



Assessing the player interaction experiences based on playability[☆]



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ABSTRACT

Nowadays, video games are the most economically profitable entertainment industry. The nature of their design means that user experience factors make design and/or evaluation difficult using traditional methods commonly used in interactive systems. It is therefore necessary to know how to apply Playability in order to design, analyse, optimise and adapt it to a player's preferences. In this paper, a strong relationship between user experience (UX) and playability is introduced and justified, a characterisation of player experience (PX) is presented based on playability, and a practical method for player experience assessment is described by using the "Castlevania: Lords of Shadow" video game to be a. The results offers a mechanism for the evaluation (validation and verification) of the quality of the experience and interaction process and acts as a complementary alternative to the traditional tests performed by the video game industry professionals during the Quality Assurance Process (QA Process) to help to share results, reports and have a global point of view to analyse the final game experience.

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1. Introduction

User Experience (UX) is understood as a set of sensations, feelings or emotional responses that occur when users interact with the system. A formal definition for UX has been issued by ISO/IEC 9241-210 (2010, clause 2.15): "a person's perceptions and responses that result from the use and/or anticipated use of a product, system or service". Furthermore, UX manifests itself as a quality of design, interaction and in the value of using a product. UX focuses more on the subjective aspect of the interaction process, and goes beyond the traditional study of the skills and cognitive processes of users and their rational behaviour when interacting with computers (ISO 9241, 2010). UX is a term that covers known multidisciplinary HCI terms and goes a step further in investigating all the sensations experienced by the user when performing a particular task in a particular interactive system. UX covers *pragmatic* and *hedonic* properties of the interaction. UX should be taken into account throughout product development (hardware or software), so as to achieve the optimum experience for the users [1,2].

Video games are highly interactive systems whose main goal is to entertain users (players) that interact with them in order to have

fun. Nowadays, video games are the most economically profitable entertainment industry and there are relevant and meaningful software products where UX achievement is a real challenge. The importance of video games in current society justifies the need to question whether the analysis of user experience is correct or if the interaction experience has a direct impact on emotional reactions, cultural influences or other subjective perceptions and how to measure these with metrics to ensure a desired experience during play time. Player eXperience (PX or User Experience in Video Games) depends not only on the product itself, but also on the user and the situation in which he or she uses the product. The importance of video games experience evaluation justifies the need for models that characterise the overall experience, and mechanisms for designing and analysing the Experience throughout the video game development process become a must [3].

The purpose of this work is to present Playability as measurement of the interactive experience with video games and entertainment systems, and uses it for the evaluation of the enjoyment and entertainment on interaction systems. This work reflects the importance of a Playability to evaluate the final experience for developing more efficient and successful products in terms of entertainment and amusement, a crucial factor to improve the final satisfaction of users. In the second point, we discuss about the User Experience in Video Game, especially how emotions and cross-cultural factors can affect to the overall experience in games. Then (third section), we present a Playability to characterise the user experience in video games. We introduce a Playability Model,

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section forth, to characterise the player experience (Playability) based on measurable and quantifiable attributes and properties and to evaluate and understand the impact of the elements of a video game on user experience across diverse player profiles thanks to a Playability Model. Later, we apply the Playability Model in a Video Game Evaluation to analyse the experience. The main objective with this model is offering a *complementary alternative to the traditional tests* performed by the video game industry professionals during the Quality Assurance Process (QA Process) to help to share results, reports and have a global point of view to analyse the final game experience based in hedonic and pragmatic factors. Finally, we discuss about our proposals in conclusion and future works related with this chapter will be presented.

2. User experience and video games

Software developers should aspire to the attainment of a high level of quality of the interaction experience in the software systems that they develop. User eXperience Evaluation has the main objective of offering information about emotional interaction (subjective values, hedonic properties) to complete the objective information (objective metrics, pragmatic properties) [1,2]. Traditional Video Games Evaluation Methods are based on usability/quality in use or functionality techniques, which analyse the satisfaction property as a consequence of performing a task in an efficient and effective way (pragmatic objectives of the video game). However, there are some properties, such as enjoyment, pleasure, and sociocultural factors that have a crucial impact on the final user's satisfaction with the video game. Hence, UX goes beyond the traditional study of the skills and cognitive processes of users and their rational behaviour when interacting with video games.

There are numerous parameters and variables when designing video games, including cultural features and emotions, which characterise a number of different player interaction experiences.

Cultural features are extracted from sociological models [4–6]. These *social* aspects of the interaction improve the final experiences: Universalism versus uniqueness, Affective versus neutral, Translation, Colour, Directions and symmetry, Feminism versus Male chauvinism or Contextualization.

Emotion is the complex psychophysiological experience of an individual's state of mind, interacting with biochemical (internal) and environmental (external) influences. The user's emotional response to the interactive process is a factor that can cause that user to love or hate a product. Norman [7] has mentioned many features of *emotion* that motivate users. *Emotions* such as beauty, fun, and pleasure work together to produce enjoyment and a state of positive affect. *Motivation* is a key factor in provoking better interaction experiences with products [8]. To measure the emotional response, oral self-tests may be used, where respondents use a numerical scale to record their emotions [9,10]. We can make use of emotions heuristics to analyse facial expressions [11] or use Emoticon cards (Emocards) to identify visually how the user feels about the system and analyse the “emotional feedback”. Also, we may carry out some measurement based on biofeedback such as Emotional Response Analysis (ERA) [12,13].

