CHAPTER I

THE PROJECT AND ITS BACKGROUND

This chapter introduces and discusses the topic of the project and provides a brief description, specifies the problem of the study, scope and limitation, rationale of the study, significance of the study, current state of technology and definition of terms.

Introduction

Mobile gaming, a continually evolving realm of interactive digital entertainment, has witnessed a remarkable proliferation of genres and subgenres catering to diverse tastes and preferences. Among these, the enigmatic and adrenaline-pumping world of mystery, investigation, and crime thriller games has gained remarkable prominence. Within this niche, players are transported into a realm where they do the metaphorical trench coat of a detective, equipped with keen analytical skills and an insatiable thirst for the truth. They become the central protagonists in a labyrinthine narrative, tasked with deciphering cryptic clues, solving intricate puzzles, and apprehending cunning criminals. The smartphone environment, with its compact canvas of possibilities, has become the ideal stage for these narratives to unfold, offering not just entertainment but a unique platform for intellectual and emotional engagement.

Intriguing and multi-faceted, mystery, investigation, and crime thriller games on smartphone platforms represent a synergy of storytelling, gameplay mechanics, and cutting-edge technology. These games are not merely about solving crimes; they are about immersing players in a complex, morally ambiguous universe where right and wrong often blur into shades of gray. The rich, immersive narratives featured in these games demand players to think

critically, assess evidence, and make moral decisions that carry weighty consequences. These experiences go beyond mere escapism; they challenge players to grapple with dilemmas, confront ethical choices, and forge their own path through the labyrinth of virtual intrigue.

The allure of mystery, investigation, and crime thriller games is deeply rooted in their ability to engage players on multiple levels. Beyond their role as digital entertainment, these games provide a unique opportunity for cognitive stimulation. The intricate puzzles and enigmatic clues scattered throughout the game world require players to think critically and employ deductive reasoning, enhancing their problem-solving skills. Moreover, the complex narratives often explore intricate societal and psychological themes, encouraging players to consider the human condition and the motivations that drive characters within the game.

Additionally, as technology continues to advance, the potential for immersive storytelling in smartphone gaming is growing quickly. A higher level of immersion is made possible by the incorporation of top-notch graphics, accurate physics, and cutting-edge artificial intelligence. The boundaries between reality and the digital world are becoming even more hazy as players can now live in virtual worlds that are startlingly realistic. In addition to improving the gameplay experience, technological advancement offers intriguing opportunities for researchers and game developers to investigate the psychological and emotional effects of these games on players.

Objectives of the Study

The main objective of the study is to design and develop an investigation game to provide gamers with an immersive experience of educational entertainment. Specifically, this study aims to:

1. Design and develop an Android-based game using blender, and unity;
2. Develop a game that gives players a third-person perspective of game investigation, mystery, and crime thriller;
3. Design an investigation game consisting of 30 missions with 3 levels of difficulties;
4. Develop a game with animation and sound effects that allows user interaction using touchscreen technology.

Scope and Limitation

The thesis is crafted with the primary objective of imparting essential information and knowledge pertaining to the field of investigation and crime game. This knowledge is drawn from the insights of respondents, contemporary research studies, and pertinent theses, as well as relevant online resources. The intended significance of this study is to offer valuable insights to a diverse audience, catering to the specific needs and interests of individuals:

The study will concentrate on a single-player game set in a three-dimensional environment, designed to significantly enrich the gameplay experience for mobile device users. The game will be presented from a third-person perspective and will be compatible with Android devices running on Android platform version 11 or higher. Incorporating both English and Filipino languages, the game's content is primarily tailored for individuals aged 18 and above. It will be freely accessible for offline use, fostering an immersive experience in the world of investigation and crime.

Moreover, it's worth noting that while the game is specifically intended for individuals aged 18 and above, it also welcomes enthusiasts of investigation and

crime, regardless of their age, encouraging a diverse player base to partake in the game and enjoy an enriching and entertaining experience. This inclusive approach ensures that anyone interested in exploring the world of crime-solving and investigation can join in and derive valuable learning experiences while having a blast.

The game comprises a total of thirty (30) missions, subdivided into three (3) levels of difficulty: Easy (15 missions), Intermediate (10 missions), and Difficult (5 missions). Gameplay will revolve around the collection of clues and various information sources, strategically targeting and resolving criminal activities. Players will be equipped with a variety of tools and equipment to aid in their investigative efforts. These tools and equipment will be obtainable at designated intervals throughout the game.

As mentioned, collecting clues and information sources was part of the gameplay. Collected valuable clues and evidence during investigations can be used to piece together the storyline or solve complex cases. Access to informants or reliable sources of information will also provide hints, tips, or secret leads during the game. In addition, earning achievements or trophies for completing specific challenges or objectives, will add to the player's overall progress.

Nonetheless, it is imperative to note that the proposed game will exclusively be accessible on Android devices. The game will strictly utilize the English and Filipino languages as its linguistic mediums. Furthermore, the game will not incorporate a user profile system, as it restricts registration to a single account per device. Additionally, the image resolution will depend on the screen resolution of the user's device.

Furthermore, the game entitled “Inspector Herrero: Pursuit of the Phantom in Manila” will be designed and developed to provide players with an immersive

experience of educational entertainment. The game will be developed in a three-dimensional design.

Rationale of the Study

Gaming in today's era has evolved significantly and encompasses a wide range of experiences and aspects. Gaming is no longer limited to traditional gaming consoles and PCs. Players can engage in gaming on a variety of platforms, including smartphones and tablets.

Mobile gaming, particularly on smartphones, has become a dominant force in the gaming industry. Mobile games cover various genres and are accessible to a broad audience, with adults being a significant target user group. They often seek entertaining and engaging gaming experiences on their smartphones and tablets.

Investigation gameplay has many educational advantages for players. As they examine hints, work out puzzles, and reach deductive conclusions, players in these games are encouraged to think critically and solve problems. Users gain analytical abilities that can be used in real-world situations by working on complex investigations, which helps to develop a sharper mind. Investigation games also improve memory and cognitive abilities. To advance, players must recall facts, events, and supporting evidence, which can enhance memory retention. In academic settings, these improved cognitive abilities can be helpful because they make it easier to remember concepts and facts.

