# exGDD: Extended Game Design Document template for Mobile Game Design and Development

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Abstract - In gaming industry, requirement gathering is considered as the most crucial phase of game development. It is also considered as a critical software engineering research area as about 39.3% of the overall published papers on computer games discussed game development with requirements. Requirement gathering phase of the mobile game is different from traditional approaches like Software Requirement Document (SRS). Game Design Document (GDD) is used as requirement specification document for mobile game development which provides detailed features and functionality of the games. The basic GDD version provides game concept analysis and template for requirement specification. The improved version, called improved GDD (iGDD), provides enhanced game development design by adding the experience of game players. However, both of these versions do not include non-functional requirements of the target audience. The objective of this paper is to conduct an analysis of existing GDD in practice in game development industry and propose a template-tool to extend Game Design Document, named as exGDD. The exGDD considers more non-functional requirements of the target audience. The proposed template is evaluated with Core Elements of the Gaming Experience (CEGE). The evaluation of exGDD is conducted using evaluation tool and conducting case study. The results are promising which shows that the use of exGDD will lead to the success of the end product in terms of satisfying user

## requirements and can result in improved productivity of the company.

GDD, SDPP, iGDD, Game Design, Gaming Industry.

#### 1. Introduction

Mobile games are a new emerging trend in the gaming industry. The rise of mobile devices and other technologies have opened a new market [1]. Nowadays, it is fast trending business because it allows an individual developer to upload games at a low cost in an agile manner that may generate huge revenue. However, in terms of gaming industry, productivity and benefits can only be achieved if all procedures of software engineering development models are followed [2]. Requirement gathering phase of the mobile game is different from traditional approaches like Software Requirement Document (SRS). Game Design Document (GDD) is used as requirement specification document for mobile game development which provides detailed features and functionality of the games. One can increase the quality of the product and may increase productivity by following proper pattern of game development by using Game Design Document (GDD). There are four main stages of game development these include concept, pre-product, production, and post-product stage. Game development design falls in the pre-product stage which is responsible for the development of a successful product. On the other hand, the production stage deals with the development stages and post-production phase finalizes testing and maintenance procedures.

Game Design Document (GDD) is first introduced by Taylor as "Design Template." in 1999 [3]. The document is then evaluated and improved by different researchers that is [3]-[10]. In 2012, M. G. Salazar [11] proposed Improved Game Development Design (iGDD) by adding experience

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i.

factor in GDD. However, both of these versions do not include non-functional requirements of the target audience. This study analyzes the limitation of GDD and iGDD in terms of mobile game development and provides a solution which considers the functional and non-functional requirement of the end-user to design attractive games. To achieve this objective, an initial survey of different mobile gaming companies has been conducted. The results of the survey show that there is no proper documentation or game design available for game developer. Moreover, if such a document is provided, the game developers are not to apply it properly. The main reason is that they are not aware of their target audience and their functional and non-functional requirements. The outcome of the survey highlighted some issues and limitations of requirement gathering practices adopted by mobile gaming industries. In addition to this, existing literature related to requirement documents of game development has been reviewed. Considering highlighted issues of the industrial survey and existing practices and documents available in the literature, this paper presents an extended version of the Game Design Document (exGDD) as a solution.

The main contributions of the paper are as follows:

- Analyzed and reviewed existing literature to highlight existing requirement documents or game development
- Conducted initial survey to analyze issues and limitations in existing practices of mobile game development industry
- Developed extended Game Design Document (exGDD) template-tool to facilitate the development and production of mobile games
- Evaluated exGDD using Core Elements of the Gaming Experience (CEGE) evaluation tool and conducting Case-Study.

The rest of the paper is organized as follows. Introduction section is followed by background and related work section which highlights the findings and limitations of existing literature. Next section describes proposed exGDD framework which is followed by section material and methods. Section five demonstrates the evaluation of exGDD using evaluating tool. The results of the case study implementing GDD, iGDD and proposed exGDD are elaborated in section six. Finally, conclusion of the study is presented in last section.