Therefore, the design and evaluation of the interaction experience should be enriched by these factors in order to obtain more complete information on the quality of the experience in the user interaction process. In this paper, video games are identified as prototypical examples in which the many faces of UX are presented and can be analysed to complete the evaluation of video games. Traditionally, playability has been used to this end, but it is important to consider not only functional values but also a set of specific non-functional values, given the hedonic properties of video games: emotional response, social and cultural background,

etc. User Experience in video games is enriched by the playful nature of game systems, together with the characteristics that give identity to the game, which are unique to each game and make the experience with every game different for each player, who will also have different experiences from one another.

3. Playability and the player experience

Playability is a key factor in the success of the video game due to its ability to ensure that the game engages, motivates and entertains the player during playing time. The most important references on playability are compiled in [3,14–16]. Playability has been studied from different points of view and with different objectives.

From the *design* point of view, there are three key elements for identifying the playability of a videogame: Core Mechanics, Storytelling & Narrative and Interactivity: the elements of a video game that the player can see, hear and interact with in the virtual world [17] and it is improvement thanks to the combination and proper structuring of the game elements during the play-time [18] the platform [19] and the management of emotions, immersion and the motivation of the player [20,21].

Other works on Playability and player experience define playability as “the usability in the context of video games”, in which usability is understood as a traditional pragmatic property of the UX [22] and there are several works about heuristics and evaluation criteria of the playability as pragmatic property of the interaction process [23,24]. Some interesting works focus more on how to evaluate the player experience applying biometric techniques [25] and gameplay metrics [26] or to readapt the experience to the user cross-cultural and location issues or promoting the social game [27,28]. Another important research line is the one, which uses questionnaires to assess the user experience. The most significant is Game Experience Questionnaire (GEQ) [29,30].

As already stated, Playability is based on Usability but, in the context of video games, it goes much further. Furthermore, Playability is not limited to the degree of ‘fun’ or ‘entertainment’ experienced when playing a game. Although these are primary objectives, they are concepts so diffuse as to require definition using a broad set of attributes and properties to measure the player experience. Playability is a crucial factor, because to have the opportunity of combine accessibility techniques to properties to characterise and improve the entertainment of the player with the video game. There is a clear need for a common or unambiguous definition of Playability, attributes to help characterise the player experience, properties to measure the development process of the video game, and mechanisms to associate the impact/influence of each video game element in the player experience. We consider this a significant lack, since the different definitions and models of how to measure the playability. Based in previous works in the field, there are no universals model, properties and definitions, but we can extract a common definition of playability based on them: *‘a set of properties that describe the Player Experience using a specific game system whose main objective is to provide enjoyment and entertainment, by being credible and satisfying, when the player plays alone or in company’* [16,31]. It is important to emphasise the ‘satisfying’ and ‘credible’ dimensions. The former is more difficult to measure in video games than in desktop systems due to the high degree of subjectivity of non-functional objectives. Similarly, the latter depends on the degree to which players assimilate and become absorbed in the game during play time – also difficult to measure objectively. Playability represents the *degree to which specified users can achieve specified goals with effectiveness, efficiency and, especially, satisfaction and fun in a playable context of use*. This Playability definition and the properties to characterises de player

experience, and different facets to related the interaction experience with game elements will be the base of the Playability Model to evaluate the player experience. We based in previous experiences in the area and unify the results in a unique model to characterise the full experience and not only one part of it. We introduce them in the next section.

4. Playability Model to evaluate the player experience

As previously mentioned, the user experience is characterised by two main points of view: process of use and product quality development. These are enhanced and enriched by the user's emotional reactions, and the perception of non-instrumental qualities. Playability is based on Usability in video games, but in the context of video games it goes much further. Furthermore, Playability is not limited to the degree of 'fun' or 'entertainment' experienced when playing a game. Although these are primary objectives, they are very subjective concepts. It entails extending and formally completing the characteristics of user experience with players' dimensions using a broad set of attributes and properties in order to measure the player experience, see Fig. 1.

In this work we apply our Playability Model proposal to evaluate PX in video games to achieve the best player experience, we propose a set of attributes to characterise the playability. This model offers a mechanism for the evaluation (validation and verification) of the quality of the experience and interaction process and acts as a *complementary alternative* to the traditional tests performed by the video game industry professionals during the QA Process (Quality Assurance Process) focus on functional aspects of the game, rather than on the non-functional, or aspects related to the interaction experience [32]. For this reason, the model presented serves as an assessment tool to ascertain which attributes have a greater influence on the interactive experience, and the global properties and metrics help them to compare and re-use results in order to improve the evaluation or QA Process. The model also assists exchange information between different development studios within the same company and improves the model and metrics we are presenting in this work because the present a shared model with properties and attributes to analyse, share and compare reports and test between different player profiles and video games.

The evaluation of UX in videogames based on Playability process in video games is performed through a combination of evaluations metrics, properties and questionnaires. The evaluations with users are based on tasks to be completed using the evaluated video game. The interaction is analysed and the selected metrics among the proposed set is used to measure the quality factors of each task.