The game “Inspector Herrero: Pursuit of the Phantom in Manila" will be designed to specifically satisfy the enjoyment and entertainment of the user. This game will be designed not only for the players’ amusement and excitement but

also for educational objectives. The game centered on a storyline of crime and mystery, which served as a tool to broaden the player's understanding of crime investigation.

The study will have a significant impact on the proponents since it enhances their software engineering skills. It boosted organizational and information-use skills, which will subsequently aid in overcoming potential challenges.

Furthermore, the study would serve as a reference for future proponents who will encounter a comparable study in the long run.

Current State of Technology

3D gaming has emerged as a pivotal technology within the gaming industry, enabling a new level of immersion and realism for players. Three-dimensional graphics create a virtual world with depth and perspective, enhancing the gaming experience. Complex 3D rendering techniques, such as polygonal modeling, lighting, and shading, have become integral to crafting realistic visuals. Games harness the power of advanced GPUs to transform 3D models into visually appealing 2D images, providing players with intricate, lifelike environments to explore. With the use of lighting, shadows, and reflections, modern games achieve an unparalleled visual quality. The gaming industry relies on game engines that employ rasterization to present these 3D objects on 2D screens seamlessly. This technology not only captivates players but also drives the industry's pursuit of ever-more realistic and immersive gameplay.

According to Stegner (2020) 3D games, by contrast, include full movement through three-dimensional planes. This means that the player is able to move

around in a "real world" setting where they can turn 360 degrees, and in which objects have length, height, and depth. You can see that 3D games are considerably more complicated than 2D games. The camera perspective is one of the most notable variations. You can move the camera independently of your character in many 3D games, allowing you to view the game world from different perspectives. You can view your character's appearance from above or at a 45-degree angle rather than flat sprites. It may be necessary to adjust the camera in order to complete tricky jumps or solve puzzles.

Before the first 3D game, the gaming industry primarily thrived on two-dimensional (2D) titles. However, the desire to transcend the limitations of 2D graphics and create a more immersive experience drove developers to experiment with 3D technologies. The concept of 3D graphics in gaming was not entirely new, as early attempts were made in the 1970s with wireframe graphics and vector displays. Although various early games dabbled with 3D elements, the title that often holds the distinction of being the first 3D game is Maze War. Building upon the foundations laid by the first 3D game, Maze War, the 1990s marked a watershed moment in the evolution of 3D gaming with the rise of first-person shooter (FPS) games. This transformative era witnessed the release of groundbreaking titles like Wolfenstein 3D in 1992 and Doom in 1993, which not only harnessed the power of 3D graphics but also redefined the gaming landscape by delivering unprecedented levels of intensity and immersion. These games seamlessly integrated fast-paced action, intricate exploration, and a first-person perspective, forever changing the way players interacted with virtual worlds. Wolfenstein 3D, developed by id Software, was a trailblazing title that pushed the boundaries of what was possible in the realm of 3D gaming.

The turn of the millennium marked the dawn of a new era for 3D gaming, characterized by refined graphics, diverse gameplay experiences, and powerful hardware. Much different than how things were at the time of the first 3D game.

Console gaming played a pivotal role during this period, with platforms like the PlayStation 2, Xbox, and GameCube offering hardware capabilities that could deliver impressive visual fidelity and physics simulations. The advancements in technology enabled developers to create groundbreaking titles that pushed the boundaries of what was possible in the realm of 3D gaming. One of the defining games of this era was Grand Theft Auto III, released in 2001 by Rockstar Games. This open-world action-adventure game revolutionized the genre by introducing a fully realized 3D cityscape, giving players unprecedented freedom to explore and interact with the environment, (Mainleaf, 2023).

Nextech3D.ai (2023) Over the years, the gaming industry has undergone a striking transformation, largely fueled by technological advancements. The field of 3D modeling is one of the major innovations that has significantly influenced contemporary gaming. 3D modeling has evolved into a crucial component of game development from the era of pixelated sprites to the intricately detailed game worlds we explore today.

Definition of Terms

The following terms are defined theoretically and operationally for clarity of thoughts among readers.

Android Device. An Android device is a mobile or tablet device that runs on the Android operating system, which is developed by Google (Myers, 2023). In this study, it refers to the device the player can use in playing this game which can either be a mobile phone or tablet.

Blender. Blender is free and open software used by multiple graphics and VFX artists to bring their imagination to the visually realistic world on the

screens in 2D and 3D computer graphics (Educba, 2023). In this study, it will be used to create 3d characters and environments of the game.

Mobile Game. Mobile games are basically online video games that may be connected to the internet and are specifically designed for mobile devices (Yamini, 2022). As used in this study, Inspector Herrero: Pursuit of the Phantom in Manila game which will be developed by the proponents is a mobile game because it will be running on mobile phone.

Single Player. Single-player games are those that can be played by yourself. They come in a variety of themes and genres, but the main standout feature of a single-player game is that the player completes the game by themselves (HG Staff, 2021). In this study, the proposed game is developed for single player only.

Three Dimensional. Three dimensional, refers to the three spatial dimensions of width, height and depth (Barney & Sheldon, 2022). In this study, it will be used to provide visual realism to enrich the gameplay experience of the user.

Unity. Unity is a 3D/2D game engine and powerful cross-platform IDE for developers (Sinicki, 2021). In this study, it will be used to make the game work.

User. A user is a person or entity that engages with a product, service, or system in some way, such as by using it, interacting with it, or consuming it (Chisel, 2023). In this study, it pertains to the player who will be playing “Inspector Herrero: Pursuit of the Phantom in Manila”.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter discusses the various literatures that the proponents used to provide more information about the study, specifically the systems content and its development. It also includes the related studies that helped the proponents conceptualize and formulate the study.

Conceptual Literature

Conceptual Literature presents theories and ideas gathered from different published materials and research studies relevant to the course of study. This includes discussions on the Gaming industry in the Philippines, Mobile Games Benefit for Academic Institutions, 3d Gaming, and Mobile Game Storylines.