#### 2. Background and related studies

This section examines the Game Design Document (GDD) and its phases. According to existing studies [3]-[10], game development follows four main stages which include concept, pre-production, production, and post-production. However, the concept phase of game development varies in different designs. In some design documents, it is included and some others ignore it. Also, the boundaries of all four stages change as per the requirements and scope of the game.

#### Stages of Game Design Document (GDD)

According to the literature, four stages of GDD are described as follows:

*Concept.* The concept phase lists down business parameters and define game goals. It is an iterative phase that builds the base of the game project.

*Pre-Production.* The pre-production phase is considered as a brainstorming phase. In this phase, different types of questions, related to game requirements, have been addressed. For example, why we want to develop this game? For whom to develop it? Which type of environment do we need to create? What type of user interface is required? These types of questions are handled in this stage. This phase builds the foundation of the game for its further development. This will also address rework by providing an accurate structure of the game which will not need any update after development and provide a quality product. For this stage, Salazar et al. [11] presented improved Game Design Document (iGDD) that helped the developer to produce quality product.

*Production.* In this stage game design document is used for development, graphical representation, and validation. In this phase, the implementation of GDD takes place.

*Post-Production.* The phase of post-production deals with the maintenance of the product. It includes taking corrective actions, makes a different version or add more features/functionality into the game according to requirements. Overlapping Game Developing stages are shown in Fig. 1 [9].



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Figure I

#### *ii.* Existing versions of GDD and their limitations.

Taylor [3] proposed Game Design Document (GDD) concept and also presented a template but it does not describe experience, constraints, and target audience of game development. Bethke [6] gave detailed and extensive picture of game development and production. They explained it with real-life examples, elaborated what GDD contains, described the process of creating GDD and defined amount of work each stage required. But the only limitation in its work is that it doesn't provide a GDD template and did not find the relation between each part of GDD. Rolling and Adams [4][22] presented three documents for game design. These include high concept, game treatment, and script game. High concept document contained the main features of the game and its aim was to sell the idea of the game. Game Treatment was more detailed with a greater level of content and was defined for those who are most interested in the game and want to know it. Script game was designed as GDD which contained game features or references for creating the game. The problem in their work was that they don't provide any example of GDD but refer to Taylor's template [3]. In the similar context, Crawford [36] presented a series of lessons learned throughout his career as a game designer, but it failed to present any significant contribution in terms of game design document and implementation of practical and complex examples.

Bates [5] gave the introduction of game design and described the process and documentation of game design and analyzes it according to the business perspective. His work followed the process of Rollings and Adams in [4][22] and suggested that GDD should be used as vital asset and available online on the wiki. He used the game genre to explain different styles in game design and explained it with a template of GDD for an action genre. The limitation in his work was its hard to classify the game by genre due to lack of standard, a new genre, and multi-genre. Richard Rouse [23] covered the main topic of game design and also used concept phase and relate it with his own experience. He also presented two samples of different GDD. The limitations in his work was that he did not give the template and both examples were difficult to relate in terms of the basic structure. Similarly, Oxland [20] gave a detailed description of how to document game design and also cover different subjects in-game design but he did not give a GDD template and detailed example.

Callel et al. [8] point out the difficulties of moving from pre-production to the production stage because the GDD fails to meet the formality that SRS provides. Although, the author mentioned the problem but he did not provide any solution. The work also presented a chart to differentiate pre-production and production. Copyrights @ Roman Science Publications Brinkkemper, Weerd, & Weerd [7], in their research work, emphasized on concept building of game before implementation. The work highlighted all the activities and sub-activities of the concept. But did not emphasize on the target audience and not even provides the template for implementation. Schell [33] mapped the elements that interact in process of playing a game but he focused more on how game and game design work rather than on GDD and also did not provide any GDD template [33]. In the work presented by Sanchez [34], the main focus was on Game Design Technical, Design Implementation, Alpha test, Beta test but they did not provide the template and not even emphasize on the target audience [34]. Roger in 2010 presented the progress of GDD and also used reference drawing to clarify its concept. He mentioned the template but it was too specific to game with particular characteristics and did not mention NFR in his work.

