the player, and tactical combat achieved by a flexible characterization system. While the game was designed to utilize Real-time with Pause system where the player can pause the game to assess a situation and give commands to their characters (akin to Baldur's Gate and Planescape Torment), the developers added a unique turn-based system post-launch without altering the structure of the game too much. There are frequent dialogue and environment skill checks that requires certain sets of Attributes to pass. I have picked PoE II for analysis due to its approach to RPG design of modernizing classic gameplay feel. There are some elements that are very useful to implement in the design of Neolithic Quest, which are discussed in the following sections.

Disco Elysium (ZA/UM, 2019) is a unique CRPG with mechanical and storytelling aspects that are tightly woven together. It is a narrative-driven RPG, played in an isometric view like PoE II, that emphasizes dialogue, player choice, and character development over traditional combat mechanics (Figure 21). The game explores sensitive themes such as ideology, trauma, and identity through a murder mystery set in a decaying, politically troubled city. The characterization system is deeply tied to the protagonist's psyche, with different *Skills* representing aspects of the mind, such as logic, empathy, and intuition. These *Skills* engage in constant inner dialogues, normally how NPCs would, influencing how players interact with the world and shape the narrative through a blend of rationality and emotional impulses. Disco Elysium avoids traditional RPG combat, instead using *Skill* checks and dialogue trees to resolve conflicts and progress the story. The protagonist is a complete blank slate; someone who lost his memories recently. While this may come as somewhat cliché, this allows the player to discover the world around the protagonist while he rediscovers it himself. With a heavy focus on moral ambiguity, personal consequences, and philosophical reflection, Disco Elysium stands out as an RPG that prioritizes storytelling, role-playing, and character introspection above all else. Disco Elysium's lack of combat mechanics, and skilful fusion of characterization and narrative makes it worth to analyse and learn from its design.

Roadwarden (Moral Anxiety Studio, 2022) is a text-heavy, choice-based CRPG that blends elements of interactive fiction with role-playing mechanics, set in a grim, mysterious world. The game centres on exploration and survival, as the player takes on the role of a "roadwarden" tasked with patrolling dangerous routes, helping villages, and uncovering secrets in a hostile, unforgiving land. Roadwarden is somewhat very close to a TTRPG experience through its choice of minimal visual representation of the game world, and agents. Only environments are presented to the player with an accompanying text that narrates the scenes. The player must use their imagination to play out the scenes as they make their way through the game world. The game focuses on atmosphere and storytelling rather than combat. It presents a world filled with ancient lore, mysteries, and the remnants of a lost civilization, encouraging players to uncover the history of the land and its inhabitants. Dialogue and choices are central to the experience, as players build their character's personality through interactions and decisions, which affect how NPCs respond and how the story unfolds. I have chosen to analyse Roadwarden due to its rich-world building, lack of combat, and emphasis on exploration. The game also incorporates only static images and text to tell a story, which is very useful to analyse to see how limitations can be taken advantage of (Figure 21).

4.2.1.4.1. Characterization in CRPGs

As the analyses of TTRPGs showed, the three design areas are tightly woven together. Characterization is perhaps the central area in terms of player involvement. A player is most curious about what kind of character they can create and enact in the game world. The other two design areas can only exist where the quantitative aspects of characters provide procedures.

In most CRPGs, Character creation screen is the first thing a player experiences, sometimes after a brief story exposition to provide a foundation for Character creation decisions. Approach towards the freedom of Character creation varies from game to game. Some games provide the player a blank slate, so to speak. Players customize every *Characteristic*, including their appearance and name. Design of other aspects of the game, such as narrative, quests, combat, and progression, must consider all the

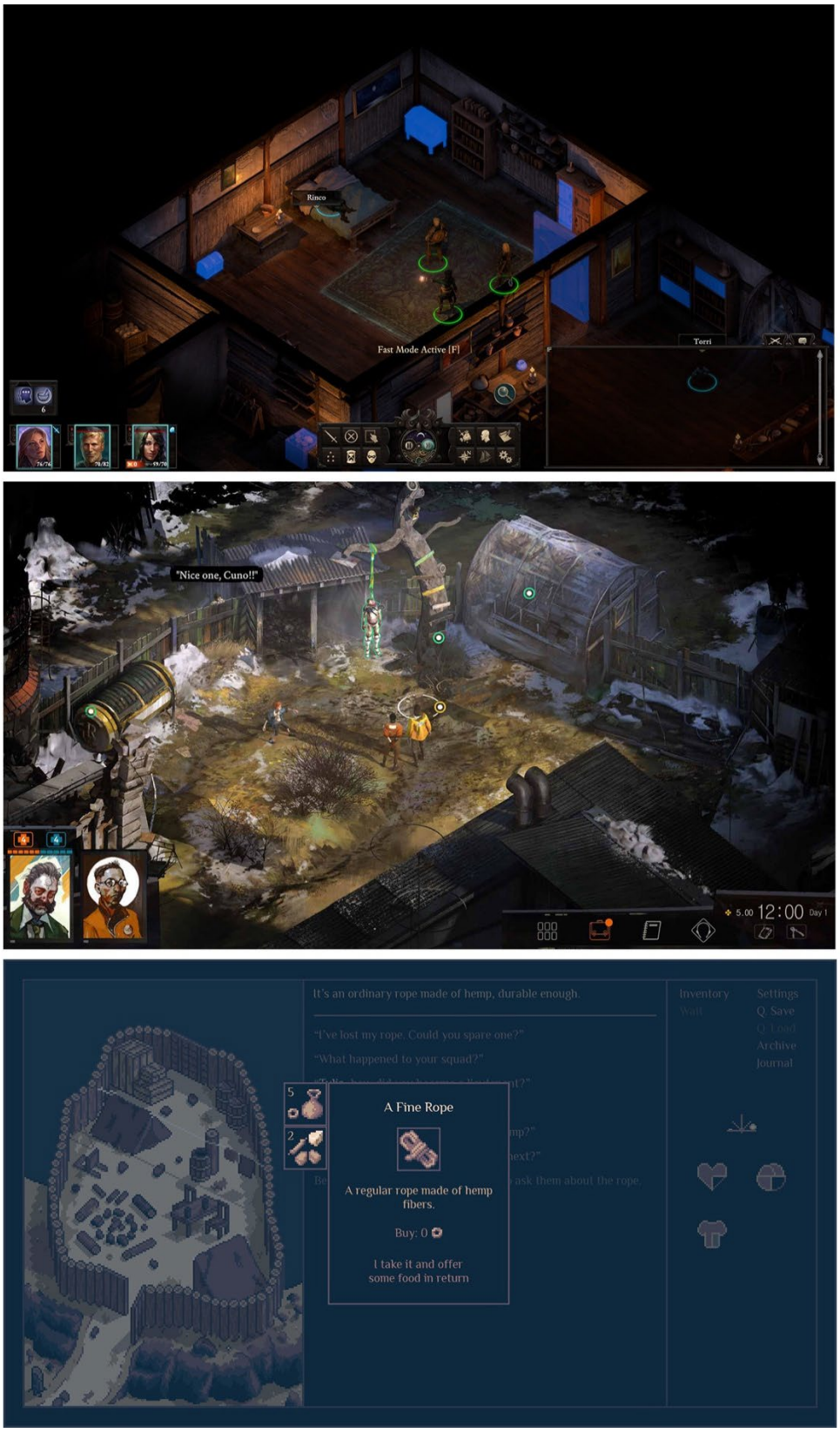


Figure 21. Screenshots from PoE II, Disco Elysium, and Roadwarden showcasing their gameplay modalities.

varied decisions player would make for their characters. This is specifically true if the game designers want to emphasize role-playing aspects in the game.

Classic CRPGs from the 90s and 00s follow this fashion; some of them provide progenerated character for players who want to start playing immediately or are overwhelmed with the choices before them, and PoE II follows this trend for instance. Through a specialized sequence of screens, the player makes choices on every character aspect the rules provide (Figure 22). Each screen provides contextual information on almost every characterization option. This is a common design feature in most CRPGs: Players learn the game as they play, as opposed to TTRPGs where players need to get accustomed to the rules, mechanics, and the game world before and during a session by reading the rulebook for the game. The method of application of this trend, however, varies greatly.

Character creation in PoE II occurs after a brief exposition to the story of the previous game, and the world state in the story. The game asks if the player want to import a save from the previous game so that the decision made, and their consequences carries into the second one. The player can choose from 6 different world states that effect the narrative if they didn't play the first game or does not have the save file. The character is not a blank slate, but an inhabitant who already had some impact on the game world and its numerous stories. PoE II has a highly customizable and flexible characterization system that draws from classic RPG mechanics while introducing a modern depth in terms of player choice, personality, and narrative impact. The game's Class system (*Functional Roles*), character progression, and *Roleplaying* options are designed to offer players a wide range of approaches to how they create and develop their characters, both mechanically and narratively. The prominent mode of play in PoE II is *Combat.* This is evident in the design of the Classes, and Attributes having high impact on Combat capabilities, as well as the heavy focus on getting more powerful *Loot* as *Equipment* as part of its Character Development. PoE II is also a party-based CRPG, meaning the player takes control of companions that participate in *Combat*, and have narrative effect on the gameplay. The design of Characterization pushes to come up with synergies between the capabilities of the main protagonist, and their companions.

Disco Elysium, a narrative focused CRPG, have a different design perspective on the integration of Characterization with other systems compared to PoE II. Central to its narrative is a broken man with a fragmented psyche. *Attributes* are the protagonist's capabilities, a common feature in RPGs. However, the *Skills* derived from *Attributes* (Figure 22) are different aspects of the protagonist's mind acting as distinct "voices" influencing thoughts and actions, much like NPCs or companions, aligns with the central theme of a man struggling to piece himself together. The initial challenge in the game is to discover who the protagonist is, without running out of *HP (Hit Points)*, or Morale Points. Morale Points represent the willpower of the protagonist and can be depleted when he makes a wrong choice in dialogues, which results in him losing confidence. This design choice is a very clever way to create an artificial conflict, putting a heavy focus on meaningful dialogue choices; the consequences of a wrong decision is as significant as a risky action made in *Combat*.

In Roadwarden, Characterization is built around the theme of survival and the responsibilities that come with navigating a dangerous and isolated world. The *Player Character* is a roadwarden, someone tasked with patrolling dangerous routes and making difficult choices to survive in an environment where resources are scarce, and danger is ever-present. Unlike PoE II and Disco Elysium, the player does not control a Character that has a visual avatar. The game plays more like TTRPG; the player needs to imagine how the *Scenes* play out, with only the environment rendered as 2D illustrations in pixel art style, and an accompanying text narrating the story in the second-person perspective. This style has the implication on making the "reader", or the player, the main character. The *Characterization* system is designed on the theme of defining one's own identity: Rather than relying on quantified and abstract *Attributes*, the game provides resources to the player, and their *Character* develops according to how they utilize these resources. While there are no tactical combat scenes like PoE II, the conflicts are resolved through meaningful choices that carry heavy consequences, further shaping the PCs identity. The game's default difficulty setting also give the player 40 in-game days to explore the game's world, the "peninsula", adding further meaning into the decision-making, and resource management the player must do.

Characterization options in PoE II are Sex & Race (species), Class (Functional Role), starting Privileged Abilities, Attributes, Culture, Weapon Proficiency, and Appearance

(Figure 22). Like D&D 5E, race selection has impact on both role-playing and statistics. Class has the biggest impact on the playstyle for the players, granting both possibilities and limitations on how they approach the challenges the game throws at them. There are 11 classes, with possibilities of multiclassing, each with its own distinct abilities, combat styles, and thematic identity. There are both familiar and novel approaches to class design, such as a priest offering a mostly supportive play style, while a cipher is unique to the world PoE, offering a playstyle of …. LOOK UP CIPHER. Each class is further divided into subclasses, allowing players to refine their *Characters* even further by specializing within their chosen Class, giving each iteration unique strengths, weaknesses, and flavour. For example, a Paladin can choose different orders, like the Darcozzi Paladini or the Goldpact Knights, which provide specific *Privileged Abilities* and *Role-playing* contexts.

Attributes system in PoE II ties directly into the gameplay and narrative by defining a character's core strengths and weaknesses. There are six key *Attributes*—Might, Constitution, Dexterity, Perception, Intellect, and Resolve—each contributing to both *Combat* effectiveness and social interactions. Unlike some CRPGs where *Attributes* are narrowly focused on *Functional Roles* (foremost in *Combat*; for an example see Divinity: Original Sin, Larian Studios, 2014), PoE II makes each *Attribute* valuable in different contexts. For instance, Might isn't just about physical

Figure 22. Character creation screen from Pillars of Eternity II: Deadfire.

power but also governs healing and spell *Damage*, making it relevant for both fighters and casters. Similarly, Resolve influences leadership and presence in dialogue, but it also contributes to the *Character's Ability* to resist hostile effects. This holistic approach ensures that *Attributes* impact both the mechanical and *Storytelling* dimensions of the game, blending *Role-playing* with *Combat* customization.

Skills in PoE II are not derived from *Attributes,* they depend partly on the culture and the background of the *Character*, and the player's decisions during the Character Creation and Level up screens. There are passive and active *Skills* that refer to a *Character's* likelihood of becoming successful in encounters requires *Skill* checks. Passive *Skills* are utilized during dialogue *Scenes*, while Active Skills on the other can be used to perform *Actions* in the *Game World*. Both types of *Skills* are also used in Scripted Interactions (Obsidian Entertainment, 2018); *Scenes* that are designed in a distinctive style to narrate certain non-combat encounters. For instance, Diplomacy *Passive Skill* determines how a character is patient, and respectful, and can be used to negotiate rational and reasonable resolutions to difficult situations. Mechanics *Active Skill* refers to a *Character's* knowledge on mechanical contraptions such as locks, and traps, allowing them to pick locks, disarm hostile traps or even place one on their own.

Background options in PoE II, similar to D&D 5E, have both mechanical (*Statistical*) and *Role-playing* impacts. Culture in PoE II refers to where a character hails from, while Background refers to what their job was before the start of the story. Culture gives bonuses to *Attributes*, while Background increases certain *Skills*. Dialogues between the PC and other *Agents* can shape in certain ways depending on the PCs Culture, also effecting the disposition of the society toward the PC. The final option the game gives to the players in terms of Characterization is Weapon Proficiency. An Agent can use any weapon in *Combat*, however, to access a weapon's special ability, they must be proficient in it.

It is evident from the analyses of both D&D 5E (Wizards of the Coast, 2014) and PoE II, RPGs with *Combat* mechanics have complex relationships between its systems. Characterization features have effects on *Combat, Storytelling,* and *Role-playing*, forcing the player to balance their character creation choices to be effective on both aspects. In TTRPGs, the *Game Master* can customize what kind of gameplay the players will experience; *Combat* or narrative focused, sometimes changing form

session to session. CRPGs deal with this situation through making various levels of difficulty available. For instance, PoE II have 5 difficulty levels, the easiest being named as “Story”, making the combat extremely easy, allowing players to focus on exploration and the story development. However, these options do not change the game’s foundational design philosophy, they only provide players an alternative play experience.

Disco Elysium’s characterization mechanics are divided into 24 *Skills*, categorized into four major *Attributes*: Intellect, Psyche, Physique, and Motorics. Each *Skill* represents a different aspect of the protagonist’s mind and body (Figure 23). For instance, "Empathy" gives insight into others' emotions, "Encyclopedia" provides historical or cultural knowledge, and "Shivers" connects the player to the mysterious sensations of the environment. These skills act like "voices" in the protagonist’s head, influencing how the player perceives the world and responds to situations. The unique approach Disco Elysium takes on *Character’s Attributes* and *Skills* contrasts common usage of these aspects. *Skills* in the game are not static—they act as *Agents* themselves. The more a player invests in a particular skill, the more vocal and dominant that skill becomes in shaping the protagonist's thoughts and actions. For example, high "Authority" may cause the player to act brashly, while high "Inland Empire" opens the door to surreal, dreamlike interpretations of reality. *Skills* intervene in the dialogues and interaction sequences depending on the success of the *Skill Check*. The player cannot fully anticipate the outcome of the *Skills’* interventions, and how the *Storytelling* will affect the overall narrative. There aren’t any standard *Abilities* in the game; every *Scene* presents different challenges and conflicts through the intervention of the relevant and dominant *Skills* the *PC* have. Coupled with the game’s approach to *Randomness* through *Dice Rolls,* the uncertainty of the *PCs* interaction with the *Game World* reinforces the protagonist’s narration of broken mind and fractured identity.

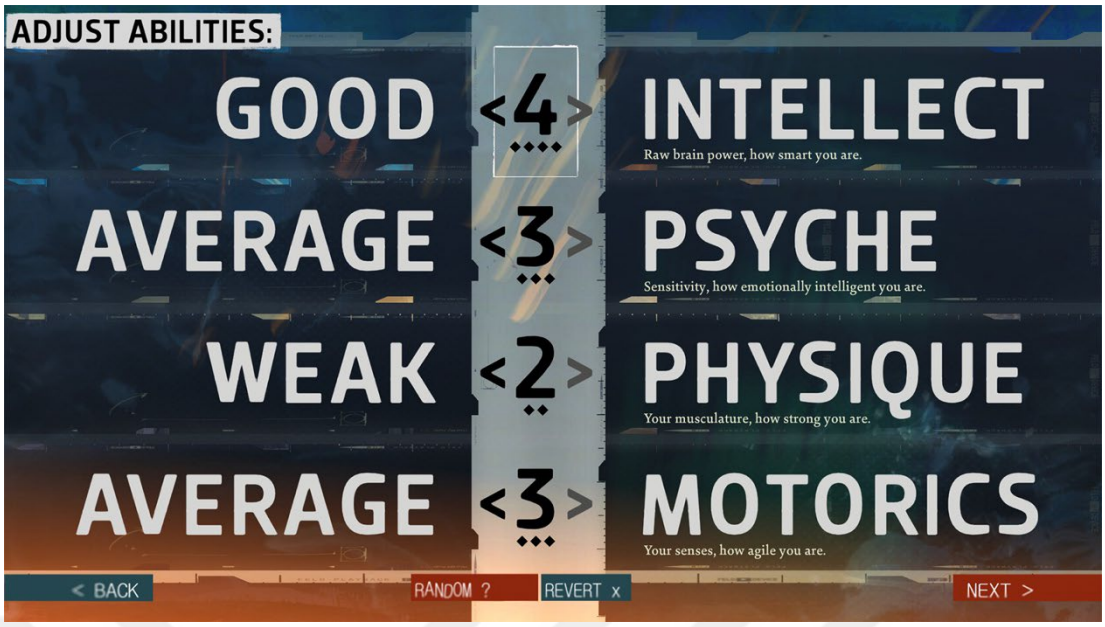


Figure 23. Character creation screen from Disco Elysium.

The “Thought Cabinet” is a rather unique gameplay mechanic that blends *Roleplaying* progression with narrative and *Character Development*. It functions as a system that allows the *PC* to internalize certain thoughts, philosophies, and ideologies over time. These internalized ideas have tangible effects on both gameplay and story progression. As the player interacts with the world, engages in dialogue, or makes decisions, new “thoughts” can be unlocked based on the choices they make, their dialogue responses, and the *Skills* they prioritize. These thoughts are not static bonuses; they reflect the protagonist's changing worldview, personality, and inner conflicts. The process of choosing which thoughts to internalize allows players to shape the character’s identity over time, adding a deeper layer of personalization and *Role-playing*. When the player discovers a new thought, it can be slotted into one of the available spaces in the Thought Cabinet. These thoughts need to be internalized over time, and each thought takes a set amount of in-game time or actions to fully process. During this period, the thought can provide temporary penalties or bonuses that influence *Skills*, *Attributes*, or even dialogue options. Once the thought is fully internalized, it becomes a permanent part of the protagonist’s personality, offering a set of lasting benefits or drawbacks. These effects can range from *Attribute* or *Skill* increases (e.g., boosts to Authority, Intellect, etc.), access to new dialogue choices, or changes in how NPCs react to the protagonist. This system is a double-edged sword: while thoughts can offer valuable

bonuses, they can also lock the player into certain mindsets that affect how the story unfolds.

The *Inventory* and *Equipment* system of Disco Elysium is minimalistic and primarily narrative-driven, focusing on items that enhance role-playing and storytelling rather than combat or resource management, thus it can be argued that the items a player receives can be counted as *Loot*. Items in the *Inventory*, such as clothes or tools, often provide boost to certain *Skills* or unlock new dialogue options, reinforcing the game's emphasis on psychological and social interactions. Disco Elysium's *Characterization* system is rich and well-thought, providing the players methods to interact with the *Game World* that keeps the *Diegetic Consistency* between *Role-playing*, and structural elements.

Attributes and *Skills* in Roadwarden are not utilized similar to PoE II and Disco Elysium. Instead, *Statistics (Stats)* are constantly displayed in the screen to make the player aware of their current situation, because they are also treated as *Resources* rather than quantitative aspects solely effecting probability of an action being successful. These *Stats* are vitality, nourishment, *Armor*, appearance and pneuma if the player chose a magic based class. Date, and time until dusk is also treated as a resource much like other *Stats.* The player needs to consider the Actions they take while playing to finish their main task before returning to the mainland in 40 days. The player's ability to survive is constantly tested, forcing them to make difficult decisions about how to allocate their resources. This balancing act reflects the theme of survival in a dangerous world, where every decision has a cost, and the player's success depends on their ability to navigate these challenges.

In conclusion, these games showcase different philosophies in integrating Characterization into *Role-playing, Storytelling,* and Action Resolution. PoE II sticks closer to traditional RPG roots with a blend of narrative and combat-focused mechanics, offering a familiar yet modernized and flexible approach. Disco Elysium redefines character development through psychological depth, using *Skills* and internal conflicts to drive the narrative and gameplay experience. Roadwarden, on the other hand, strips down to a more resource-focused system, where character progression is shaped by managing the consequences of choices within a survival framework. Each game provides a unique *Role-playing* experience, reflecting its core themes through its

approach to characterization: whether it be combat, psychological introspection, or resource management.

4.2.1.4.2. Action Resolution and Combat in CRPGs

Rules for Action Resolution are applied whenever a player attempts an action that have chance of failing. Unlike TTRPGs where possible actions are only limited through the negotiation between the rules, *Game Master*, and the player, a player enacting a *Character* in a CRPG can only make actions made possible by the game's design, without any negotiations. Therefore, designers of CRPGs craft these interactions meticulously so that actions of the players become meaningful choices as the Game Master is absent.

The three games also take diverse approaches towards Action Resolution and Combat. Only PoE II have dedicated *Combat Scenes* that require strategic utilization of *Abilities, Attributes*, and *Equipment* to overcome them. Disco Elysium and Roadwarden also resolves conflicts through encounters that rely on *Stats*, however, they are not tactical modes of play, rather built as Scenes that involve dialogue choices and decision making towards how to approach an encounter or a conflict.

PoE II and Disco Elysium are games played in an isometric point of view. They imitate the visual style of CRPGs released late 90s and early 2000s, such as Baldur's Gate (1998), Planescape Torment (1999), and Diablo 2 (2000). Even though this style emerged due to technical limitations, it has become a staple for CRPGs that have classic approaches to game design or have similar technical or budget limitations. The backgrounds in PoE II and Disco Elysium are pre-rendered 3D images projected as 2D. The characters are rendered in full 3D; however, the player cannot rotate the camera or change the perspective at any point (see Section 4.2.1.4.1. and Figure 21 for a review). This approach carries with it a nod to TTRPGs; animations are minimal, allowing the player to imagine nuances that are narrated in the game, such as mimic the characters are making, or characters dodging or blocking attacks.

How the player plays the game in terms of their perception is significant for Action Resolution. Possible interactions between the player and the game world are limited. Making their decisions as meaningful as possible is important. PC's possible interactions with a *Scene* may depend on their *Characteristics* revealing them. In PoE

II, there are three distinct situations where the Characteristics are utilized to expand on action possibilities.

First is during exploration, a player can hold the "Tab" key to reveal points of interests available by default. Perception *Attribute* is checked in the background by the game's engine, like a *Game Master* would in a TTRPG. If it passes the difficulty level, a new point of interest would be revealed, such as hidden chest, or a trap, in a different colour. Afterwards, a *Character* can interact with the object to see available actions. Second situation is during dialogue screens: An *Attribute* or a *Skill* is compared against a difficulty number. *Passive Skills* open-up new options, usually in the form of approaches. For example, Intimidate *Passive Skill* allows the *PC* to persuade an *NPC* through physical intensity and treats. Culture of a *Character* sometimes exposes their knowledge on the dialogue subject, granting new options. There are also dialogue choices associated with personalities. As the player selects options associated with a personality, it gives them a certain reputation, such as Stoic, Passionate, or Aggressive. This mechanic affects the *Roleplaying* aspects of the game the most. Finally, there are "scripted interactions" that are represented and narrated through text and illustrations. In these interactions, certain events transpire through players decisions. *Skill*, *Attributes*, and Cultural background also have roles in providing new options or granting approaches. *Ability* and *Skill* checks provide a layer of uncertainty in PoE II, because they are about the *Character's Skills* and *Abilities* rather than the player's. The player can strategize and plan for an action to be successful. This puts Characterization and Character Development a great significance. At the same time, success at an action feels rewarding because of the right decisions made during the gameplay.

Disco Elysium's *Skill* system is the foundation of its *Action Resolution.* The 24 *Skills* represent a facet of the protagonist's personality or abilities. However, they are not *Abilities* in the traditional sense but are internal voices that reflect the character's psyche. The player uses them to interact with the *Game World*, at the same time interacts with them to understand the world. As elaborated in the previous section, these internal voices intervene during a *Scene* that adds unique flavour to interactions, providing different perspectives or even conflicting advice. These voices do this according to the *Skill* they are manifested in. The success or failure of an action is determined through *Dice Rolls* influenced by the protagonist's *Attributes* and *Skills.* What sets Disco Elysium apart is that it doesn't treat failure as a simple binary

outcome. Failing a *Skill Check* often leads to new opportunities, humorous moments, or even advances in the plot in unexpected ways.

The Thought Cabinet in Disco Elysium is a unique system that allows the protagonist to internalize various ideas, philosophies, and memories, which shape his worldview and affect gameplay. Players collect thoughts during dialogues and interactions, which are then "processed" over time, providing both positive and negative modifiers to *Skills*, unlocking new dialogue options, or altering the *Storytelling* progression. This system is a unique approach on how Roleplaying in a CRPG can be made more explicit; the player can shape the identity, beliefs, and ideologies of the PC through strategic decisions. These decisions are not exclusively positive in terms of intentionally creating an advantage during Action Resolution, but they can be deliberately negative towards what kind of a *Character* the player wants the protagonist to become.

In Roadwarden, Action Resolution is primarily driven by narrative choices, resource management, and exploration, rather than traditional *Combat* or *Dice-based* mechanics. Players navigate a branching *Story* where decisions, influenced by character stats like combat, charisma, and knowledge, determine the outcome of player actions. Resource management, including time, food, and supplies, plays a crucial role, adding a strategic layer to survival and travel. With an emphasis on non-combat resolutions and permanent consequences, the game rewards thoughtful decision-making, careful planning, and exploration, creating a deeply immersive and narrative-focused experience.

