Updates effects in a Puzzle/RPG game and their impacts on players experience

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ABSTRACT

Game companies and game developers maintain communities of players interested and active through news and updates. Games are updated to increase players' satisfaction, the user experience and gameplay. However, constant updates may generate frustration in players. In this work, the Semiotic Inspection Method (SIM) has been applied to analyze a Puzzle/RPG game, Gems of War. As a result we have identified strategies used to provide players with information about changes in Gems of War and verified how this information has been accepted. We have studied the level of users' acceptability, impact and understanding of users by coding players' comments on the online forum of the game. This paper shows that understanding the reaction of the players about the updates on a game is as important as understanding how the game interface elements and periodicity of changes are perceived.

Keywords: human-computer interaction, rpg games, puzzle games, semiotic inspection method, coding.

1 INTRODUCTION

A large number of current games receive constant updates from their developers to improve the players experience. Nonetheless, there are not many works that describe the frequency and impacts of such changes. These updates can be used to fix gameplay issues, to fix interface problems or to generate new incentives for players. The increments made in the games create new experiences to players over time, especially for veteran players. Often, when users stop playing a game and return to the game after a while, they realize that many things have changed. This is common in current games, since developers need to comply with players' demands because of the strong competition in game industry [25].

Measuring user experience in games can be complicated and generate many questions [3]. For example, there are games available for different operational systems such as: Android, Windows, iOS or consoles such as: Xbox and Playstation. Cross-platform games can amplify the players' different user experiences, even though the game is the same. Players of the same game may have different experiences in distinct platforms, because of differences in some interface options, language or versions [26].

The goal of this research is to evaluate how updates impact players' user experience and what strategies are used in updates. To do so, we have studied the game Gems of War¹ which received a general update in October 2015 (Update $1.0.7^2$). The game has a mixed genre (Puzzle and Role-Playing Game). In addition, the developers of Gems of War apply small changes weekly and make

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¹http://gemsofwar.com/. Accessed on June 7th, 2016.

major changes in short periods of time, once every 2 or 3 months approximately, based on patch notes presented in the Gems of War website³. Because of these constant updates, Gems of War was chosen for this study.

To find out how updates impact the Gems of War players' experience, two methods of analysis commonly used in the Human-Computer Interaction (HCI) field were used. The first method was the Semiotic Inspection Method (SIM) [13] which allowed us to evaluate Gems of Wars communicability - that is, how well the game communicates its designers' intention regarding who the game is for, what its goals are and how to interact with it. As a result of the inspection, evidence was collected about the main features of the game, and classes of signs were identified. The second method used was the analysis of the users' feedback published on the game's forum. Players' comments were coded in relation to game updates through open coding [7]. Both methods are qualitative and their results were then triangulated as will be present in Sections 3.1 and 3.2.

Finally, we seek to understand which features of the game analyzed can interfere with the user experience when modified. The study enabled us to discovery classes of signs and how it related to users' perceptions and experiences. We have generated the following classes of signs with SIM: Items and Skills; Communication; Story; Enigmas; Interaction Mechanisms; Character Evolution; Continuity; Bonus and Rewards; Visual Effects; Layout and Mini Game. We have also identified categories based on game forum publications. The contrast of the results generated by the two methods indicate that players value their participation in the updating process through suggestions or criticism. For example, changing the layout of the screen elements in a new version of the game may displease players who have been playing the game for a long time, changing the game logic (how the system behaves, such as how to interact and battle) can generate a cost to learning the new behavior, creating new game functions can facilitate interaction or make the game more complex. Therefore, updates can be a factor that defines whether players will continue playing or decide to exchange games.

In section 2 we present other studies that have evaluated aspects related to qualities of use and user experience in games. The methodology for the development of this work is described in Section 3. Explanations about how the Semiotic Method Inspection and Coding were applied are shown in sections 3.1 and 3.2, respectively, and their main results in sections 4 and 5. In Section 6 we discuss the triangulation of the results. Finally, in Section 7 we present the main contributions of this paper and the next steps in this research.

