Game-based systems: Towards a new proposal for playability analysis

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Abstract. A growing number of people are increasingly using digital games with different approaches and types, regardless of the gender or age of the participants. This increase justifies the research of elements associated with this field such as playability properties, game-based systems and the relationship with the players' characteristics and preferences. These types of evaluations represent a great challenge and require a clear and complete characterization in order to apply them in a detailed and objective way, not only evaluating the game as a product, but also the experiences that players live individually and as a whole, according to the type of game-based systems, the player type and their characteristics. This paper establishes a proposal for a general framework of playability and game experiences, taking as a basis the playability characterizations of existing models, typologies of game-based systems and types of players, integrating them and including elements that are not currently taken into account but that are necessary to adjust to the new needs and realities presented by games, their types and the goal that each one offers, including fun, interaction, motivation and realism.

Keywords: Playability, Game-Based System, Game Experience, Play Experience, Games, Player Experience

1 Introduction

The social and cultural context in which computer games emerged in the 70's is very different from today's environments and needs [1]. Also, from a technological perspec-

tive, it can be stated that the means and mechanisms used to interact with gaming systems have evolved and improved drastically. In the last decade, the gaming industry, mainly computer games, has grown on different platforms such as personal computers, specific gaming consoles and mobile devices. To provide a better user experience (UX), these platforms have evolved in graphic processing, user interfaces and complexity. These elements, together with the increasing number of players, have allowed the area of HCI (Human-Computer Interaction) to focus on the study and improvement of the user experience of this special type of interactive systems. This has been achieved through the use and adaptation of techniques and tools of this discipline, such as heuristic evaluation or usability tests, which can be used to evaluate these experiences and the impact that games have on human beings. [2].

Mechanisms are now available to evaluate both player experience (PX) and its impact during gameplay, as well as the levels of enjoyment that these can achieve depending on their design and the elements incorporated [3].However, the player's environment has changed so much that it has become necessary to add new elements and rethink the existing mechanisms to adjust such evaluations. The same happens with the concepts of playability and player experience, which at the beginning were very focused on the analysis of fun as the basic objective of game processes, and nowadays they must be rethought with the incorporation of relevant aspects such as motivation, learning, engagement, etc.

This paper presents a current status of the types of game-based systems (GBS) and playability evaluation. This allows us to identify the need to formulate new elements in the measurement of the previously mentioned sensations. Moreover, we want to achieve the adaptation of these and have a more accurate assessment of the environment that involves "the game", in all its variants, and how to evaluate the quality of the experiences that these currently provide. GBS are an existing concept that include different solutions and systems based on the game concept, which is related to the main objective of this article, where the definition of a new proposal for the evaluation of the playability of these solutions is presented. This is due to the existing evaluations are focused on video games or games with an educational approach.

This article is structured as follows: In section 1, there is an introductory explanation of the content of this article. Section 2 provides a background on playability and game experience. In section 3 , the proposed framework is established, differentiating the concepts of playability, player experience and game experience, and a characterization of playability and Play Experience evaluation is proposed. Finally, in section 4, a series of conclusions and possible future works are introduced based on what has been previously established.

2   Background

The main term for this whole research process is "Game", which must be defined before delving into the concepts of playability, game experience and player experience. The

word "Game" has been defined by multiple authors, and each one has placed his personal stamp and vision. We must take into account that nowadays the game is found in most of the activities of our life and on all types of media.

According to Marczewski [4], Game is the voluntary completion of tasks within a system constrained by a set of rules, in order to achieve a desirable outcome. In addition, this same author has established a concept called "Game Thinking" to encompass different types of GBS. Game Thinking is applied in game-inspired designs, serious games, and even in games in their purest state in search of fun. Another interesting definition is the one established by Bernard Suits [5], which indicates that a game is an attempt to reach a specific state, using only the means allowed by rules that prohibit the use of more efficient means in favor of less efficient means, and where the rules are accepted because they make the activity possible.

In the world of video games there is often not consensus or standardization of concepts. This is also the case of the definition of the property of playability, which can be understood and used in different ways when measuring the quality of a game [6]. This problem of consensus not only occurs at the conceptual level, but also in the terminology used to refer to a particular concept. An example of this is the case of "playability", also defined as "Gameplay" or "Gamefulness", which can generate confusion.