The evaluations with users are complemented by questionnaires that measure the satisfaction, cultural impacts and emotional reactions factors and collect information about user's perception or the process of use, the hedonic and subjective quality of the gaming experience. Experience analysis based on playability analysis is a highly complex process due to the different perspectives that can be used to analyse the various parts of the video game elements. To facilitate the analysis of video game quality, we used the Playability Facets. Each facet allows us to identify the different attributes and properties (internal and external) of video games that are affected by the different elements of video game [16]. The six facets of video games are:

- **Intrinsic facet:** This is the characteristic inherent in the nature of the video game itself and how it is presented to the player. It is closely related to rules, goals, mechanics, challenges, rewards or elements that characterise and differentiate one game from another.
- **Mechanical facet:** This facet is related to the quality of the video game as a software system. It is associated with the game engine and other game software routines that allow the execution of all elements of the game.
- **Interactive facet:** This is associated with player interaction and videogame user interface development. It is strongly connected to the game interface: UIs, game controller, navigation system or elements that are responsible for the interaction between players and video game.
- **Artistic facet:** This facet relates to the quality of the artistic and aesthetic rendering of the game elements, for example, visual graphics, melodies, storyline or storytelling and their perception by the player.
- **Intrapersonal or Personal facet:** This refers to the individual outlook, perceptions and feelings that the video game produces in each player and as such has a highly subjective value.
- **Interpersonal or Social facet:** This refers to the feelings and perceptions of users and the group awareness that arises when a game is played in a group situation, be it in a competitive, cooperative or collaborative way.

The different facets proposed for video game experience analysis help us to identify and to analyse specific aspects of video games. Facets offer the possibility of analysing specific aspects of the interaction quality focusing on specific aspects of the video game. The meaning or importance of each facet may differ depending on the genre (complex adventure game or simply a chess game). The analysis must be contextualised and facets offer a way to perform this contextualisation.



Fig. 1. Playability as characterisation and measurement of the interaction experience.

Playability Attribute indicates which characteristics are used as indicators of the quality of an interaction experience. They describe the external view of the game as software, as viewed by the users during the process of use. They are measured by some criteria (or properties) that indicate measurable attributes linked to the factors [16,31]. Playability describes the player experience using the following attributes and properties:

- **Satisfaction:** This is the degree to which users (players) are satisfied in an entertainment context of use, i.e. the video game. This factor considers various hedonic attributes such as fun, trust, pleasure, attractiveness, motivation, emotion or the sociable. Satisfaction is the most important attribute in video games, as it considers different aspects (pragmatic and hedonic): cognitive, emotional, physical, fun and social. The estimation of the degree of satisfaction in a video game is performed using questionnaires and observing players as they play, and analysing user preferences in different game sessions with video games. Satisfaction is a highly subjective attribute that is by definition difficult to measure as it depends on the preferences of each player, which in turn influence the satisfaction derived from specific elements of the game (characters, virtual world, and challenges). Example of metric: How satisfied is the player?
- **Learnability:** It is defined as the player's capacity to understand and master the game's system and mechanics (objectives, rules, how to interact with the video game, and so on). Desktop systems try to minimise the learning effort, but in video games we can play with the 'learning curve' according to the nature of the game. For example, on the one hand, a game may demand a high initial skill level before playing, or it may put the player on a steep learning curve during the first phases of the game, to help them understand and master all the game's rules and resources so that they can use them virtually from the outset. We propose attempt frequency as a metric. Normally, games introduce difficulties to attract and hook new players; a very simple game is not attractive, because it is boring.
- **Effectiveness:** It is defined as the time and resources necessary to offer players an entertaining experience whilst they achieve the game's various objectives and reach the final goal. This factor is determined by the level of completion of the video game (due to the different users' profiles, the degree of completion may affect the final experience), or the organisation (when it achieves a good balance between the various objectives to be achieved and the different challenges to overcome, so that the players remain engaged and enjoy themselves throughout the entire game time). An 'Effective' video game is able to engage the player's attention from the outset through to the very end of the game. Effectiveness can be analysed as the correct use of the challenges by the player throughout the game, the correct structuring of the objectives of the game and/or the best adaptation of the controls to the actions in the game. Effectiveness represents how players can achieve the proposed goals with completeness in an entertainment context of use.
- **Immersion:** It is defined as the capacity of the video game contents to be believable, such that the player becomes directly involved in the virtual game world. This intense involvement means that the player effectively becomes part of the virtual world, interacting with it and with the laws and rules that characterise it. A video game has a good Immersion level when it achieves a balance between the challenges it presents and the player abilities necessary to overcome them. Therefore, the key factors are the challenge and the goal; how the players reach these depend on their skills or how they play or focus on them. A video game should stimulate and focus the players by presenting some difficulty in the achievement of goals.