Gaming Industry in the Philippines. Online gaming is a growing industry in the Philippines, with earnings predicted to skyrocket in 2020 compared to previous years. Gaming on consoles, mobile devices, and personal computers is becoming increasingly popular among Filipinos, particularly the younger population. Despite an increasing preference for mobile phones for gaming due to the availability of low-cost smartphones and mobile Internet infrastructures, gaming consoles remain popular. The mobile gaming market is expected to grow over the next five years, with sales reaching USD 2.18 billion in 2027. (Gumasing et al., 2023)

The Mobile Gaming industry in the Philippines is continuously soaring in terms of revenue and use. A total revenue of US$85M is expected to be generated for 2019 and would reach up to US$135M in the year 2023. Currently, the Philippines is ranked #26 in the Global Revenue Ranking. The consistent growth

in the gaming industry has led to the creation of the Philippine Video Game Industry Roadmap 2016 – 2022 which envisions the country to become a hub for video game development in Southeast Asia. This has led to the proliferation of some local and known international game studios in the country. In terms of mobile game use, the expected mobile game users are expected to reach 4.5 M this 2019 and could reach up to 7.4M in 2023. The Average Revenue per User (ARPU) in the Philippines is estimated to be $18.82 for 2019. Given the rapid and sustained growth, local game manufacturers may be able to compete with games created by international game developers. What is popular among Filipino mobile gamers are those that fall under the strategy, action, and RPG genres. These games that most Filipinos enjoy are associated with developers from the West. (Fabito & Cabredo, 2019)

Mobile Games Benefit for Academic Institutions. Outside of academic setting, most of the hours of the students were spent on playing online mobile games that resulted in absence of classes, tardiness at school, failing grades on a specific course and missing a community social life involvement. Similarly, online gaming consumes a lot of time to the extent that some of the gamers put in so much time and effort which affects their sleep, hygiene, health and wellness, exercise, school, work and family relationships. Also, it affects the learning interest of the students that tend to drop out in school. Researchers and experts stated that one of the most addictive things happening on the internet was online gaming, also considered as one subtype of internet and computer addiction. According to various researchers there are more males as compared to females who are delinquent in using the internet. Based on some research conducted, there was a significant relationship between the amount of time spent using the internet and higher ratings of distractibility to academic tasks by young gamers. A significant relationship was found between the amount of time spent on using the internet and poor performance at school. The same result revealed that the relationship

between online gaming engagement and academic performance among university students shows a lowered school grades of the addicted players than the non-addicted peers. (De Los Santos, et al., 2020)

Digital games can be used as educational tools to enhance teaching and learning in K-12 schools. Mobile digital games have become the way for young people to communicate and make connections to the world; therefore, educators have started to introduce mobile digital games to support teaching and learning in classrooms which provide students with meaningful learning experiences. To achieve optimal success in learning outcomes, educators need to constantly evaluate their instructional practices, tools, and resources. For instance, research shows that mobile games are beneficial for children's development and academic achievement. It is important for educators and researchers to evaluate and recognize the potential of using mobile digital games to engage learners in multi-sensory and complex learning processes. (Crompton, 2018)

Digital game-based learning combines educational content with the use of video games. The digital games are explicitly designed for educational purposes and have the capability to engage a diverse range of learning styles and behaviors. Learning can take place in both formal and informal environments, one-on-one or in groups. Game-based learning has shown to increase various abilities related to cognition such as perception, reasoning, critical-thinking, spatial navigation, and memory retention. (Turner, et al., 2018)

Digital games-based learning has been used to increase student retention, build teamwork skills, and communication (Bodnar, Anastasio, Enszer, & Burkey, 2016). Furthermore, digital gaming technology provides the option to measure students' progress over extended periods of time due to the prolonged interaction and play with the games.

Mobile games can be socially valuable particularly for people who are geographically isolated. Online mobile gaming is often found to be associated with positive emotions and social relationships. However, problematic and excessive gaming is also associated with poor academic performance (Heiden et al., 2019).

3d Gaming. The main advantage of using a 3D game instead of a 2D game is that the scenarios can be more realistic for users and this will allow the movements and actions that the user performs can be more natural. This will help them to understand better what to do at any time and scenario. As previous authors state, the user can feel more motivated, and can more easily transfer the gaming experience to similar situations in real life. (Rodriguez-Fortiz, et al., 2016)

Current video games have evolved from the previous 2D effect to 3D effect, which enables video games to have vivid scenes like movies. At present, the 3D video game industry has become a representative of high and new technology in the entertainment industry, and gradually tends to mature. With the development of game technology, game content and game mode, 3D games will become an important part of people's lives. (Su, 2018)

The findings to the study are relevant for game developers, marketers and researchers. This study contributes to research and theory in various ways, since it empirically examines the evaluation of video games and the brand placements within the games, by directly comparing players' reactions to a 2D, stereoscopic 3D and Head-Mounted Display VR video game. Our results indicate that 3D and VR lead to higher presence, i.e. to a pronounced feeling of "being in the game", but game evaluation did not differ between the 2D, 3D, and VR version. This is an important finding, because it shows that an enhancement in technology to 3D or VR does not necessarily lead to a better game evaluation. The additional depth perception in the 3D environments and the increased presence lead to a higher cognitive load and also come along with negative aspects such as dizziness and

eye fatigue that probably impair video game evaluation. Subjects who played the VR game in particular reported higher levels of dizziness and motion-sickness while playing the game. Hence, the fact that video game evaluation was not worse in the 2D condition as compared to the 3D and VR condition indicates that game developers can still be quite successful by continuing to offer “traditional” 2D video games. Game developers of 3D or VR video games need to be aware that the 3D and VR experiences can come along with negative feelings that could possibly harm game evaluation, so they need to develop video games in which the advantages of 3D or VR use clearly outweigh these associated disadvantages. (Roettl & Terlutter, 2018)

Mobile Game Storylines. Game story is an important part of the player experience and it is used to create a premise (or fiction) of a game or it can provide a theme that gives a flavor to the game. The story can also direct choices that a player makes in the game.Game premises can be complex as in the case of character and story-based games. The story can make a player feel that the player is inside the story and is affecting its flow and events (Korhonen, 2016).