Actions that have a chance of failure are usually resolved through *Randomness* in CRPGs. In PoE II, during Combat, and depending on the Action, relevant *Statistics* are added to the 100-sided Dice Roll (d100). This calculation is very complex and is done hidden from the player unless they want to see them. *Combat* becomes a fluid and visual action-feedback loop, eliciting a highly strategic gameplay experience. Depending on the action, such as attacking or using *Abilities* or spells, relevant *Statistics* of the attacker is compared against the target's (the *Enemy*), resulting in the action missing, hitting, grazing or critically hitting. The calculation of the *Damage* also depends on the success of the action, again informed by a set of relevant Statistics on both sides. Compared to D&D 5E and Quest, PoE II takes advantage of the

computational medium and relieves the player from making the complex calculations themselves and only making them aware of the result through visual feedback. The player can access a Combat Log real-time to see the results of their actions, and how they are calculated (Figure 24). Players then can strategize and modify their *Character* by gaining new *Equipment*, or *New and Improved Abilities and Skills* by levelling up to influence the outcomes of subsequent *Combat* encounters. *Randomness* exists to close the gap between a player's skill and their *Characters'*, like in TTRPGs. A hit or miss does not depend on the player's motor skills, but their decisions on strategically using an action made possible by the game's rules.

Figure 24. A screenshot of a Combat Scene from PoE II. At the bottom right, calculations of a single can be seen.

Disco Elysium utilizes d12 system to resolve actions with uncertain outcomes. As there are no Combat mechanics, conflicts are resolved through Active or Passive *Skill Checks.* During a Scene, the system can check if a specific *Skill* of the *PC* is high enough to grant any new options or interactions, without any *Dice*-rolls. If it passes, the Skill intervenes, and the game gives immediate feedback on the result of the interaction. This feedback is also highly embedded in *Storytelling*, providing important information about the *Game World*, the *PC*, or the inhabitants. If it fails, it remains hidden as the player is not skilful enough to notice details of the *Scene*, whether it is relevant to dialogue speech, or the environment. In Figure 25, the *Skill* Encyclopedia passes a passive check and intervenes to provide crucial information relevant to the

context and receives a quest from the *Skill* itself; a rather unique way to receive a quest compared to most RPGs. The player can also attempt an active check if the game prompts one depending on the scene. The player can see the likelihood of the check succeeding and the relevant modifiers added to the result. At this point the game makes the *Dice*-roll explicit, providing a glimpse of the inner workings of the system. This design decision is perhaps made to give the feeling of playing a TTRPG, where the *Dice* is rolled physically. It adds the uneasiness of anticipating a high roll, and provides feedback on what went wrong, or right. If the player fails an active check, and the check is a White check, the player can retry after investing a point in the relevant skill, or they meet the requirements. They are recorded in the journal to provide easy access. However, if the check is Red, they cannot be retried, and success or failure will impact the story immensely. On both instances of active checks, a double 1 roll always fails, and double 6 rolls always wins. Critical failure or success is a staple TTRPGs, reminding the players there is always a chance of performing beyond expectations, or miserably.

Figure 25. Screenshots from Disco Elysium showcasing *Active and Passive Skill* checks.

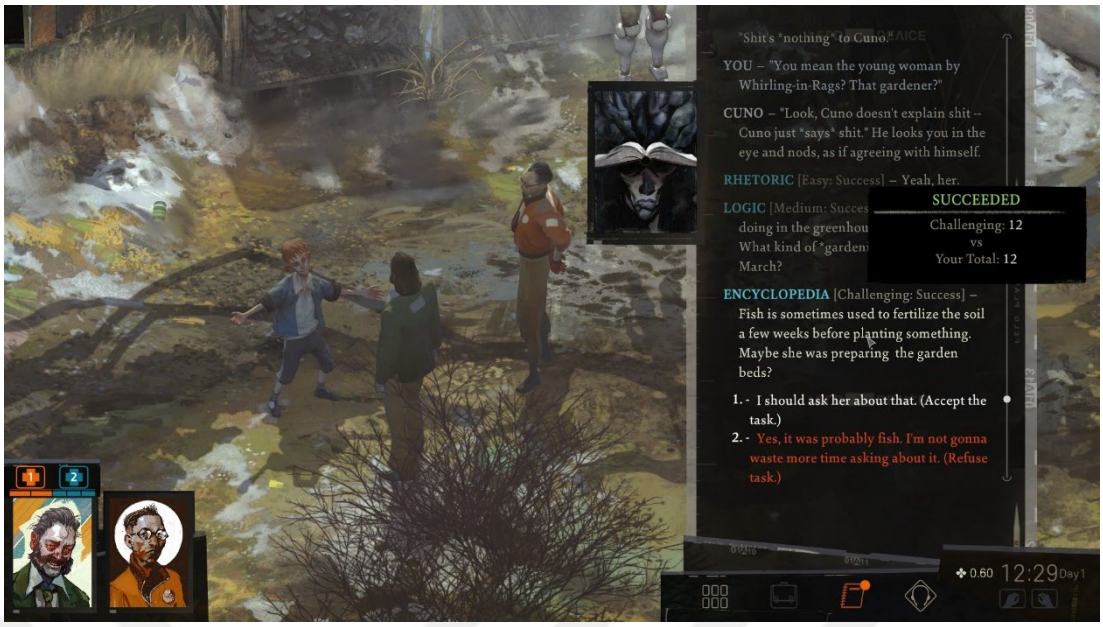


Figure 26. Screenshots from Disco Elysium showcasing *Active and Passive Skill* checks.

In Roadwarden, action resolution is primarily driven by exploration and narrative choices. The resources *PC* have act as *Statistics* during any action that have chance of failing. Their effects are also connected with each other, pushing the player to take care of their *Characters* by focusing on keeping all the resources as high as possible, not just exclusively on one. Vitality affects Appearance and chance of success during physical struggles. PC can lose Vitality during Combat if their *Armor* is damaged. It can be restored by sleeping, if the PC's Nourishment is higher than 1. There is also Stat referring to *Combat* experience which effects the success of Combat scenes that involve random chance, and it increases in the verbal increments between none, and expert. Appearance is a resource that is affected by Vitality, *PC's* Cleanliness, and Outfit. It affects social interactions, and how well the PC is received. Nourishment affects the success of physical struggles and restoring Vitality during sleep. It is refilled by eating and depletes after physical struggles and sleeping. *Armor* can be damaged during *Combat* and can be restored by fixing with it tools. Time is the Stat and resource that binds all the other mechanics. Most tasks and the main objective the player chose at the start of the game are time sensitive, and major actions such as sleeping, and travelling consumes time. The player needs to plan their actions accordingly to finish their objective before 40 days of in-game time on the default difficulty. The interconnectedness of the player *Stats* and resources create a tense experience that

reflects and embodies the struggles the protagonist of the game having in the *Game World*. Unlike most CRPGs that focus on *Combat* where the player might choose the ignore *Roleplaying* and focus on maximizing *Attributes* and *Skills* to overcome *Combat* challenges, Roadwarden rewards player's meaningful decisions towards their *Character's* personal objectives.

CHAPTER 5: IMPLEMENTATION AND EVALUATION

This chapter documents the Implementation and Evaluation phases of the design explorations for Neolithic Quest. Informed by the insights gained through Inquiry and Investigation phases, design decisions were made in different levels of abstraction. The resulting prototype is then evaluated by play-testers. The interpretations of the evaluations and observations were presented in this chapter, while the discussions are documented in Chapter 6.

5.1. Implementation

In this section, materials from the literature review, and the Inquiry and Investigation phases come together towards building a prototype. Implementation starts form high-level design decisions, building a foundation to answer the research aims and design goals. Mid-level abstraction is built upon the conceptual foundations and is concerned with a player's experience on a wide perspective. Low-level abstractions are design decisions that strived to create a concrete prototype to be evaluated by the players. All the design decisions are informed by inquiries and investigations made in the previous chapter. Figure 27 illustrates these relationships in a simplified way.

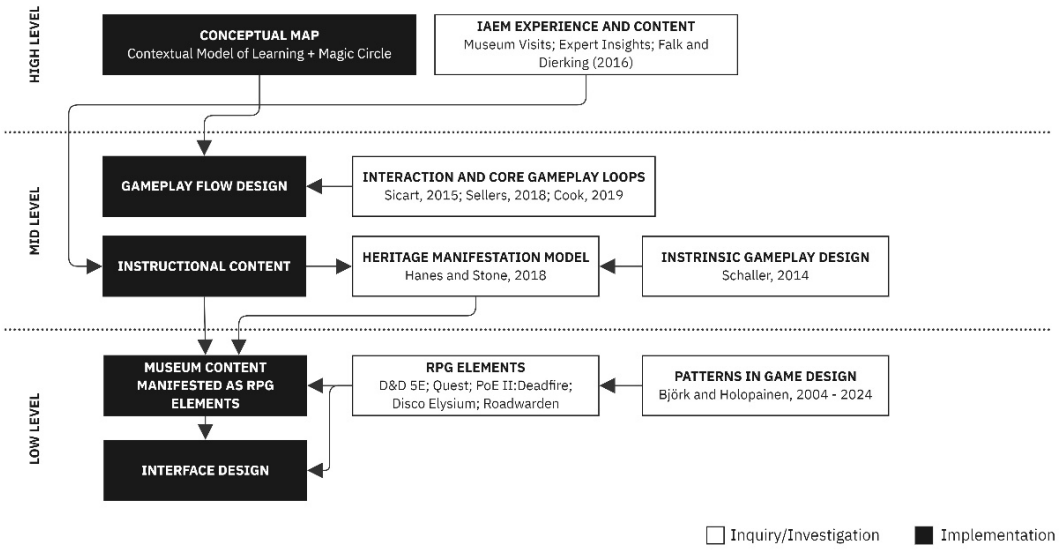


Figure 27. Diagram illustrating the relationship between design decisions in the Implementation and Inquiry/ Investigation phases. It also showcases how the process moves through different levels of abstractions.

5.1.1. Conceptualization and High-level Abstraction

As a designed artifact that needs participants to become an experience, a game creates its own context to engage with the players. The museum also provides its own context by creating learning opportunities, engagement, and entertainment for its visitors. It is inevitable that contexts the game and the museum create will intersect and interact with each other. This intersection is the foundational design situation that creates both the challenges and the opportunities.

Contextual Model of Learning (CML; Falk and Dierking, 2016) sees the museum experience holistically, as reviewed in Section 4.1.3. This model views museum visits as shaped by the interaction of personal, sociocultural, and physical contexts, with time as a fourth dimension. The personal context includes visitors' knowledge, motivations, and expectations; the sociocultural context reflects cultural background, social interactions, and group dynamics; and the physical context encompasses the museum's architecture, layout, and atmosphere. These factors collectively influence visitors' experiences before, during, and after the visit, with the museum responsible for shaping this extended experience over time.

The opportunity here is that "a game designed to be played in the museum" does not necessarily mean that it should be played during the visit. As Falk and Dierking suggest, museum experience starts with the decision to go to the museum and lasts long after they leave (2016). A gameplay experience that intersects with every aspect of a museum visit can also enrich that experience in a wider scope and on a deeper level.

Museums can adopt informal educational roles, such as promoting awareness, changing habits, and contextualizing visits to enhance their experience (Wang and Nunes, 2019). These roles coincide with what IAEM wants to achieve in terms of their visitors' experience (see Section 4.1.4. for a review). IAEM wants to impress their visitors through the design and content of the exhibitions, provide opportunities to contextualize their visits by addressing various visitors' interest and knowledge, and make the visitors museum regulars of IAEM or other archaeology museums. Mortara et al. (2014) acknowledge cultural heritage serious games can achieve awareness regarding cultural, archaeological, and natural heritage. Thus, a serious game designed

to be aligned with these educational roles can enhance museum experience (Djaouti el al., 2011).

Neolithic Quest is conceptualized as an RPG that can be played before a player visits the museum, during their visits, and after they leave. Before visiting the museum and when a player plays Neolithic Quest, they can be made aware of the museum's affordances, such as the exhibitions and their content. This can address the personal context of a player, stimulate interest in the subject, and motivate to learn more. Even though IAEM has its own dissemination channels such as a website and presence on social media platforms, they do not give attention to the content and the experience itself, but the museum as a place only. This iteration of the game, as the name suggests, focuses on the Neolithic period artifacts displayed in the Mind of Civilization (MoC) exhibition. However, if a player can be turned into a visitor, they can become motivated to see other exhibitions as they will be aware of the museum as an institution.

This iteration of the game only covers the "before visit" phase to work on a narrower scope. However, the foundation was conceptualized to encompass all phases as structural design decisions should be made thinking holistically. When the player starts learning to play the game, they are also exposed to the cultural content manifested in the game. This means that as they start learning about the artifacts, their sociocultural context is also addressed. They might have prior knowledge on the subject, or they are motivated to learn more as they are engaged with the gameplay. At this point they might be already motivated to visit the museum. In the game, some concrete goal can be utilized to motivate the players extrinsically visit the museum such a quest that involves an artifact in MoC. In any case, play need to "move" to the physical museum setting (see Huizinga, 1980; Salen and Zimmerman, 2004).

At this point I want to draw attention to how a voluntary museum visit can be related to the metaphor of Magic Circle. When a person visits a museum, they know they are entering an educational institution, unlike going to a shopping mall or an amusement park (Falk and Dierking, 2016, p. 45). They may have idiosyncratic reasons for such a visit depending on their personal interests, needs, and motivations. When the desire to satisfy one or more personal needs meets with the perception that the museum is the context that can meet those needs, they can decide to visit that particular museum (p.

55). Museums can offer personal experiences that are somewhat “reverential” (Graburn, 1997 cited in Falk and Dierking, 2016, p. 46), and “peace and fantasy” where visitors can escape the mundane and ordinary life. However, visiting a museum does not allude to entering a Magic Circle. It can offer a separate experience than ordinary life, and create a unique context, but without the lusory attitude that play creates. What if a visitor goes to the museum with the goal of playing in the museum? Does that create a Magic Circle unique to the museum?

This question does not pose a hypothesis, but a design situation that can be explored. Matched with the potential learning outcomes and educational goals of the museum, the concept of Magic Circle and CML can come together to form a conceptual map of a museum experience enhanced through gameplay.

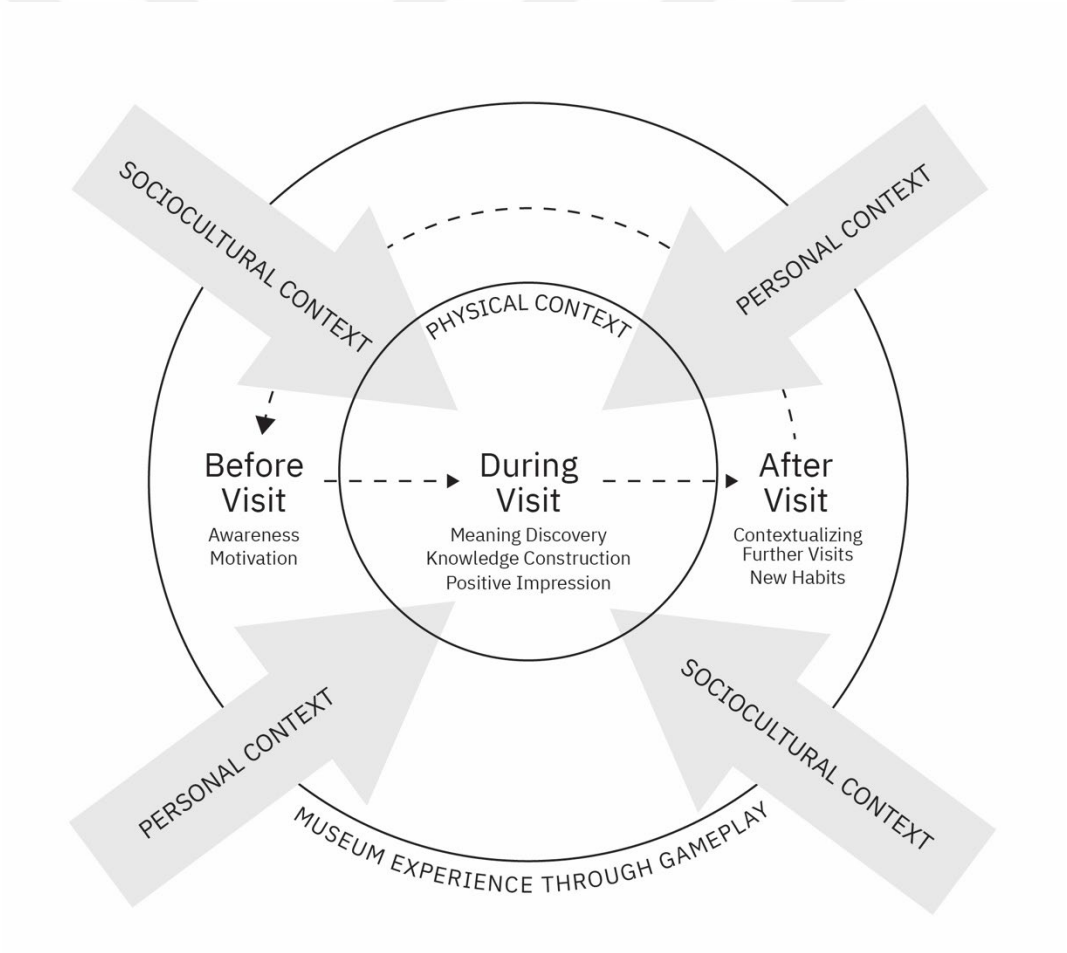


Figure 28. Conceptual map for high-level abstraction of the gameplay encompassing the museum experience.

Personal and sociocultural contexts inform every aspect of the game, whether it is played during, before or after visit. Physical context, specifically the exhibition, labels, and all the content that is physically displayed are addressed during the visit. As illustrated in the map, instances of the visit can inform different potential learning outcomes, educational and experience goals. Playing before visit can provide motivation and promote awareness. During the visit, the players can discover meanings of the artifacts, construct knowledge through these discoveries, and as a result, gameplay can help in leaving a positive and lasting impression on the player. After the player leaves the museum, the meanings, impressions, and knowledge they constructed during the visit, can help the players to contextualize the content of IAEM with other museums or their prior knowledge and preconceptions, and ultimately create new habits such as becoming archaeology museum regulars, inciting them to visit museums in other cities and regions. These objectives, however, might move to other instances of museum visit, which is the aim of the holistic play experience of the game.

When played before visit, and outside of the physical context of the museum, the players enter a "frame". This frame is the Magic Circle the game creates through its artificiality inhabited by the player, where rules have authority, and objects and behaviours gain new meanings. However, this frame is not absolute and concrete. Endogenous meaning (see Section 2.1.3; Costikyan, 2002) the game holds can transform into a new and personal meaning constructed by the player as they engage with the game. This "new" meaning would rise from the manifestation of heritage content and narratives from the MoC exhibition. Players are introduced to the Game World, starts to enact their *Characters,* and become an inhabitant of the Neolithic age. As they learn the game, they would build awareness of what to expect from the museum, in terms of content and experience. When they visit the museum, they become visitors, but also carries the knowledge and the meaning of being a Neolithic age inhabitant.

As the players moves in time, play also moves (see Huizinga, 1980, p. 10). With play, the meanings transform. When players visit the museum with the intention of playing a game in the physical space, the relationship between the artificiality of the game and the physical reality of their museum create a new frame. This new frame is now informed by the physical context the designers, curators, and staff of the museum

create. Players engage with this physical context through their new impressions of the museum. If their experience with the game was evaluative (see Section 2.1.3 for a review on the concept; Salen and Zimmerman, 2004); meaningful play from their actions and the outcomes being both discernable and integrated in the larger context of the game, the experience of the museum for them would be enriched. Of course, all this depends on how well the gameplay elements were designed to accommodate a cultural context informed by the heritage content.

Players entering the museum have an impression on what kind of an experience the museum affords. They bring their own personal and sociocultural context to the museum. Similarly, players also bring outside knowledge when playing a game. This makes gameplay contingent on the acts by the player, and those acts are highly contextual and dynamic (Malaby, 2007; Consalvo, 2009). If the knowledge they bring into the museum is informed by the knowledge and meanings they have made from playing Neolithic Quest before visiting, then their learning experience can be enriched as they have started to be engrossed in the cultural framework the museum created for the MoC exhibition. The framework they engaged with that involves digital representations of the artifacts and the narratives they carry can become objects to see and learn about during a visit. These objects are imbued with tangible and intangible heritage knowledge, which are both explicit and implicit in the physical space of the museum. The game takes place in a context that is informed by personal, sociocultural, and physical contexts now, thus the gameplay needs to be accommodating for such a transformation. Gameplay must be adapted so that they are meaningful in the new frame the reality of the museum creates. The player's agency must be considered as the museum is an informal learning space.

When the game's designed experience for the museum space ends, the player can continue playing the game normally. After their visit, it is intended for the visitor to recall their experience and contextualize their learning with content from other museums.

The conceptualization of a holistic gameplay experience that encompasses every context of a museum visit is built on the interpretation of the Magic Circle metaphor as an enabler for the transformation of meaning. This can only be achieved if the lusory attitude of the player also moves with the meanings. Good game design can leave

strong personal, social, and cultural impressions on the players, addressing multiple capabilities and learning outcomes. Select game design and game-based learning methodologies were utilized to inform mid-level and low-level design decisions.

5.1.2. Mid-level Abstraction

David Schaller's intrinsic gameplay design approach is taken as a way of thinking on integrating museum content with RPG elements (Section 2.4.3; Schaller, 2014). This approach aims to "marry" the inherent attributes of the museum content with gameplay. Gameplay is designed specifically for the content, rather than putting content on arbitrary game elements. Players are required to make thoughtful decisions based on the content, leading to a more immersive experience: "a game which challenges the player to understand the content, not just the gameplay, in order to succeed" (Schaller, 2014, p. 6).

In the case of IAEM and the MoC exhibition, and referring to the design goals, players must made aware of the museum's affordances, learn about the significance of the prehistoric heritage of Izmir, and be motivated to visit the museum. The content needs to be carefully selected to provide purposeful engagements, and meaningful decisions. When looked through evaluative meaningful play perspective (Salen and Zimmerman, 2004), player's actions and their outcomes must be discernable and integrated in the overall framework of the game. With the intrinsic approach, this framework must be a marriage between the roleplaying experience and museum content. Thus, the first decisions need to make are about structural elements.

There is also a challenge for the museum to keep its identity in a game designed with an intrinsic approach: Museum's physical context should be addressed in the game explicitly without breaking the immersion. While diegetic elements such as tools, settlements, and agents represented in the game might have the spotlight in terms overall gameplay experience, meta elements should also be manifested with care. Archaeological information, facts, and techniques must be included in the game in some form. The opportunity here is that RPGs are very well suited to portray culturally rich worlds. As evidenced in Section 4.2.1.4.4, CRPGs usually include screens that provide information on the game world, giving opportunities for contextualization. This information, while not necessarily to progress in the game, makes the experience

and the player interactions far more meaningful and purposeful as the players are acting as inhabitants in the designed game world.

Heritage knowledge that is inherent in the artifacts are explored to be manifested in the game is selected from the content in the museum is and strengthened by expert views and outside sources. The content can be tangible heritage knowledge such as archaeological facts of the artifact, and intangible heritage knowledge referring to the customs, practices, and narratives forming around the artifact. An overall experience is formulated as gameplay loops which the player will do constantly through the game. Player's movement across different contexts and time should be considered inside those loops to achieve intrinsic gameplay.

MoC exhibition displays frames of prehistoric life presented through artifacts. These artifacts have both tangible and intangible attributes that are inherent to them, which are crucial for integrating into the gameplay. However, the exhibition focuses on a wide timeline, from Palaeolithic to Iron Age. Together with the museum experts, we have decided to focus on the Neolithic age which has a rich history and archive. The initial prototype was designed to integrate heritage knowledge form a very few artifacts to be tested.

The subtheme of "Technology that Comes with Stone Tool" focuses on how stone tools helped developed the prehistoric culture of Izmir. It is a good starting point to build a prototype that would act as a foundation for a larger, more encompassing game. While they are not explicitly mentioned in the exhibition, there are topics with specific design opportunities. For instance, stone tools were created for hunting, meat processing and piercing, and leather processing. These purposes are mentioned in the information text for the subtheme, however, the displays focus only on presentation of the artifacts and associated archaeological facts. Opportunities here are turning these facts into abstract and demonstrative gameplay elements, while the challenge is making them engaging and educational at the same time.

Before making any low-level design decisions, an abstracted gameplay loop must be defined. Through explorations, it can be iterated and refined. As analysed in Section 4.2.1.4.4., gameplay loops across different RPGs follow a similar pattern: Exploration, Encounter, and Progression. Exploration occurs when players look for ways to interact with the Scenes described by the game. These Scenes can provide direct goals for the

players or incite them to come up with personal ones. When they want to interact with the Scene, depending on the game's design, an Encounter in various shapes happens such as Combat, dialogue choices or Skill checks. As the actions of the players are resolved, depending on the outcome the Story and the goals are updated, or PCs are rewarded in abstract or concrete ways.

Core loop for Neolithic Quest (NQ) was decided to be as abstract as possible, following the same patterns described above. However, unique to NQ is that the gameplay will move between in and out of the museum. Thus, a gameplay loop can be illustrated to accommodate such a change and allow a designer to see the how player actions can create a certain kind of experience (Figure 29). The player can explore the

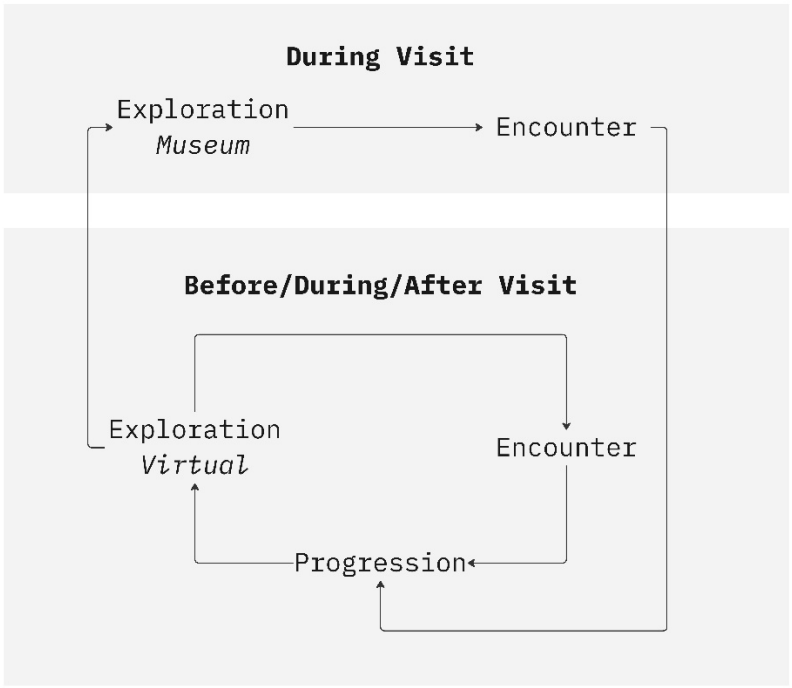


Figure 29. Provisional core gameplay loop of Neolithic Quest.

virtual world. Possibly through a *Quest* given to the PC, the player can visit the museum and have a unique Exploration phase informed by the physicality of the museum. Encounters can be also distinct; however, they are more or less closed structures, tied to numerous quantitative aspects of the game. These are crucial in terms having meaningful interactions with the exhibition. When the player leaves the museum, and if they continue playing the game, a new *Quest* can be given to incite another visit, possibly involving a different artifact with distinct Progression implications.