- **Motivation:** This is defined as the set of game characteristics that prompt a player to realise specific actions and continue undertaking them until they are completed. To achieve a high degree of Motivation, the game should offer a set of resources to ensure the player's perseverance in the actions performed to overcome challenges. By 'resources' we mean different elements to ensure positive behaviour in the interpretation of the game process, thereby focusing the player on the proposed challenges and their respective rewards, showing the relevance of the objectives to be achieved, and encouraging the player's confidence and pleasure in meeting and achieving challenges.
- **Emotion:** This refers to the player's involuntary impulse in response to the stimulus of the video game that induces feelings or a chain reaction of automatic behaviours. The use of Emotion in video games helps achieve an optimum player experience by leading players to enter different emotional states. We may carry out some measurement based on biofeedback such as Emotional Response Analysis (ERA).
- **Socialisation:** It is defined as the set of game attributes, elements, and resources that promote the social dimension of the game experience in a group scenario. This kind of collective experience makes players appreciate the game in a different way, thanks to the relationships that are established with other players (or with other characters from the game). Game socialisation allows players to have a totally different game experience when they play with others and it promotes new social relationships thanks to interaction among players. Socialisation is also at work in the connections that players make with the characters of the video game. Examples of this might include: choosing a character to relate to or to share something with; interacting with characters to obtain information, ask for help, or negotiate for some items; and how our influence on other characters may benefit, or not, the achievement of particular objectives. To promote the 'social factor', new shared challenges need to be developed that help players join in with and assimilate the new game dynamic, creating a set of collective emotions where players (or characters) encourage and motivate themselves and each other to overcome collective challenges.

The overall Playability of a video game, then, is the sum total of values across all attributes in the different Facets of Playability. It is crucial to optimise playability across the different facets in order to guarantee the best player experience.

We recommend evaluating and testing the Playability and player experience during the entire development process in order to ensure the quality of Playability/Experience in every playable video game element or game content in the final product. When testing or evaluating experience, a Playability Model is used to achieve the following objectives: analyse the player experience in a quantitative/qualitative way using the Playability Model; test the effects of certain elements of a video game on overall player experience; identify problems that may cause a negative player experience; complete the functional assessment and objectives of QA systems with non-functional evaluations that are closer to the experience for each player profile; and offer reports that provide complete information of every aspect of the player experience.

In typical Playability and PX evaluation there are four steps to test pragmatic and hedonic attributes of the experience see Fig. 2:

- **Pre-test:** The test facilities are set and the context of use is defined, including the factors and properties to be measured, the kinds of tasks and the users recruited. The user profiles are determined using questionnaires about age, skills, etc. Relevant characteristics about users' profiles are: gender (male or female), age, education (number of years of completed formal education) or product experience (type and duration of any

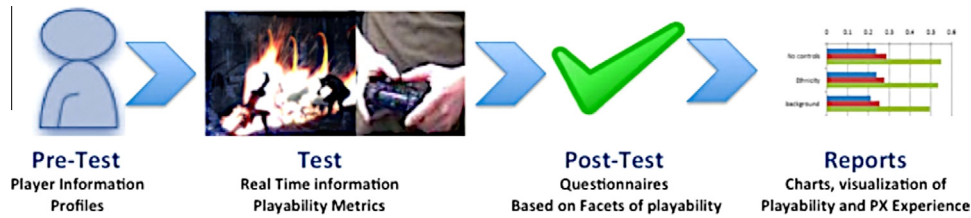


Fig. 2. Playability evaluation phases for video games and entertainment systems.

prior experience with the product or similar products). These were completed with emotional information and cultural background influences, video game genre and platform preferences.

- **Test:** We collected information with metrics about player experience whilst users played a video game. Observation techniques should be used to measure facial and corporal expressions or biometric constants and the gameplay actions should be analysed with Playability metrics.
- **Post-test:** User satisfaction is measured after performing the test using questionnaires that capture the subjective vision of the interactive process of use. In addition to the post-test satisfaction questionnaires, it is also possible to use post-task satisfaction questionnaires, which are presented to the user after the completion of each individual task. We gave to the players different questionnaires (players) or heuristics (expert player or video game developers), according to the user profile. These questionnaires/heuristics were guided by the Facets of Playability. Hedonic properties are a crucial factor in the motivation, emotion and satisfaction attributes of User Experience. Special emotional and cultural information can be obtained using emocards. The questionnaires or heuristics guided by facets offer the possibility of analysing specific aspects of the video game, or a specific video game element.
- **Reports:** The data resulting from the evaluations with users and questionnaires is analysed. The metrics for the quality factor are computed and they are interpreted in the context of the evaluation

5. Case of study: “Castlevania: Lords of Shadow”

In this point we present a practical example of how to use Playability to analyze the interactive experience with a real video game: “Castlevania: Lords of Shadows” [33].

This game was developed by the Spanish company Mercury-steam and published by Konami. The game is a reboot of the franchise. It is an action-adventure game in a dark fantasy (horror/fantasy) setting in Southern Europe during the Middle Ages (in the year 1047) for PlayStation 3 and Xbox360 consoles. “Castlevania: Lords of Shadow” takes place at the end of days. The Earth’s alliance with the Heavens has been threatened by a dark and malevolent force – the mysterious ‘Lords of Shadow’ – darkness reigns over the world. Across this shattered land, the souls of the dead wander unable to find peace, whilst creatures of evil roam free wreaking chaos and death upon the living. Gabriel is a member of the ‘Brotherhood of Light’, an elite group of holy knights who protect and defend the innocent against the supernatural. His beloved wife was brutally murdered by the evil forces of darkness and her soul trapped for eternity. Neither living nor dead she realises the horrific truth of what is at stake and guides Gabriel to his destiny – and hopefully salvation for the world... but at what cost? Thus, Gabriel must travel the destroyed world, defeating the evil tyrants in order to use their powers to bring balance back to the world. Armed with the versatile Combat Cross – the world’s last hope must encounter the three factions of the Lords of Shadow and end their unholy rule.