The measurement of "game experience", "playability" and "player experience" has been a key and a challenging topic of study to understand the impacts of games on players [7]. According to this fact, different theories and tools have been formulated, including the Game Experience Questionnaire (GEQ) [8], the Player Satisfaction Need Experience (PENS) [9], the System Usability Scale (SUS) [10], and others. In addition, there are some typologies defined for the classification of GBS, as well as for playability. These types of classification provide a solid basis for understanding the different possibilities that exist due to their broad scope, but they also open the possibility of evolving to provide solutions to current needs.

2.1 Types of Players

One of the important elements when analyzing playability is that not all players are the same and what is fun for some may not be fun for others. It is important to classify the potential users of the game systems according to characteristics that allow to homogenize, in some way, their relationship with the mechanics incorporated in the game and the dynamics provided in the players.

Different typologies of players defined by some authors have been established in order to have a basic characterization [4, 11]. These definitions are updated over the years to adjust to new contexts and realities. Therefore, one of the most complete and commonly used typologies is Marczewski's [12], where there is a definition of 6 basic types of player with ramifications and subcategories that adapts more precisely to the current models and mechanisms of entertainment.

Each of these categories of players have been analyzed from the point of view of their motivations for the game and it should be noted that these motivations are the key to be able to analyze the playability of a GBS, taking into account the potential users.

2.2   Types of Playability

Analyzing previous proposals, it can be seen that playability is a complex term that encompasses different aspects of a GBS that must be taken into account during its evaluation. For this paper, we have started from a previous proposal of our research group in which González [3] indicated that there are 6 facets or types of playability: Intrinsic, mechanical, interactive, artistic, intrapersonal and social.

Each of these facets are different views of playability. It is not the same to look at the social aspects of the GBS than those that are more related to the mechanics. These facets are not disjoint, and this is one of the most important problems that we find when analyzing a GBS from the point of view of each of them, because the experience must be analyzed in a global way and then how each aspect of the analysis influences each of the facets must be analyzed as well.

2.3   Types of Game-Based Systems

One of the most important elements when analyzing playability is the difference between computer game, physical game and GBS. As mentioned in the introduction, the concept of game and its incorporation into all types of systems is becoming more and more widely used. An important example of this idea are gamification techniques, which are widely used today to increase and guide the motivation of users during the completion of activities that do not necessarily have to be of a playful nature.

Nowadays, there is an interesting proposal for analysis and classification of the different uses of games, the term is "Game Thinking" [4], and it is described as "the use of a game and game-like approaches to solve problems and create better experiences". It defines the following 5 types of GBS: Playful Design (ideas such as designs and illustrations that are inspired by games or the way they should be written), Gamification (use of game elements and thoughts in non-game contexts), Simulation (virtual version of elements belonging to the real world that allows learning, practice and safe testing), Serious Games (games that are not related to entertain and enjoy), and Game (Games with the purpose to entertain). In some of them, if it is necessary, subcategories have been defined to deepen the definitions and cover as many GBS as possible.

It is also considered relevant the proposal that has been made in our group to define and include the "Pervasive Game" in the properties of these existing typologies [13] as a way to break the limits produced by the "Magic Circle" classically proposed by Huizinga, through spatial, temporal and social expansions. The potential of this type of experience can be seen in systems such as Pokémon Go, where millions of players have shared experiences and activities and they have achieved very high levels of playability. It is important to detect how, specifically, in this type of geolocated experiences, aspects such as mobility are a key when analyzing the playability levels achieved in the experience.

3 Proposal for a general playability definition framework for game-based systems

The analysis of the concepts associated with playability is a complex process that has been explored throughout the literature from different points of view, taking into account some aspects of the design and development of a GBS. In this section of the paper, some of these aspects and which have been the most relevant proposals from our point of view will be analyzed. Based on this, we will detail a proposal for a general framework of definition and analysis of playability for the types of GBS that can be currently found.