Storyline as a sequence of connected events that occur one after the other. The storyline is simply like a story of which the player is a part. It’s because an exciting storyline is what people crave. If you don’t have one, the players will lose interest and perhaps move to another game. If you want to learn more information regarding storylines and their prominence, read along. A great storyline can help your player feel involved in the game. If the main character has not much to do, he’ll get bored somewhere in the middle. It’s the reason an interactive storyline is vital in a game. (Juego, 2021).

Storytelling refers to the narrative structure of a game. A well-told story keeps players engaged and curious to find out how such a game will turn out. The narrative in a game is essential as it ensures a gamer is immersed and actively

participates in determining the outcome of the game. It supplies the game with meaning and aids the player in recognizing every step to take. (Thompson, 2019)

Research Literature

This section presents previous studies that are likely similar to the present study. This would help the readers conceptualize the technology that the proponents used. Presented herein are the foreign and local literatures related to the present study which served as the basis for the game development.

The study of Yohanes et al. (2020) entitled “Adventure Game “Detective Adventure” Using Unity Virtual Reality” has an adventure genre so that it has a storyline such as serial killings in cases that exist in the real world. It has a different concept to adventure games, each stage has a unique puzzle, players play as detectives who are looking for evidence of serial killers. Players must solve the puzzle given to be able to proceed to the next stage. Players can control characters by using Remote VR and can use the action buttons such as taking items, activating items taken, placing items, and so on.

Tsai & Hsu (2020); in the study “Exploring the Effects of Guidance in a Computer Detectives Game for Science Education” demonstrated the development of a computer detective game which provided the students a real-world problem-solving skills experiences after learning electricity-related knowledge and finds that integrating the guidance of process constraints and prompts into the game have effects on enhancing students’ problem-solving performance and knowledge acquisition. The evaluation of this game indicates that students have significantly better problem-solving performance in the game task with the guidance of process constraints and prompts than those in the game task without guidance. It also indicates that the design of real-time prompts may not only enhance students’ problem-solving performance and knowledge

acquisition but may also lower students' perceptions of cognitive load. However, the research experiments should be improved in some aspects.

The study by Ferreiro-Gonzalez et al (2019). entitled "Escape Classroom: Can You Solve a Crime Using the Analytical Process?" presents the "CSI 1.0" Escape Classroom, which introduces an innovative educational escape room designed for teaching analytical chemistry. This escape room served as an interactive learning tool that allows students to practically apply their theoretical knowledge. It reinforces concepts like sampling, formulation, hypothesis testing, and drawing conclusions, which are often taught in theory but not always practically executed in the laboratory. Through this unique educational environment, students are given the opportunity to engage in the entire analytical process, starting from selecting the appropriate samples or evidence at a simulated crime scene and concluding with the interpretation of results in a forensic laboratory setting. This approach enabled students to work in a more realistic context, bridging concepts they've learned in various subjects and encouraging them to apply their scientific knowledge from a holistic perspective. Utilizing live-action learning activities, such as the escape room described in this study, facilitates students' understanding of these concepts in a different academic setting. This type of learning exercise doesn't provide a set procedure for problem-solving, giving students more autonomy. As a result, it enhances their analytical skills, including creativity, decision-making, data analysis, teamwork, and critical thinking.

The work entitled "Learning Game Application Development: Crime Scene Investigation (CSI)" by Ramadhani (2023) developed a digital forensic learning media as a computer-based application using the ADDIE research and development method. The gaming app includes gameplay and detective work with varying degrees. Crime scene investigation game application development

efforts have gone through several stages, starting with the analysis process, followed by modeling or designing, implementing, and testing the application. Based on the tests and questionnaire results concluded after the implementation, it can be said that the work about gaming applications has been operating effectively and as expected.

Galanakis et al. (2021); in the study “A Study of 3D Digitisation Modalities for Crime Scene Investigation” summarizes and analyzes the state-of-the-art technologies in scene documentation using 3D digitisation and assesses the usefulness in typical police-related situations and the forensics domain in general. Presented the methodology for acquiring data for 3D reconstruction of various types of scenes. The Study confirmed the efficacy of high-end digitisation modules, i.e., terrestrial and handheld laser scanners, especially for cases where precise measurements are of greater interest than texture quality.

The study conducted by Gustavsson (2019), titled "Creation and optimization of Motion-based Platform game in Unity 3D," resulted in the creation of customized tools in Unity and demonstrated excellent support within the editor, accompanied by well-documented instructions, which made the creation process easier compared to other tasks. The tools designed to assist in level creation significantly shortened the time required for level design, streamlining the workflow. Moreover, maintaining consistency in distance was an effective means of preserving the game's flow.

However, when this tool was used in the development of the game, the number of objects required became a bottleneck in the project as the scale of the level increased. The tool facilitated easy creation but showed performance limitations in the later stages. The necessity of a web camera, which caused CPU stalls, mandated the use of a minimal number of objects to reduce these stalls as

much as possible. Until an alternative solution is found for calculating player movement, the CPU stall remains the primary bottleneck in this project.

The study from Dafoulas & Neilson (2019), entitled “An overview of Digital Forensic Education” concluded the analysis of the programmes and came across a number of findings. It appears that this field of education, although highly specialized, still attracts a significant number of students. It is also an attractive study choice for mature students, as it appears that a significant number of professionals in the field have no formal education. Increasingly the need for professional standards and benchmarks push individuals towards postgraduate study to ensure compliance with a sector that is likely to be more regulated in the future.

Synthesis

In recent years, the Philippine gaming market has expanded significantly, especially in the area of mobile gaming. The country has become a Southeast Asian hub for video game development as a result of this expansion, which has also had a positive economic impact. By 2027, the mobile gaming market is anticipated to grow to $2.18 billion, making a sizable economic contribution, according to Gumasing et al. (2023). It also makes the nation a competitive player in the international gaming market. This growth not only generates job opportunities. The expansion of foreign studios and the popularity of local game developers serve as further evidence of the industry's potential to stimulate Philippine economic development.

On the other hand, the expansion of the gaming sector caused worries about how it will affect academic achievement. De Los Santos et al. (2020) provide insights into how excessive gaming can result in absenteeism, failing grades, and a drop-in learning interest among students. This suggests that,

despite the economic advantages, the industry may be negatively affecting the academic results of the younger population who are heavily engaged in gaming. The prevalence of online gaming addiction, especially among young men, brings to light the potential risks associated with gaming.