One objective of the work is to develop the UX evaluation to extract results *easily* and *cost-effectively* for the company and is effortlessly adaptable to the traditional quality assurance that video game developers perform with the product. Also, to measure the experience a *non-intrusive mechanism* is advisable when users are playing. We discard the use of sophisticated mechanisms of measurement like EEG because one of the requirements was to make the player feel at home when they are playing the video game. Each mechanism of evaluation has an intrusive grade that affects the experience, but due to the objective of analysing the interactive experience, the cultural influences and the emotional impact to improve the design, we introduce some Evaluation Techniques with the Playability Model to complete the traditional QA evaluation.

5.1. Materials and methods

The evaluation was conducted at the UsabiliLAB, the usability laboratory of the Universitat de Lleida. The evaluation equipment was based on two computers. One of them was for the user and it was equipped with the Morae Recorder, which registered user interaction, screen video, user interactions, user voice and video through a web-cam. The other computer was equipped with Morae Observer and Morae Manager, which were used by the evaluation team to observe, annotate and analyse the interaction session. There was also a member of the evaluation team, the facilitator, who assisted users during the evaluation. Also we had a PlayStation 3 to run the video game and the first computer captured the interactions with the video game users. We used cameras to record the users’ facial and body expressions and their heart rate was monitored to obtain information about biofeedback.

5.2. Participants. Pre-test: profiles and influences

The experiment involved the participation of 35 student volunteers from different degree courses at the University of Lleida, Spain. The students did not know about Castlevania. It is highly advisable to work with different player profiles (game stakeholders) so that the results are representative of the context of real-life video game use. The majority of the participants (Pre-test information and results) were male (75%) between 19 and 22 years old (90%). They were considered to be casual players (playing approximately 5 h per week, and with experience of only one console or a mobile phone). They had knowledge of different gaming platforms, including a mobile and a desktop platform (90%). The preferences for different game genres were: adventure (~60%) and fighting (~30%). 87% preferred to play in company.

5.3. Test. Procedure and measurement

During the Test, the users play the beta of the videogame (the first two levels, Test Cases, Fig. 2) at a ‘normal’ difficulty level. The goal of the first level is to save a village from wolves and wargs. The goal of the second level is to run away from wargs and fight against them using a horse and finally escape from them.

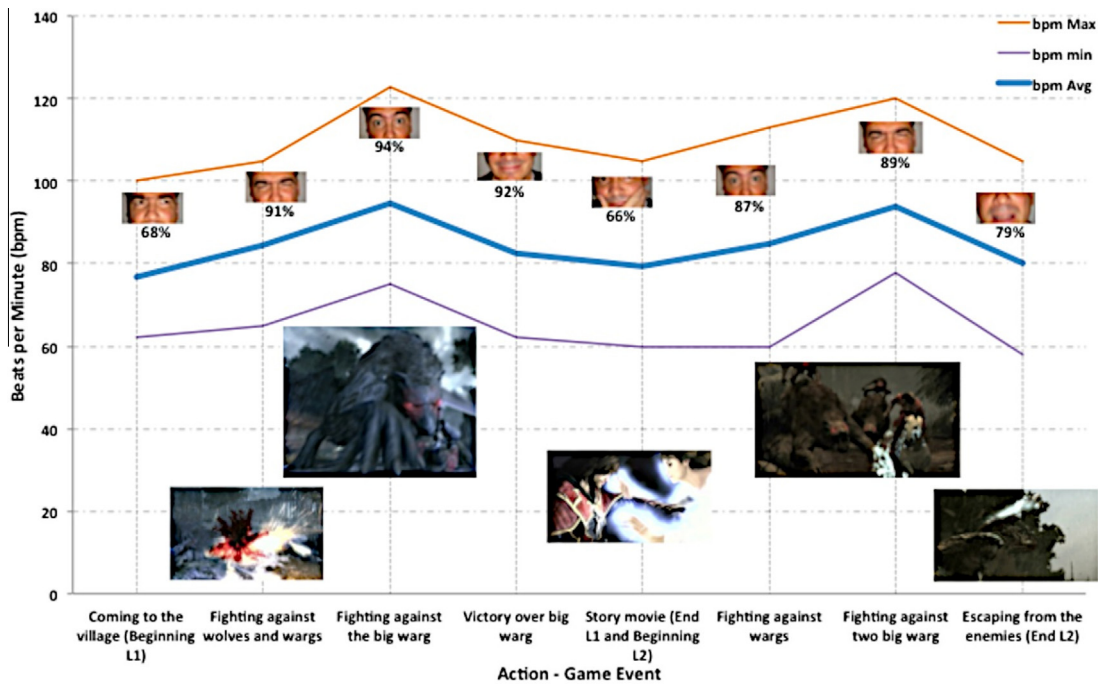


Fig. 3. Game actions/events and correlation with the user's heart rate.