This loop is very abstract; it does not portray the complexity of such an interaction between the virtual representations of artifacts and the *Game World*, and their physical ones. There is also the educational aspect; how will the game integrate heritage content in its core loop? Daniel Cook's (Cook in Fullerton, 2019) and Michael Sellers' (2018) elaboration on feedback loops are valuable tools in this sense. Sellers' approach is broader, illustrating the feedback loop between the player and the game. A player adjusts their mental modal, and forms intents and goals depending on the feedback they get from the game, which also depends on the player's actions. The game then processes the player's input and adjusts the game state, restarting the loop through another feedback. Daniel Cook's looks at loops on a lower level: Players learn how to play a game through interaction loops. In his view, players gain skills by acting on the game rules and receive feedback on their actions. These loops can occur in split seconds, for instance in an action game, or can take weeks for a player to see the consequences of their actions in a CRPG. Thus, interaction loops must be designed to integrate possible learning outcomes. While a player learns the game through playing, they can also learn the educational content and construct meaning at the same time. This approach provides a low-level design view for Schaller's intrinsic gameplay (2014), and Salen and Zimmerman's evaluative meaningful play (2004) concepts. Both concepts aim to achieve holistic gameplay experience that feels meaningful and purposeful in the larger context of the game.

A gameplay experience encompassing every context of a museum visits needs to be informed by the museum content. The design of gameplay elements must be decided accordingly. For the prototype of Neolithic Quest, I have chosen three artifacts to integrate in the game. Slingstones (and the slings), stone axes, and obsidian arrowheads. During the interview with Expert B, it has come to light that stone axes were to cut wood, process meat, or break down bones. Slings on the other hand, were used to hunt. This fact is only conveyed in the information text of the subtheme; however, their significance is still implicit. Displays for the slingstones and the axe contains artifacts found in various regions around Izmir. Slingstones are found intact, however, the slings that were used to throw the stones are reproductions. There is an informative illustration accompanying the display showing a person using a sling. Apart from the wall text of the theme and the information label, there is no other information on slings, their usage, or significance. Similarly, display for the axes and

arrowheads have rich displays with accompanying illustrations and high number of artifacts, despite the lack of any storytelling components. However, obsidian arrowheads have a hidden narrative: they are proofs of the existence of trade in Neolithic Izmir (Expert B interview). According to the information gathered from the exhibition's wall text, artifact displays, expert interviews and external academic sources, the following possible learning outcomes from the stone tool theme can be integrated into the game:

- People in the Neolithic age tried to make their lives easier by using stone tools (Exhibition information labels).
- With the transition to settled life, they began to tame animals and grains (Exhibition information labels).
- Even though they started to practice agriculture, hunting became the most important way for them to meet their needs for animal products (Locay, 1989; Robson, 2010).
- Hunting also had a cultural meaning within the society, so it continued to be practiced for a very long time (Svizzero and Tisdell, 2015).
- They hunted using slings (sling stones) and bows (arrowheads).
- They used axes and chisels to process wood and meat (Exhibition information labels).
- They obtained the materials they could not get from their own environment through trade.

If these learning outcomes are naturally integrated into the aforementioned interaction loops, the player's gameplay and learning experience can become a holistic experience rather than separate modalities. For example, someone who has never been to a museum will learn that prehistoric slingshots were used for hunting. This information can be obtained through the choices made by the player's character when encountering a hunting animal in the game and the mental model formed in the player according to the results of these choices. In this case, the player's mental model in the first place will be that they will use a slingshot for hunting. However, if the player is asked to make a meaningful choice, the feedback of this action can be stronger. So, I can set the player's initial mental model as "I'm going hunting with a sling and an axe". According to Sellers' loop model, after adjusting their mental model, players set intentions and goals according to this model (see Section 2.2.1.2). They decide their

actions in the game to realize these goals. The key contribution of Cook's model is that the mental model is created and updated through learning (Section 2.2.1.2). This means that the final learning outcomes of the game can be achieved by integrating them into the gameplay loops that will naturally occur in the game. For Neolithic Quest, a possible loop that could be formed by the combination of Sellers and Cook's models and the provisional design decisions that could match this loop can be summarized as follows and illustrated in Figure 30:

1- The player character is given a quest to hunt with a sling and an axe. This will be the first version of the mental model. The quest will set a concrete goal.

2- The character encounters an animal, and the player needs to decide how to approach the situation. It is necessary to give the player options that will allow them to roleplay while making this decision. For example, the choice of sneaking up on prey or direct confrontation can help the player take on a character.

3- The player performs the action they want to do according to how they want to achieve their goal. In order to serve the learning outcome "Neolithic people produced sling and sling stones for hunting", the player character can be given the option of using a sling or an axe at this point. They will be more likely to succeed if they use a sling. In this way, they can learn both the Game World and the content of the museum through feedback.

4- According to Cook's model, players "manipulate" the rules at this point, that is, they evaluate them in such a way that their actions are successful. In the RPG context, these rules can be *Attributes*, *Skills*, *Abilities*, or *Equipment*. The opportunity for rules to influence actions should be taken as an opportunity for gameplay elements to reflect heritage content. For example, if the equipment is slings and axes, Attributes can be designed to affect the use of these tools. In this way, the richness of the learning outcomes can be increased.

5- Players can receive feedback on their actions in a balancing (negative) or reinforcing (positive) way. These feedbacks inform the player how their actions affect the game. Players adjust their mental models according to this feedback. According to Cook, feedback is an evocative stimulus; the better the game expresses the consequences of its actions, the more the player will care. This makes for a meaningful playing experience. The most important point in the context of Neolithic Quest is that this feedback should be meaningful and purposeful. For players' choices and actions

not to be arbitrary, their feedback needs to be discernible and integrated into the game as a whole (see evaluative definition of meaningful play in Section 2.1.3; Salen and Zimmerman, 2004, p. 34).

6- When the feedback is evaluated by the player, players update their mental models depending on whether they are balancing or reinforcing. In both cases, by updating their mental models in the light of this feedback, players learn how the different systems of the game work; that is, how to play. According to Cook, by combining different mental models, players acquire the skills required by the game. These skills can be physical or cognitive. In an RPG that does not require motor skills, players learn cognitive elements such as the mechanics, the *Game World*, and the story, as the physical skill would consist of being able to use an interface. In the context of game-based learning, when these elements are matched with learning outcomes and museum experience expectations, meaningful and intrinsic gameplay can emerge.

This loop can occur in different ways throughout the game. It can take different lengths of time for the player to see the impact of a decision on the story or the success of their character's skills in an action. So, the loops can occur one after the other or in parallel. They can be in the Explore, Encounter, or Progression phases of the game. In order for the narratives hidden in the museum to be experienced by the player as an RPG, the inherent properties of the artifacts in the museum need to be incorporated into the loops through the mechanics of the game. Design decisions in this context should be made to enrich the intended experience and learning outcomes of the museum. This is where low-level design decisions come into play.

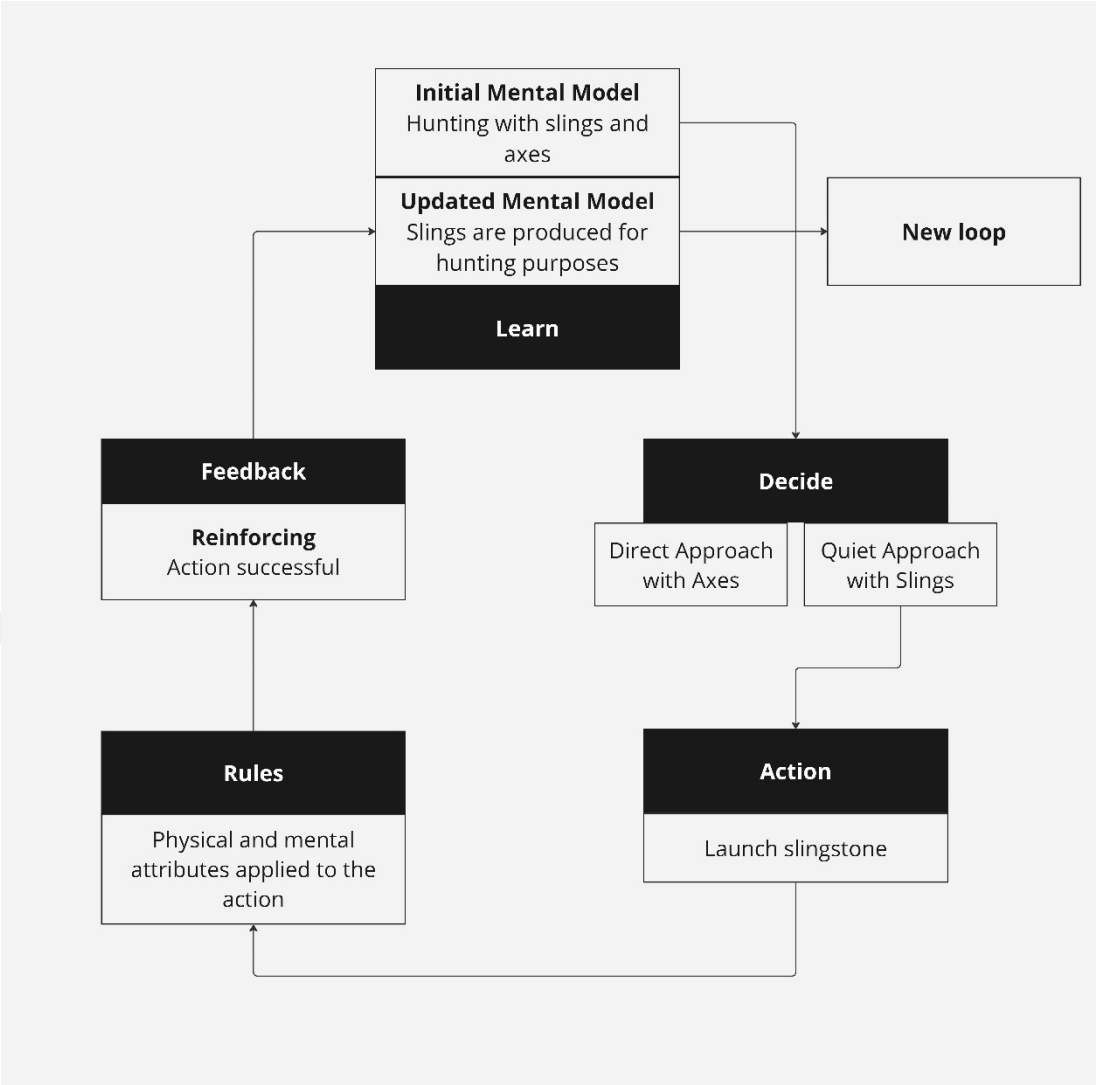


Figure 30. Provisional and example interaction loop of a small section for Neolithic Quest illustrating the update of mental models. As a two-fold interaction, learning of the game and learning of the heritage content matches.

I used Hanes and Stone's model to inform low level design decisions (see Section 2.4.3 for a review; Hanes and Stone, 2018). This model provides guidance on how heritage content can be intrinsically manifested in the game. The content planned to be learned by the players was decided considering the learning objectives. In the context of Neolithic Quest, an overarching learning objective was to "explore the traces of stone tool technology". Archaeological information, explicitly stated in the artifacts of slings, axes, and arrows, and implicit, hidden narratives were selected as content.

"The importance of hunting for the Neolithic inhabitants" is an overarching learning objective and one that can have the most impact on mental modelling. A holistic experience can be achieved if all other learning objectives and design decisions are

based on this objective. When deciding how to manifest this learning objective and the educational content in the game, RPG design areas and game design patterns were utilized. Before deciding on the other educational content, a simple scenario can be created and an approach that can go from general to specific can be taken.

In order to allow players to explore the Neolithic period with their characters, the main character can be designed as a young individual trying to make a place for himself in the settlement. In this way, the players have the opportunity to shape the character's personality traits. For them to learn the importance of hunting, they are sent to the nearby forest to hunt by the settlement's wise man. They will be accompanied by one of the settlement's hunters. This is an *Agent* with influence on both diegetic and meta levels, guiding not only the player's character but also the player. The PC is armed with sling stones, a sling, and a hand axe. When they encounter an animal in the forest, the player decides how they want to approach it. If he chooses to use a sling he will succeed, if he chooses to use an axe he will fail. In this way, both the player and the PC will update their mental models accordingly and learn the importance of slings in hunting. He will take his prey to the settlement and will gain both material and moral gains.

A customized game flow and loop created with this simple scenario can be thought of as consisting of Exploration, Encounter, and Progression phases. In the first prototype, this loop will only repeat a few times, but it will provide a lot of information about the impact of the design. Once the overall scenario and flow have been decided, the overall structure of the game needs to be decided. In a mobile game that will be played inside and outside a museum, a text-based but non-real-time structure would be more appropriate than a game that requires a lot of visual attention, considering that the player will also interact with the artifacts in the museum when needed. Roadwarden's overall structure is well suited to this: Illustrations and text depicting scenes visually accompany the narrative and allowing players to use their imagination. PoE II's "scripted interactions" screens offer a similar experience (Figure 31).

Figure 31. Simple core gameplay loop for Neolithic Quest.

Educational content to enrich the museum experience should be developed in line with the museum's experience objectives. While playing Neolithic Quest, players should be aware of the affordances of the IAEM and what kind of experience it offers and should be motivated to visit the museum. The way the artifacts in the MoC are manifested in the game should also help to reinforce this awareness and motivation. The best way to do this is for players to care about these manifestations and for their interactions with them to feel meaningful. Since Neolithic Quest is an RPG, this content should be based on RPG elements. For example, the player character should have traits that reflect the way they use stone tools. The following instructional content was developed for the first prototype of Neolithic Quest:

- Significance of stone tools for hunting in Neolithic age
- Using slings for hunting
- Capabilities of inhabitants
- Archaeological knowledge of slings
- Affordances of IAEM

The above list is not exhaustive, more content can be created during the design and testing processes. Since there will be content that can exist in the game on a diegetic and meta-level, design decisions should be based on these two different types of content. Hanes and Stone's (2018) model is a very good guide for this situation.

5.1.3. Low-level Design Decisions

Since RPGs are based on the player characters and serve as the interface between the game world and the player, it would be right to start from the Characterization design area when making design decisions. As can be seen in the RPG analysis, there are very different approaches to Character designs depending on the intended experience. The difference in complexity between D&D 5E and Quest is very apparent in every design decision of the game. Whereas Quest is more "light" and centred on shared story

creation, D&D 5E has a more strategic approach where almost every action is tied to a rule. In D&D 5E, *Characters* have 6 different Attributes, and 11 Skills derived from them. The *Attributes* and *Skills* determine their overall physical, mental, and social capacities. These *Attributes* and *Skills* determine the probability of a Character's actions being successful. While D&D 5E may seem more restrictive, these character traits act as "verbs" for players in their interactions with the world. They can understand what their character is capable of. PCs in Quest, on the other hand, are limited in the actions they can take when not using an Ability only by the discretion of the Game Master and whether they are compatible with the game world.

In CRPGs, the situation is different. Since interactions with a virtual *Game World* are limited, and these interactions take place through an interface, the application of *Character Attributes* are much more restricted. Since PoE II is Combat based, every Attribute is designed to give you an advantage in Combat in some way. Instead of these Attributes, Skills are based on the characters' background and Class choices. Skills are used in interactions with the environment and NPCs. In Disco Elysium, Skills are directly inherited from Attributes, and all interactions in the game are based on them. There are 4 Attributes that indicate physical, mental, and social skills. The numerical values of the Attributes determine the numerical values of the Skills at the beginning of the game, and the player can upgrade them later. In Roadwarden, resources such as Armor, Time, and Nutrition replace attributes and increase the likelihood of success in Encounters. It's a design that makes you feel the danger and time constraints of the game world through the decisions the player makes.

I planned to design the Characterization options in Neolithic Quest to manifest the intrinsic tangible and intangible properties of the artifacts in the exhibition. If Neolithic Quest is to be a game that represents the relationships and interactions of the Neolithic inhabitants with stone tools and their environment, the *Characters'* capabilities should provide meaningful actions during these interactions. But at this point an important decision needs to be made: How much fiction and abstraction should be used in the manifestation of archaeological phenomena and the artifacts in the exhibit. In all the RPGs analysed, *Attributes* and *Skills* abstract and quantify the capabilities of characters. A character's Strength of "16" means nothing outside the game's magic circle. This arbitrary number becomes tangible as the character performs actions in the game world, affecting the likelihood of those actions succeeding. The skills needed by

the Neolithic natives can be determined with a little bit of fiction and a little bit of present-day skills.

Considering that IAEM addresses a general audience (interview with Expert A), it is important that the game mechanics are accessible and understandable. In complex systems like RPGs, the learning process depends on many interaction loops informing each other to create a holistic and multi-layered mental model. Therefore, the mechanics' endogenous meaning of Neolithic Quest should be as familiar as possible. It makes sense that the *PC's Attributes* refer to the physical, mental, and social capacities we need in everyday life, and are named directly as such.

PC's interactions with the Game World will be based on these 3 *Attributes.* They will act like both an *Attribute* and a *Skill*. So instead of separate systems that inform each other like Disco Elysium or D&D 5E, it is a single system that will work on both *Active* and *Passive Checks* and affect tool usage. These skills need to be expressed to the player in a clear and meaningful way. Table 2 shows how to describe Skills on the Character Screen.

Table 2. Planned Character Skills of the protagonist of Neolithic Quest.

Player Character Skills	Description
Physical	Body strength, endurance and agility. It shapes your ability to show strength, withstand challenges and move with precision.
Mental	Intelligence, willpower and perception. It affects your capacity for understanding, your resistance to mental stress and your ability to notice fine details.
Social	Charisma, empathy and influence on others. It determines your ability to build bonds, motivate allies and persuade others.

The materialization of PC's *Skills* as *Statistics* will be decided during the design of *Action Resolution*. This design decision will determine how *Randomness* will be implemented, the lower and upper limits of these numerical values, and how the probability of player actions being successful will be calculated. PC skills will also

allow players to influence *Storytelling* through *Roleplaying*. A PC who develops physical *Skills* will be better able to perform actions that require strength, stamina and agility, and will be more likely to choose to interact in Scenes. In order for players to demonstrate their *Skills* in meaningful and purposeful actions, Scenes need to allow for different approaches. It is even possible to create situations where some Skills can be used together. For example, a PC with high Physical and Social skills can try to influence an NPC by using "Intimidation" in a dialog with him. Likewise, a PC with a high Mental skill might try to persuade by being "Diplomatic" in social interactions. One important point here is that interactions in CRPGs are much more restrictive than in TTRPGs. Therefore, these interactions need to be very detailed and carefully designed, and they need to provide the player with a meaningful game.

The best way for the intrinsic properties of the artifacts in the museum to be manifested in the game is for the players' actions with the stone tools to be meaningful and purposeful. This can be achieved by creating a holistic framework while the results of their actions form their mental models. The instructional content "capabilities of Neolithic inhabitants" by itself will not contribute to the museum experience. PCs need to utilize their capabilities. The *Inventory* and *Equipment* patterns will be very helpful for making design decisions in a game that aims to make sense of stone tool use.

In this context it makes sense to return to Hanes and Stone's model. As explored in Section 2.4.3, the ways in which heritage content is manifested in the game has a huge impact on the experience of the game and the learning of heritage. These ways also indicate which capabilities of the learner the learning outcomes can point to. Hanes and Stone reported that serious games can build skills and competence in the cognitive, affective, and psychomotor domains of Bloom's taxonomy, as well as in the meaning making domain (Hanes and Stone, 2018, p. 594). Since Neolithic Quest, as mentioned earlier, does not expect a more complex psychomotor skill than the ability to use a mobile interface and does not target learning or development in this domain, I exclude this domain. Cognitive capabilities refer to the “changes in information processing in the mind” (Hammer et al., 2018, p. 284). Cognitive effects include instructional content that has to do with facts, practices, and other representations of concrete knowledge (Wouters et al., 2013). Players integrate knowledge about the world into building or updating their mental models through their cognitive processes (Schank and Ableson, 2013). When players encounter new information, they update their

mental models according to the feedback provided by the game. If the game has a specific learning goal and domain, players learn this domain while learning the game (Shaffer, 2006); that is, they construct new knowledge about the instructional content intrinsically as they play.

Affective domain addresses attitudes, emotions, values, and motivation, shaping how learners engage with and internalize content on an emotional level (Krathwohl, Bloom, and Masia, 1964). This domain is essential in fostering a deep connection with the instructional content and supporting learning in a holistic way. In the context of game-based learning, affective learning is achieved by creating an emotional experience that engages players and helps them explore emotions through gameplay (Dorman and Biddle, 2008) resulting in improved player immersion, motivation, and overall learning effectiveness (Argasiński and Węgrzyn, 2019). Meaning making refers to the understanding of the overall framework of heritage content that is manifested in the game. It is an act of building knowledge through interaction and analysis. The process of meaning making involves developing understanding by interpreting and engaging with textual content, as well as visual and sensory information sources (Wolsey and Lapp, 2019). Meaning making necessitates conceptual change on the part of the individual engaged in a cognitive activity. Such conceptual change requires existing mental models to undergo modification or transformation in response to encounters with novel experiences (Wolsey and Lapp, 2019). It can be inferred from Wolsey and Lapp's elaboration on the meaning making process that the inherent interaction loops in games have a potential for change in the player's side. If the game can present novel experiences to players in an affective way, their meaning-making processes can go together with learning to play the game.

The foundational instructional content of Neolithic Quest is the significance of stone tools for hunting in Neolithic age, using slings for hunting, and capabilities of inhabitants. Significance of stone tools for hunting addresses cognitive, affective, and meaning-making capabilities. Although the importance of stone tools is given as information in the museum, there is no narrative to create meaning. One of the hidden narratives in the museum is to explain to the player why hunting remains a viable activity despite the transition to settlement and agriculture becoming the main food production technique. This educational content, which will form the players' first mental models, will also set in-game goals for them. Affective capability will be a

long-lasting effect at this point, as the player will be able to assess that hunting is still necessary after a few interaction loops, together with the in-game narrative.

If both cognitive and affective capacities are properly addressed, the player's meaning-making process would work in a meaningful way, they would eventually have a good impression of the museum contents and will be motivated to visit the museum.

Table 3 shows the design decisions of the three instructional contents according to Hanes and Stone's model. However, these decisions are not set in stone. They were turned into playable prototypes for further exploration. My contribution to Hanes and Stone's model is the game design pattern associations with the instructional content to reveal what kind of low-level design decisions can be made. At this stage, analysis of CRPGs is very beneficial to revisit. Even though the instructional content has distinct means of manifestations, formal elements of gameplay need to be accessed through interface elements that are consistent in design.

Table 3. Heritage manifestation for Neolithic Quest.

Instructional content	Significance of stone tools in Neolithic age		Using slings for hunting	Capabilities of Neolithic age inhabitants
Capability	Cognitive, affective and meaning-making		Cognitive, affective, and meaning-making	Cognitive, and meaning-making
Information Type	Intangible Heritage		Intangible Heritage, Tangible Heritage	Intangible Heritage
Focus	The focus is on hunting as an activity in the Neolithic age using stone tools. Existence of stone tools technology, and their usage in hunting is a fact relayed in the museum. Narratives behind this activity is fictionalized and simplified for affect.		Showcasing a fictionalized and simplified hunting activity to convey usage of slings for hunting purposes.	Focus is on capabilities of Neolithic age inhabitants that are partly fictionalized and abstracted.
Manifestation	Manifested as a *Quest* to establish goals for the players. NPC who gives the quest is a fictionalized character.	Shown as an entry in a "Quests" menu found in most CRPGs. It is renamed to "Thoughts" to achieve affect in a diegetic way.	As an *Encounter Scene* with multiple outcomes providing possibilities for the player to interact with the game world and learn from the feedback of their actions.	Shown as a character sheet that corresponds to the abstract statistics for physical, mental, and social capabilities. They are called *Abilities* in the game.

Table 3 (continued). Heritage manifestation for Neolithic Quest.

Means of Manifestations	Dialogue with an NPC providing goals for the player. A static 2D illustration of the NPC is accompanied by narrative text and dialogue choices. The manifestation would take a long time and other content to achieve the learning outcome. Mechanical, graphical, verbal.	Text in a journal format that records the "thoughts" of the protagonist. Verbal.	Static 2D illustration with narrative text and dialogue choices. Interface elements conveying action resolution. Mechanical, verbal, and graphical.	Abstract statistics utilized as modifiers towards deciding the likelihood of success of player's actions. Mechanical, and verbal.
Level of Demonstration	Abstraction informed by facts	Abstracted	Abstraction informed by facts	Abstracted
Tone	Affective within game narrative	Affective	Affective	Affective within game narrative
Pattern Associations	Agents, Quests, Storytelling, Roleplaying	Predefined Goals, Direct Information, Diegetic Consistency	Agents, Enemies, Combat, Statistics, Dice, Randomness, Turn-Based Games, Diegetic Consistency	Agents, Player Characters, Attributes, Skills, Statistics

As a mobile CRPG that will have to be played while visiting a museum, interaction with the game should not be distracting. The first design decision to make in this matter is to limit direct control of the Player Characters as an Avatar, and move between Scenes through Actions, much like in TTRPG. As mentioned before, PoE II and Roadwarden have play modalities that fit with this aim. In PoE II there are "Scripted Interactions" that act as a break from general mode of play, shifting perspective from isometric view to a perspective resembling an adventure book. In this mode, players are confronted with a Scene narrated through text and illustrations. They are given

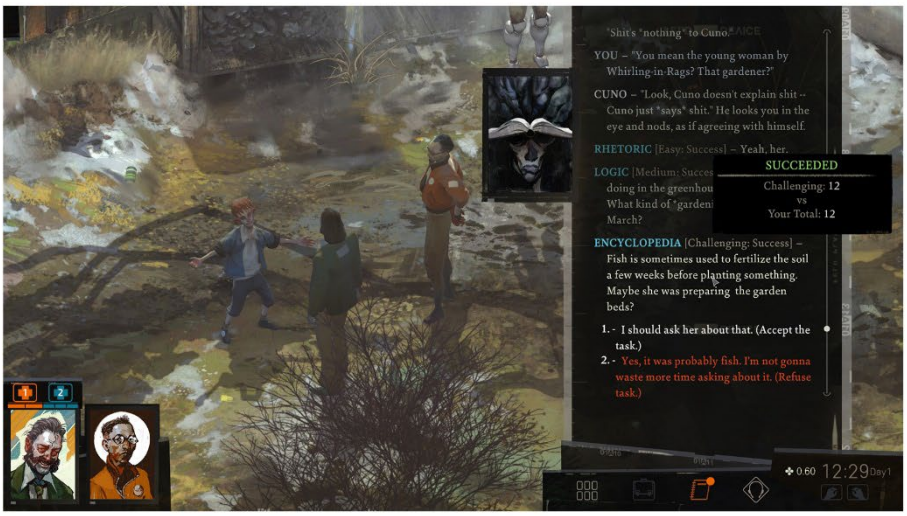
choice on how to approach the encounter, usually triggering Skill Checks, both passive and active. This modality enables the designers of the game to tell stories that would incentivize player imagination and go around making complex animations in the isometric perspective. Roadwarden's modality is consistent throughout the game. There is no direct control over the avatar, and players moves from Scene to Scene. There are also heavy textual and audial narration in Disco Elysium, although they don't break the overall modality, they are more focused sequences during dialogues and interactions. Scripted interactions in PoE II, and Roadwarden's modality are distinct in terms of how a player interacts with the game world represented in 3D. They are akin to a conversation between a Game Master and a player in a TTRPG session. The game narrates the scene, and players decide what to do. However, the difference is the limitations in possible actions. Example screens are shown in Figure 32. Designing Neolithic Quests gameplay perspective like these modalities will allow players to focus both on gameplay and museum content.