Positively speaking, digital games can be useful teaching tools that improve the educational process for K–12 students. According to Crompton (2018), students can participate in multisensory and complex learning processes by playing mobile digital games. They might enhance different cognitive processes like reasoning, critical thinking, and memory retention. This suggests that gaming can provide significant benefits in terms of learning outcomes when used for educational purposes.

However, Heiden et al. (2019) caution that problematic and excessive gaming is linked to poor academic performance. While gaming can be a valuable educational tool, excessive use, particularly outside of academic settings, can lead to negative consequences such as lower grades and impaired focus on academic tasks. This raises concerns about the fine balance between gaming for education and gaming as a distraction from education.

In order to keep players interested and immersed in the gaming world, compelling storylines are essential in video games. The importance of story in video games is emphasized by Korhonen (2016) because it establishes a setting, guides player decisions, and makes the player feel invested in the game. A compelling plot can keep a player engaged and interested throughout the entire gaming process.

Juego (2021) highlights that an exciting storyline is vital in preventing players from losing interest in a game. If a game lacks an interactive storyline,

players may become bored and abandon the game. Thus, the absence of an engaging narrative can have a detrimental impact on a game's success.

Conceptual Framework

This section presents the conceptual framework of the study, specifically the steps to be undertaken and the approach to be preferred in the study. Figure 1 illustrates the conceptual paradigm of the Inspector Herrero: Pursuit of the Phantom in Manila. It shows the model which consists of the input, process, and output boxes

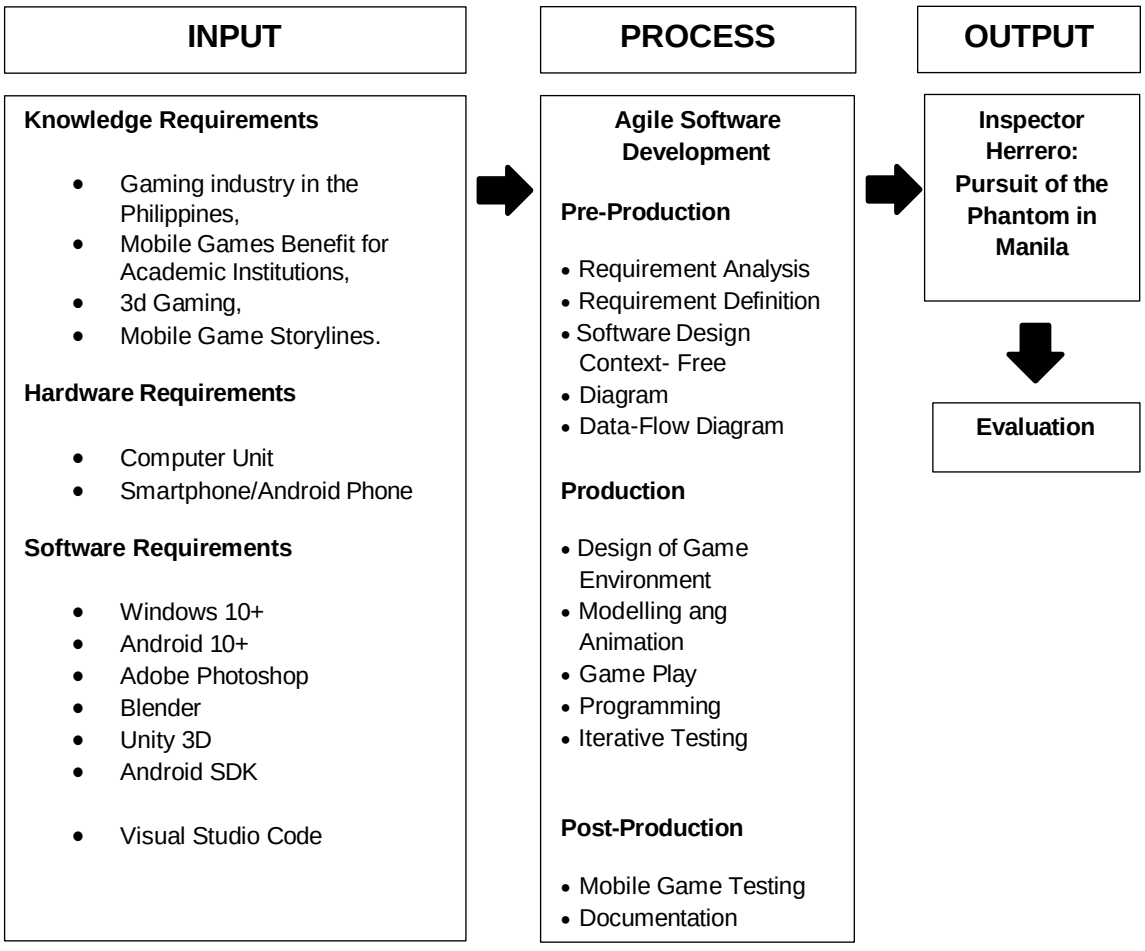

Figure 1

Conceptual Paradigm of the study

The requirements that are necessary for the construction of the game are presented in the input box, which can be seen in Figure 1. This encompasses ideas pertaining to the Gaming industry in the Philippines, Mobile Games Benefit for Academic Institutions, 3D gaming, and Mobile Game Storylines. In addition, the Computer Unit and Smartphone or Android Phone are necessary pieces of the hardware requirements that will be the tools for developing the desired results. Also taken into considerations as inputs were major prerequisites for software development, such as Windows 10 plus for PC's, while Android 10 plus for Android, along with the Adobe Photoshop, Blender, Unity 3D, Android SDK, and Visual Studio.

The process box shows the steps in obtaining significant information prior to software development. This includes Pre-Production, Production, and Post-Production. It incorporates the Requirement Analysis, Requirements Definition, Software Design, Data Flow Diagram, Context-Free Diagram, Modeling and Animation, the development of testing, coding, debugging and documenting.

The output box presents the developed game, titled "Inspector Herrero: Pursuit of the Phantom in Manila". The game will then be tested and evaluated on the game's functionality, reliability, presentation, fun-factor, and user-friendliness.