The facial and body expressions of the participants should be recorded and their heart rate monitored. The objective is to perform a non-intrusive measurement. The aim is to detect visceral and emotional reactions that occur during the interaction process helps us to contextualize the experience of the game process. With these techniques we can obtain information about the experience [25], Fig. 3. We can observe, for example, when players are uncertain, looking around to capture all the screen elements; how the stress caused by the challenges increases the player's concentration (for example, players press the pad quicker and more violently than at the beginning of the game). The degree of immersion can be indicated by an increase in heartbeats per minute or how stress becomes satisfaction, which may be expressed as a slight smile or slight gasp.

To perform the gameplay analysis we use Playability Metrics [26,31]. These metrics offer information about properties and attributes of Playability. These metrics are measured with observation techniques such as those indicated in this work. These metrics are contextualised by the mechanical and dynamical nature of this video game. These analyses are based in the player interaction, but we can use expert information to analyse how the user plays the video game.

5.4. Post-test. Reports and results

In the *Post-test*, informal interviews and questionnaires are used to obtain information about the player experience. The evaluation process is performed using a list of questions, with the aim of investigating the degree of each attribute of Playability and Facets in order to obtain a measurement of the player experience. We readapt the list of questions from validated works [10,22–24,29–31]. The rating scale for the answer is 1 (very unsatisfied) to 5 (very satisfied). Each question is related to a facet and property of Playability.

Using the Emocards, we are able to analyse factors that are difficult to assess objectively using a number on a scale of values, following the ideas shown into obtain information about emotional feedback. However, at the same time, players are able to easily identify the emotional impact they have felt. Examples of these

questions and answers can reaffirm the positive feedback from users with regards to the setting and context as well as sound effects and music in general (high level of satisfaction, mainly characterised by a state of pleasure, which varies between excitement and neutral state) [20,25]. The analyses of the hedonic factor help us to identify whether the game satisfies players. We consider that enriching the PX analysis with multicultural and emotional factors (hedonic properties) helps us to establish information about player preferences and likes.

The analysis of the experience performed by Playability measurements (Table 1 and Fig. 4) shows that this game causes a very balanced UX, as there is not attribute or facet that is highlighted over others. The average punctuation in questionnaires marks a value near to 4, which represents a video game with a good value of interactive experience for players. Fig. 4(1) shows the avg. value of every facet. Fig. 4(2) shows avg. value of every attribute. The results are obtained by applying a specific “weighted video game influence” to balance the results for each question and factor. Each question is related to an attribute to obtain the final values.² Some examples of weighted considerations and how to apply them in the video game analysis according to the users' profiles and video game genres can be found in [16,31].³

Notably, the central user comments focused on high quality graphics and cinematic effects (Artistic and Mechanical properties) that caused the desire to continue playing (Satisfaction–Motivation–Immersion). Moreover, the technical quality of the game, together with concern for good artistic effects causes the Motivation and Immersion to be high. The ease of controlling and using the game interfaces to perform the actions (or game combos) in

² A Playability Factor is calculated in the same way as a weighted mean. Each factor (f) has a weight (w) due to the influence on the punctuation in a specific question (q).

The factor value is calculated: $f = \frac{\sum_{i=1}^n w_i q_i}{\sum_{i=1}^n w_i}$.

³ It is not the main objective of this work to emphasise how to make the correlation of each question and the Playability Attribute. The objective is to use the result as complementary information regarding the quality of the interaction experience. The questionnaire with the weighted values and Playability Attribute and Facets from this study can be download from <http://tiny.cc/pqm>.

Table 1

Questionnaire and results to analyse PX guided by Facets of Playability.