As Donadl Schön conveys, design materials need to be "seen" by the designer, then "moved" so that they can be reflected on (1992). Neolithic Quest's prototype now has a gameplay loop, a provisional scenario, and initial interface design inspirations. These materials were turned into sketches and prototypes to provide reflection for further iterations.

Daniel Cook's interaction loops have a variation called interaction arcs (Cook in Fullerton, 2019). Arcs have similar elements, but they do not loop. They are mostly employed to deliver evocative content. Players still act on the game world according to their mental models; however, their intentions are not to make a decision to manipulate the rules of the game. Arcs deliver "preprocessed" content and information for the players. In the context of RPGs, these could be any Scene that have affective outcomes. For instance, receiving a Quest in the form of Direct Information, does not invoke an action from the player, yet they update their mental models in an evocative way that provides goals and intentions. Because arcs do not loop, unique arcs are executed only once or twice through the game. They can be expanding into and from loops to form sequences that provide possibilities for the players to achieve cognitive and affective learning.

A

B



C

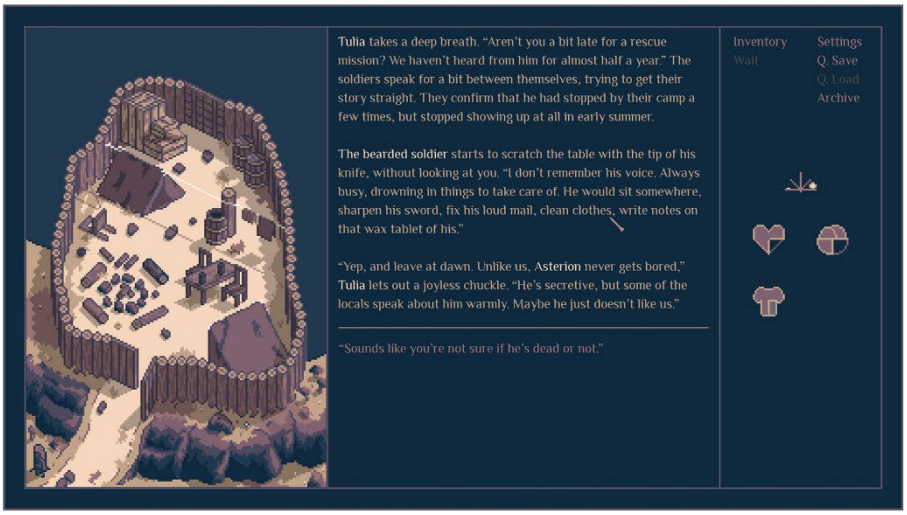


Figure 32. Narrative sequences across the CRPGs analysed in Section 4.2.1.4. A: Scripted Interaction from Pillars of Eternity II: Deadfire. B: A dialogue screen from Disco Elysium. C: A general gameplay sequence from Roadwarden.

In Figure 33, I have illustrated a possible sequence of arcs and loops and their respective learning outcomes that emerges from mental model updates. First arc establishes the story for the player which will give context and introduce them to the *Game World*. Their mental model is now inciting them to *Roleplay* their *Player Character* as a Neolithic age inhabitant. To reinforce the *Roleplaying* aspect, the PC is introduced to a *Non-Player Character (NPC)* who gives them a *Quest.* This Quest establishes a *Predefined Goal:* Go and hunt a small animal to prove yourself to the settlement. The "proving self" is a fictionalized and somewhat cliché Quest type and it does not represent any fact relayed in the museum. However, it is a fictionalized and abstracted design choice that is informed by the facts established in academic sources: Hunting were still relevant after the advent of agriculture if it was economically viable, and provide additional sustenance, but also existed as communal and cultural activity (Svizzero and Tisdell, 2015; Weisdorf, 2003; Harris, Price and Gebauer, 1999). *PCs* then *Encounter* a small animal that they need to hunt to complete their Quest. This *Encounter* utilizes mechanical elements of Neolithic Quest. *PCs* will be confronted with two main choices: Approach the small animal with their slings, or their axes. They

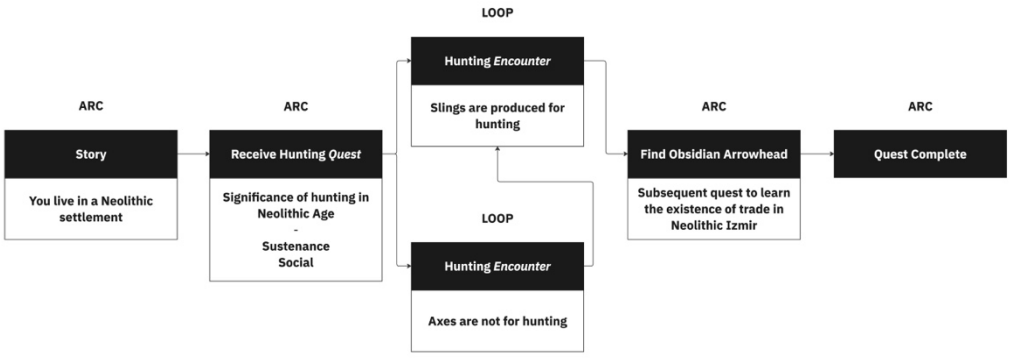


Figure 33. Sequences of arcs and loops to establish learning outcomes.

will only be successful if they use their slings, which will update their mental model accordingly through reinforcing feedback. And if they use axes, they will fail through balancing feedback. It is not a failure that will have player lose anything but pushes them to the right track. However, the success or failure of their action is not deterministic; as most RPGs employ, Neolithic Quest needs to utilize *Randomness* to provide uncertainty as an element. Uncertainty itself provides ways for emergent *Storytelling* where the player can interpret the outcomes of their actions. Usually, the complexity of RPGs come from the rules for Action Resolution and how

Characterization affects those rules. For a RPG designed to appeal a general audience with mixed game literacy, it is logical that the Action Resolution system is simple, but meaningful at the same time. These decisions are explained further into section where the Encounters are scrutinized.

The Encounter *Scenes* are composed of multiple loops depending on the player actions. They will provide necessary feedback to achieve potential learning outcomes. The player will get out of the loop then they successfully hunt using a sling and move to the next arc. To enrich the prototype, I have decided to include a small section for a possible future quest that would have the players learn about the existence of trade in Neolithic Izmir. The PC finds an arrowhead on the ground on the way back to the settlement but does not recognize the stone. They decide to take it to the settlement and learn about it. For finishing the hunting *Quest*, the player can develop their PC further.

As explored above, design of the interfaces will get inspiration from narrative sequences of CRPGs. The scenes are composed of similar verbal, graphical, and mechanical components: A narrative sequential text that flows with the input from the player, an illustration or image depicting the Scene that helps with modelling, and relevant actions that can be made by the player. In Disco Elysium's case, Scenes are played out as more zoomed in version of what the player sees during Exploration. In any case, the design of the interface needs to accommodate other kind of screens with verbal, graphical, and mechanical elements. Manifestations of instructional content were explored in Table X, and Neolithic Quest needs a dialogue screen where the majority of interactions with the *Game World* would take place. A Character screen is also needed to allow the player to view the PC's Attributes. One of the crucial screens would be an Equipment screen containing mechanical, verbal, and graphical descriptions of the tools the PC will use throughout the game. It is crucial since the instructional content comes from the factual knowledge the museum provides. Then the game needs a kind of a "journal" or "quest log" screen recording the *Quest* progression. In the manifestation table, I have described the screen to be named as Thoughts, the reason being Journal or Quest Log might not translate into a proper mental model for the player who are not familiar with RPG jargon. "Thoughts" would also be more diegetic as the recordings of the Quest can be update throughout the

gameplay and become an archive of what the PC learned, and if the interaction loops are successful, eventually become what the player learns.

Wireframes were designed in the prototyping application Figma by adhering to the conventions of mobile wireframing (Figure 34). Prototyping as a design method were explored briefly in Section 3.3.2. It is a way to explore the uncertainty behind a design situation to find possible means for changing it into a preferable state (Quinten et al., 2015). Prototypes are utilized to enable designers to learn, discover, generate and refine designs so that the design materials can be reflected upon and reconfigured (Agustin et al., 2007; Lim, Stolterman, and Tenenberg, 2008).

In Figure 34, five wireframes were designed as low-fidelity as possible without losing the context. Real content from the scenario and the game's context were implemented on low-fidelity designs. This choice was made to ensure the interface matches the needs of the content so that design reflections are done for design materials that are contextual rather than generic. A reflection will be made on the wireframing process after description of each screen below. Three distinct designs were made for Scenes that depicts different content. A is a generic dialogue between the PC and the exploration for how Action Resolution would be conveyed to the player. The Randomness or Dice system has not been explored yet, for the wireframes a 2D6 (2 six-sided dice) system were chosen to communicate the design decisions. These three Scenes will make much of the gameplay as they describe sequences of interaction arc and loops. D is an exploration of the Character screen that players view their Characters diegetic information, in this case Attributes. For the time being, all three Attributes have score of 1, and have descriptions below them to ensure the players understand their endogenous meanings. Finally, E is the Equipment screen consisting of slingstones and slings. In CRPGs with complex systems, these screens are usually filled with Statistics, numbers, and mechanical explanations. In Neolithic Quest, translation of Attributes to Statistics in Action Resolution will be simple, direct, and understandable.

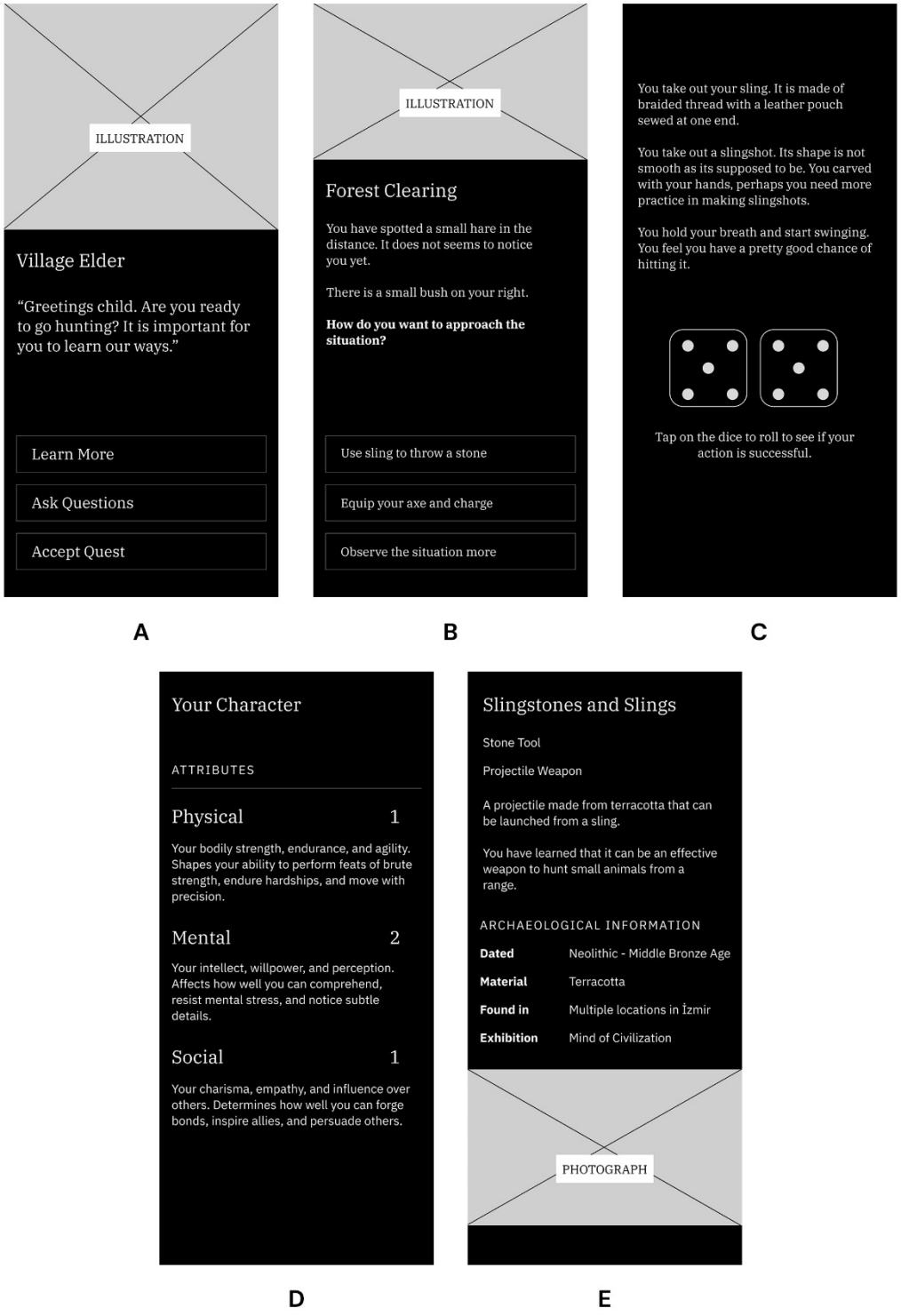


Figure 34. Low-fidelity prototypes for various gameplay elements.

NPC, and B is a simple interaction between the Game World and the PC. They were explored as if different sets of text lengths would be needed. C is a very crude

Through prototyping Equipment screen, the need to make a substantial design decision has become apparent: If the player's construction of mental models through gameplay interactions are to be matched with the learning of the instructional content, their manifestation in the game should be designed accordingly so that the player can easily contextualize diegetic and fictional content with meta and factual knowledge, and vice versa. For instance, in screen E, a provisional description has been made about slingstones: A projectile made from terracotta that can be launched from a sling. This information exists in the museum in two forms: information labels and instructional illustrations accompanying the displays. Below this is another description: You have learned that it can be an effective weapon to hunt small animals from a range. This is the learning outcome for the manifestation of slings and slingstones in the game conveyed in a diegetic way, and it can be revealed to the player only after they have resolved an *Encounter* with a result of hunting a small animal successfully. A gameplay aspect like this might strengthen their construction and update of the mental model they had initially. Aside from diegetic and meta description, the *Equipment* screen also has the information for the slingstones displayed in the museum manifested as *Direct Information.* Having access to factual knowledge directly in a diegetic way might also enrich the contextualization of heritage knowledge on the player's side.

Design explorations through prototyping has revealed numerous possible improvements for the heritage manifestation. There is also the need to make more refined decisions of over formal elements such as Action Resolution, and dramatic elements to achieve *Diegetic Consistency* across distinct gameplay components. However, achieving an overall view of the gameplay experience is logical before narrowing the scope. Thus, two new instructional content should be added to the gameplay experience.

First is the archaeological knowledge of slingstones and slings. While explorations pondered over slingstones, in Neolithic Quest, manifestations of tangible heritage can be in the form of meta information in the *Equipment* screen if they are tools to be used in the game. This form of manifestation would be demonstrative rather than abstract. As showcased in table 3, all the manifestations currently planned and prototyped in the game are abstracted, or are abstractions informed by facts. Attributes of *PCs* are inherently abstractions of *Character* capabilities that turn into statistics during Action Resolution. Significance of stone tools have two different manifestations but only have

single focus: an affective narrative that is informed by facts conveyed in the museum. This instructional content manifests in two ways. One is the encompassing *Quest* that would take a long time to finish and would need connections with other instructional content to achieve its learning outcome. The other is how the *Quest* will be recorded and displayed to the player. Both instances are abstracted manifestations and have affective tones. Manifestation of archaeological knowledge in the game should be demonstrative, addressing cognitive capabilities first and foremost, and have a factual tone. Their manifestations are explained further in table 4.

Second instructional content to be added is the affordances of IAEM. Since one of the aims are to motivate players to become visitors, the museum's affordance and intended visitor experience should be manifested in some ways. In this case I have added a new information type that is "meta knowledge" to Hanes and Stone's model. Their model does not consider instructional contents specific to museums, since their analysis is on heritage content manifesting in commercial games. In Neolithic Quest's case, the game should address physical context of the museum not only during visit phases, but also before and after visit. Level of demonstration in both cases are "demonstrative", with affordances having an affective level added, resulting in a motivational tone. Both instructional content has a factual tone. The archaeological

Table 4. Heritage manifestations for Neolithic Quest.

Instructional content	Archaeological knowledge of stone tools	Affordances of IAEM
Capability	Cognitive	Cognitive, and affective
Information Type	Tangible Heritage Analytical Heritage	Meta Knowledge
Focus	The focus is on the archaeological knowledge both hidden and displayed in the museum.	The focus is on making awareness for the museum through meta information, such as its history, significance, and the collections.
Manifestation	Shown as an item description in the PC's inventory	Shown as a text entry in its specific screen.
Means of Manifestations	Photograph/illustration of the artifact and text. Graphical, and verbal	Text and photographs. Verbal, and graphical.
Level of Demonstration	Demonstrative	Demonstrative and affective
Tone	Factual	Factual and Motivational
Pattern Associations	Direct Information, Equipment, Inventories, Statistics	Direct Information

knowledge instructional content also has distinct information type that is analytical heritage. Hanes and Stone refer to analytical knowledge as processes and research conducted within the tangible and intangible heritage categories.

Since first reflections on prototypes revealed possible improvements, next set of explorations were done to make the improvements meaningful and engaging. In an RPG, the design of the Action Resolution has utmost importance in terms of player's engagement with the *Game World*. Player Character's abstract Characteristics, such as *Attributes* and *Skills* affecting *Roleplaying* and *Storytelling*, are made concrete during Action Resolution. In Neolithic Quest the PC have three Attributes: Physical, mental, and social. They can be utilized in numerous interactions with the Game World. In D&D 5E Attributes affect the usage of *Equipment*, *Abilities, Privileged Abilities,* and *Skills.* Utilization of various types of Dice to manipulate the outcome of Actions derived from the Characteristics above creates a rather complex rule system. Quest on the other hand have no Characteristics that manipulates Action Resolution but pushes players to use *Privileged Abilities* to manipulate the rules and create *Roleplaying* and *Storytelling* experiences.

In CRPGs Action Resolution can be very complex if there is a Combat system, for instance PoE II. On the other hand, a game like Disco Elysium has a basic Action Resolution process, albeit built on a deep *Skill* system. When the player attempts a task with a chance of failure, they roll 2D6, and the relevant *Skill* and *Attribute* score is added to the result. The result is then subtracted from the *Difficulty Level* of the task, which is picked from a static table. The player needs to roll higher than the result. There is also other modifier such as bonuses from *Equipment* and Thought Cabinet. Disco Elysium's *Dice* system is simple enough to grasp naturally during gameplay but generate meaningful decisions through well-designed Characterization. Roadwarden is an outlier case; Characterization and Action Resolution is designed to elicit a survival experience with time limitations and nourishment mechanics. Such an experience would not be fitting to a game with Neolithic Quest's learning and experience aims.

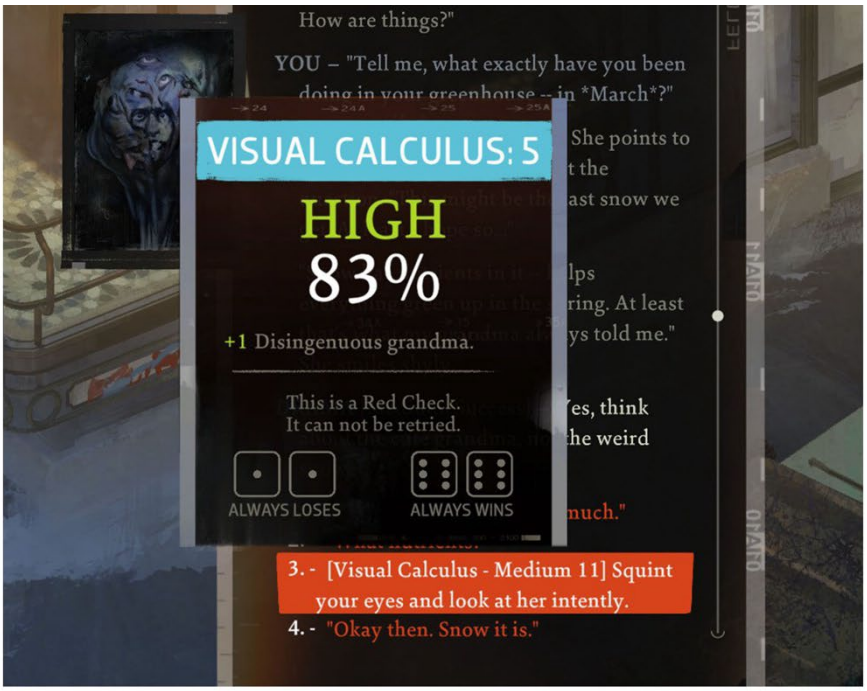
In Neolithic Quest, PCs can interact with the world through physical, mental, or social means. These *Attributes* can be named *Skills* as they are the main means of engaging for Agents, and they refer to how successful an Agent would be in their actions. To

keep Action Resolution in Neolithic Quest simple and meaningful, each Skill were associated with an Equipment. The decision behind the pairings would be fictional, but logical and Affective within the game's narrative. For instance, concerning the main instructional content of the prototype, that is the slingstones and slings, can be associated with Physical and Mental *Skills*. Certain motor skills would be needed to throw the stone, and mental capabilities would help with perceiving the target and assessing the distance. These predications on how the Skills are utilized are not amongst the learning outcomes. As explained by Hanes and Stone, some facts can be omitted so that the focus can be on specific instructional content (2018). Since the heritage content is coming from the museum, and the fact that Neolithic Quest is not a simulation, these kinds of decisions to abstract and omit certain aspects of gameplay are necessary.

For the first prototype I have decided to use a single six-sided dice to achieve the uncertainty during player actions. This decision would help lower the learning curve of the game, and keep the *Statistics* displayed in the game low. The Difficulty Class can be pre-defined specifically for the Encounter. Skill modifiers can be added to the dice roll, then compared to the roll to assess the success of the Action. The game needs two different screens to manifest these design decisions. The Skill modifiers associated with the Equipment needs to be displayed in the relevant screen. This is necessary to establish a proper mental model so that the player can make meaningful decisions. The other screen is where the player sees their actions unfold. CRPGs treat this screen differently. In PoE II, the calculations are hidden until the player wants to access them.

Disco Elysium does it in a way that is informative and non-obstructive. During a dialogue, the player can see the difficulty of the actions, relevant Skill, situational bonuses, the type of check, and the likelihood of the action being successful (Figure 35.A). While Disco Elysium's approach is partly hypermediated (see Malaby, 2023), Baldur's Gate 3 (Larian Studios, 2023) approaches Dice Rolls completely in a tactile way (Figure 35.B). The player rolls a virtual d20 modelled after a physical one. The screen also displays relevant bonuses and the Difficulty Class, helping player assess their Attributes' and Skills' effectiveness on certain types of Encounters.

A



B

Figure 35. Dice roll screens from Disco Elysium (A) and Baldur's Gate III (B).

Considering the above assessments, the design of two screens in questions were explored through a new set of wireframes. During this process, there were byproducts of redefining design materials. First is the realization of a need to navigate across screens that the player visits the most. These would be the Character Sheet, Thoughts, and Inventory screens. A convention for mobile interface design is to place a

navigation bar at the bottom of the screen for the users to easily reach with their thumbs (see Material Design by Google, Google, 2024). Another is the decisions for visual design of the game. First wireframes were made in black and white to assess structural decisions from a neutral perspective. Even though design decisions such as typography, layout, and colour are elements that affect the play experience immensely, they are not foundational; they exist to honour the content and make it more pleasurable. Provisional visual design decisions were made while exploring *Equipment* and *Dice* screens (Figures 36, and 37).

In the *Equipment* screen, there are two distinct information type for the tools: Archaeological, and in-game. Archaeological is the information displayed in the museum for the related artifacts on their information label and the exhibition it belongs to with a factual tone. There are accompanying photographs taken at the museum as well. Recording archaeological knowledge of artifacts act as a digital archive for the museum. In-game knowledge is the diegetic elements of the Equipment: Its usage, Skill requirements and what the PC learned about it. The player can switch between the two by tapping on the segmented button at the top of the information box.

Screens for Action Resolution has been refined as in Figure 37. The player goes through a sequence of screens showing the difficulty level of the action, and relevant Skill requirement and modifier. In this example I have decided to increase the Mental Skill of the player to showcase the calculation better. Since the Action Resolution system is based on a single d6 roll, as the player increases in Mental or Physical *Skill* they get better at the task. The keep the flow of gameplay engaging, the difficulty level can be increased as the player becomes more skilled, and the story moves forward.

Through another set of reflections, new improvements have been made to the interface and the general gameplay. Thoughts screen is important for the player to seek relevant information about a certain subject, whether diegetic or meta. Its design should take familiar elements form CRPG's Journal, Log, or Quest screens. Generally, they resemble lists of tasks and the relevant textual information that are updated as the player progresses in the game. Neolithic Quest's first prototype will have two Quests. The screens first iteration shows the progression of the quest "First Hunt" and "Strange Arrowhead" (Figure 38). First Hunt is the Quest given to the PC by the Village Elder.

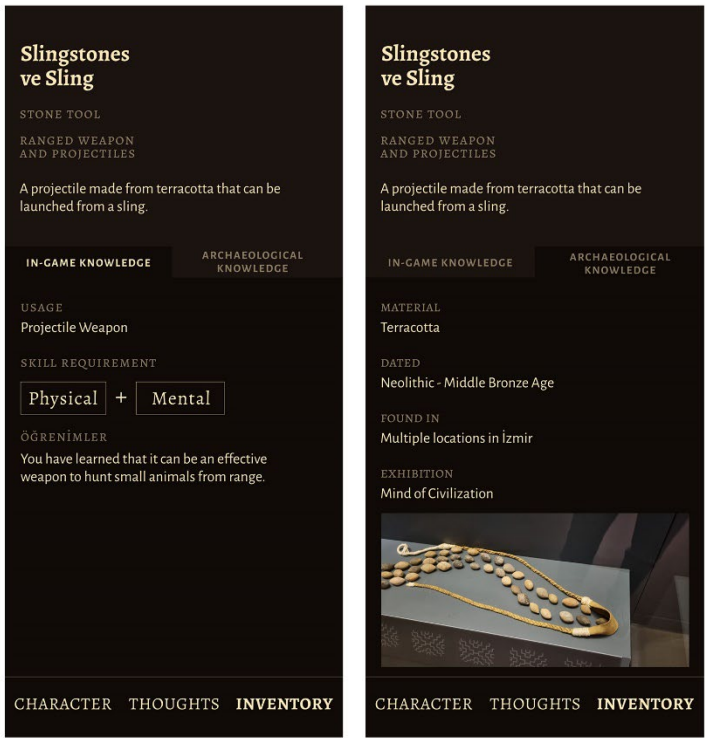


Figure 36. Design iterations for the Inventory screens of Neolithic Quest.