CHAPTER III

METHODOLOGY AND HARDWARE & SOFTWARE DESIGN & DEVELOPMENT

This chapter presents the target user of the study, methods of data gathering, methods of software development, and system design specification. It also includes the software and hardware requirements, context flow diagram, and data flow diagram to discuss the activities and tools of technology used to develop the present study.

Research Design

Research Design

A research design refers to the comprehensive framework that directs the execution of research. It plays a pivotal role in the research process, outlining how a study will be conducted, encompassing the strategies and approaches employed for data collection and analysis. A meticulously planned research study is imperative for achieving the research goals and attaining results that are both valid and dependable (Ideascale, 2023).

The researchers' primary emphasis was on establishing the study's objectives to guide the development of the proposed application. The study encompassed defining the scope and limitations, which involved outlining the problem statement and highlighting the study's significance.

In their research, the researchers will employ descriptive analysis. Descriptive analysis serves the typical purpose of generating a situational overview, where the gathered data offers a snapshot of the situation being studied.

Research Methodology

Research methodology is the systematic, theoretical framework or approach that guides the entire research process. It encompasses the principles, procedures, and techniques employed by researchers to design and conduct their studies, collect data, analyze information, and draw valid conclusions. Research methodology is a crucial aspect of any research project, as it ensures that the research is conducted in a structured and rigorous manner, producing reliable and meaningful results. It involves choices about data sources, research design, data collection methods, data analysis techniques, and the overall strategy for investigating a particular research question or problem. Researchers select and apply appropriate methodologies based on the nature of their research, the questions they seek to answer, and the available resources.

The proponents will use qualitative research to thoroughly understand how individuals immersed themselves to the world of 3D using their Android Phones or Tablets, and also to know the effectiveness and accuracy of the game to the users.

Target User of the Study. "Inspector Herrero: Pursuit of the Phantom in Manila", Although the game is primarily designed for players who are 18 and older, it is open to anyone interested in mysteries and crime, regardless of their age. This inclusivity aims to attract a wide range of players, offering an enjoyable and educational experience.

The age requirement of 18 and older is chosen to align with the mature and complex themes present in the game. These themes may involve crime, investigations, and ethical dilemmas that are more suitable for adult players with greater life experience. Furthermore, setting this age limit ensures that players

can fully comprehend and navigate the game's content, maintaining its realism and authenticity. It also allows for better parental control over younger players' access to potentially graphic or complex material.

Data Gathering Instruments. To assess the mobile game application "Inspector Herrero: Pursuit of the Phantom in Manila," an evaluation survey questionnaire will be employed. This questionnaire consists of inquiries directed towards users of the game, aiming to discern their perspectives on various aspects. These aspects include the game's presentation, functionality, reliability, enjoyment, and ease of use. Respondents will provide their ratings on a 5-point Likert scale, enabling game evaluators to gauge the quality of their assessments regarding the game. Additionally, the game's features, as outlined in the conceptual framework, will also undergo evaluation.

Data Gathering Procedure. The proponents will gather and review conceptual and research literature that is relevant to the construction of the conceptual framework as part of the data collection approach for the study. This process is designed to detect different design components and 3D approaches in the game.

Furthermore, the research team will perform in-depth investigations on the internet and engage in interviews with experts in the field of mobile game development. Tutorials and technological tool recommendations will serve as additional resources to aid the researchers in achieving their study's goals. Moreover, the ongoing guidance and feedback from the thesis advisor have proven invaluable in enhancing the components of the mobile game.

The Likert scale questions will enable survey participants to express the extent to which they assess the quality of their ratings concerning the game. The research team will utilize Raosoft.com to calculate sample sizes, aiming for a 10%

margin of error and a 90% confidence level to ensure more persuasive and reliable outcomes.

Statistical Treatment of Data. The website Raosoft will be used to compute the sample size. The data collected from the survey evaluation will be tallied and analyzed. Statistically, weighted mean will be used to determine the assessment of the respondents with the following formula:

The formula is: $X = \Sigma x / n$

Where:

x= weighted mean

x= Respondent's answer

n= Total number of respondents Σ=

summation

The result of the weighted mean average on each indicator will be interpreted using the likert five-point scale as shown below:

Scale	**Option**	**Verbal Interpretation**
4.50- 5.00	5	Excellent
3.50- 4.49	4	Good
2.50- 3.49	3	Average
1.50- 2.49	2	Poor
0.10- 1.49	1	Very Poor

Methods of Software Development

The Agile Software Method will be used in this study's creation by the proponents. This approach aims to make software development processes simple by allowing changes at any stage and creating a framework for highly collaborative software development.

Agile projects use an iterative method to achieve incremental delivery. A project can be divided up into several releases, which reduces the amount of time needed to get a product to market. This method allowed for the division of the game's modules into three iterations. User stories are the most common method of collecting and expressing needs, and each iteration is made up of a variety of user stories. To carry out the function, a user narrative is split up into several tasks.

The initial iteration covers the pre-production phase. During this stage, a series of plans will be developed in order to supervise the group while the task is carried out and finished. Project operations must be coordinated at this phase, and time project hazards must be successfully controlled. At this stage, the proponents will exchange ideas in order to develop their unique topic. In addition, the proponents will take the time to study the fundamentals of 3D technologies and how game concepts could be created and implemented using this technology. This phase will also include the User Interface, Environment, Characters, Levels, Missions, Audio, and Storyboard for games. It aids in determining the types of assets required for the game.

The next phase and the second iteration is the production phase. It occurred to the program needs and the design interface. Due to the interface, methodology, diagrams, and documentation, sensitivity is essential during this phase. The proponents will begin constructing the game's characters and

environment as 3D models in Blender at this phase. These models will be converted into assets for the game engine. The gameplay functions will be written in C# programming language using Unity 3D.

The final stage, or third iteration is post-production, during this time all the documentation from the first stage will be converted into the actual software. At this stage, everything of the content including artwork, models, audio, dialogues, and missions will be developed. The game will be installed on an Android device. The hardware components of the device will define the compatibility of the game features.

Software Design Specification

The software design specifications included software requirements, hardware requirements, and design tools which were subdivided into Context-Free Diagram (CFD) and Data Flow Diagram (DFD).