2 RELATED WORK

The literature search for studies that address updates on games did not return works intrinsically related to this work. Several works related to the term "*update*" are focused on "Massive Multiplayer Online Games" games. Usually, these games use peer-to-peer net-

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²http://gemsofwar.com/1-0-7-out-now/

³http://gemsofwar.com/patch-notes/. Acessed on June 7th, 2016.

However, we have found some studies that evaluated gameplay, qualities of use and other aspects related to games. For example, studies addressing the needs of communities of players, game industry and developers needs in relation to users' experiences with games [3][4], or the use of game elements in other systems to enhance the experience and involvement of users (gamification) [15]. Authors also study the relationship between interfaces and game development project which require appropriate documentation, mainly to provide adequate control to multidisciplinary teams, challenges and timelines [5].

In particular, gameplay is considered crucial for the success of a game. Some works [14][32] present heuristics to assess the general gameplay, while others propose heuristics specific to an aspect of the game (mobile, multiplayer, online and others) [23]. Some papers discuss determining factors to the level of entertainment that a game provides and resulting phenomena, such as: game flow, immersion, excitement or fun [21]. Other studies conduct experiments with players who are exposed to different versions of the same game in order to assess the impact of the removal or mitigation of some factor [22][16]. This research aims to identify the main characteristics that affect users after an update. To do so, in this study we have applied the performed a qualitative analysis of the impact of on one update of the games Gems of War, version 1.0.7. To do so, we have used the Semiotic Inspection Method (SIM) to analyze Gems of War and contrasted it with users' discourse available on the games' forum.

Other works have also used the SIM to analyze games. For instance, SIM was applied in First-person Shooter Games (FPS) to identify which strategies are used to convey information through audio [9][27][8]. There are studies that applied SIM in Tower Defense games to evaluate similar semiotic characteristics that influence the sales of these games [2]. Furthermore, there are studies evaluating syntactic, semantic and pragmatic dimensions of a given game interface [17]. In this work, SIM is used to allow for the identification of interface signs that when modified or updated, affect the players' user experience.

There are specific assessments focused on gameplay, interface and game mechanics [6], including game development and its impact on gameplay interface [19]. Another important aspect is the redesign of old games to current platforms [31], in other words, not only should designers pay attention to the initial development of interface, but they should also invest on iterative processes of modifications. We found studies that analyzed how to generate a narrative of a game through players' responses, even without direct contact with the game [24]. Similarly, we use a qualitative method (coding) to code sections of Gems of War community forum.

In short, although there are many studies that focus on evaluating user experience and gameplay, to the best of our knowledge there has not been any investigation on the impact of a games update on their players experience. In this paper, we conducted an indepth qualitative study that allows us to better understand aspects involved in this phenomena.

3 METHODOLOGY

In order to conduct our study we have chosen the game Gems of War, because it mixes two games genres: Puzzle and Role-playing game (RPG). Currently, many games have hybrid genres, and the combination of genres makes the games richer in details [30]. Thus we believed that this game could point to interesting aspects regarding updates and had been recently updated (in October 2015). SIM was used to examine the game and identify classes of signs used in this type of game. These results were contrasted with results generated from the analysis and codification of players' posts on the game forum related to the game's update. The methods were applied by the two first authors who had applied SIM and open coding before (as a course activity) and had experience in Human-Computer Interaction (HCI) and game development. One of the authors applied SIM, and the other performed the open coding. Then each one reviewed each others analysis and discussed any issues they identified. The final results were discussed with the third author who is an expert in Semiotic Engineering, Human-Computer Interaction and Qualitative Research.

3.1 Semiotic Inspection Method

Semiotic Inspection Method (SIM) is an inspection method [13] based on Semiotic Engineering theory (SemEng), which allows the evaluator to examine the communication strategies used by systems' designers [28] and identify potential communicative break-downs that may take place. Semiotic Engineering presents a comprehensive theoretical view of HCI, allowing for the understanding of the phenomena involved in the design, use and evaluation of interactive systems [28].