While working on this screen, it has become evident that there should be dramatic elements to have affective and motivational outcomes. There is evidence indicating presence of leader figures in Neolithic settlements, though their roles and the nature of their authority are varied across regions and time periods (Rosenberg and Rocek, 2019; Dietrich, Notroff and Schmidt, 2017; Kuijt, 2018). Thus, an NPC who acts as a leader with fictionalized alterations can act as an affective element. The existence of a guide who will act as a mentor both for the PC and the player can also elevate the affective element in the game: A female hunter who goes to the hunt with the player whom the PC can socialize with and get help with the *Quest*.

Through reflections during the design of the Thoughts screen, it has been revealed that the *Characters* needed names. Since there was no written language back then, anthropological studies were conducted to ascertain how Neolithic people identified each other. There is evidence suggesting that people identified themselves with symbols and their relationship with animals was a significant aspect (Antanaitis, 1998; Bernabò Brea, Mazzieri and Micheli, 2010; Siddiq, Şahin and Özkaya, 2021). Thus, I

have decided to give the NPC animal names. The Village Elder is named Kuzgun, and the hunter is called Atmaca (Raven and Hawk respectively). The decisions for fictional and dramatic element are to enrich the affective and motivational aspects in the game.

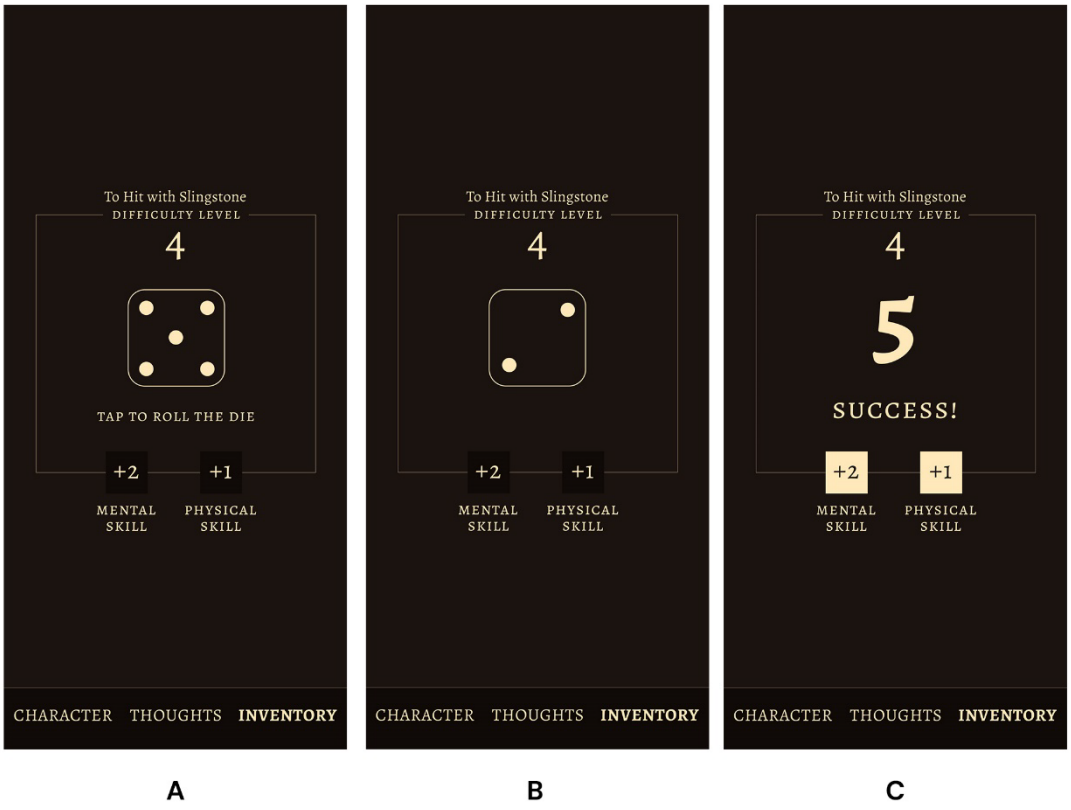


Figure 37. Design iterations for the Dice roll screens of Neolithic Quest.

The process of defining and redefining materials documented above is inherent in design practice. Some materials such as a Characterization and Action Resolution system were planned to be implemented in the game as foundational elements from the beginning. However, the dramatic and fictional elements were coming up as reflections over the movement of the materials during thinking and making of the design decisions. For instance, through reflections on *Quest* design, a new NPC to help both the player and the PC has emerged. If Atmaca is present during the hunt, she must have a weight in the PC's decisions. While not planned during the initial prototype, PC's Social *Skill* can be utilized to personalize PC's interactions with Atmaca.

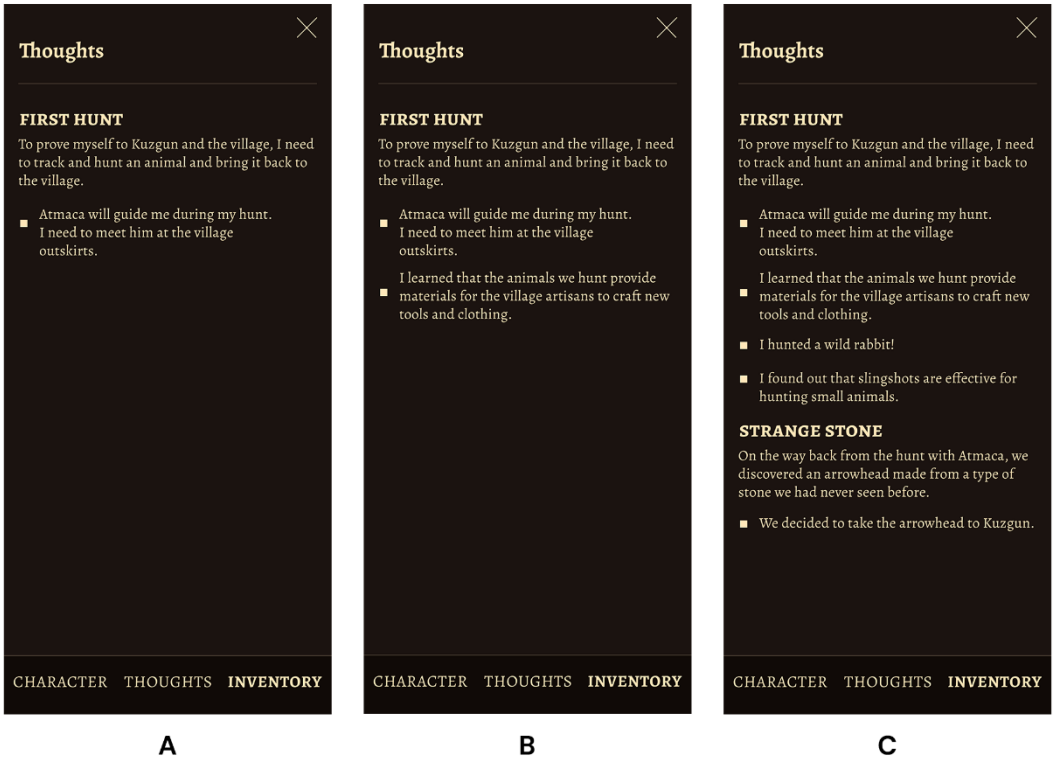


Figure 38. Designs for the Thoughts screens of Neolithic Quest.

The Encounter *Scene* that depicts the hunt presents three choices to the player: use your sling, use your axe, or observe. This feels dry and utilitarian. Thus, to embellish the choices the player has, the choices can be turned into approaches to the *Encounter Scene*, that has more *Roleplaying* feeling to it. Also, Atmaca is there in the encounter, and the player can consult her if they choose to do so. The choices were turned into three different approaches: Cautious, direct, or social. Through cautious approach, after carefully approaching the animal, the PC can decide to use their sling or axe. With this approach, using the sling or axe tasks have *Difficulty Levels* of 4, and 8 respectively. Hitting the animal with the sling is an automatic success since getting 1 on the die is enough to get a total result of 4 due to the PC having 2 on their Mental *Skill*, and 1 on their Physical *Skill*. The player can get a result of 8 if they roll a 5, however, to achieve the intended learning outcome, the player rolls a 3 and fails the attempt. Since the Dice rolls are not actual rolls in the prototype, but scripted outcomes, player's mental model adjustment is manipulated. This situation is something to be avoided during the game's actual development. However, to explore the effects the interaction loops have on heritage manifestation and the learning outcomes, this kind of controlled results for *Randomness* is crucial. Game's feedback

is significant in updating player's mental model in a way that reflects the learning outcomes. The player's decisions and the resulting actions need to be reflecting in the feedback the game gives. Failing an action needs to direct the player towards another set of decisions that might have the possibility of success.

In Figure 39, possible actions and results of those action are illustrated. Ultimately, the game will direct the player to use their slings so that they can be successful, and their mental models can be updated accordingly. Their success is also recorded in the Thoughts screen in the form of a learning outcome, but with a diegetic tone and first-person view (see Figure 39). General dramatic tone of the Scenes is designed to be as light-hearted as possible.

Through another set of reflections, new improvements and additions have been made to the design of Neolithic Quest. The players need to be made aware the aim of the game. The connection between the content of the game, IAEM and MoC exhibition should be made explicit. Also, the expectations in terms of how playing an RPG feels like needs to be conveyed to the player before the game starts, so that the general audience who might be curious about the subject, the museum, or the game itself can decide if it is worth their time and attention. For the purposes above, four screens consisting of Foreword, and About the Game were designed and implemented in the prototype (Figure 40).

Another improvement has been the Action Resolution screens. In the previous iteration, there was no explanation of the Dice mechanics. This would be complicated for a general audience who are not familiar with Dice rolls or RPGs. The image of the Die also is 2 dimensional, becoming somewhat ambiguous representation of a physical die. A possible improvement was to design a pseudo-3D illustration of the Die to represent the state before the roll. As the player taps on the Die, after a brief interval, a 2D image would show the result of the die. After another interval, the modifiers from the PC Skills are added, and another image shows the final result. The new designs are showcased in Figure 42.

Finally, a more detailed gameplay sequence comprised of interaction arcs and loops, resulting in new or updated mental models can be described. Going back to a higher level of abstraction help to see possible refinements on a design at a lower level.

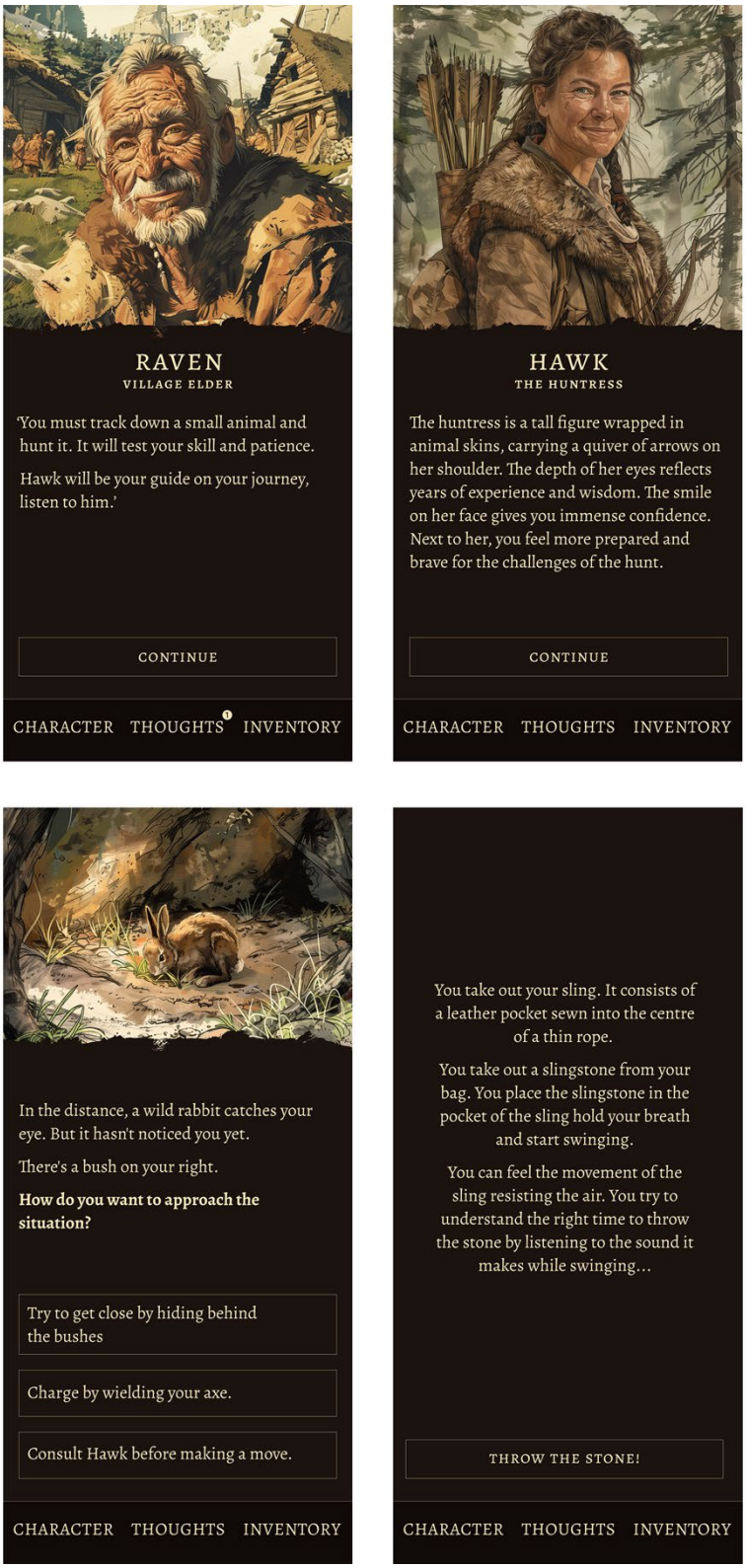


Figure 39. Final designs for the narrative sequences that the core gameplay takes place.

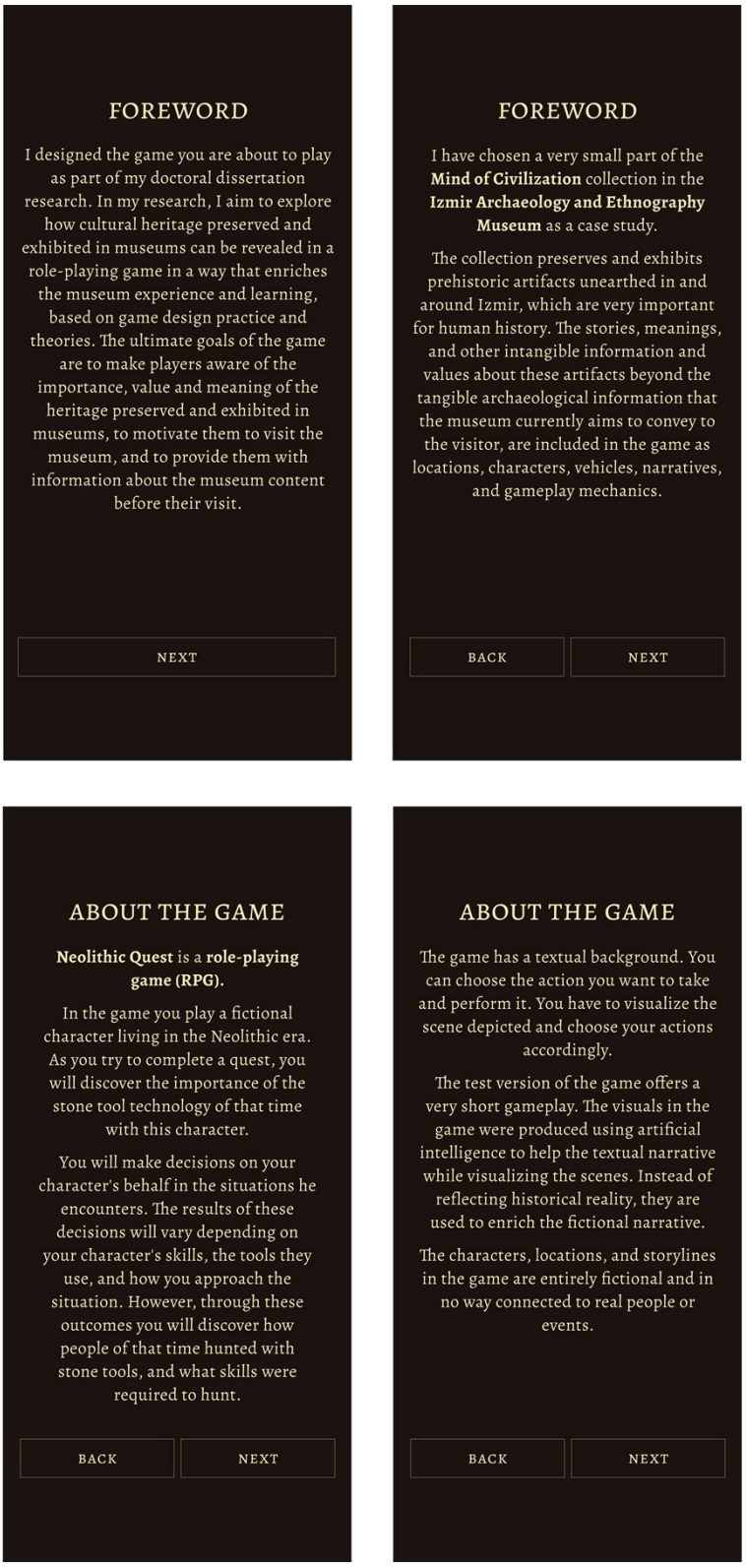


Figure 40. Screens for the Foreword and About the Game sections.

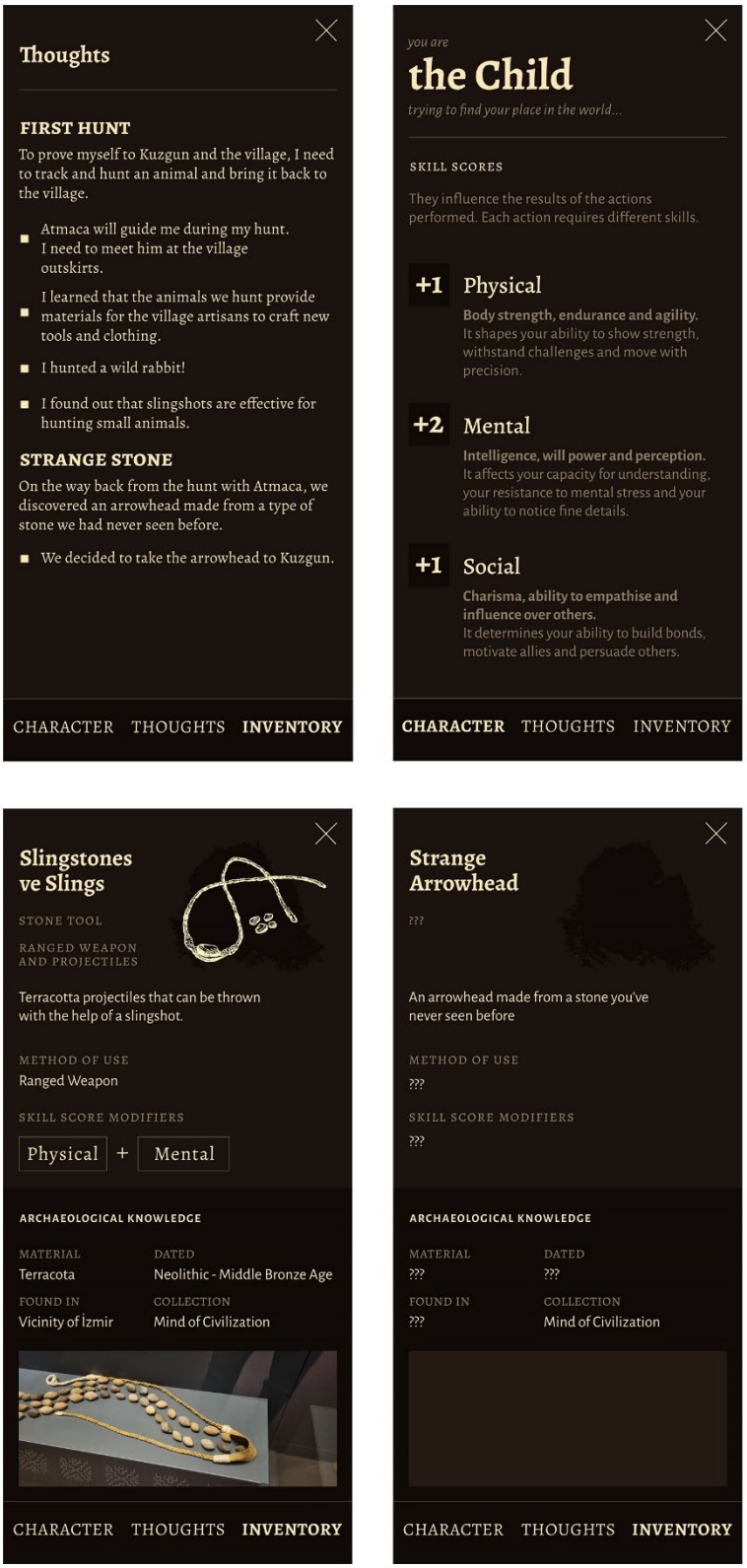


Figure 41. Final designs for the Character, Thoughts, and Inventory screens.

Figure 42. Final designs for the Dice roll screens.

To aid the dramatic elements and the player's interpretation of the Scenes, illustrations of NPCs, and environment were created using the generative AI tool Midjourney

(REF). Since the first prototype is comprised of a very small portion of the game, the illustrations accompanying the text are provisional. They were generated to help the players imagine the Scenes and enrich the fictional narrative, rather than reflecting reality. In appendix X, each image used in the prototype and the prompts used to generate them is showcased.

In figures 39 through 42, designs for unique screens are showcased. A major improvement in this final iteration is the Inventory screen (Figure 41). The segmented button allowing to switch between diegetic and meta knowledge has been removed. The player can access both kinds of information on the same screen without the need for input. However, to achieve the feeling of discovery, as in the case of the "Strange Arrowhead", Items and Equipment that the PC has a lack of knowledge on has information missing on its corresponding Inventory screen. This design choice was made with the intention of revealing new information progressively as both the protagonist and the player learns about the subject at hand.

With the improvements made to the final iteration of the first prototype, the project can move to the testing phase. The next section documented and analysed the playtesting sessions with a focus on common themes and patterns to understand how the emerging experience reflects the design choices made.

Resulting prototype from the design explorations discussed in Chapter 4 has been put to a playtest. Playtesting have been conducted in three stages: Picking participants, playtesting, and semi-structured interviews. The target audience of Neolithic Quest is parallel to the audience of IAEM. The museum does not target a specific type of audience, they aim to motivate and create a learning experience for a wide range of individuals. Since the first prototype is designed to encompass only the before visit stage of the museum experience, an on-site testing is left for a future research project. Playtesting Neolithic Quest has been done in a controlled environment which reflects the players', and potential visitors', possible play environment. Neolithic Quest was designed to be played anywhere on a mobile phone to achieve the movement of play between museum and non-museum contexts. Playtesting participants have played the game without any heritage or museum content stimulation.

5.2. Evaluation

5.2.1 Selecting Participants

Playtesting participants were selected amongst Yaşar University students due to the ease of reach, and proximity to the testing environment of the researcher. However, to narrow down possible candidates, several criteria have been defined to assess the game's appeal on certain demographics, and players' familiarity with the gameplay experience of Neolithic Quest.

A survey on Google form was designed and sent out to Visual Communication Design students from Yaşar University (Appendix A). In the survey, aims of the research and the game were explained. The candidates were informed about the voluntary aspect of the test. They were also informed on the confidentiality of the information gathered with respect to the laws, the possibility of the usage of the data for scientific research purposes, and the official consent forms they will need to sign if they were picked to participate. The survey consisted of the following questions (Asterisks denote questions required to be answered to complete the survey):

1- E-mail address *

2- Age *

3- Name *

4- Department *

5- Have you ever visited the Museum İKSF - Archaeology and Ethnography Museum within the Izmir Culture and Art Factory in Alsancak? *

6- Do you play video games? *

7- How often do you play video games? *

8- Do you play role-playing games (RPG) (e.g. Baldur's Gate series, Witcher series, Final Fantasy series, Deus Ex series, Disco Elysium)? *

9- Would you characterize yourself as a gamer?

10- Would you like to participate in a gameplay test and research at the Izmir Archaeology and Ethnography Museum in the later stages of the test?

Participants' ages are important to assess how the age group who tested the game responded to the gameplay experience. Depending on the results of the tests, gameplay experience can be altered accordingly on subsequent prototypes. Even though each

participant were a design student, narrow scope of the game in terms of its genre and educational aspect, have resulted in varying emergent experiences.

Question 5 onwards are defining questions to assess the gameplay and learning experience. Their familiarity with IAEM is crucial in this sense. The fact that they have visited or not could reveal important information in both cases. They would not be aware of the museum at all, or they were not motivated enough to visit are two possibilities. Also having visited the museum before and being aware or oblivious of the content are two different possibilities. In each case, question 5 remains significant on assessing the affective and motivational outcomes of Neolithic Quest.

Questions 6 through 8 are about their video game literacy. Video game literacy is a concept that extends beyond traditional notions of literacy to encompass the skills required to interact meaningfully with video games as cultural, operational, and critical tools (Bourgonjon, 2014). It includes not only the ability to understand and interpret game mechanics but also the social and cultural engagement within gaming communities (Steinkuehler, 2010). Video game literacy underlines the importance of understanding games as both an educational tool and a reflection of modern digital culture (Zimmerman, 2008). Participants' differing levels of video game literacy determines their perspective on experiencing cultures on a medium that asks for specific set of skills and can provide important data on subsequent prototypes for Neolithic Quest. Since Neolithic Quest were designed as an RPG, it has a specific modality and emerging experience. Literacy on RPGs was also an important defining trait of participants.

Final two questions were not required to complete the survey. Identifying oneself as a gamer can provide additional interpretation of the playtest data in terms of the attention the game had over participants before the playtesting. The last question is to assess which participants can be reached out for an on-site visit. Participants that playtested the game in both lab and museum settings might reveal important information on how play moves in between contexts and how this movement affects the learning experience of the players.

14 participants have filled the survey over a period of two weeks in June 2024 (Figure 43). Their ages ranged from 20 to 30. Over the 14 participants only two of them have visited IAEM before. Eleven participants revealed that they play video games, with

six of them declared that they play every day (Figure 44). The frequency of playing games were important during individual playtesting sessions.