In doing the study entitled “Inspector Herrero: Pursuit of the Phantom in Manila”, the proponents will modify character images using Adobe Photoshop to create the game's characters and environments. The game functions will be developed using the C# programming language. The use of an Android operating system, Blender, and Unity to make an interface graphic design suitable area will be also considered by the proponents.

Software Requirements. The software requirements are the devices that are being utilized to make or to work the program. It will provide a description, a codification, and the particulars of a software-based solution to be implemented to address and fulfill an apparent requirement. Utilizing a range of technological techniques will be necessary for the development of this project. The presentation will feature a desktop operating system, photo editing applications, graphics

modeler, game engine, programming language, and development kit. Table 1 shows the software requirements needed for the proposed program. It included both minimum and the suggested software requirements.

Table 1

Software Requirements

SOFTWARE	MINIMUM	SUGGESTED
Operating System • PC	Windows 10	Windows 10
• Android Device	Android 10	Android 10
Graphics Design	Adobe Photoshop 2020	Adobe Photoshop 2020 and Higher
Graphics Modeler	Blender 2021	Blender 2021
Game Engine	Unity 3D 2021	Unity 3D 2021
Programming Language	C#	C#
Development Kit	Android SDK 31	Android SDK 31

Table 1 shows the software requirements used by the developers of the mobile game as well as the OS requirements for mobile devices. The developers of the game used computers to create it. They used Adobe Photoshop to alter the

characters and objects in the images. Blender and Unity 3D are used to model the game's environment and render and transfer the game's assets.

Operating System: Windows 10. It is an operating system made by Microsoft for laptops and tablets. Using MDM (mobile device management) software, it has built-in capabilities that let corporate IT organizations secure and control devices running the operating system. This operating system was specified as a minimum requirement for the computer used in the study due to the fact that all of the applications needed for it would function on it.

Android 12. It is the tenth version of Android is a mature and highly refined mobile operating system with an enormous user base and vast array of supported devices. Android 10 continues to iterate on all that, adding new gestures, a dark mode, and 5G support, to name a few. It's an editor's choice winner, alongside IOS 13. This operating system version was found to be compatible with the mobile and game application's processor and memory needs in this testing.

Graphics Design Editor: Adobe Photoshop 2020. It is a software that will be used for graphic design, animation, and photo editing. With the aid of the expert tools offered by Adobe Photoshop, artists can more easily realize their ideas. This program will be used to edit and modify the images that were used in Blender's 3D modeling.

Graphics Modeler: Blender. a free three-dimensional computer graphics program that is open source and has a ton of features. All under one roof, users can create textures, animate models, and model objects. Compared to many other 3D tools, Blender prioritizes customization and flexibility.

Game Engine: Unity. It's a cross-platform that allows programmers to create games on a variety of platforms quickly. It was the game engine used for both 3D rendering and testing game simulations

Programming Language: C#. It is one of, if not the finest, programming languages for video games. Every game developer should have a thorough understanding of C#. Many programmers prefer to study C# because it is their first choice.

Development Kit: Android SDK. Vendors of hardware and software provide it. It's a collection of software tools and technologies that developers can utilize to create apps for various platforms. It is the collection of development tools that will be used in this project to create the game application for the Android platform.

Hardware Requirements. These are the devices that made up the tangible requirements of the proposed study. The table shows the hardware requirements needed for the proposed program which included both the minimum and the suggested list of hardware.

Table 2

Hardware Requirements (Development Phase)

HARDWARE	MINIMUM	SUGGESTED
Processor	Intel i3 or AMD Ryzen 3	Intel i5 or AMD Ryzen 5
Memory	8gb Ram	16gb Ram

Solid State Drive	500gb	1tb
Graphics Card	GTX 1050 ti or RX 750	GTX 1660 super or Radeon RX 590
Monitor	IPS 1280 x 720	IPS 1980 x 1080

Table 2 shows the computer requirements that went into creating Inspector Herrero: Pursuit of the Phantom in Manila. In order to understand performance based on CPU type and speed, memory, storage, and peripherals compatibility, the presentation primarily focuses on hardware specifications.

In particular, the processor, also known as the CPU, is the most important component of the system. The support compatibility is something to think about for the PC processor. In this scenario, the proponents will have to decide how many hard drives, how much RAM will be used for the system, and any additional components that might be needed.

The Android operating system makes various memory optimizations to free up space as needed while attempting to use as much system memory as possible. These improvements might harm the game, slowing it down or even putting an end to it. Fast RAM and a large amount of it are essential for developers. You can run more simultaneous projects the more RAM you have. In addition, the video card was essential for working with and playing games. The used graphics card falls under the GTX 1050ti or 1660 Super categories. These differ from their predecessors in a number of ways. It is much faster, more capable, and built with better materials.

Table 3

Hardware Requirements for the Android Device

HARDWARE	MINIMUM	SUGGESTED
Processor	Snapdragon 400 series	Snapdragon 700 series or higher
Memory	6gb Ram	8gb Ram or higher
Storage	10gb	20gb or higher

Table 3 outlines the hardware specifications needed for an android device. The specifications for the Android device are displayed in the table. With an improved GPU processor, the Snapdragon could provide more graphics processing power to meet the demands of gaming applications in terms of processing speed and 3D graphics support. For android devices, 16GB RAM is advised in order to enable faster and lag-free game application performance. Additionally, adding 20GB to a storage device is the easiest and most efficient way to increase the storage space available for a game application.

These specifications are typically known to be a component of mobile device design for the majority of 3D game implementations. Its processors can handle the demands of game applications in terms of processing speed and 3D graphics handling.

Table 4

Hardware Performance Specifications

Hardware	Performance Specifications
Processor	Having the best visuals is the best way to get games to run on your gaming system like butter. Intel's core i5 processors

	seem to be more potent than their i3 predecessors. More cores and higher average clock rates are to blame for this.
Memory	For work area programming response time, an 8GB RAM minimum is sufficient. However, using 16 GB of RAM or more is recommended for speed and quicker reaction.
Solid State Drive	Since the project's graphics are enormous, a solid-state drive's storage capacity should be at least 500GB. Higher storage is determined by greater capacity.
Graphics Card	High-quality graphics are essential for improving the game development process. More so than their predecessors, graphics cards like the GTX 1660 Super and GTX 1050 Ti are essential. By increasing graphical performance and frame rates, these GPUs speed up development, ensuring accurate and effective game development.
Monitor	For better graphics output, the IPS Monitor's resolution should be at least 1280 x 720. A higher IPS resolution indicates better graphics display quality.