In Semiotic Engineering, the interface of a system is perceived as a message being sentfrom designers to users in which designers convey to users who are the intended users of the system, what goals can be achieved with the it and how to interact with it to achieve those goals [11]. The message being sent is composed by signs (i.e. anything that means anything to anyone). Interface signs are classified as metalinguistic, static and dynamic [28][12]. Metalinguistic signs are those that explain other interface signs. Static signs express the system state, independently of temporal or causal relations. Finally, dynamic signs express the system behavior when users interact with it, i.e. causal and temporal relation.

SIM consists of 5 steps, preceded by the preparation process for the method. The steps are: 1 - Inspection of metalinguistic signs; 2 - Inspection of static signs; 3 - Inspection of dynamic signs; 4 - Comparison and contrast of reconstructed meta-communication messages; 5 - Appreciation of system's communicability. During the application of the method in steps 1, 2 and 3, the meta-message of the designer is reconstructed based on the inspected signs. In step 4, the applicator generates a single meta-message contrasting the meta-messages generated in the previous steps. In step 5 is generated a report about the system's communicability.

SIM can be applied technically or scientifically [12]. The technical application of SIM focuses on the quality of the system and identifies potential communicative breakdowns in the system. The scientific application, on the other hand, focuses on inspecting the system to investigate a research question. In this paper, we have performed a scientific application of SIM to identify the types of signs present in the game Gems of War and understand how games updates impact the players' user experience.

3.1.1 Preparation and Execution

SIM was used to investigate the following research question: "What are the types of signs present in a game of the genre Puzzle/RPG and how they impact the players user experience?". We analyzed all main screens and interactions that the game provides to users, identifying the types of signs and the function of each sign in the gameplay. To guide the inspection, the following scenario was defined:

"John is a student who always liked computer games, video games and mobile games. A few months ago, John found the game Gems of War. He installed it on his smartphone and computer. The young man began to play it frequently. However, after a while he had to format his computer and change his phone. As John had many things to do, he forgot to reinstall the game. When he decided to play Gems of War again, John realized that the game had been updated. Several screens were changed and features added. He accessed the game website and found the update notes about the As required by SIM, after each step analyzing one type of signs – metalinguistic, static and dynamic – we reconstructed the designers' meta-message identifying who the designer expects the players to be, what they want to do and how to play. We next present some highlights to illustrate the application of the method.

The game's web page displays metalinguistic signs related to the platform and game genre, as well as information on how to play it. On the screens of the game, the metalinguistic signs are expressed by warnings or tips to the players, and also, information on the use of certain elements. Figure 1 shows an example of a metalinguistic sign. This sign indicates that designers understand that users would like a game that combines puzzle and RPG genres, and also that they probably know the game Puzzle Quest.

Gems of War is the latest Puzzle/RPG from the original creators of Puzzle Quest.

Figure 1: Example of a metalinguistic sign. Source: Game website: http://gemsofwar.com/. Accessed in 02/23/2016.

Through the static signs it is possible to infer the resources available to the player and how the player can interact with the game. The game has several features of the RPG style, such as the existence of a map and scattered kingdoms, which indicate that the player can win and play in different kingdoms; possibly, the player will have a different gaming experience in each kingdom. Furthermore, it is possible to play with other players, customize the player character, gather coins and other resources. Related to the puzzle, the game has an 8x8 size board with colored pieces, which refers to a puzzle style "Match 3". Players should combine three or more pieces of the same type. A game board status is shown in Figure 2. We can see the existence of two players and puzzle game works as a battle between them.



Figure 2: Example of a static sign. Source: Screenshot of the game Gems of War, patch 1.0.7.

The game engine is perceived with greater accuracy through dynamic signs. With these signs, it is possible to verify the existence of game features observed during the analysis of static signs. We can inspect the players' interaction by various visual effects that indicate, for example, the conquest of a new kingdom or a victory. A player can match 3, 4 or 5 pieces of the same color. In Figure 3, observe that combining four pieces, the game produces an animation of destruction of pieces. Then, the player gets an extra move and coins.