The work proposed by Salazar et al. [11] mainly focused to highlight the experience factor in the game design document. He also motivated the developers to design the game first before implementation. He also provided a template of an improved game design document. But the limitation with his work was that he did not provided any non-functional requirement details in his proposed solution. This improved game design document (iGDD) emphasized the concept of the game that is based on the requirement analysis. Game development becomes a complex procedure and no proper planning was adopted which may also lead to wrong product development or rework. iGDD included six stages these include overview, mechanics, dynamics, aesthetics, experiences, assumption, and constraints. Overview summarized the game which answered important questions which arise initially i.e., what type of game? Which factor makes it unique? What is the goal of the game? Game features? What is the theme of the game? The number of players? related history? player characteristics? etc. Mechanic described game elements, attributes, and rules. In the game, element discussed different elements such as boss, enemy, environment, weapons, and then described attributes of each element. In rules phase, different element's interactive rules, artificial intelligence, game log (sore), game world element and asset list, etc. were described. Dynamics elaborated the flow of the game which explained missions, chapters, hurdles, and interfaces. It, first, discussed the game world which included game theme details, missions/ levels, and game detail history. Next, it discussed the game interface, game learning, and game balance factor. Aesthetics described what players see and hear. This section can also be extended to smell (augmented reality). It also discussed visuals that include core game elements, special area, game world element,

game log elements, and sounds of the game world such as special area, mission/levels, and game interface. Experiences dealt with the quality of the game by adding different attributes i.e., feeling, enjoyment, and stability. This section explained the important aspects of intrinsic gameplay, mechanics gameplay, interactive gameplay, aesthetic gameplay, intrapersonal gameplay, and interpersonal gameplay. Assumptions and Constraints explained the limitation of the games that we can assume and check later. It also included business constraints, technical constraints, and assumptions. Orita and Correa [35] classify their work into three categories i.e., shared design vocabulary, game design method and tools, design virtual language. The limitation of this work that tools were tools general that hinder creativity. Zook and Riedl [12] proposed the mechanic's generation as a tool to create an automatic game design. It provided a specific domain to help with mechanics but gave freedom to nondomain requirement. The issue with approach is the same; it restricts creativity [12].

#### iii. Initial Survey of Gaming Industry of Pakistan

Based on the limitations highlighted in the reviewed literature, the author of this study conducted an initial survey of different companies of Pakistan. Figure 2 represents a graph which shows all the survey details which have been conducted with 14 mobile gaming companies in Pakistan. The results of the survey highlighted that 10 out of 14 gaming companies' developers do not get clarity about the target audience no matter whether they are provided with a game design document or not. In Fig. 2, it can also be seen that 4 out of 14 companies provide game design document. When the author asked the question from the CEO of companies that GDD is necessary for game development; mostly are not in favor of it. When Author asks the same question from the developers, they think that it is the necessary tool because they are facing many difficulties in the balanced flow of the game and identification of the target audience (12 out of 14 agree upon it). So, we can resolve that issue by writing all the required details in the GDD game format (pre-production stage). This can be achieved by adding target audience and their nonfunctional requirements in game design document. The recently published format of game design document iGDD is presented by Salazar [11] but in his template, the non-functional requirements of the target audience are not explained in detail. The importance of non-functional requirements in the mobile game development has also been elaborated in existing studies [13][14]. Therefore, based on the initial survey results, the non-functional requirements of target audience should be highlighted and added in game design document.



FIGURE 2 SURVEY RESULT OF USING GDD FOR GAME DEVELOPMENT

TABLE I

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NON-FUNCTIONAL REQUIREMENTS (NFR) IN GAME DEVELOPMENT				
Unit	NFR in Game Development	Description		
1	Performance	Playability, Responsiveness, Identification		
2	Reliability	Stability (Fatigue/ Frustration, Balance Flow, Back Track)		
3	Quality	Usability.		
4	Security and Other factors	Safety Concerns, Memory allocation, Permission		

## 3. Proposed Extended Game Design Document (ExGDD)

The proposed solution presents extended Game Design Document (exGDD) and provides template in which developers can add up details of the target audience with the functional and non-functional requirement. The major non-functional requirement that we have included to add up in the extended version are shown in Table 1.