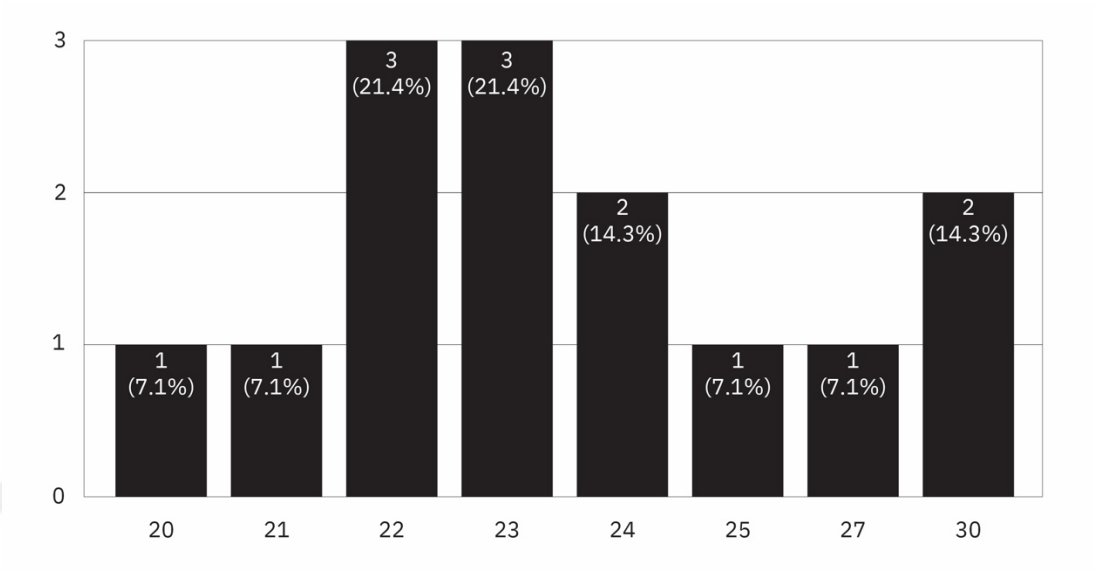


Figure 43. Results of the age question from the preliminary survey

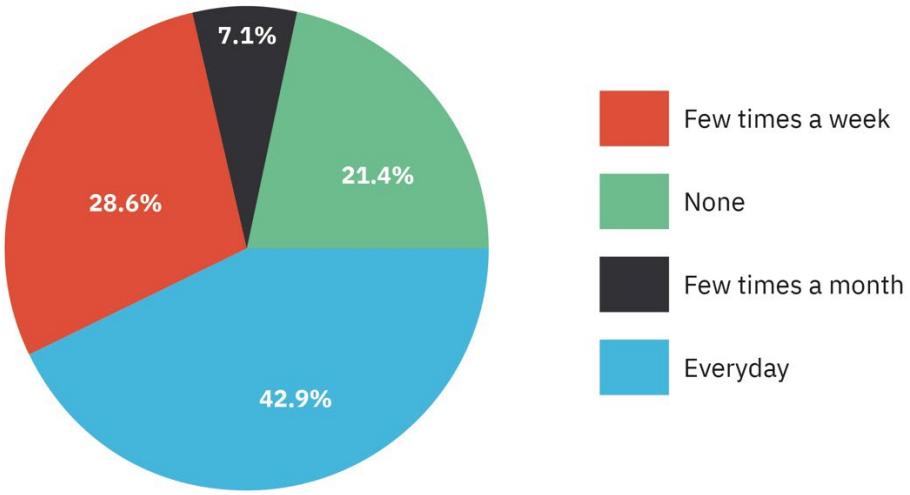


Figure 44. Results of the questions “How often do you play video games?”

All 14 candidates were reached out to determine appropriate day and time to conduct the playtesting sessions. 8 participants have decided to participate in the play testing and subsequent interview sessions.

5.2.3. Playtesting and Interview Sessions

Playtesting and post-test interview sessions were conducted between July 2 and July 18, 2024. The participants were informed about the procedure and asked to give their official consent on the usage of the anonymous data gathered in the sessions. The sessions were conducted in two phases. In the first phase, each participant played Neolithic Quest's prototype that were designed on Figma prototyping application, and on the same Android smartphone. This was done to ensure that the visual design elements are identical for each participant. Responsiveness of the game interface is a concern for final refinements before the game is released to the public. While the participants played the game, the phone screen was recorded to document the play. They were also asked to articulate their thoughts while playing to provide insights of their understanding and experience of the game. This method is called the "think-a-loud protocol". It is a usability tool that allows participants to verbalize their thoughts, feelings, and intentions while engaging with a product (Knoll, 2018). It provides qualitative insights into player cognition and decision-making. Focuses on improving game design, usability, and player experience. Helps in identifying gameplay issues, interface challenges, and emotional engagement. While real-time observation or post-test analysis gives insights on what a player does while playing game, it is sometimes hard to ascertain exact cognitive processes and emotional evocations. Think-a-loud protocol helps the researcher to understand what the player thinks. The pitfall is that people usually do not express their thoughts while cognitively engaged with a product, resulting in a disruption of natural playing behaviour.

The second phase of the sessions was the post-test interview conducted immediately after the play session ended. The interviews were designed as semi-structured questions. Semi-structured interviews are a flexible qualitative research method that combines pre-determined questions with the ability to explore emergent themes, making them ideal for gathering in-depth data (Edwards & Holland, 2013). This method allows researchers to maintain consistency across participants while also adapting to their unique perspectives, facilitating a richer understanding of the subject matter (Galletta, 2013). Since player experience is subjective, semi-structured interview questions can help a researcher to understand and reflect on the participant thoughts. Emerging unexpected reflections are valuable in terms of generating new design situations.

The purpose of playtesting Neolithic Quest is to ascertain if the design decisions made reflects the intended gameplay experience. During the design explorations, testing the game is done informally, meaning by the designers themselves (Quinten et al., 2013). However, to fully grasp the repercussions of game design decisions, playtesting should be done formally with participants that are strangers to the process.

All the candidates who participated in the playtesting and interview sessions and their demographics are displayed in Table 5. None of the participants have visited the museum before, creating a very good opportunity to assess the motivational aspect of the game. The diversity of video game literacy and RPG familiarity is a positive in terms of comparing the understanding of the game between participants. For instance, participants D and E declared they play video games every day, however, participant D is not familiar with RPGs. There are only two participants who does not play video games, and their understanding of the gameplay were a significant data.

Table 5. Summary of the preliminary survey results of the 8 candidates who agreed to participate in the playtest and interview sessions.

Participant	**Age**	**Visited IAEM**	**Video Game Playing Frequency**	**RPG Familiarity**	**Identify as Gamer**	**Join Testing in the Museum**
A	21	No	Everyday	Yes	Yes	Willing
B	24	No	Couple Times a Week	Yes	Yes	Willing
C	22	No	Never	No	No	Willing
D	22	No	Everyday	No	Yes	Willing
E	30	No	Everyday	Yes	Yes	Willing
F	30	No	Couple Times a Week	Yes	No	Willing
G	27	No	Couple Times a Week	Yes	Yes	Willing
H	23	No	Never	No	No	Willing

5.3 Playtesting Sessions

Playtesting sessions of the 8 participants were recorded. Each session started as soon as the players are exposed to the "foreword" screens explaining the aim of the game as a research study. Video recordings of the screen also illustrates where the player taps while playing, providing important input on how they play the game. In Table 6, observations relevant to the subjects from each participants' playtest session were recorded. Through the 8 playtests, several themes have emerged. Analysis of the results were showcased; however, the reflections and discussions of the results were

explored in tandem with the interview analysis since the participants could not reflect on their experiences while they were playing the game.

5.3.1 Decision Making

Neolithic Quest's prototype had only one encounter in the game comprised of several loops (Figure 38). At the end of the loops there are two possible arcs that teaches the player slings are produced for hunting. This learning outcome was intended to be elevated by introducing reinforcing feedback in the diegetic form of using an axe and failing. If the player decided to their axe during the hunt, the Die result and the Skill bonuses would not be able to reach Difficulty level 10. Eventually the PC uses a sling and becomes successful in their hunt.

Table 6. Playtesting observations categorized under relevant themes.

Themes	**Participant**	**Observations and Thoughts**
Decision making during the encounter	A	Expressed in using their own logic at least once when making a decision. Consulted Atmaca. Adhered Atmaca's advise. Used sling.
	B	Expressed in using their own logic at least once when making a decision. Consulted Atmaca. Adhered Atmaca's advise. Used axe.
	C	Chose to hide. Used sling.
	D	Consulted Atmaca. Adhered Atmaca's advise. Used axe.
	E	Consulted Atmaca. Adhered Atmaca's advise. Used sling.
	F	Expressed in using their own logic at least once when making a decision. Consulted Atmaca. Adhered Atmaca's advise. Used sling. Expressed their reluctance for attacking an animal.
	G	Consulted Atmaca. Adhered Atmaca's advise. Used sling.
	H	Chose to hide. Used sling.

Table 6 (continued). Playtesting observations categorized under relevant themes.

Discovering the interface	A	Explored the navigation bar. Made comments on the dice screen. Expressed his anticipation over dramatic elements affecting PC's abilities (Over the description of the protagonist feeling brave when close to Atmaca).
	B	Explored Thoughts and Inventory menus only when prompted by the notification signal.
	C	Did not explore the navigation bar menus.
	D	Explored the navigation bar.
	E	Explored the navigation bar. Commented on Skill descriptions (Saw them as combination of different Skills) Commented on Thoughts screen as "Quests". Commented on Skill Scores section of Inventory screen. Wondered if they are requirements of bonuses to Skills. Made the connection with museum content through Inventory screen. Commented on the Die illustration being distinct in style from the rest of the screen.
	F	Explored the navigation bar.
	G	Explored the navigation bar. Expressed that Inventory screen is interesting. Checked to see if Thoughts screen was updating on several points.
	H	Explored the navigation bar only mid-game. Did not go into Inventory after Strange Stone was discovered.
Understanding museum content	A	Realised the existence of museum content in the Inventory screen.
	B	Did not make any comment.
	C	Did not make any comment.
	D	Articulated that they learned slings are better for hunting animals after the relevant scene.
	E	Realised the existence of museum content in the Inventory screen.
	F	Did not make any comment.
	G	Did not make any comment.
	H	Did not make any comment.

There were three different sequences of actions been made by the participants during the hunting encounter as seen in Table 6:

- Consulted Atmaca – Adhered her advice – Used sling (4 participants)
- Consulted Atmaca – Adhered her advice – Used axe (2 participants)
- Chose to hide – Used sling (2 participants)

There seems to be some correlation between demographics of the participants and their decision making. Participants C and H, who declared they do not play video games, chose to hide behind the bushes and then used their slings. All the other participants,

regardless of using slings or axes at the end, have consulted Atmaca first. Atmaca's introduction to the player might not have an affect over Participants C and H's decisions over relying on her as a guide, or it might be their lack of experience with making choices in video games. Participants C and H were also quite silent during the playtest session. They only thought out loud when reminded of the protocol's benefits.

Participants A, B, and F expressed that consulting Atmaca was a logical decision, without explaining why it was so except participant F. They expressed they wanted to get guidance since they were reluctant to hurt an animal in the first place. They might have hoped that the decision to ask for guidance would reveal another choice to approach the encounter.

5.3.2. Discovering and Understanding the Interface

Introduction screens of Neolithic Quest does not contain a tutorial or onboarding intentionally. To see if the interface is discoverable and understandable, the participants needed to be able to explore the game on their own. This decision was made to ascertain if players with and without video game literacy would be able perceive the affordances of the game. It was anticipated that participants familiar with videogames and RPGs would have found the semantic meanings of the menus explicit and encouraging to explore them.

Every participant except Participant B and C have entered the Character, Thoughts, and Inventory screens through the navigation bar. Participant B entered the screens when the notification prompts appeared over Thoughts and Inventory screens, while Participant C did not enter at all. Participant B is not familiar with RPGs, and Participant C does not play video games. These two facts will help in coming up with practical suggestions in the next chapter.

On the other side of the video literacy spectrum, Participants A, E, and G who are familiar with RPGs, were engaging with the interface at a deeper level and being verbal about their experiences. A expressed their anticipation over the protagonist feeling brave while interacting with Atmaca have some effect on *Characteristics* of their *Character.* They said, "we could have got +1 to Bravery or something…", being verbal by using RPG lingo. Participant E was very verbal on major screens. On the Character screen they interpreted Skill descriptions as combination of what we would expect from RPGs; Physical skill reflects both strength and agility feats. They commented on

the Thoughts screen being a Quest log of some sort. Perhaps one of the most insightful comments was Participant E's understanding of the Skill Scores section on Inventory screen. They were confused on whether "Physical + Mental" expression was a requirement, or actual bonus. Even though their confusion was dispelled in the *Dice* screen, proper understanding needs to be established through correct affordances in the subsequent design iterations. One other comment this participant gave was that the die illustration before rolling was visually distinct from the rest of the design.

Participant G expressed their interest in the Inventory screen specifically, saying that the screen was "well done". They also checked regularly to see if the Thoughts screen was getting updated. Participant H, who does not play video games, was reluctant to check the navigation bar, and only did halfway through the prototype. They also did not check the Inventory screen when it was updated with Strange Stone.

5.3.3. Understanding the Museum Content Manifestation

The final theme did not emerge during playtesting observations, but through a grounded approach. Intrinsic gameplay (Section 2.4.3; Schaller, 2014), heritage content manifestation (see Section 2.4.3; Hanes and Stone, 2018), and culturally significant presence (see Section 2.4.3; Champion, 2020) approaches to game-based learning emphasize how heritage is experience in a serious game. In a game designed to encompass museum content, it is important that the heritage manifestations are distinguished and intrinsic at the same time. In the Neolithic Quest prototype, the players are briefed at the start about the game's aim and how it is informed by IAEM content. In the game however, there is no explicit guidance or tutorials. This design decision was intentional to assess how diegetically the heritage content can be manifested in the game. The participants' distinct personal context is important to make proper assessment in this aspect.

According to the playtest observations, 5 participants did not express making any connections with the museum content. Aside from the 5, Participants A and E made connections with the museum content in the inventory screen. The archaeological knowledge of slings in the Inventory screen (see Figure 41) is very explicit, to the point it might even break immersion for some players. Considering every participant except C saw the Inventory screen, the reasons why only 2 participants commented on the museum content might be their general reluctance for expressing themselves, or

somehow did not get interested in the knowledge to facilitate a change in their cognitive processes.

Participant D articulated they learned that slings are better for hunting than axes, which is the aim of instructional content, and is a museum content manifestation. While they did not comment on the Inventory screen like A and E, their expression of learning outcome is very valuable.

5.3.4. Playtesting Reflections

Observations of gameplay were very valuable to assess what a player does in the game. Their decision making is the basis of how their mental models are updated. Cognitive capabilities were transparent; however, affective and meaning-making processes were obscured, even more so if the playtester was not articulate of their actions. This is one of the pitfalls of the think-a-loud method. Thus, playtesting was followed by a semi-structured session immediately.

5.4. Semi-structured Interview Sessions

Semi-structured interviews were done with 8 participants that playtested the game prototype. Sample questions were designed through a grounded approach. IAEM's intended experience and educational roles informed the design decisions for Neolithic Quest (see Section 4.1.4.) and Quinn et al.'s (2013) heuristic evaluation for serious games were utilized in generating general heuristics for assessment.

Heuristics and their descriptions are guides for sample questions that were designed to mainly to probe into obscured processes such invoking affection and emotions. The interviews also aimed to understand the cognitive capabilities of the players better. Depending on the responses, follow-up questions or any new questions relevant to the themes were relayed to the participants. Through the analysis of the interview sessions, several themes and subthemes had emerged. Table 7 showcases these themes and subthemes, as well as coding instructions and samples from the interviews. Next section summarises the analyses.

Table 7. Sample questions relevant to the evaluation heuristics. The descriptions are general guidelines to build upon during the interview sessions.

Heuristics	**Description**	**Sample Questions**
Gameplay Experience	What was the player's general impression of the game?	How would you describe your overall experience of the game? What did you like the best about the game? What did you like the least about the game? What are your general impressions of the game? (Elaborate?)
Understanding	Can the player discover and understand formal and dramatic gameplay elements?	What can you do in this game? (Elaborate?) Which parts/elements/components did you find difficult to understand? What kind of connection did you make with the protagonist?
Heritage Knowledge and Learning	Did the instructional contents manifested in the game achieve their objectives?	What new things did you learn while playing the game? What were familiar things? Can you explain to me what kind of heritage were portrayed in the game? What do you remember about the artifact(s) portrayed in the game?
Museum Awareness	Did the game provided awareness towards the museum's affordances?	What can you tell me about the significant heritage content in the museum? What kind of content IAEM has in your opinion? What kind of experience does IAEM provides in your opinion?
Motivation	Did the game motivated the player to become a visitor of IAEM?	What can you tell me about the game motivating you to visit the museum physically?

5.4.1. Analysis of the Interview Sessions

Results of the interview sessions provided guidance towards practical suggestions that can be made to improve the experience of the game. Since the participants' familiarity with video game and RPGs, personal expectations from and views of museums, and characteristics vary greatly, reflections on their experiences are also varied.

5.4.1.1. Gameplay Experience

General orientation for the description of the gameplay experience has been the feeling of discovery and curiosity. Even though almost all the participants relayed that they were curious about something during their playtest, their reasons have manifested in various means. For instance, Participant C's curiosity was somewhat superficial; they were curious about what will happen in the story at every stage. Participant G on the other hand, were curious due to the affordances of the inventory screen for the obsidian arrowhead. Because the screen was devoid of information, since the player does not know anything about it yet, the player was curious because of how the screen was different from the sling's item information. They relayed that the in-game information does not exist, thus they are curious on that object. Participant A also expressed that the inventory screen was interesting to present both the in-game item and museum artifacts, making them have a kind of "reality check". They said "this (slings) exists! And we are doing something that is [real]."

Participant F and G are among the participants expressing discovery and exploration were part of their experience. Participant F answered the question "what can you do as a player in the game?" as "This is like an exploration game for me". While Participant G said that through the inventory screens "… both my character and I will discover something".

There was a consensus among several participants with video game and RPG familiarity that the game was linear, limiting, and lacking choices, which can be thematized as lack of depth. This stemmed from various reflections from the players. Participants A, E, F, G, and H found the choices presented to the player obvious, predictable, and too few. Among these participants H was the only one without video game and RPG familiarity. According to them, the experience "it felt like I was reading a story rather than playing a game". When asked what they meant by that, the answer

was “Seemed like there weren’t many choices. Most screens had only one choice, and I was required to click (tap) on them”. While lack of choices is objectively true and was an intended design decision, this could be the result of H’s lack of familiarity with RPGs, specifically text-based ones. The other four participants that expressed similar concerns, A, E, F, and G, were aware of that they were playing an RPG, and that was the reason they felt like there wasn’t enough choices. A, E, and G expressed the choices were obvious and predictable. Specifically, A expressed that the choice for approaching the animal in a stealthy way was obvious, and at the end of the day, felt like the protagonist would be successful in their task no matter what decisions the player makes. One peculiar expression came from Participant F. They said that they don’t want to kill an animal, and there was no such choice. Even though they understood that their character “needs to hunt” and expressed it as such during the playtesting session, they were curious if the game would allow other choices. They said, “I would want to turn into a wise person.” Participant A also expressed there is no way to navigate the game world, and the gameplay basically moves from screen to screen.

A player’s experience with a game depends on a lot of variables. Asking about their general impression and asking them to define their experience yielded valuable results. Playing an RPG is an invested endeavour and understanding the game’s various gameplay elements can be complicated for them.

A player’s character in an RPG is at the core of its experience (see Section 2.3 for a review on the subject). For that reason, with or without any prompt during the conversation, players were asked that if they could make any connection with their character. It was conveyed directly or inferred by their reflections; Participants A, B, E, F, G, and H has made very little or no connections with the player character. Participants B and H put themselves in the place of the character and made decisions accordingly. B said that they made the choice of consulting Atmaca during the encounter because “it seemed reasonable to them”, not because the character would have done so. Similarly, H made decisions as if they were the ones going hunting. B did not enter the character screen at all, resulting in them establishing an incomplete mental model about capabilities of their character, and consequently, the statistics on the *Dice* screen. This is evidenced during the interview, since B says that “I did not understand the dice part…”. H on the other hand, did not make a connection with the

game's flow and the functions of the navigation var menus. When the "1" notification popped up, they noticed that but was reluctant to follow up on the signal. They expressed that thought "nothing happened in the game, why do I have to tap on there [Thoughts]?" But when they entered the Thoughts screen, they saw how it worked.

A, E, F, and G also had trouble connecting with their characters. However, compared to what B and H experienced, theirs was somewhat an intentional, or at least conscious disconnection or disassociation. A said that due to the PC having no background whatsoever, they felt that the character was themselves and decided on their behalf. They used an RPG jargon here and said that "There are some specific character builds that I usually make. There are ones that are like me and ones that are not", meaning they want to roleplay specific characters, but in Neolithic Quest this was not possible. Their disconnection is evident in other themes as well. E also said that they put themselves in the starring role and played the game accordingly. They said "I did not feel that [the main character] had character", suggesting a similar disconnection as participant A.

Participant G outright expressed that they "do not connect with the characters they play" and said that they like to meta-game more. There is a situation of duality in the A's and G's case. They regard the PC as an avatar which they control and use to interact with the game world. As mentioned above, Participant F had this disconnection due to them as a player did not want to hurt an animal. Which may or may not be a conscious disconnection, however, it showcases how players' own preferences and perspective on life affect their choices.

On the other end of the spectrum, participants C and D declared that they connected with the character. Participant C, even though they did not even enter the character screen, said that they have "Embraced [the character]. I felt I was there." They added that the character gave the feeling of a student and a novice like themselves. The thing that was interesting to hear is that participant C could not articulate the actions they did as a player. When asked "what can you do as a player?", they replied, "I control the player" and "I direct the game"; which true in a sense, however, this suggest that their connection with their character might stem from the fact that they do not distinguish between the concepts of character and player. Understandable considering they are one of the two participants who do not play video games at all.

Participant D seemed to have a more genuine connection with the PC. Due to the PC being a novice, they could internalize that and that was reflected in their decisions in the game. For instance, when asked the reason for picking the charge with axe action after consulting Atmaca, they said "After consulting first… I wanted to prove myself immediately, but failed…" Their reply to the question of whether they could connect with the PC or not, they said "They want to become an adult in their village and join the team. For that, they need to prove themselves. Maybe due to my age I felt like that."

Participants that are familiar with RPGs had trouble with making connections with their character, intentionally or otherwise. The ones that could make some connections, could do so in a more superficial and meta level.

Sellers's and Cook's interaction loop model suggest players learn to play a game through their interaction with the game's system (Sellers, 2018; Cook in Fullerton, 2019; see Section 2.2.1.2). Their actions facilitate feedback from the game and their mental models are updated through the cognitive change they undergo. When there is a purpose of learning or other impact in game, the mental models are crucial to achieve the intended outcomes. A game that was designed through an intrinsic gameplay approach (Schaller, 2014; see Section 2.4.3), the instructional content and gameplay are integrated with each other, making correct mental model creation and updating even more significant. The observations and analysis above suggested the participants' gameplay experience is affected by how they perceived the game as whole, and specific elements. Their familiarity with the medium, and the genre, their prior knowledge, interest, expectations, and other characteristics indicates personal context have an immense influence on their experience with the game. Consequently, how they learn the instructional and museum content manifested in the game is also affected. While the participants' understanding of the game works is hinted before, below is deeper analysis in the subject.

5.4.1.2. Understanding Gameplay Elements

One of the things that seemed problematic for several participants is discovering navigation bar menus Character, Thoughts, and Inventory. Each screen carries a manifestation for an instructional content, thus, discovering and understanding them was important. For the first iteration of Neolithic Quest, signifiers for those menus

were kept minimal to assess which players could learn the menus and why (see Figure 41 to see the designs that were utilized during playtesting sessions).

Participants B, C, and H had trouble with the navigation bar menus. C did not enter any of the menus because “the game was playable”. H was reluctant due to game flowing and progressing normally without the interaction with them, like C. And B did not enter the character screen, and did not enter inventory screen before the strange arrowhead was found. C, and H never play videogames and RPGs. B plays couple times a week, plays RPGs and identify themselves as gamer, however, she had trouble discovering the menus. Participant B only reacted to the menus when there was a notification to prompt them to do so, thus missed the opportunity to learn the character screen, and the inventory screen for the slingstones and the sling.

Consequently, both B and C had trouble understanding the dice screen. While B did not articulate what the issue was, C said that “there were nothing [explained] about this (dice screen)” even though there is an explanation at the top of dice screen. However, it is understandable for them to struggle with a game mechanic that almost exclusive in tabletop RPGs. It would be good to find out what the connotation of dice for them is. As for participant H, they had a similar issue as participant B; the game progressing fine without the exploration of menus. This in fact shows a problem with the character, thoughts, and inventory screens possibly having no purpose, or at least some significance, from the players’ perspective. While the other participants with video game and RPG familiarity (n=5) had naturally explored the menus out of habit, they would not reflect the general audience of visitors for IAEM. Missing crucial mechanics have hindered some participants learning experiences, as evidenced by the case of participant C. They haven’t had the opportunity to examine diegetic and meta information of slings and haven’t discovered the thoughts and capabilities of their character. Basically, they have experienced a linear and short adventure, not an RPG.

Aside from confusion over navigation bar menus and dice mechanics, there were some small suggestions from participants. Participant A expected to see an inventory screen built as an overview of everything the character has on themselves. In the current iteration, information on slingstones and slings are the default inventory screen. When the player discovers the obsidian arrowhead, inventory menu shows the relevant but blank inventory screen as default. An overview of the items a PC carries is a staple in

RPGs; thus, it is understandable for a player to have that expectation. Participant E and F were able to discover the menus, however, they voiced their confusion over how the notifications worked. Video games conveying constant information updates through various levels of menus usually resort to a similar design decision; make player aware that a new information has been revealed or updated. However, signalling the existence of new information through a quantitative way, by signalling the number of notifications, might have been confusing. It seems to give away the wrong affordance for the player. Participant A were also confused on how the calculations worked out during dice rolls, even thought they were an RPG player.

Participant E and A expressed the Thoughts screen felt like a generic quest log. The name of the screen gave away a different expectation. A expected to see the thoughts of the protagonist about more varies occurrences in the game world: "Thoughts screen could be more like… Why doesn't our character have any impressions towards Kuzgun or Atmaca? When we first met them?... Thoughts screen could reflect that." Participant E on the other hand, saw this screen as a sort of to-do list; checkboxes to be checked.

Aside from suggestions from players, when asked what their character can do, 7 participants said that they can hunt, 5 said they can use slings, 3 said they can discover or explore, and one participant could not articulate the actions of the character properly. The significance of these results is the way the players learn about the game and the heritage knowledge manifested in the game. Their mental models and how the game presents actions pave the way for meaningful decision making. Understanding how the game works is very important in terms of achieving the learning outcomes.

5.4.1.3. Heritage Learning and Knowledge

Participants' heritage learning was assessed during the interviews. If they did not express their learning organically, they were asked to tell if they have learned anything while playing, and if there is any significance about what they learned in the context of Neolithic period. However, this method provided mixed results as it depended on how a participant were vocal about their experiences. For instance, Participant B implied learning that small animals (rabbits) could only be hunted using slings, not axes. However, they were also talking about "trial and error" was the method of doing

this. The significance of using slings for hunting was again discovering through trial and error. They did not express that they learned about hunting.

Participants A, E, and G implied or expressed that they learned slings' form and function. Participant A expressed that their character learned that slings were used to hunt small animals, and they, as a player, learned that Neolithic inhabitants used slings in the first place. They were not clear on whether the character knew this before the events of the game or established using it to hunt small animals. They said that they read this in the Thoughts screen and if it wasn't there, they wouldn't grasped that. Their expression also implied that the character was the one learned that: "The character said in their thoughts: … I learned slings were used to hunt small animals. The character learned this." Participant E learned about slings from the image in the inventory screen. They compared it to the slingshot they knew from before and liken the prehistoric sling to David's from the story of David and Goliath.