The designers' meta-message does not have any inconsistencies and is well organized. The metalinguistic signs are mostly con-



Figure 3: Example of a dynamic sign. Source: Screenshot of the game Gems of War, patch 1.0.7.

centrated on the game site than in the game's interface. Static and dynamic signs are related to each other, which contributes to a more complete presentation of the elements and actions of the game. The main interaction style used is direct manipulation. This allows the player to explore the resources and learn more about what the game offers.

The gameplay is simple. There are different ways a player can interact with the game environment: a player can enter into kingdoms, buy items in the game store, set up and adjust a team battle and communicate with other players. In general, the set of available actions is small. There are not many possibilities to interact with the scenario and modify it, in other words to influence the games context. Nevertheless, the game has no inconsistency or disruptions that hinder the player to continue the game. The controls in the interface are clear and customizable. Also, players can customize the volume and size of the game screen according to their needs.

In addition, a player can easily obtain information about the game on the online forum and available tutorials. Some visual representations may not be easily understood by beginners. Overall, the layout and menus are intuitive and organized, but some functions are camouflaged. The story is a motivational element, meaning that the player will want to know more; however, the combination of stories and relationship among various kingdoms do not seem to create a cohesive plot. The soundtrack is repetitive and possibly unattractive to players, but players can turn it off. Finally, the game is rich in characters, it has clear objectives, adjustable difficulty levels and a rewards system.

3.2 Coding

Coding is a qualitative method used to index and categorize text. Thus, it is possible to establish a structure of themes. Coding means recognizing and identifying different types of topics existing in a text [29]. That is, similarities of contexts, differences in attitudes, frequencies, sequences, thoughts and patterns.

In the codification process concepts or codes are identified. A code gives name to a phenomenon of interest to the researcher: an event, object or action [7]. The codification process can be divided into three phases: open coding, axial and selective [7]. In this work, open coding was performed. Open coding involves breaking down, analyzing, comparing, conceptualizing and categorizing data. In the early stages of open coding, a researcher explores the data and details what is relevant by intensive reading of texts. The analysis of the text does not consider any predefined categories, but rather the categories emerge from the discourse being analyzed.

The coding of the online forum is useful in the sense that this game has an active community of players. The forum is divided into subjects and players expose their impressions and requests for features. Nonetheless, it is easy to filter posts by topics and themes. The results of the coding of the posts collected from the discussion forum were used for the triangulation described in Section 6.

3.2.1 Preparation and Execution

Topics related to the update 1.0.7 of Gems of War and topics about the gaming experience on computer and mobile phone versions were coded using open coding. To do so, the steps executed were:

Step 1: Search the posts on the online community forum for all topics regarding 1.0.7 upgrades. In these topics, there are comments from players and discussions raised. Figure 4 illustrates topics related to update 1.0.7. Within each topic there are a number of replies to the topic. Figure 5 illustrates the body of a topic. A topic contains information about how many replies, how many views and how many files are shared in this environment.

Step 2: Copy all the answers present in the Gems of War forum topics (topics about the 1.0.7 update) to a text file in order to support the analysis process. These topics were found by entering "1.0.7" in the search tab for the forum topics as shown in Figure 4. The resulting file is composed of 50 topics, and each topic had a varied number of comments within it. All the participants discourse (in total 477 responses) in this file was coded. Codes and categories emerged from the analysis of these speeches. Although the forum is public, its participants are not identified. The coding process was done in November and December of 2015.

Step 3: Analyze the responses and generate the codes. To do so, we considered: What kind of comments are made? What is the impact of these reviews? What are the reasons for these comments? What are the strategies used? What types of issues are most widely discussed in relation to the game update? Some of these codes are described in Section 5.



Figure 4: Some topics related to the update 1.0.7 of the game Gems of War ordered by relevance. This functionality is present in the forum itself. Source: Forum screenshot: http://gemsofwar.com/. Accessed on December 20th, 2015.