All required Non-Functional Requirements (NFR), as shown in Table 1, are specific to mobile games which are key features to increase the quality of game as proposed by Anthony and Wasserman [15]. In this paper, we have collaborated these NFR with the proposed exGDD which will help out to develop quality products. For non- functional requirements, the game design should fulfill high performance, reliability, quality, security and other factors. These parameters can be tested by game heuristics that are used to evaluate different aspects of game design and adding security evaluation techniques [16]-[19].

Figure 3 represents exGDD integrated with the core phase of GDD. These includes overview, mechanics, dynamics, aesthetics, constraints and newly added phase concept. This new phase will identify the target audience and their non-functional requirements. In the overview section, we have also added nonfunctional requirement that is performance, reliability, quality, and security according to mobile games that lead to fulfilling all the nonfunctional requirements according to the target audience. Based on this model, we will present an exGDD template which in-cooperates nonfunctional requirement. The proposed model exGDD is tested and validated using two perspectives. First using player feedback and second through Core Elements of the Gaming Experience (CEGE) tool. The design of the exGDD model is developed with a scrum model using Software Development Project Pattern (SDPP).

## 4. Phase of Proposed exGDD Model

Game Development is divided into three parts preproduction, post-production, and production. In this chapter, the author explains the pre-production phase which includes the design of the game i.e exGDD, the purpose of this chapter is to identify the structure of exGDD. As discussed in previous chapters, exGDD is divided into Overview, Mechanics, Dynamics, Aesthetics, Experience, and Assumptions.

Overview. The overview explains the key functional requirement to summarize the main features of the game. Some authors even include a subsection i.e., the goals or objectives of the game. In this paper, the author considers its key section because it helps to summarize the requirement of the game. Author further categories this section with the target audience that emphasizes the functional and non-functional requirements of the required audience as shown in figure 3. Major nonfunctional requirements shown in table 1 are the key nonfunctional requirements that are Performance, Reliability, Quality, and Security according to Anthony and Wasserman [15] for game development.

*Mechanics*. This section describes the elements that help to build the game such as challenges, game elements, asset lists, and characteristics. It helps to make the game more interactive and make the user busy to keep it playing again and again [3]-[7],[20]-[23].

*Dynamics*. This is the common section of all authors that contain interfaces and run time activity of levels where the flow of the game describes [3],[5]-[7],[20]-[23].

Aesthetics. This section list all visual and auditory elements of the game. Linked with mechanical and dynamic properties of the game. Most of the authors cover the visual aspects in a document called the art bible. The auditory is mentioned by studies [3][21].

*Experience*. This section leads to managing the experience of the game with game goals & objectives. It helps to link goals and user experience at the same time. This section explains the important aspects of intrinsic gameplay, mechanics gameplay, interactive gameplay, aesthetic gameplay, intrapersonal gameplay, and interpersonal gameplay [11].

Assumption & Constant Section. This section explains the limitation of games that we assume and check later. It includes business constraints, technical constraints, and assumptions that suggested by studies [5] [6] [21].





*Implementation/Example.* In this section describes an example of exGDD in which explains how to design a game according to the template (Appendix A) which will increase user experience. Easy-Memory is a game which used to explain this example. In this chapter, we have to explain parts of exGDD that are overview, mechanics, and dynamics in detail which elaborate our proposed. Aesthetic, Experience, and Assumption remain the same as previous work in-game designing [11]. care of all the aspects of the target audience which will increase user experience (UI) shown in Table 2. Ijsselsteijn et al. in 2007 [24] proposed that games for entertainment provide enjoyment, social activities, and games to sharpen one's mind. Flores et al. emphases on the meaningful play that provides learning and social play. Gerling's [14] results show that elderly players have a preference for simplistic puzzle and quiz games, which may have a positive impact on daily life.