3.1 Playability vs Player Experience vs Game Experience

Understanding the concept of playability and player experience requires an analysis from two points of view. First of all, the game is viewed as a software product that needs to be analyzed in depth to determine its quality. Traditionally, the "playability" property has been used for this purpose from its double aspect of adapting the usability property to game systems as a more accurate measure of the fun of a game. Secondly, there is the quality of the "player experience", which is directly related to the concept of UX. Although the difference between the two is based on the experience provided by the game on the players, they must be addressed using more subjective and personal measures such as emotion, satisfaction or engagement, which are fundamental to describe and improve the interactive experience that humans enjoy when playing games [14].

The concept of playability tends to be used not only to evaluate the game as a product, but also to evaluate the game experience itself. Two types of playability are interpreted here: the first one is product-oriented and the second one is experience-oriented. However, it could also be understood as a misuse of concepts or lack of standardization of these concepts. For the proposed framework, we interpret "playability" as the evaluation of the game as a product and "player experience" (PX) as the experience a player has when interacting with a game. Finally, the "game experience" (GX) concept is oriented to evaluate what all participants perceive, even those who are not directly playing during the game sessions and experience the game from a much more social point of view.

3.2 Playability characterization

From our point of view, we have started from the work of J.L. González and F.L. Gutiérrez [15], and we have taken as a basis for playability evaluation elements such as effectiveness, learning, immersion, satisfaction, motivation, excitement and socialization. All these factors must be analyzed and updated because a GBS not only has to be seen as a computer game, but it should analyze more elements; contexts of use and objectives as different authors described [4] and are reflected in systems such as: serious games, simulations, gamification and playful design. Based on these types of GBS, in which playability can be measured, it can be identified that the factors established so

far are not enough to evaluate the different experiences. It should be clarified that these approaches are solid, but it is necessary to define other factors to complement the existing approaches and adjust them to the new reality.

Playability is not just a measure of fun. It is a measure of the quality of the experience that has been defined as a GBS, and, as previously stated, the use of traditional measurement processes such as UX evaluation are not enough, requiring the use of measurement of playability. To measure playability, you can't just wait for a fun environment to be generated, but you should also take into account other characteristics. The environment to be evaluated must also be motivating, satisfying and interactive (generating a physical or mental interaction in the players). All these elements together allow the evaluation of the quality of the game, but at the same time, they allow an indirect evaluation of the experience. This refers to quality during the game, not only in an individual game but also in a group game. Based on these elements, the following playability characterization is proposed, divided into 2 sections:

First section: First, we address the evaluation of the product, which, as previously indicated, refers to playability oriented to the evaluation of the game and the effectiveness and efficiency of the game that will be evaluated. One of the most relevant properties of this playability characterization proposal is narrative both from an efficiency and effectiveness perspective (see Fig. 1**¡Error! No se encuentra el origen de la referencia.**). This property is included because it is a missing element in the existing evaluation models and should be added, taking its importance because it allows to keep the player's attention, allowing the game to provide a greater experience and to keep the player as long as possible in the game.

Fig. 1. Narrative property for product evaluation

Narrative efficiency: This refers to the storytelling of the game, which must be coherent (each of the chapters must have a connection with each other), empathic (it must generate in the player a series of emotions, feelings and even thoughts that connect directly or indirectly with the game, making it a pleasant, exciting and satisfying experience), it must generate tension (in order to capture the player's attention supported by the empathic process) and it must be focused on the player, in order to positively impact the player so that he/she remains as long as possible in the game.

Narrative effectiveness : Narrative must be structured (organized by chapters in order to have a logical order) to generate suspense and curiosity (it must generate expectation to keep the player connected), allowing the player to feel that the game provides a logical and interesting experience and thus motivating their participation in the game.

Second section: The second section of the playability characterization is oriented to the evaluation of the experience, which we call "Play Experience" and which includes the player's individual evaluation (PX) and group evaluation (GX) (see Fig. 2). The individual player's evaluation includes elements of each player's own unique experiences such as:

- **Fun:** Considering that fun is a subjective value of each player according to his or her own tastes and preferences.
- **Satisfaction:** The elements offered during the experience were satisfactory and met expectations.
- **Motivation:** The player's experience included elements that generated a need to continue within the game.
- **Interaction:** The communication processes with the gaming system were appropriate to the experience.

At the social level, elements of interaction processes among several players who participate directly or indirectly with the game are evaluated, such as:

- **Collaboration:** Assistance between the different players in fulfilling their specific roles to achieve the goals established in the game system.
- **Socialization:** Satisfactory process of interaction between the different players.
- **Competition:** Experiences offered of rivalry among players through different mechanisms, thus encouraging competition among players.