What do you think about 1.0.7? ;) Gameplay Chat (PCMeblie)						
	The massive increase of speed is extremely annoying. (I hope, that it is just a bug/issue)					
	Regards					
	created last reply 82 960 48 26 2					
	Frequent Posters	j ^{a.}				
	There are 63 replies with an estimated read time of 16 minutes Summarize This Topic					

Figure 5: Example of forum thread about the update 1.0.7. In this topic there are 83 answers. These 83 answers are data to analyze and code. Adaptation of an image of the game forum: http://gemsofwar.com/. Accessed on December 20th, 2015.

Step 4: The categories generated from the codes were used to try and answer questions such as: What kind of problems did users indicate the most? Which issues addressed in the forum topics are related to which of the classes of signs identified by the SIM analysis? How can updates impact players' experience?

4 SIM RESULTS

The signs collected during the application of SIM for the desktop and smartphone versions of the Gems of War were analyzed and classified according to the recurrent features in the game and based on the designers' meta-message. We generated eleven classes of signs related to the elements in the game Gems of War.

<u>Class 1: Items and Skills</u> – The presence of items and skills is common in RPG games. In Gems of War, the weapons used by heroes are represented by cards. Weapons and troops have skills that contribute to the teams ability to win battles. It is possible to buy weapons, armor and other items as well. This is expressed by the existence of gold coins and other signs that represent money (e.g. diamonds).

<u>Class 2: Communication</u> – RPG games usually have a main character and mentor characters, and conversation is a widely used resource. Many times, the presence of dialogs insert elements of humor to the game. It contributes to a better understanding of the character and story, and also gives the player the feeling of game control. In Gems of War, communication elements are presented in the form of dialogs, tips and warnings about what to do and how to take action. There is crucial information for understanding the motivations of the character and function of the items or skills in the speeches of the characters and texts of the game cards.

<u>Class 3: Story</u> – The story in a game is created to attract the attention of the player. In the case of Gems of War, the story reflects what is the proposal within the game: win battles, conquer kingdoms and new troops. The player can navigate through a map and meet kingdoms with different storylines, missions and unique challenges. Also, there are non-playable characters (NPC's) that serve as an aid to achieve goals and continuation of the game's story, interacting alongside the player-character or against it. <u>Class 4: Enigmas</u> – Gems of War has hidden missions, which can be accessed by players in higher levels of the game. Enigmas in RPG games serve as a way to keep players interested in the game. They can also be perceived as a reward for veteran players, as they provide new and different challenges to be faced.

<u>Class 5: Interaction Mechanisms</u> – RPGs have a rich mechanism that allows the player to interact with other players and items, and also to change levels within the game. Gems of War presents two modes of interaction with other players: PvP (Player versus Player), that allows players to battle other online players; Guilds ⁴, in which groups of players interact and achieve awards and several bonuses for the group. The Puzzle in Gems of War is of the style "Match-3", that requires the player to combine three or more pieces of the same type. Players interact with a board filled with pieces of different types, and when they combine 3 of the same type they receive points and/or bonuses. That way, a player can load troops to attack the enemy.

<u>Class 6: Evolution of character</u> – The player is exposed to different difficulty levels. There is the possibility of players evolving their characters and entering battles against others by playing challenges or buying armors, items and weapons. It is also possible to evolve troops with particular objects of the game (souls). This class is represented by signs of characters status, and signs that indicate level or experience.

<u>Class 7: Continuity</u> – One of the interests of game designers is to make the players play the game for a long period of time, keeping players loyal to the game. Therefore, achievements and progress in the game are kept even if the player is not active. In Gems of War, kingdoms and coins that the player has are kept; however, a battle cannot be interrupted and continued afterwards. This class is represented by signs that offer the option to finish/save a round and it involves signs of other classes presented, such as: Communication signs, signs of Items and Skills or signs of Evolution of character.

<u>Class 8: Bonus and Rewards</u> – A feature in both games, Puzzles and RPG, is the bonus. Every time the player wins a battle he/she gets a reward. A common strategy in games for smartphones is rewarding players daily, encouraging them to play every day and to continue advancing in the game. This class is represented by various signs in the game: coins, diamonds, keys, maps and other signs used as bonuses.