*Example of Overview.* Easy-Memory which is specifically designed for old age group people by taking

TABLE 2OVERVIEW OF MEMORY GAME

Unit	Overview	
1	Game Abstract	Easy-Memory which is specifically designed for old age group people by taking care of all the aspects of this target audience which will increase user experience (UI).
2	Game Objective	It provides entertainment, enjoyment, social activities and also sharpens one's mind
3	Game Justification	It is specially designed for old age people to improve their mental capabilities
4	Core Gameplay	There are three mode
		Stage Mode

		Arcade Mode
		Multi players Mode
5	Game Genre	Puzzle Game
6	Number of Player	Multiplayers (one/ two players)
7	Target Platform	Android
8	Game Theme	Sharpen Memory.
9	History summary	According to Kathrin Maria Gerling [13], elderly players have a preference for simplistic puzzle and quiz games, which may have a positive impact on daily life.
10	Player Character-tics	Old Age People (Age between 50-69)
11	Initial scope	Developing Time: 2 weeks
	-	Budget: 800\$
		Team size: 4

*Example of Target Audience*. In this section, focus on the non-functional requirement of our target audience which is discussed in the overview section, in this section emphasis on the functional and non-functional requirement of the required audience which will increase user experience. According to Anthony and Wasserman [15], performance, reliability, quality, and security are major requirements to increase the user experience in mobile games shown in Table 1.

To increase reliability, discuss the use of color and sound according to the required audience that minimizes fatigue of the user and increases its playability. In this paper, our target audience is old age users, with increased age there is the loss of visual and dark adaption, such visual decrement makes it harder for people to perceive the small object. Allowing the user to easily control the font, color, and contrast setting as well as window resizing, scrolling, and zooming. Aging is also related to a decline in auditory acuity, in particular sensitivity for pure tone and high-frequency tone. For non-speech audio signals, lower frequency tones (5000-10000 Hz range) are easier than higher-pitched sounds [13]-[14]. In addition to this, stress level of player also plays an important role in achieving better player experience. In a study conducted by Ostberg et al. [25] stress level can be measured and can be used to develop such mobile games which can release the stress level of the user to feel comfortable.

Figure 4 shows the favorite color choice by any age or gender. Blue is the color that is attracted by most people [26]-[27]. Figure 5A show favorite colors of female while Fig. 5B shows favorite color of male, the gender specification of color in these two graphs also show that blue is the major color which is attracted by both genders. Let's talk about color specification according to age. Figure 6 shows that the major colors are blue, green, and purple. Green is liked by younger people whereas age increases the preference of purple color increases and green decreases. And our target user is between 50-69 and their preferred colors are blue, purple, red, black, and white. As discussed before, with the increase of age there is the loss of visual so it is easy to adapt to dark colors [28]-[29]. The use of proper color, sound, instant response, easy content, personal involvement, controlled mechanics, easy access, sensitive help, and consistent interface may lead to a high-quality product which increases player experience [30]-[31]. Mechanics, dynamics, aesthetics, experiences, assumption, and constraints are the same as explain by previous literature work [11].

#### 5. Evaluation of exGDD using CEGE tool

Core elements of the games are described by Calvillo-Gámez et al. [32]. In their study, it has been mentioned that a game must-have for the player to have a positive experience, they propose the Core Elements of the Gaming Experience (CEGE). The applied surveys were processed as follows. Each item of the CEGE is represented as an ordinal value  $v \in [0,6]$  where zero is the absence of the factor and six is the maximum value [32]. Let C={C<sub>1</sub>(Enjoyment), C<sub>2</sub>(Frustration), C<sub>3</sub>(Puppetry), C<sub>4</sub>(Video game)} be the categories of the CEGEQ. The evaluation c<sub>i</sub> for the category C<sub>i</sub>  $\in$  C in each survey instance is calculated as