Fig. 2. Evaluation of Play Experience

3.3 Measuring Play Experience.

In relation to the evaluation and measurement of Play eXperience, new factors have been identified affecting in some way the experience, but have not been considered yet. Among these are: the type of player, age (generational factor), the type of GBS (it is not the same to analyze the experience of a serious game or a pure game that has only

the purpose of entertaining, etc.) and the game genre, speaking specifically of computer games (it is not the same to analyze a platform game, an FPS, etc.) (see Fig. 3).

Player type factor: Depending on the type of player, the gaming experience changes drastically. The experience of a person who is only interested in winning the game is not the same as the experience of a person who only wants to share, socialize and entertain himself. For this reason, should be evaluated in a sectorized way according to the player's characteristics, in order to obtain true data that show the reality of what each player has experienced and what he/she feels.

Generational factor: Another element to consider is the evaluation of the experience according to people's age. The way of experiencing and enjoying the game changes according to the generation or age of the player. This is evident, for example, in the fact that older people have specific and special characteristics that are very different from those of children or young people.

Game-based systems type factor: Although Play eXperience is being evaluated, the type of experience according to the available characterization should drastically affect the way in which it is evaluated. For instance, it is not the same to evaluate the experience in a serious game or in a game that is intended to entertain, offer an experience or advertise a product or service. Indeed, playability measurement objectives are established according to the type of experience offered:

Fun: This objective can be measured in a computer game, guiding the playability in measuring the fun and entertainment offered by this type of GBS.

Motivation: According to the experience offered by a gamified system, its objective is not fun but motivational, thus orienting the analysis of the playability to determine the level of motivation that the player acquires in front of the gamified system to continue in this experience and to advance in this as much as possible.

Interaction: For a serious game experience, gameplay measurement should focus on measuring the player's interaction with the system. An example are serious rehabilitation games, where the main objective is the movement of the player or patient in the game to achieve goals, generating an interaction process.

Realism: For the type of experiences such as simulators, where the reflection of reality in front of the user is the key to a learning process, practice or safe testing; it makes the measurement of playability against this type of experience, the main objective of evaluation.

Game type factor: The game genre should not be confused with the type of GBS factor, as this is specifically focused on computer games. The gaming experience offered by an FPS game is very different from a Puzzle game. Each one, as in the case of the

previous factor, has its own characteristics, so it is necessary to adjust the evaluation mechanisms for each of the available game types.

Fig. 3. Play Experience Factors

4   Conclusions and Future Work

This paper has presented different elements that lead to a new proposal for the evaluation of playability in all types of GBS, allowing the adaptation to the new characteristics and current needs, adjusting existing models and integrating them, and adding different elements that had not been taken into account so far. This was achieved from the identification that playability is not only a measure of fun, but it is the evaluation of the quality of the experience that has been defined as a GBS. Moreover, the application of these elements is not only for video games, but also for the different types of GBS, each with its own specific characteristics and objectives.

To achieve the definition of the proposal for the general playability framework, two main sections were generated: The first one comprised by the evaluation of the product from a perspective of effectiveness and efficiency. The evaluation of the product is comprised of different properties, among which narrative stands out because it manages to keep the player's attention, allowing the game to provide a greater experience and keep the player in the game for as long as possible.

The second section is focused on the evaluation of the experience, called "Play Experience", which can be evaluated individually: "Player Experience" (evaluating fun, motivation, satisfaction and interaction), or in groups: "Game Experience" (evaluating socialization, collaboration and competition).

As future work, we are working on a more precise and formal definition of the properties for the evaluation of the efficiency and effectiveness of the game as a product, not only contemplating narrative. In addition, from the GBS, it will continue with the expansion of the properties identified so far in order to provide a complete evaluation at both individual and group level of the players and their lived experience. Finally, the "pervasive experiences" property is expected to integrate in a transparent way into the GBS in order to have a detailed analysis of each of the current experiences. Thus,

achieving evaluation systems that contemplate the new technologies and current pe-ripherals that are being integrated into computer games, offering new experiences and ways of playing and allowing the coupling of the new paradigm of pervasiveness.

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