<u>Class 9: Visual Effects</u> – Visual effects features (more or less elaborated) are present in games of all kinds. In Puzzle games, the visual effects are often simpler. In RPG games, the effects are better elaborated, although this feature depends on several other factors. The visual effects help to attract the players' attention to certain aspects of the game. In Puzzles match-3, it is quite common to use primary colors (blue, green and red), so as not to present a full board of mixed colors and tire the player. On the other hand, in RPG games there is a tendency to use more dark and gloomy colors to represent worlds of war or fantastic creatures, although there are many exceptions. Gems of War merges these two forms.

<u>Class 10: Layout</u> – RPG games have different elements, commonly grouped by type and presented to users by buttons arranged on the game screen. This presents players with an organized view of the possible actions or tasks at a given moment. In Puzzle games there are fewer elements and options on the screen. They are commonly presented in the game board, in the score of the player and other specific elements. In the case of Gems of War, as the puzzle is a battle between two players they are represented as set of cards on one side of the board are the player's cards, and on the opposite side, the enemy's cards.

<u>Class 11: Mini Game</u> – The goal of mini games is to entertain players and run in parallel to the main game. The idea is to prevent the player from getting tired of always performing the same

⁴The term "guild" refers to a group of players who help each other to achieve rewards and gain new items in Gems of War.

actions. It provides one more way to keep players always active. Mini games can have their own particular signs, but they also include signs that integrate them to the main game. In Gems of War, the mini games contribute to the evolution of the player in the main game. For example, the "Arena" of the Gems of War is a mini game that shares the same signs found in common battles (board with pieces, cards representing the player's team, radio buttons and others), but players will use it to improve their character, to earn items for battles against other players or to conquer kingdoms (goals that are part of the main game).

5 CODING RESULTS

In the analysis of the forum, 477 comments from different players were coded. In total, we generated 97 codes, combined into 15 different categories. Similar codes or codes with the similar purposes were grouped in the same category. For instance, the code "Search Facility" was associate to references made by players to aspects of the search engine, as illustrated by the following comment made by a player:

Search Facility – "The banner/team updates are great. But alphabetized kingdom names would be much more helpful than numbers, and would not make things any more difficult."

Categories were generated from the codes to represent the types of updates that users were referring to. They were generated by combining the codes that emerged in the open coding step. Next we present the resulting categories. For each one of them, we briefly explain what it refers to and present one of the codes associated to it, and a player's comment that illustrates the code. The categories are shown in a descending order of number of comments associated to it. That is, categories which have generated greater impact appear first.

Category 1: Updates on artificial intelligence and game logic – This category consists of codes which indicate players' reflections about the game logic and the systems learning ability in a specific battle.

Example code: Dissatisfaction with artificial intelligence

" It's not about the battle time-which isn't really significantly better anyway, as many other things like AI response still take the same time as before.".

"Honestly, I'm disappointed that the much hyped difficulty settings are just buffs to the other team. I was really hoping that they would be a smarter AI that would make choices instead of just following a formula for moves."

Category 2: Updates on speed and combination of pieces – This category is one of the most commented by players, especially regarding the fact that designers have modified the speed to match pieces in the game.

Example code: Speed - "The massive increase of speed is extremely annoying.".

Category 3: Updates on bonus – This category lists codes regarding bonus money or bonus items for the troops and kingdoms; rewards (cash and items that a player wins daily) and troops bonus.

Example code: Bonus - "The bonuses also help to make some less obvious teams more viable. The +10 life to my goblin team certainly patched a rather large hole in their functionality.".

Example code: Status bonuses for some combinations of troops - "This update bonus killed our top 200 guild, I can't imagine what it did to even lower ranked guilds. We need to switch between old and new mode!! be democratic devs!!"

Example code: Bonus of mastery⁵ - "The colors on the banners

⁵The gems in the game are pieces inside the board. By combining gems, the monsters are loaded to attack the enemy according to the color they need. "Mana surge" is a game engine that doubles the mana (or energy) that you get when you combine gems. The chance of " Mana surge" is called

indicate the bonus they give. You don't need to remember anything. If it has only one color, it gives a bonus of +2 per matches for that color. If it has two colors, it gives a +1 bonus to each color."