$$C_i = \frac{t \cdot \sum v \epsilon_i^{V}}{6 \cdot n_i} \qquad (1)$$

Where t  $\in \{+1,-1\}$ , is assigned based on the type of category (+1 for positive categories and -1 for frustration); and n<sub>i</sub>, is the number of items of the category C<sub>i</sub> In this way, each survey is represented by four normalized values; i.e., c<sub>1</sub>,c<sub>3</sub>,c<sub>4</sub>  $\in$  0,1 and c<sub>2</sub>  $\in$  [-1,0] because frustration is a negative category. Evaluate the results of three versions of games that are developed with a different technique that is exuded, GDD, without documentation. Memory-Game is an android based puzzle game that will develop with exGDD, the second game will develop with GDD that is using currently in gaming industries and the last version will create without any documentation.

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FIGURE 5 (A)FAVORITE COLOR CHOICE OF MALE (b) FAVORITE COLOR CHOICE OF FEMALE



FIGURE 6 FAVORITE COLOR CHOICE OF ANY AGE



In exGDD author take care of all the non-functional requirement of the required audience by study the behavior of its audience and add those elements in the game. i.e use of color, use of sound, easy control, social interaction, constant and interactive interface. In the GDD author design game by taking care of all functional requirements. The last game will design without document, just develop a puzzle game. Author perform an online survey by uploading all three game and evaluate result with CEGE tool that analyzes which game will increase user experience.

## 6. Case-Study Results

This section validates the three versions of games that are developed using different game design techniques i.e. exGDD, GDD and without documentation. First game is named as Memory-Game which is developed with exGDD. Second game is developed with GDD that is currently being used in gaming industries and the last version is created without using any documentation. In the exGDD version, the author takes care of all the functional and non-functional requirements of the target audience by studying their behavior; by adding that element to the game. i.e use of color, use of sound, easy control, social interaction, constant and interactive interface. In the GDD version of the game, the design of the game is developed by taking care of all functional requirements. Finally, the last game is designed without using any defined document.

The author has performed an online survey by uploading all three games and evaluated the results with CEGE tool to analyze which game will increase user experience. Core Element of Gaming Experience proposed by Calvillo et al. [32] considered as the best tool for this type of criterion because it helps to evaluate gaming experience. As explained in section 5, this tool is divided into four major categories which are Puppetry, Video Game, Frustration, and Enjoyment. Puppetry is further divided into three more categories puppetrycontrol, puppetry-facilitators, and puppetry-ownership. Each item of this tool is representing these categories as mentioned in Table 3. After collecting fifty online surveys for each game, we have evaluated the results of category enjoyment, frustration, puppetry, and video game by CEGE-Tool. The examples of each version, while using the CEGE tool, are also represented.

TABLE 3 Categories of Core Elements of the Gaming Experience Tool

Unit	ITEMS	SCALE 1	SCALE 2	
1	1,4,5	Enjoyment	-	
2	2,3	Frustration	-	
3	6-38	CEGE	-	
4	6-12,38	Puppetry	Control	
5	13-18	Puppetry	Facilitators	
6	19-24	Puppetry	Ownership	
7	25	Puppetry	Control/ownership	
8	26-31	Video-game	Environment	
9	32-37	Video-game	Game-play	

Figure 7 shows a comparison chart of fifty surveys each. One important point to note here is that the author has only considers a survey of male members falling in the age group of 50-69. Table 4 shows the comparison of the average result of three versions. CEGE-tool divides these into four categories enjoyment, frustration, video game, and puppetry. Enjoyment increases when we use the exGDD template because it is more organized and emphasizes the target audience which increased Ux (user experience) whereas frustration of user is lesser because of its smart design i.e. use of appropriate color and sound by considering increased screen time of old age group user. Similarly, the difficulty level is also balanced which minimizes frustration and increases enjoyment. Puppetry shows the control of the game that how the game reacts after every action. It shows the functionality of the game that how the game works. The video game is the most important category that deals with interface and sound. The game designed by using exGDD, video game and puppetry is according to its target audience that why its value is higher than other versions. This comparison shows that as compared to GDD and no design document, exGDD helps designers and developers to produce high quality games which provides better user experience and improved productivity levels.