As shown in table 4, These are the recommended hardware performance requirements for creating the game. The proponents are using all of these hardware requirements in the development and successful operation of the system.

Design Tools. A design tool is used to represent the data into a graphical form. The proponents will use different design tools such as Context Free Diagram (CFD) and Data Flow Diagram (DFD). These tools are created for the proponents to determine and to show the flow of information about the game. These design tools will help the proponents to be aware and understand the game.

Context-Free Diagram. Context-Free Diagram is a top-level view of the game that shows its boundaries and scope that interacts with the entities. It shows how the arriving inputs go to the process or in an entity that produces outputs. Shown in Figure 2 is the CFD of the mobile game.

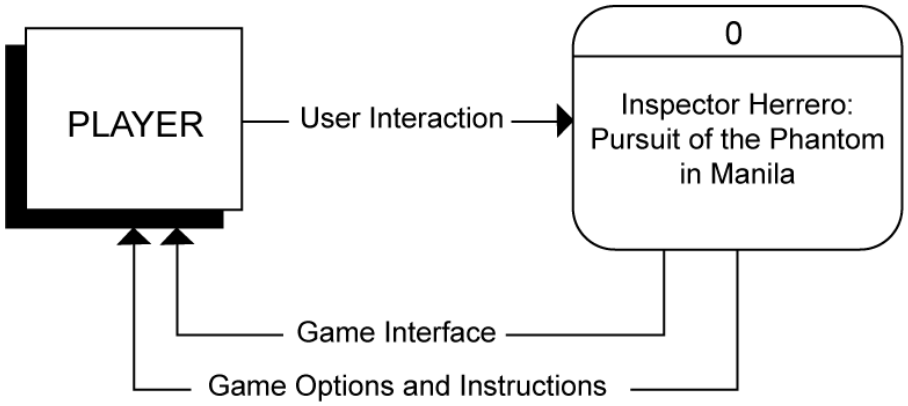

Figure 2

Context-Free Diagram of the Game

Figure 2 shows the Context-Free Diagram of the proposed Android game entitled “Inspector Herrero: Pursuit of the Phantom in Manila”. In this diagram, a single entity is involved and is required to make an interaction to the game interface. The player must input a username for simple user identification before entering the game lobby. After then, the player is now welcomed to the game, and can start to play or explore its Interface. While interacting with the interface, the game will provide options and instructions in the beginning, giving players ideas for smooth gameplays.

Data Flow Diagram. A data flow diagram (DFD) shows the logical model of the system. It shows how the data moves through the system. It shows what kinds of data will be input to and output from the system, where the data will come

from and go to, and where the data will be stored. Shown in Figure 3 is the detailed data flow diagram of the proposed study.

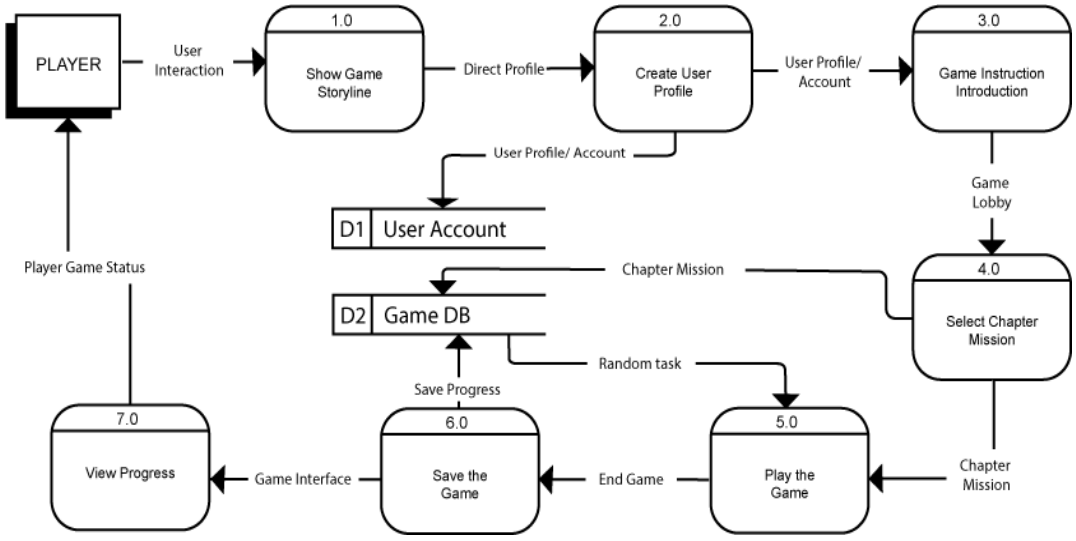

Figure 3

Data Flow Diagram of the Game

Figure 3 shows the data flow diagram of the study “Inspector Herrero: Pursuit of the Phantom in Manila”. This Diagram shows that the player embarks on a captivating journey through a rich storyline. The adventure begins with the player immersing themselves in the narrative, gaining insights into the game's plot and characters. After understanding the storyline, the player has the option to create a user profile, enabling them to personalize their gaming experience and keep track of their progress as the investigation unfolds.

Once the player has established their profile, they can choose to commence their journey or explore additional resources, such as game instructions and assistance. When they decide to play, they can select a specific chapter to dive into. Each chapter presents a series of tasks and missions that guide the player's actions and decisions, adding depth and intrigue to the story.

As the player progresses through the missions, the game diligently tracks their achievements, choices, and overall progress. Upon the successful completion of a mission, the game automatically saves the player's data, including their progress and inventory, in the game database. This database acts as a repository of game information, ensuring that the player's experience is seamless and their progress is saved. The game also displays the player's progress and status, giving them insight into their accomplishments and the direction the investigation is taking. This detailed data flow ensures that players are fully engaged in the narrative and can easily monitor their progress throughout the game.

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