Participant G were also vocal about how slings functioned. They said through the Inventory screen, they can now recognize slings when they see it and say, "these were used in hunts." Also, the depiction of the character throwing the slingstone at the animal were very explanatory for them: "When he tries to shoot a rabbit with a sling, you (the game) actually explain the basic mechanics (usage) of that sling to me in the text, you know, the resistance in the wind and so on... I was able to understand that the sling is used in this way rather than just hunting with it." For participant F, the game's learning aspect and objectives were hinted at them, however, they could not express if they have actually learned something.

Participants' conceptions about heritage were also mixed. Participant G said "I did not feel like I was playing a game about something about my own past." Participant D expressed making connections between the technology of the past and today. E has said that the heritage is more like archaeological than cultural. They did not feel like there was a culture of a civilization in front of them. Suggested if there were more artifacts represented in the game, it would feel more like cultural heritage.

5.4.1.4. Museum Awareness and Motivation

Six participants did not visit IAEM before. Participants C and D revealed that they have visited even though they said otherwise in the pre-test survey. Participants B, E, and F expressed that they were not even aware that IAEM existed. Participants'

awareness of IAEM affordances such as the content displayed, and the intended experience had close relationship with their experience with Neolithic Quest. Consequently, their motivation to visit IAEM is also affected by their perception of the IAEM as an institution and experience.

Out of the six participants who have not visited IAEM, four of them (n=4) expects to see the content represented in the game when they visit the museum. Participants B and G also anticipate an experience comprised of discovery and exploration. G specifically stated "…for instance, if I would go the Izmir Archaeology Museum right now, the main thing I want to feel is the feeling of discovering something. Instead of learning something. Because it (the game) pushed me to explore because it kept telling me things… I would be motivated If I were to see the sling there".

Participants A, E, and F were "somewhat" motivated to visit IAEM. E and F had negative impressions of museums in Turkey. E said "I become a little disappointed when I visit museums in Turkey… They feel as If I am looking at something (artifact) left alone in a corner, nothing added to it." They added that they would like to visit the museum if they are close to the location for some other reason but are not motivated to make specific plans for it. F had similar expressions: "… all the museums are standardized. They can be a little boring. You just walk around; I would like to see something different." Participant A was curious but expressed that if the game presented more artifacts and stories from the museum, they would be more motivated to visit. Nevertheless, they expressed their appreciation for integrating actual museum content into a video game.

Participants B, C, D, G, and H expressed they would like to visit the museum. C and D revealed they have visited before but none of them recalled the artifacts manifested in the game. C said they would like to visit again to see the artifacts, D on the other hand said that "… experiencing all the tools [in the game] and exploring the museum would be memorable and efficient visit to the museum." Participant H explained the reason behind their motivation as: "… because it would be more impressive to see the tools that this character uses directly in the flesh. The story can be better visualized in my head, it can be established better. I might have learned better the functions of those tools at that time."

CHAPTER 6: DISCUSSIONS AND PRACTICAL SUGGESTIONS

This discussion focuses on the interpretation of gameplay experiences of 8 players who playtested Neolithic Quest in a controlled environment: Playing the game before visiting IAEM. These interpretations were made in the light of the design explorations documented in chapter 4, as well as the research aims (Section 3.4.1) and design goals (Section 4.1.7) that were established.

During the design explorations, several game design and game-based learning methodologies were examined and utilized in making certain design decisions. There were also foundations for the gameplay experience Neolithic Quest would possibly embody. Since Neolithic Quest was conceptualized as a game that is played IAEM context, foundations for the gameplay initially involved playing the game before, during, and after visit. This research project only involved before visit segment. Thus, the playtesting sessions were done outside of the museum setting. The game itself, however, were designed to be manifested by the museum content experience.

The purpose of playtesting and post-playtest interviews were to evaluate the design decisions made during the design process of Neolithic Quest. While there is no hypothesis to prove or disprove, there are theoretical and practical implications and possible contributions to design research and practice. Since this research has documented the first playable prototype of Neolithic Quest, practical suggestions were made to be implemented in further design iterations, and possibly that would involve playing during and after visits of IAEM.

6.1. Interpretations of Playtest Analysis

Analysis of the playtest observations and post-playtest interviews were documented in the previous chapter. The findings of the analysis were interpreted and synthesised to form practical design suggestions. Main purpose of Neolithic Quest is to elevate and compliment the experience of the Mind of Civilization collection of IAEM. Current iteration of the game consists of a gameplay that were designed to be played before the visit. Thus, the game also aims to motivate the players to make a physical visit.

The interpretations were done on wide range of variables; however, they were categorized under three items: Motivation, playing and RPG, and heritage and learning. These categories were also chosen as responds to the design goals established in Section 4.1.7:

- Design Goal 1: To create a single player RPG experience that emerges through interactions with manifestations of archaeological and heritage content in IAEM
- Design Goal 2: To make significant and engaging narratives from Izmir's rich archaeological heritage explicit.
- Design Goal 3: To create awareness towards IAEM's impact on heritage preservation.
- Design Goal 4: To provide opportunities for exploration and learning of cultural knowledge.
- Design Goal 5: To motivate players to visit IAEM.

6.1.1. Museum Awareness and Motivation

The analysis showed that all the 6 participants (n=6) who have not visited IAEM before were motivated or at least curious about making a visit. The two participants who have revealed that they visited the museum contrasting their declaration in the pre-test survey. Out of the six that did not visit the museum three (Participants G, H, and B) said they would visit the museum, and the other three (A, E, and F) were motivated but reluctant to make a definitive decision. E, and F gave personal reasons and prejudice on museums in Turkey affecting their predictions and expectations. They would like to visit but not fully persuaded. Participant A declared if there were more artifacts represented in the game. Here, the conversation with the Participant A developed in way that they have articulated their opinion in a more elaborate way:

Researcher: Did playing the game provide you motivation to visit the museum?

Participant A: … Do I feel like going? A little bit. Because... If I had seen more objects, I would have wanted to visit more. I said to myself "hmm". But I couldn't go beyond that. If I had seen more objects, or if I had seen more stories or visuals that illustrate the things used in the museum…

Researcher: Can you elaborate a little bit?

Participant A: For example…

Researcher: There is a photo of the sling below on the Inventory screen.

Participant A: I'm not talking about the inventory; I'm talking about the game in general... The interface or the characters… We don't have to see them in a realistic way. It can be much more stylized. We can be reading a pot. We take the pot, and maybe a story is being told on that pot by turning it around and around. If I saw the game in that way now and if the game told me “The pottery is in the museum by the way", if it said "we took this as an example" then I would be very curious.

Participant A was looking for an experience that utilized the artifacts in the museum to directly tell a story in a more tangible way. Further along the interview they give the example of Apotheon; a computer game that imitates the art style of Greek amphora illustrations (Alientrap, 2015). Their personal interest and prior knowledge on history and archaeology seems to affect their expectations and ultimately being motivated by an artificial context. They were also sceptical about the authenticity of the visuals of the characters, clothing, and the geography; the only one to do so. They questioned the skin colour of the village elder, making them curious about their origin. Seems like the characters did not belong to Izmir province, from their perspective. Pariticipant A’s dilemma could be explained through Eric Champion’s Culturally Significant Presence framework (Champion, 2020; see Section 2.4.3. for a review). They expect to be in the presence of a “culturally significant framework of values and meanings” (Champion, 2020, p. 10).

In a similar manner, Participant E were also “did not see that much” to be persuaded. Coupled with their prejudice of museums, they were not very inclined towards visiting the museum. Participants A, E, and F are among the video game literate and RPG familiar players and had a good understanding of the game’s formal elements. This indicated that, Neolithic Quest, in its current form, lacks depth in certain aspects to sway players with high expectations from museums and their content, even though the players had good understanding of the game.

Participants B and H were among the players that had troubles in discovering and understanding the interface of the game. H anticipated seeing the real artifacts would be impressive, and for B, who were unaware of the museum’s existence, Neolithic Quest sparked their curiosity want to visit the museum now. Participant G, who were the other motivated player, expressed that the museum provided a context and a reason

for him to visit, which is to feel the “sense of exploration” in the museum that arose during gameplay.

Video game literacy affected how much they articulate their experiences with the game. Players with video game and RPG familiarity delved into topics the questions not covered. This was expected since their familiarity with the medium and certain modalities allowed them to ascertain some aspects of the game distinct from participants without video game or RPG familiarity. However, the relationship between a player discovering and understanding the game fully and the motivation they had is not absolute. Three of the video game and RPG literate players were not fully motivated (A, E, and F). While Participant C were quite motivated albeit less articulate about their reasons. They have not fully experienced what Neolithic Quest had to offer. B and H also had somewhat superficial experience, and they were motivated to visit the museum.

Discovering and learning how a game works is an inherent aspect of playing a game (Sellers, 2018; Cook in Fullerton, 2019). Decision for an intrinsic gameplay approach directed the design of the gameplay elements in a certain way. Museum and heritage content were manifested as both formal and dramatic elements. As discussed in the section above, players’ video game and RPG familiarity, interests, cultural background, and prior knowledge on the subjects had a big impact on their museum awareness and motivations, as well as their understanding of the formal elements of the game. Instructional

As documented in Section 5.5.1.1, curiosity and discovery were dominant feelings when the player described their experiences or activities. Seven participants have declared that they were curious about at least a single gameplay element or moment, either through direct questioning or organic expressions. The only participant who declared that nothing sparked their curiosity was participant H. Four participants described their experience as discovery and exploration, or expressed that discovery was a feeling they got out of the game at some point. The interpretations of these results were done on a gameplay element basis to understand the reasons why curiosity and discovery were the dominant emotions. While emotions such as curiosity and wonder are associated with the affective domain of learning (Bloom and Krath bilmem ne

REF), interactions with certain formal elements requiring cognitive capabilities also elicited feelings of discovery and curiosity. These interactions were elaborated below.

Participants B, C, D, E, and F were curious about the ending of the story: The protagonist and Atmaca find the strange arrowhead, take it to Kuzgun where he directs the player to the next village to find out what it is. These five participants did not express if their curiosity had mainly emerged from the story itself or the blank Inventory screen for the strange arrowhead had any affect (Figure 41). While B and C had pretty much a simple wonder over the "cliffhanger" of the story, D, E, and F made more nuanced comments on their curiosity.

D was curious about the source of the arrowhead. They wondered "Was stone passed down from previous generations? Or did it belong to people from different cultures?". Participant E were curious how the story would unfold, and what will happen to the strange stone: "What is this stone? What's going to happen? There's something more advanced than these [people], or maybe they will improve themselves with this stone. They'll do something, they'll learn something. But obviously at the end of the mission he sends it to the other tribe. You know, what's going to happen? It's a bit of curious." Participant F made a connection with archaeology, probably through the dramatization of the scene where they find the arrowhead. They have declared that they discovered and learned the arrowhead. All three participants (D, E, and F) who have interacted with the Inventory screen for the item, however, did not comment on it specifically.

Participants A and G's descriptions of their feelings of curiosity were more specific. A was impressed by the Inventory screen for the slings as the diegetic Equipment with in-game function and abstract statistics, and real artifact with factual museum knowledge and its photograph as it is displayed in the museum (see Section 5.5.1.1 for the accurate quote; see Section 4.3.3 for the design of the screen). The immediate relationship between the virtual and the real made them feel that they are "doing something that is real" and they are person that held that artifact in the past. This immediate connection apparently came from their familiarity of interacting with similar interfaces that enabled them to contextualize diegetic information with factual knowledge. It can be argued that a cognitive process of understanding what the gameplay elements afforded turned into an affective outcome of impression and

curiosity. However, the significance of this interaction is that Participant A constructed their own meaning from this meeting of two contexts.

Participant G were also vocal about the Inventory screen. At first, their description of what was good about the game included Inventory screen showing the real artifact. It told them that "The thing I use is from the archaeology museum and I am using it. The real photograph tells me that… If I see that tool in the museum I would say 'I used that!' and would know its function. Normally, I would not be sure if that sling were this sling [used in this way]." Participant G were also impressed by how the Inventory screen for the strange arrowhead was purposefully obscuring information. It established "Neither my character nor me know anything about it." And they also expressed that the same screen gave the feeling of discovery for them: "…I discover something in the Inventory screen. … The question mark in the Inventory screen arose the discovery feeling when I pick up a new item. Because my character will discover something, and I will also discover." Like the case of Participant A, G had understood the affordances of the Inventory screens and made their own meanings. The blank Inventory screen was purposefully designed to evoke the feeling of discovery. It was a test to see if it will motivate the participants or at least make them curious about the museum visit. However, being the dominant enabler of curiosity was not planned.

Both A and G's reflections come from their personal and sociocultural context informing their comprehension of the game, their video game and RPG familiarity, interests, prior knowledge, cultural backgrounds, and so forth. Even though the game sparked curiosity for all the participants except one, not every instance of those were rooted in the understanding and cognition of formal design elements. Participants B, C, D, E, and F were curious to see the story moving forward, without any reflections of meaning-making.

In the artificial context of Neolithic Quest's current iteration; what seems to affect the motivation most, is a player's personal and sociocultural context. Their perception and preconception of museums, heritage, archaeology, and other related knowledge resonated with the gameplay experience in varied levels. Players' experience who was unfamiliar with RPGs shows the intrinsic gameplay approach could have the same outcome as an extrinsic approach. It can be said that fully understanding Neolithic Quest's gameplay elements and content is not crucial for providing museum awareness

and motivation. This revelation depends on the hierarchy of the design goals. If the game's ultimate aim is to motivate the player for a visit, then Neolithic Quest seems to be successful on that part. However, the game was conceptualized to be a holistic, encompassing experience that would be integrated into the museum context. And at the end of the day, player actions and decisions were not meaningful and purposeful enough to achieve heritage and cultural awareness for the museum content for most participants. The next section discusses the results of the interview from the perspective of roleplaying elements.

6.1.2. Playing an RPG in the Museum Context

Aim of this thesis project was the exploration of RPGs in the museum context from a design perspective (see Section 3.2.3 for a review on the research aims). Thus, reviewing and discussing how RPG elements were perceived, comprehended, and "played" was crucial.

CRPGs and TTRPGs have multifaceted designs. Character sheets, skill trees, quest logs, maps, interface elements that enables actions, and many other require different modes of interactions. The feedback for those interactions constructs and update mental models that converge to form a more holistic conceptual model of how the game works (see Section 2.2.1.2 for a review on interaction loops). Understanding how a game works means the endogenous meanings of gameplay elements resonates with the player on a deeper level, and possibly they gain new and personal meanings.

The current iteration of Neolithic Quest's storytelling was purposefully designed to be linear to accommodate gameplay experience of players with various video game and RPG familiarity. While linear, the game provided several approaches in the hunting encounter (see Figure 38 for an overview of the gameplay flow). These approaches were embedded with instructional content manifested from the museum, namely, to make players learn the function and significance of slings for Neolithic inhabitants (see Table 3 for an overview of the instructional content and relevant design decisions). However, the players could only be successful in the hunt by using slings, which acted as reinforcing feedback (Sellers, 2018) to create a mental model of "slings are created for hunting". Using axes on the other hand provided balancing feedback that created the mental model of "axes are not for hunting". This result is opposing the intrinsic gameplay design principle that was established. The players were forced to make

decisions that were somewhat arbitrary in the game's context. This was evident in multiple occurrences of playtesting.

At the centre of RPGs are the enactment of player characters in a game world inhabited by other agents (see Section 2.3 for definitions). Thus, the manifestation of heritage content should allow roleplaying interactions that are informed by the design choices made in Characterization, Action Resolution, and Character Development areas. Meaning; understanding players' learning and comprehension of RPG elements is crucial for the exploration of the design situation. During the interview, the participants were asked to elaborate their actions as a player and as the protagonist, and if they have made any connections with the protagonist (see Table 7 for the interview guide). Assessment of the roleplaying experiences had also emerged from their descriptions of the gameplay experience.

Regarding actions during the gameplay, Participant B articulated their actions as a player as "trial and error", which means the choices or the anticipated feedback from their actions were not meaningful or did not carry any purpose. This opposes the intrinsic gameplay design approach Neolithic Quest embraced. For Participant C on the hand, their actions were controlling "the player", suggesting an incomprehension on the concept of character in a video game. Five participants said they can use slings, and seven of them said they can hunt, either as the player or the character. Three participants said that the protagonist can discover and explore the world; the same participants also declared discovery as their experience, which suggests a kind of experience taking (Bowman and Schrier, 2018), and a connection between the character and the player, albeit a weak one and only on the meta level.

Through direct expressions, it was inferred that only participants C and D made a connection and internalized their characters in-game. C said the player character is like learner, much like themselves, so they could internalize them. An important thing to note here is that Participant C did not know anything diegetic about their character: they did not see the Character, Thoughts, or Inventory screens, thus the experience they might have resulted as a linear adventure. They do not know what their character is capable of; they did not see the descriptions for the slings and slingstones, and the references of what the character learned in the Thoughts screen. Participant D on the other hand was more comprehensive and perceptive towards the game's systems, but

their connection was similar to C's. They said that "I wanted to prove myself immediately but failed…" and were eager to prove themselves as their character and charged with their axe. Participant D were the only playtester whose actions reflected the Quest given by Raven. But they did not elaborate on their decisions.

Rest of the participants (A, B, E, F, G, and H) did not seem to have any connections with their characters, consciously or otherwise. They have put themselves in the place of the protagonist and made decisions as if they were there. Participants B and H said that they made their decisions according to what was logical for them. This was also evident in the experiences of other participants. For Participant A, the protagonist did not have any character; lack of a tangible background other than being a "rookie" who are discovering things in the world. G said they like to "meta game" when they play RPGs, which was a conscious choice for disregarding characteristics of the protagonist. F did not want to hurt animals and wished there were other choices besides this. There were also comments and reflections the player not having any agency to navigate the Game World, and the protagonist moved from Scene to Scene only.

At the base of the results of the interpretations made above is the fact that various gameplay elements of Neolithic Quest, mainly Characterization and Action Resolution, did not come together to create a cohesive gameplay experience that allowed meaningful and purposeful choices. As analysed in Chapter 4, RPG elements are designed to inform each other to provide a certain experience. Players make decisions according to their Character's capabilities, in order to manipulate the rules to be successful in their actions. In the current iteration of Neolithic Quest, the tangible heritage was manifested mainly as Equipment and Inventory that represented stone tools from the Mind of Civilization collection. Abstracted Attributes in the form of Skills were designed to give a sense of control to the player, making their Actions to be informed by their Character's capabilities. However, the lack of possible actions was limiting the utilization of those Skills, making them arbitrary Statistics that the players were only exposed to once or twice. Using an axe or a sling did not have any purpose or meaning until the result of the action were fed to them back. Only then they would understand if the choice was right or wrong. And still the choice was made depending on their own logic, not what their character would do.

This had also stemmed from the decision of incorporating only a single activity from the museum, which was “hunting with stone tools”. While it was logical to keep the scope as narrow as possible to control the playtest better, the prototype did not achieve “meaningful play” for the majority of playtesters.

While the game did not resonate much for the playtesters that had established expectations for an RPG, playtesters that were unfamiliar with RPGs had not even fully discovered what the game afforded. Specifically, some playtesters missed the opportunity to view the tangible manifestation of slings in the form of Inventory screen. Or the instructional content that is “capabilities of Neolithic inhabitants” were hidden away behind the Character screen. The Dice screen also became incomprehensible for players that did not access those screens. There were two possible reasons for the occurrence of this: First the game progressed without any need for input from the player regarding Character, Thoughts, or Inventory screens. Playtesters who did not have any natural impulse to discover the interface of a video game missed them. Thus, their mental models were incomplete to make meaningful choices when they were prompted to do so.

Second, the naming convention for those screens may have meant nothing to the players that were unfamiliar with those conventions. The words Character and Inventory are peculiar to the medium and genre. Thoughts on the other hand hints at its function better that the other two, however, it still failed to accommodate proper affordances towards understanding and discovering the interface. It is not possible to know if a person who were interested in the game can understand what Character means in this certain context. The opposite possibility could be thought of it the game were designed to be released in a commercial platform such as Steam and would be played by players who were interested because the game is an RPG. Thus, the design of the signifiers could be more discoverable and understandable for a wider audience.

To resonate with the RPG players more, the design also needs to be altered to provide more Characterization possibilities. The protagonist’s background could be picked by the players from a selection of diegetic choices that also reflects the Neolithic era inhabitants. While the current prototype only consists of the hunting activity, it could be enriched by adding interaction with different tools, so that more Skills could be utilized. As some participants suggested, a player could want to roleplay a Character

that are strong and agile, wise and intelligent, or with leadership qualities. While Character creation is a viable option, which is the case with most CRPGs, a serious game with a target of general audience, it might be complex and inaccessible. In the current iteration, Social Skill was not even utilized in any Scenes.

In general, the player's impact in the Game World should be more discernable. The endogenous meanings that emerge should be understood so that the player can make actions that feel purposeful; if there is a settlement the player character inhabits, it should be explorable; if there are Agents inhabiting the Game World, the player should be able to choose the means they want to interact with them; and if there are tools to be used, the player should be able to choose how and when to use them.

At the end of the they, player's experience with a serious game affects their learning and understanding of the instructional content. In the next section, the interpretations of how the participants engaged and learned the instructional content were documented.

6.1.3. Heritage and Learning

In Section 4.1 the museum context, specifically IAEM, were examined. Possible heritage content from the Mind of Civilization were selected to be manifested as instructional content. These manifestations were planned to be designed with an intrinsic gameplay approach, integrating them with the gameplay to achieve a holistic and seamless experience. In Table 3, design decisions made that were associated with instructional content can be seen. These associations were then implemented as the prototype that was put to playtest.

Post-playtest interview sessions shed light on the learning of the heritage content by the playtesters. During some of the conversations, the topic of learning emerged organically. If not, the players were asked to elaborate if they can say they have learned anything. Also, their expressions about their gameplay experience revealed important insights. As the Hanes and Stone's model suggests (2018), instructional content aimed to addressed players' cognitive, affective, and meaning-making capabilities. Since Neolithic Quest is informed by the museum context, players' learning is also affected by the personal, sociocultural, and the physical context. The main findings of the interviews are documented below.

Seven participants expressed they have learned that slings are for hunting. While for some participants this learning outcome emerged directly as a result of the feedbacks they have received during the encounter scene (Participants B, C, D and H), others made deeper connections with the archaeological heritage and connected them with the museum's physical context (A, E, and G). These deeper connections were the results of the comprehension of the Inventory screen for the slings and slingstones. Seeing the photograph for the real artifact in a diegetic menu enabled them to make the connections with the museum. Participant G also learned how slings are used through the depiction made in the game and expressed that they can recall that if they see the real artifact.

There was one unintentional learning outcome that have emerged during the interview sessions. Obsidian arrowheads and their connections with trade in the Neolithic ages were not planned as instructional content during the design process. That gameplay segment was designed to explore how Neolithic Quest's gameplay can connect with a physical museum visit. As documented in Section 6.2.1, this segment sparked curiosity for most of the participants and was impactful in terms of providing motivation to visit IAEM. And for some, the "blank" Inventory screen of the arrowheads provided a deeper level of meaning and discovery for some. The reactions towards the ending of the game shows that the possibilities for discovery and exploration have emerged from the uncertainty (see Costikyan, 2002) the blank Inventory screen and the dramatization of the Quest the Raven gave to the player.

During the interview, the participants' understanding of heritage according to the experience they had while playing Neolithic Quest were assessed. For most participants, concept of heritage was not established. Participants E, F and H, commented that what they experienced was archaeological heritage, however, they weren't able to articulate further. Participant D made a comment on how they made connection between the artifacts and the tool of today. Participant G made contrasting remark: The game did not give the feeling that they were "playing something from my own past."

6.2. Synthesis and Practical Suggestions

This section documented the synthesis of all the findings during playtesting and interview sessions. The synthesis was done as reflections of the designer to explore

the design situation through the “movement” of design materials (Schön, 1992). Practical suggestions were made to improve the gameplay experience of the current iteration of Neolithic Quest. They were suggested to be implemented in the next iteration, prototyped, and consequently playtested. The principle here was not to see the results of the playtests as problems to be solves, but as design situations to be explored.

6.2.1. Main Findings

Neolithic Quest were assessed in its impact on museum awareness and motivation, comprehension of its gameplay elements, and engagement with and learning of heritage content through a roleplaying experience. The main findings and some immediate reflections can be synthesised and summarized as follows:

1- The game successfully motivated the players to visit or made them aware of the museum’s affordances and experience. Their personal interests, prior knowledge of relevant subjects, and preconception about museums as an institution played the biggest role in making decisions towards a potential visit. A comprehensive understanding of the game’s mechanics and systems was not a prerequisite for motivation. On the contrary, most players that had an affective, albeit a superficial, experience had the most clear and explicit motivations. Players expecting a deeper gameplay experience were not incentivized or fully committed to making a visit.

2- Feelings of discovery, exploration, and curiosity had a very positive impact on the gameplay experiences and motivations of the player, regardless of their comprehension of the game. Elements that had this affect should be utilized more. For instance, the concealed attributes of the obsidian arrowhead and the corresponding storytelling of the relevant quest were the most impactful reason of discovery and curiosity.

3- Players having few choices and actions to make had a negative impact. For most, the choices felt obvious and arbitrary. The players were forced to make decisions that were not purposeful and devoid of meaning in the game’s context. The first reason for this is how the choices presented during the encounter are deprived of any connection with other elements of the game. The player does not know what Skill will be utilised if they use their slings or axes, unless they enter the Character screen. Even then, the choice for using slings were obvious, without any feeling of uncertainty, and no possibility of failing. Second reason is a consequence of the first one. The game

progresses without any input from the player regarding accessing the Character, Thoughts, and Inventory screens. Because they have no reason to enter those screens, a few players missed some of the instructional content manifestations. Connected to the second reason, the affordances of Neolithic Quest probably "lost in translation" for some players. While the word "Character" have connotations on other media, it is still an endogenous meaning in the context of a CRPG. Similarly, Inventory might have felt too formal.

4- Although few, there were instances of meaning-making that emerged from some players forming connections between the diegetic knowledge of artifacts and the factual knowledge from the museum. Cognition of gameplay elements that manifests this kind of relationship should be made more accessible so that all the players can make such connections. Specifically, elements unique or at least have strong relationships with RPGs, such as Characters, Skills, Equipment, Inventory, and Dices, should be designed in a way that is meaningful and understandable.

5- As a culmination of all the previous finding, Neolithic Quest, in its current iteration, does not express a holistic cultural heritage framework. In general, the player's impact in the Game World should be more discernable and distinguishable. The endogenous meanings, meaning that emerged from the game's elements intrinsically, should be understood so that the player can make actions that feel purposeful; if there is a settlement the player character inhabits, it should be explorable; if there are Agents inhabiting the Game World, the player should be able to choose the means they want to interact with them; and if there are tools to be used, the player should be able to choose how and when to use them. Currently, the players do not do anything with the heritage content they learned in the game, as opposed to the intrinsic gameplay design principles it aimed to uphold.

6.2.2. Practical Suggestions

Reflecting on the findings summarized in the previous section, there are a number of refinements and alterations that can be made to the design of Neolithic Quest. These were done in the form of practical suggestions to be implemented in the next prototype. Rather than addressing the findings individually, a more holistic approach that refines the design in a way that each finding has an effect on the overall experience. These suggestions are provisional and needs to be implemented in the prototype to evaluate their effectiveness.

A look at the overview of how the game flow could be improved can be seen in Figure 45. This high-level abstraction could provide necessary insights on how the players experiences can be elevated. At the foundation of the design suggestions is making the experience more meaningful by making the possible choices purposeful.