FIGURE 7 CAMPARISION RESULT OF DIFFERENT VERSION OF GDD

TABLE 4 COMPARISON TABLE OF DIFFERENT VERSIONS

Unit	Category	Version 1	(without	Version 2 (with iGDD)	Version 3 (with exGDD)
		documentation)			
1	Enjoyment	0.43		0.56	0.92
2	Puppetry	0.54		0.72	0.88
3	Video Game	0.34		0.7	0.92
4	Frustration	0.72		0.63	0.44

## 7. Conclusion

The main contribution of this paper is to provide a template to track, enhance and validate user experience to achieve improved game design. The proposed exGDD template (Appendix A) also emphasizes the non-functional requirements of the target audience which can help the game developers to produce successful games generating more revenue. This template also helps to provide a platform that will help designers and developers to collaborate and include target audience perceptions while designing and developing the games. In future work, we will include more nonfunctional requirements in exGDD and will elaborate in detail their purpose and impact on end product. Adding more non-functional requirements in exGDD tool will make it more effective. Moreover, exGDD template will be integrated with software development tool that will help in increasing the productivity of the game.

## Appendix A

## **Extend Game Design Document Template**

## **1.** Overview

- 1.1 Game Abstract
- **1.2** Objectives to be achieved by the game
- 1.3 Game justification
- **1.4** Core gameplay
- 1.5 Game features
  - 1.5.1 Genre
    - **1.5.2** Number of Players
    - 1.5.3 Target Platforms
    - 1.5.4 Game theme
    - 1.5.5 History Summary
- **1.6** Player Characteristics
- **1.7** Initial Scope
- 1.8 Target Audience
  - **1.8.1** Functional Requirement
  - **1.8.2** Non-Functional Requirement
    - 1.8.2.1 Performance
      - 1.8.2.2 Reliability
      - 1.8.2.3 Quality
    - 1.8.2.4 Security

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## 2. Mechanics

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- 2.1 Game elements categories
- **2.2** Core game elements
- 2.3 Rules
  - **2.3.1** Interaction rules
  - 2.3.2 Artificial Intelligence
- 2.4 Gameworld elements
- 2.5 Game log elements
- 2.6 Assets list

## **3.** Dynamics

- 3.1 Game World
  - **3.1.1** Game theme details
  - 3.1.2 Missions/levels/chapters Flow
  - **3.1.3** Game detailed history
- **3.2** Missions/levels/chapters elements
  - 3.2.1 Objectives
    - **3.2.1.1** Primary
    - 3.2.1.2 Secondary
  - 3.2.2 Rewards
    - **3.2.2.1** Implicit
    - 3.2.2.2 Explicit
  - 3.2.3 Challenges
  - **3.2.4** Other Missions/levels/chapters elements
- 3.3 Missions/levels/chapters description
- 3.4 Special areas
- **3.5** Game interface
- 3.6 Controls interface
- 3.7 Game learning
- 3.8 Game Balance

## 4. Aesthetics

- 4.1 Core game elements visual
- **4.2** Gameworld elements visual
- **4.3** Game log elements visual
- **4.4** Other elements visual
- 4.5 Gameworld visual
- **4.6** Missions/levels/chapters visual
- 4.7 Special areas visual
- **4.8** Game interface visual
- **4.9** Core game elements sound
- 4.10Gameworld elements sound
- 4.11Other elements sound
- 4.12Gameworld sound
- **4.13**Missions/levels/chapters sound
- 4.14 Special areas sound
- 4.15Game interface sound

## **5.** Experience

- **5.1** Intrinsic gameplay
- **5.2** Mechanic gameplay
- 5.3 Interactive gameplay
- 5.4 Aesthetic gameplay
- **5.5** Intrapersonal gameplay
- **5.6** Interpersonal gameplay
- 6. Constraints and assumptions 6.1 Technical constraints

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- 6.2 Detailed technical constraints
- 6.3 Business constraints
- **6.4** Detailed business constraints
- 6.5 Assumptions

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