Questions	Max	Min	Avg.	Std. dev.
<i>Intrinsic playability</i>				
1. The way you play the game is fun and interesting	5	2	3.84	0.80
2. Key concepts to play are easy to remember and learn	5	3	4.22	0.60
3. The game has offered fun from the moment you started with it	5	2	3.45	1.25
4. The elements of the game are consistent with the game story	5	3	4.15	0.70
5. The game provokes the need to keep playing to know what will happen with the protagonist	5	2	4.00	1.00
6. Game elements successfully transmits the emotions of the game dynamics	5	2	3.65	1.05
7. The game allows you to interact with other characters and use different elements that they offer	4	0	2.74	1.25
Avg.	4.86	1.57	3.72	0.95
<i>Mechanical playability</i>				
1. The game engine exploits the graphic and physical characteristics of the virtual world	5	2	3.81	0.85
2. The game offers a dynamic and context-sensitive help for the current challenges	5	3	3.91	0.80
3. The game provides mechanisms to capture the player's attention	5	2	3.69	1.05
4. The lighting and rain effects are similar to reality	5	3	4.19	0.95
5. The game makes it easy to learn new moves and improvements	4	3	3.95	0.85
6. The facial expressions and gestures are understandable and representative to the context of game	5	3	3.65	0.90
7. The Social interaction and dialogue with other characters is fluid and natural	5	0	2.95	1.40
Avg.	4.86	1.86	3.73	0.97
<i>Interactive playability</i>				
1. The control system is balanced and easy to interact	5	3	4.10	0.70
2. Learn the key combination is easy to remember	5	2	4.05	1.00
3. To Access and use actions and secondary armament is fast and fun	4	2	3.36	1.10
4. The game interface is not intrusive, and it is natural to the nature of virtual world	5	3	3.69	0.70
5. The game's information helps you to continue playing	5	3	4.15	0.70
6. The storytelling helps you understand how the protagonist feels	5	2	3.24	1.15
7. The interaction with other characters is entertaining and relevant to the game process	4	2	2.98	0.85
Avg.	4.71	1.93	3.65	0.89
<i>Artistical playability</i>				
1. The story and narrative are interesting	5	0	3.48	1.45
2. The cut scenes and movies have a high degree of quality	5	3	4.00	0.85
3. The game's visual elements are recognisable elements of familiar places or monuments of humanity	5	2	3.91	0.95
4. The music is appropriate to the action and game dynamics	5	3	3.98	0.75
5. The game does not discover story elements that may affect the future interest of the player	4	2	3.38	0.85
6. The artistic elements transmit emotion to the player	5	3	3.81	0.95
7. Being an ally or enemy is easily identifiable during play	5	2	4.34	1.10
Avg.	4.86	1.71	3.84	0.99
<i>Personal playability</i>				
1. The obtained fun when playing is adequate	5	2	3.81	1.05
2. The entertainment was appropriate to the game duration	5	2	3.79	0.95
3. The difficulty level was suitable	4	1	3.74	0.90
4. Accuracy and the skill to preform the actions was right	5	3	3.79	0.80
5. The sound effects helped to continue the game action	5	3	4.31	0.90
6. The nerves did not affect the way you played	5	0	3.53	1.40
7. I would have liked to share the game with friends	5	0	3.60	1.50
Avg.	4.86	1.29	3.79	1.07
<i>Social playability</i>				
1. New game objectives, rules and challenges are easily identified when several players play the game	4	1	2.77	1.32
2. Social interaction helps to improve the game actions	5	1	3.53	0.95
3. The social interaction helps to understands and feels the story	5	0	2.12	1.45
4. There are game elements to identify the identity of each player with the virtual world	4	0	1.8	1.23
5. The social game players or controls with other characters, differ from the individual game system	4	0	2.24	0.89
Avg.	4.40	0.40	2.49	1.17
Total avg.	4.83	1.67	3.75	0.97

the video game and overcome the goals is an incitement to play. This can be corroborated thanks to Interactive Facet.

Also, in Learnability; the punctuation could be better if the video game were to incorporate more adaptation facilities. The socialisation option also has a good value due to the 'number of social elements' that players used, but could be better. The Personalisation (effectiveness and motivations properties) level is low due to these being the first levels of the video game, and therefore players cannot sufficiently personalise the weapons or combos with which to attack the enemies. Everybody remarks on the capacity of the video game to excite and to 'fight' energetically with the enemies (emotion–immersion–satisfaction).

The *Post-test* results reaffirm the good opinion of the users as to the localisation and game context (immersion), as well as to sound effects and music in general (high level of satisfaction, mainly

characterised by a state of pleasure, which varies between excitation and neutral state (immersion–emotion). These factors contribute to a better atmosphere and emotion, emphasising the closeness and familiar culture players chose for the various elements of the game based on Lovecraftian ideas (the selection of the hero, the design in representing a dark place in the Middle Ages). This result may be due to *cultural perceptions*, but this is not demonstrated in this work. The cinematic quality and the artistic elements or the *quality design of the enemies improves effectiveness in the assimilation of all the experiences suggestive of the universe of the game* (cultural and emotional influences).

Globally, the UX analysis indicates that the results pertaining to interactive experience are very positive because most players (experts or casual players) played equally, see Table 1 (Avg. and Std. dev. values).