At the beginning of the game, Raven gives the players a Quest in the same manner as the previous iteration. However, this time the Quest should not be limited to a hunting activity, but kind of a learning ritual which the Player Character is sent with a Hawk to spend a night in the forest and learns ins and outs of tools and practices.

After receiving their tasks, players are confronted with a choice to select what kind of Character they want to play as. Again, the choices here should be meaningful while being understandable and accessible as possible. The three Skills the Characters would have remained the same: Physical, Mental, and Social. When the players are prompted to select their Characters, they are directed to the Character Screen to learn its function and significance. This way, they can understand the purpose of this screen, and also the general importance of other menus in the game. The three Character types could be Athletic with high Physical Skill score, Wise with high Mental Skill score, and Charismatic with high Social Skill score. This approach provides the first steps to create a deeper and richer roleplaying experience. Having higher scores in a particular skill can allow players to make decisions with more purpose, and in line with the protagonist's Characteristics.

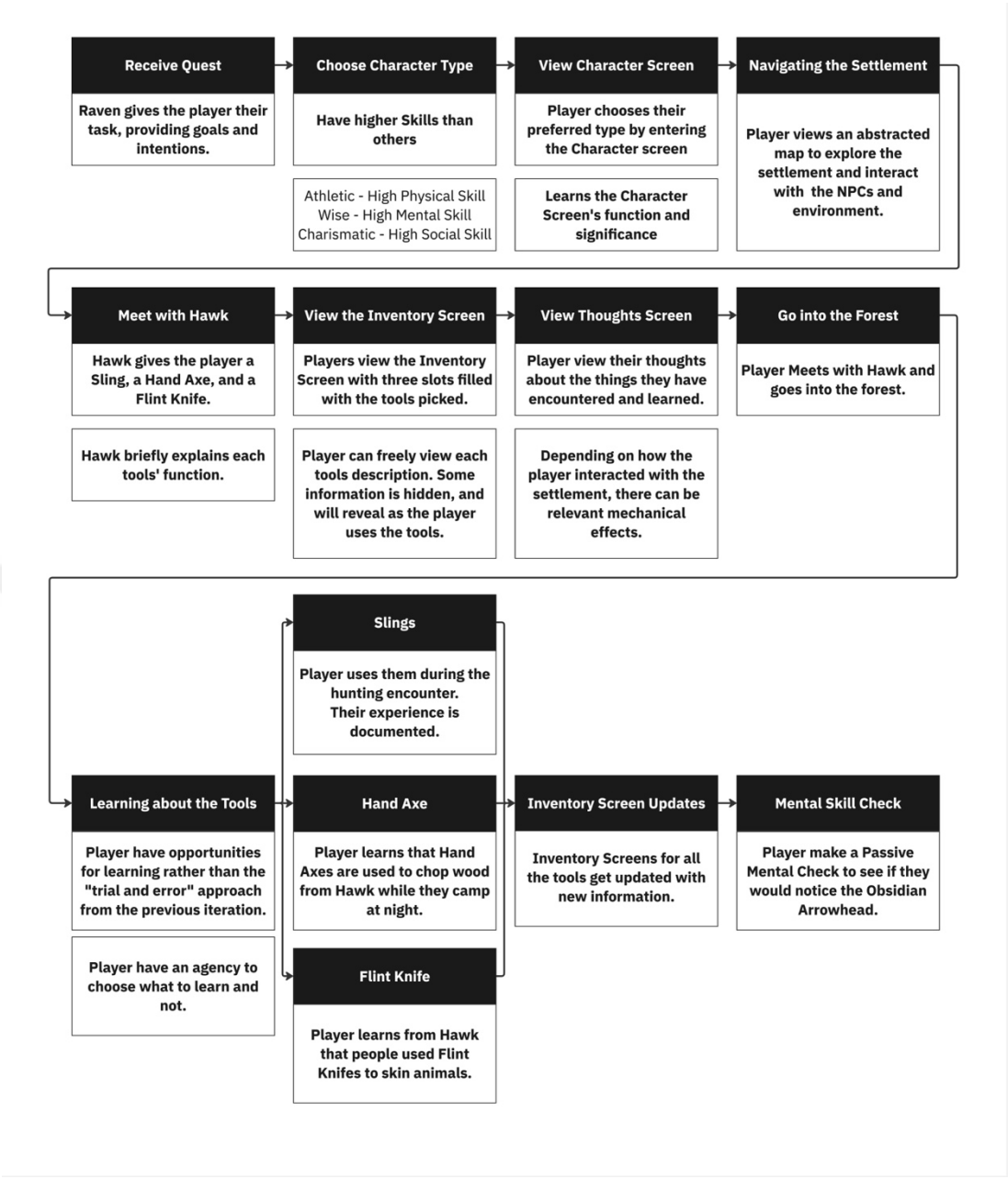


Figure 45. Improved gameplay flow suggested in the light of the playtest and interview results.

Having the player to navigate the settlement they live is crucial to create the cultural and diegetic framework. Players need to be able to interact with inhabitants of the village and the environment. They can choose to learn the significance of other concepts disseminated in the Mind of Civilization collection such as agriculture, craftsmanship, fire, pottery, and other customs and practices. The player agency is also in line with the informal education structures of museums.

The improvements on Characterization and navigation of the Game World would allow players construct more robust mental models for their intentions so their decisions can be purposeful and meaningful. Rather than providing a trial-and-error approach that resulted in predictable and arbitrary choices in the only activity the game had, players can be introduced to three tools with distinguishable functions in distinct activities. Players are given a Sling and some Slingstones, a Hand Axe, and a Flint Knife and directly introduced to the Inventory which now has an overview of all the tools they carry with them. Informed by the positive reactions towards the screen of the Obsidian Arrowhead with hidden information, these tools similar would reveal more diegetic and factual knowledge as the players use them or learn about them through interactions with NPCs.

The Sling can be integrated into a hunting activity again. Player Character and the players learn slings' functions and significance. Hand Axe can be utilized in a scenario for chopping wood to make fire at night, while Flint Knife can be integrated in an activity about skinning animals. The outcomes of these activities would be recorded in the Thoughts screen, depending on which ones the player chose to do. Players would be regularly led to Character, Thoughts, and Inventory screens throughout the game to update their mental models.

Regarding the Obsidian Arrowhead sequence, *Passive Skill Checks* pattern can be utilized to see if the Player Character can notice it on the ground. If they are successful, they can add it to their Inventory and view its description, otherwise they go back to the settlement, and find out that someone brought a "strange arrowhead", and Raven asks you to investigate.

Low-level decisions for the refined game flow can be made at this point to spark a new set of reflections. However, the research project's aim was to generate applicable design knowledge in the intersection of design practice research and game-based learning. Currently, there are numerous findings and reflections that are theoretical and practical contributions.

In this chapter, the post-playtest interview results of Neolithic Quest were analysed to assess its effectiveness in promoting museum awareness, encouraging visits, and providing a meaningful roleplaying experience within the context of heritage learning. While the game successfully motivated several participants to visit or learn more about

the Izmir Archaeology and Ethnography Museum (IAEM), this outcome was largely influenced by personal interests, prior knowledge, and preconceptions about museums. Participants with limited RPG familiarity often had difficulty accessing key elements such as the Inventory and Character screens, leading to incomplete comprehension of the game's affordances and instructional content. On the other hand, curiosity, exploration, and discovery emerged as dominant emotions across participants, underscoring the game's potential to create engaging experiences that connect players to cultural heritage.

However, the current iteration revealed several areas for improvement. Limited player agency, arbitrary decision-making, and a lack of meaningful roleplaying choices hindered the game's ability to deliver a cohesive and purposeful experience. To address these issues, practical design suggestions were proposed, including enhancing the player's interaction with the game world, broadening the protagonist's characterization options, and integrating more diverse activities tied to Neolithic practices. These changes aim to deepen the connection between the game's elements and its heritage content, fostering a richer and more impactful roleplaying experience. By refining these aspects, Neolithic Quest can better fulfil its goal of offering an engaging, educational, and motivational experience that bridges digital gameplay with museum visits.

CHAPTER 7: CONCLUSION AND FUTURE WORK

This study set out to explore the integration of cultural heritage into computer role-playing games (CRPGs) as a medium to enhance museum experiences through research through design methodology. Grounded in the context of the Izmir Archaeology and Ethnography Museum, the research aimed to design a prototype that integrates tangible and intangible heritage content into a holistic gameplay experience, transforming museum visits into enriched, engaging, and meaningful experiences. By investigating the theoretical and practical aspects of game design and game-based learning methodologies, the study had strived to contribute to both these disciplines, as well as other fields that were embedded in the design of the final prototype: museum studies, cultural heritage, and game studies. The following sections consolidate the contributions, limitations, and broader implications of this work, along with recommendations for future research and personal reflections.

7.1. Responding to Research Questions

The study started its exploration through broad research aims established in Section 3.3.3. These research aims provided guidelines on how to approach the design situation at hand. Through the design process the research aims turned into research questions:

1. How can computer role-playing games serve as a medium for the exploration and dissemination of heritage knowledge and enhance learning experiences in museum settings?
2. How can game design and game-based learning methodologies facilitate the manifestation of heritage content in museum collections?
3. How can practice-based design research contribute to the design of game-based learning experiences?

7.1.1. Research Question 1

How can computer role-playing games serve as a medium for the exploration and dissemination of heritage knowledge and enhance learning experiences in museum settings?

Through designerly exploration this study engaged in, it can be concluded that role-playing games is a valid medium to engage with cultural heritage in the museum context. The prototype, Neolithic Quest, showcased how tangible knowledge and intangible narratives of artifacts can be transformed into gameplay elements, allowing

players to engage with them in a meaningful and playful way. The game presented a game world in which the players roleplayed as a fictional inhabitant engaged in a hunting activity, interacting with real tools used in the Neolithic ages. By relating its own artificial context to the Izmir Archaeology and Ethnography Museum's context, it created a playful space for exploration of archaeological knowledge through a diegetic framework. Current iteration of the game consisted only the before visit segment of its holistic design philosophy, thus, reflections were made regarding its utilization and applicability for players who hasn't made a visit to the museum yet.

Even though playtest and post-playtest interview results show that the game were successful in providing awareness and motivation, it was mostly achieved through dramatic elements evoking the feeling of curiosity and discovery in the players. Elements affective within the game's narrative (see tables 3 and 4 for a review) were received positively mainly by the players with low cognition of the game's systems. CRPGs are multifaceted games (Section 4.2.1.4) that requires comprehension of its various structures to achieve meaningful play (Salen and Zimmerman, 2004). This has illustrated the design of the prototype were not able to accommodate its target audience in terms of understanding and discovery of its gameplay elements.

Through a pragmatic perspective, the results documented above could be interpreted as successful design outcome: The game elicited curiosity towards the museum and the heritage knowledge it preserves and disseminates. However, games as a medium are contingent structures with interpretable outcomes and meanings that are highly contextual (Salen and Zimmerman, 2004; Juul, 2005; Malaby, 2007; Section 2.1.2 for a review of the concept of games) compared to other media that can still achieve the same on a distinct level. These characteristics make unique experiences possible. A more valuable and exciting, albeit rare, outcome from Neolithic Quest's playtests had occurred at the intersection of the game's negotiable and artificial context (Dourish, 2004), and the museum's own context. Through diegetic manifestation of an artifact displayed in a museum, players were confronted with both the fictional and real representations intentionally. Players who had the intended cognitive change towards an intended mental model update (Section 4.3.2), made an affective connection between the diegetic and the meta; the fictional and the real (Juul, 2005); the virtual and the real (Aarseth, 2007). This connection resulted in a highly personal meaning-

making at the account of some players acknowledging the museum context in the game they were playing (see Section 5.5.1.3 for the analysis).

While the players engaged with the game world of Neolithic Quest, they roleplayed as a character who had skills as abstracted scores that had diegetic properties. These scores were utilized in determining whether their actions regarding tool usage were successful or not. The results of their actions were recorded as thoughts, again with both diegetic and meta implications; what the character learned, and what the player learned. The player character had tools with diegetic properties that were manifested as artifacts from the museum collections, which were accessed through an inventory screen. These seemingly relevant elements of a game system proved hard to grasp for some players who only engaged with the narrative of the game and missed out on valuable learning opportunities, however, they were still motivated to visit the museum. Synthesis of the findings revealed that personal and sociocultural context have the highest impact on the motivational outcomes of gameplay experience.

Findings revealed the shortcomings of the protype in terms of establishing or reinforcing the players' understanding of cultural heritage. This revelation had stemmed from the design failing to address higher levels of cognitive capabilities of the players, excluding few meaning-making occurrences, resulting in the lack of purposeful decisions and meaningful play. Linking gameplay elements that require and elicit cognitive and affective capabilities with discoverable and understandable affordances would increase the frequency of these meaning-making instances that occurs at the intersection of museum, game, and player contexts.

7.1.2. Research Question 2

How can game design and game-based learning methodologies facilitate the manifestation of heritage content in museum collections?

The research and design process of Neolithic Quest was informed by methodologies devised by researchers, theorists, and designers from design research, game studies, game design, game-based learning, museum studies, and roleplaying studies disciplines. These methodologies were reviewed (chapter 2), and synthesised (chapter 4) on various application methods, and levels of abstractions.

The concept of Magic Circle (Section 2.1.3) and the Contextual Model of Learning (CML; Section 4.1.3; Falk and Dierking, 2016) was utilized as a foundational approach

to frame the design situation of "playing a digital game in the museum context". Interpretations of Magic Circle as a frame or boundary where meanings get transformed were proved a useful outlook on how play can occur on different contexts (Salen and Zimmerman, 2004; Stenros and Montola, 2024). If the museum experience is comprised of personal, sociocultural, and physical (and time) contexts according to CML, a visitor playing a game before visiting the museum would carry the endogenous meanings in the game (Costikyan, 2002) with them to the museum context and transform them as they are contextualized through their personal interpretations. For instance, slings with diegetic properties that have no meanings outside of the game's context were designed to provide meanings towards understanding the cultural heritage related to using stone tools in the Neolithic ages. These kinds of design decisions were made by utilizing game design and game-based learning methodologies.

As with the sling example above, an intrinsic gameplay design approach was adapted (Schaller, 2014; Section 4.3). Players were meant to engage with the heritage content presented in the game as they interact with the game intrinsically. This approach sought to provide a deeper learning experience for the players. Heritage manifestation model (Hanes and Stone, 2018) provided the guideline to make low-level design decisions on turning instructional content from the museum into gameplay elements that resides in the game intrinsically. One of the contributions this study made in integrating game design and game-based learning methodologies were to associate the instructional content manifestation with game design patterns to provide a new layer of design cognition towards making appropriate design decisions (Tables 3 and 4). Patterns in game design (Bjork and Holopainen, 2004) and RPG design areas (Bjork and Zagal, 2018) were also utilized to provide necessary vocabulary for analysing TTRPGs and CRPGs and communicating design decisions. Analysis of design artifacts (Section 4.2.1.1) guided the design process in determining gameplay elements.

Interaction and gameplay loops (Sicart, 2015; Sellers, 2018; Cook in Fullerton, 2019) that occur during gameplay were thought as procedures of intrinsic learning in games (Section 4.3.2). As the player interacts with the game system (Salen and Zimmerman, 2004; Juul, 2005; or game + player system as in Seller, 2018), their cognitive processes are changed through their actions and the feedback of the system. As a result, their

mental model of the system is updated. If the heritage content was manifested in the game can be learned coincidently as learning to play the game, intrinsic gameplay approach could be achieved. However, accurate application of this holistic approach did not depend exclusively on design decisions; the gameplay elements embedded with the heritage content were only made explicit when the players discovered, understood, and did something with the content itself.

7.1.3. Research Question 3

How can practice-based design research contribute to the design of game-based learning experiences?

The study adopted a practice-based design research approach to explore the design situation at hand (Chapter 3). This approach proved beneficial in terms of generating applicable design knowledge that contributes to multiple disciplines (documented in Section 7.2). The constant "designerly" conversation between the design situation, design artifact, and design process (Cross, 2001), enabled a deeper and informed understanding of the design process and the resulting artefact (Frayling, 1993).

Acknowledging the uncertain and non-linear, the study involved exploration and experimentation of a design situation (Kruger and Cross, 2006; Quinten et al., 2015). Residues of these explorations are new design materials to be reflected upon and "moved" in iterative cycles (Schön, 1983; 1992). This reflective conversation allows framing design situation that are contingent upon the context. The design process of Neolithic Quest was informed by game design and game-based learning methodologies, as well as concepts of museum experience and cultural heritage. The intersections of these methodologies and concepts are uncertain design materials that strive to be put into frames that are less ambiguous. Prototypes are ways to achieve concrete solutions for the designers to learn new ways and discover inspirations to move the materials (Lim, Stolterman, and Tenenberg, 2008).

Neolithic Quest is one prototype that culminated as the designer/researcher's unique insights gained during the design process. Research through design (Frayling, 1993; Gaver, 2012) is the type of design research approach that aims to construct knowledge through practical engagement in the activity of designing. Game-based learning is a multidisciplinary endeavour combining game design and instructional design to achieve learning through unique means (Czauderna and Guardiola, 2019). Game

design as a practical and theoretical discipline is also pluralistic (Kultima, 2015). Gaining insights through the design activity with the purpose creating applicable design knowledge were suitable and valuable for the intersections of multitude of disciplines.

As summarized in the above section (7.1.3), the design process leveraged several game design and game-based learning methods and frameworks to guide the design process on multiple levels of abstraction. This approach treated the design process of serious games as full-fledged games rather that playful or gamified utilitarian artefacts. As every design situation is unique, artefacts of game-based learning amplify this uniqueness in terms of possible instructional content and potential learning outcomes. Barrowing from robust methods devised by design practitioners and researchers allowed interventions in these unique situations.

7.2. Contributions

Documentation of design activity informed by game design and game-based learning methodologies were the material outcome of this research. This approach found common grounds in diverse cognitions of designers, theorists, and researchers to further serious game design in informal learning contexts (see Section 4.3).

- A holistic approach towards playing games in the museum context that transcends the physical setting. It demonstrated how exploring the metaphor of Magic Circle can help the meanings endogenous to roleplaying games and museums inform each other to transform into personal meanings during play (see Chapter 6).
- A documentation of the design process and approach for designing computer roleplaying game elements that embodies tangible, intangible, and analytical aspects of heritage content preserved and displayed in an archaeology museum (Section 4.3.3). The design process was not procedural. It was informed by multiple game design and game-based learning methodologies. In the case of an archaeology museum, the study showcased ways for how implicit narratives could be made explicit through analysing roleplaying game elements and embedding them with attributes of artefacts to transform them into diegetic objects.
- An approach for designing game-based learning experience with intrinsic learning qualities. Treating the museum content as diegetic objects in the game that a player can interact with in the appropriate contexts revealed ways of engaging with the

heritage knowledge. While this approach required a higher cognitive input from the players, it presented valuable meaning-making opportunities that can be improved in frequency and accuracy.

7.3. Limitations

This research utilized research through design methodology, exploring defined research objectives via practical means to explore design concepts, principles, and methods for game-based learning in the museum context. The process was not entirely systematic, but rather non-linear, emergent, and uncertain. Nevertheless, the inherent complexity of the design process can be viewed as a key advantage, enabling the emergence of research outcomes that might not have materialized under a more structured investigative approach. It's worth noting that during the design exploration, outcomes from the reflections often stemmed from intuition rather than a methodical, theory-driven approach to the situation. Only after a new form took shape and became available for evaluation did the conceptual ideas behind its design begin to surface, allowing for the construction of a rational discourse explaining the design logic or connecting design decisions to relevant theoretical frameworks.

The chosen research approach successfully addressed the research aims, but it's crucial to recognize the complexities associated with deriving theory from design practices. This method, while effective, presents notable challenges that deserve attention. Even though I have tried to systematically express my design decisions in a coherent manner, I must acknowledge the unavoidable influence of personal design outlook and motivations on the design process. Most design challenges lack a single correct answer, and my own solutions would undergo significant changes over time.

Regarding the scope of the project, the current prototype acted as a reflection of a very small segment of a framework that was planned to encompass a holistic museum experience. Since the aim is to generate research outcomes through design activity in a particular context, treating the design process as if releasing a commercial and polished game were, without a question, unrealistic and illogical. Creating functional games, even at the prototype stage, is a challenging endeavour due to their complex nature. Typically, a diverse team of specialists collaborates for extended periods, often spanning months or years, to produce a product. Consequently, certain crucial elements like sound design, fleshed out non-player characters, and comprehensive

game narratives were either minimally developed or omitted from the design. The primary objective of developing these prototypes was not to create a finished, refined game comparable to professional standards, but rather to accurately investigate the design situation, and as the project progressed, addressed the emerging research questions. For these reasons, the prototype of Neolithic Quest were realized as somewhat a "pseudo-game". The design made available for the playtests as Figma prototype which was very suitable for prototyping text-based games. The prototype acted as it was a game with choices presented to the players predetermined. Even though these limitations, it was successful in eliciting valuable reflections from the playtesters.

This iteration of Neolithic Quest only involved the portion for the before visit segment. The decision for this were to narrow down both the research and design focus. Thus, the design for the prototype did not involve possible interactions with the artifacts in the museum. Nevertheless, the formal and dramatic elements would be considered as backbone of a game with much larger scale and scope despite its current much smaller scope.

7.4. Recommendations for Future Research

Several potential paths for further research can be identified through an examination of the topics that emerged at various stages of the study, as well as through a reassessment of the limitations and constraints encountered during this research project. These are explained below.

Expanding the game to the physical museum setting, and consequently testing with a larger audience. As explained above, Neolithic Quest were conceptualized as a game that encompasses the totality of the museum experience. Currently, it was design and tested as a game to be played before visiting the museum to gain awareness, spark interest, and be motivated towards a physical visit. As the gameplay moves to the physical setting, the interactions would also be adapted to address an experience that is influenced by the museum physical context, which were only manifested as the tangible aspects of artifacts before. Testing with an audience that plays the game before visiting and during the visit would prove invaluable and further the design in a way that could be implemented as a staple part of Izmir Archaeology and Ethnography Museum. However, this foresight also calls for a larger collaboration with the museum

experts, archaeologist, anthropologists, and other relevant social scientists. Also, to develop a game with a larger scope, a team with specialists such as game developers, narrative designers, artists, and sound designers would be needed.

Implementation of the project informed by the insights gained through the process to other learning settings with varied instructional content. As a consequence of the previous path, the methods utilized in the design process could be tested out in another context. These could be other informal learning settings that have close relationships with heritage museums but with a distinct experience such as archaeological sites. Other informal learning settings such as science museums would push the means of manifestations of the instructional content and open up new possibilities for collaboration, research methods, and design practices.

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APPENDICES

Appendix A. Ethical Board Approval

T.C.
YAŞAR ÜNİVERSİTESİ
ETİK KOMİSYONU

Toplantı Tarihi: 05.10.2023 *2023-2024 Akademik Yılı Toplantı Sayısı: 01*

GÜNDEM 3:

Yaşar Üniversitesi Rektörlüğü İletişim Fakültesi Dekanlığı' nın 15/09/2023 tarih ve 50885 sayılı yazısı ile sunulan; Fakültemiz Görsel İletişim Tasarımı Bölümü Araştırma Görevlisi Doruk TÜRKMEN' in, İzmir Ekonomi Üniversitesi Tasarım Çalışmaları Programında yapmakta olduğu "Kültürel Miras için Mobil Rol Yapma Oyunu Tasarlamak" başlıklı doktora tez çalışması kapsamında; İzmir Arkeoloji ve Etnografya Müzesi uzmanlarına uygulamayı planladığı anket çalışmasına ilişkin Etik Komisyonu onay talebinin görüşülmesi.

GÖRÜŞME ve KARAR:

Yaşar Üniversitesi Etik Komisyonu 05.10.2023 Perşembe günü, Prof. Dr. M. Erol SEZER başkanlığında, dijital ortamda toplanarak gündem maddesini değerlendirmiş ve tüm üyelerin oybirliği ile aşağıdaki karar alınmıştır.

KARAR 3:

Yaşar Üniversitesi Rektörlüğü İletişim Fakültesi Dekanlığı' nın 15/09/2023 tarih ve 50885 sayılı yazısı ile sunulan; Fakültemiz Görsel İletişim Tasarımı Bölümü Araştırma Görevlisi Doruk TÜRKMEN' in, İzmir Ekonomi Üniversitesi Tasarım Çalışmaları Programında yapmakta olduğu "Kültürel Miras için Mobil Rol Yapma Oyunu Tasarlamak" başlıklı doktora tez çalışması kapsamında; İzmir Arkeoloji ve Etnografya Müzesi uzmanlarına uygulamayı planladığı anket çalışmasının uygunluğuna oy birliği ile karar verildi.

T.C.
YAŞAR ÜNİVERSİTESİ
ETİK KOMİSYONU

Toplantı Tarihi: 21.03.2024 *2023-2024 Akademik Yılı Toplantı Sayısı: 05*

GÜNDEM 4:

Yaşar Üniversitesi Rektörlüğü İletişim Fakültesi Dekanlığı' nın 29/02/2024 tarih ve 60121 sayılı yazısı ile sunulan; Görsel İletişim Tasarımı Bölümü Araş. Gör. Doruk TÜRKMEN' in; İzmir Ekonomi Üniversitesi Tasarım Çalışmaları Programında yapmakta olduğu "Designing Role-playing Games for Cultural Heritage" başlıklı doktora tez çalışması kapsamında; Üniversitemiz öğrencilerine uygulamayı planladığı oynanış testleri ve odak grup çalışmalarına ilişkin Etik Komisyonu onay talebinin görüşülmesi.

GÖRÜŞME ve KARAR:

Yaşar Üniversitesi Etik Komisyonu 21.03.2024 Perşembe günü, Prof. Dr. Aylin GÜNEY başkanlığında, dijital ortamda toplanarak gündem maddesini değerlendirmiş ve tüm üyelerin oybirliği ile aşağıdaki karar alınmıştır.

KARAR 4:

Yaşar Üniversitesi Rektörlüğü İletişim Fakültesi Dekanlığı' nın 29/02/2024 tarih ve 60121 sayılı yazısı ile sunulan; Görsel İletişim Tasarımı Bölümü Araş. Gör. Doruk TÜRKMEN' in; İzmir Ekonomi Üniversitesi Tasarım Çalışmaları Programında yapmakta olduğu "Designing Role-playing Games for Cultural Heritage" başlıklı doktora tez çalışması kapsamında; Üniversitemiz öğrencilerine uygulamayı planladığı oynanış testleri ve odak grup çalışmalarının uygunluğuna oy birliği ile karar verildi.

Appendix B. Curriculum Vitae

Doruk Türkmen is a designer and researcher at Yaşar University, Türkiye, and a PhD candidate in Design Studies Program at Izmir University of Economics. His research focuses on the design of game-based learning in heritage museum settings, taking a practice-based approach with the aim of generating applicable design knowledge.

Teaching Experience

2019 – present ***Research Assistant***

Yaşar University

Faculty of Communication

Visual Communication Design Department

Publications

Türkmen, D. and Savasta, D. (2024) *Cultural Heritage Manifestation in Computer Role-Playing Games for Enhancing Museum Experience: A Model Proposal,* Journal of Museum Education, pp. 1–14. doi: 10.1080/10598650.2024.2391718.

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