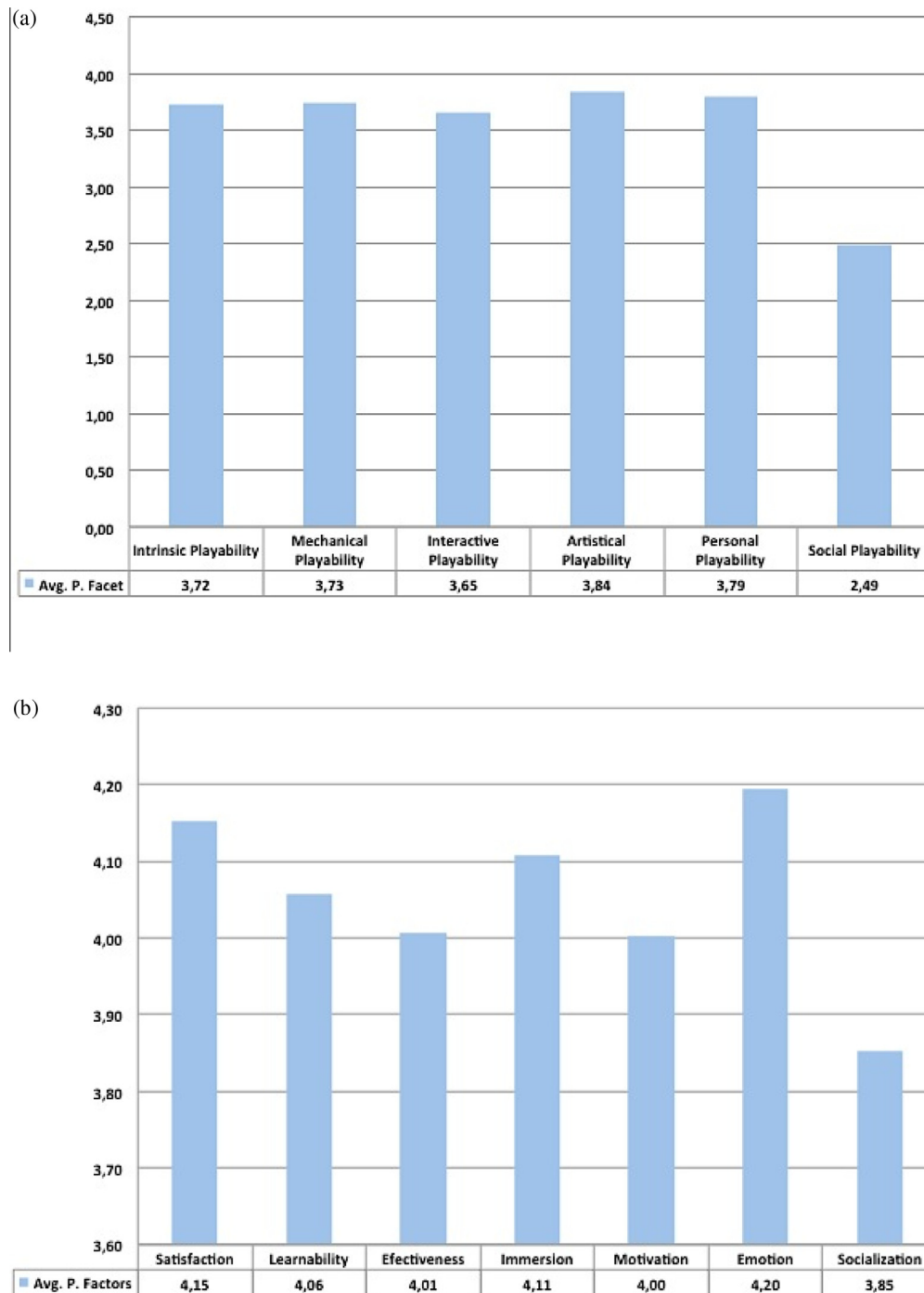


Fig. 4. Experience results of “Castlevania: Lords of Shadow”. (a) The avg. value of every facet. (b) Avg. value of every attribute of playability.

6. Conclusions and future work

This work reflects the importance of analysing the experience that players have with video games in a pragmatic and hedonic way. Understanding and evaluating the user experience in video games is important for developing more efficient and successful products in terms of entertainment. Our work reflects the importance of having a playability measurement model to analyse a player’s experience of the process of use of a videogame. In our proposal, the characterisation of playability is related to the evaluation of player satisfaction and the evaluation of the effect of video games. Furthermore, we highlight the importance of this type of analysis where the cultural or emotional impact should be a crucial

factor during the design process to enhance the experience or how the same product is “made up” according to the characteristics of the population (hedonic and pragmatic factors).

We have presented the concept of Playability as a crucial characteristic of player experience in video games, outlining the attributes and properties that characterise it in order to measure and guarantee an optimum player experience. To facilitate the analysis of Playability, we have proposed six Facets of Playability in order to study every property in each attribute and identify the elements necessary to achieve a positive overall Playability in different video games. Our proposal have been applied in the case of “Castlevania: Lords of Shadow” and are promoted by the Academy of Interactive Arts and Sciences of Spain. The enrichment of the development

process with Playability Model, emotional and multicultural techniques will help game developers improve the final player experience at different stages of the development and in the overall final product. The outcomes and reports of this work were used to perform the design of the experience of the forthcoming videogames of Castlevania Series. With this model with this model is offering a complementary alternative to the traditional tests performed by the video game industry and complete another alternatives in the area professionals during the Quality Assurance Process (QA Process) to help to share results, reports and present a global point of view to analyse the final game experience based in hedonic and pragmatic factors.

Now we are working on incorporating specific metrics, questionnaires and heuristics from other research projects (see previous point) and public methods from different video game development companies and QA studios to extend our proposal and have enough alternatives for different player profiles, video game genres and platforms in the video game industry to perform a more complete and unified analysis of video games. Results of our work are a complementary alternative to the traditional tests and methodological QA evaluations performed by the video game industry professionals of each company. This proposal will always be in progress according to the requirements of the studios and video game developers and market. Playability Model is not as complete as other specific UX techniques for a particular attribute or measurement criteria. But the model is open to the inclusion of more properties, criteria, metrics, indicators or techniques to improve the model to characterise the quality of the interaction and the experience of video games; this is part of our current work. The main objective is offering the Quality Assurance Process (QA Process) a global framework to share information, reports and studies about the experience results with the benefits and advantages of a standard evaluation model to help exchange information between different development studios, journalists and researchers or video game experts.

Finally, we are also currently updating and completing the different development phases of the Player Centred Video Game Development Process based on Agile Development Process to help us iterate on different game prototypes, we are incorporating playability factors to guarantee the experience in order to evaluate and improve playable prototypes and readapt the user experience to the possible changes in requirements and preferences which can occur when players test the game. We are integrating these ideas in educational and sanitary rehabilitation video games where a positive experience is a crucial factor for the success of the video games as support tools.

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