Category 4: Updates on types of monsters and troops – This category is another category that generated a large impact on players experience. In previous versions, not all monsters or troops had types. In 1.0.7 update all troops have types, and some monsters had their types modified.

Example code: Types of troops - "How is Bone Dragon a dragon when he could also be undead at the same time? And why is the Templar a knight, when the Paladin from the very same kingdom is divine? How is the Goblin King not a giant? I guess they should rework the troop types anyway.".

"Speaking of odd troop types, how exactly is Orion the Centaur a Fey and not Wildfolk? Also, if Goblin + Rocket = Construct, then shouldn't Goblin + Boar = Beast?"

Category 5: Updates on bugs – The codes in this category contrast game problems or errors. For example, cards that do not appear in images, card combinations that are very difficult to fight or synchronization problems and even outages in the middle of a match. In addition, explanations of what has been done or is being done to fix it.

Example code: Game errors - "The most recent one I can think of is if Kerberos was entangled and he consumed a target, he got the health buffs but not the attack buffs. I'm assuming they have code to get this bug out of everything come 1.0.7.".

Example code: No functional changes in troops - "Some troops became much too strong, like Webspinner, others took the troops from borderline playable to too far under the power curve.".

Category 6: Updates on search filters – The codes forming this category indicate players' satisfaction in most cases. Players can sort and search troops by name, level, rarity or skills with the search filters. Players can also find a monster/troop by color, kingdom or by its name.

Example code: Search filters - "I think the search box works exceedingly well actually. Want to make a team that does stuff with skulls? Type "skull" In the bar... Etc. I love it!".

Category 7: Updates on weapons, heroes and armors – These three characteristics were put together, since the heroes of Gems of War use weapons and armors. There were not many comments associated to this category. One of the reasons for this could be the fact that weapons and heroes did not receive updates on version 1.0.7, during our period of analysis. Armors have received updates only for Xbox One and Playstation 4 versions. Therefore, this may justify the few comments in the forum, since the selected topics are from computer and smartphone players.

Example code: Items - "Many weapons and troop abilities don't scale in balance with the new bonuses.".

Category 8: Updates on the layout of the elements – Changes related to the buttons that disappeared or buttons that switched places on the main screen. It also includes suggestions from players about the elements on the screen and possible explanations about screen changes.

Example code: Organization of strike team - "I don't think this is working as intended. It looks like the only place it saves your team is when you're on the page where your about to hit the button to attack someone. Very annoying for period like me who want to make a bunch of teams at once.".

Category 9: Updates on difficulty level – Most of the comments referred to changes in the level of difficulty of the battles. Players

can choose a difficulty level to play, but they do not need to activate them if they don't want to. However, in Gems of War, the higher the difficulty levels, the greater the experience, gold, and rewards obtained.

Example code: Difficulty levels

"Add in the fact that there is now difficulty levels, and my concerns about "not challenging enough" are addressed – well done!"

"The only way they generally make it challenging is to increase the health/damage/stats of the enemies or increase the number of enemies. The only game I had a hard time beating doing everything in my power to do so was Dark Souls."

"My team got squashed in seconds using Warlord IV. But Warlord I is quite fun!"

Category 10: Updates for advanced players – Some of the codes generated represent events on updates which favored, excluded or have been felt by players with advanced levels in Gems of War.

Example code: Advanced players - "The problem is that the battle became quite repetitive all the way. I guess other high level players may feel the same way. Hopefully, the new patch 1.07 will give me a new horizon.".

Category 11: Updates on card design and troops design – This category is comprised by codes that describe what users liked and what users did not like in the design of game cards. The cards have drawings which represent troops and weapons inside the game.

Example code: Elements design - "Card art was better before; Card text is hard to read on a mobile phone.".

Category 12: Updates regarding the communication options – It is formed by codes that depict what the players said about teams' and guilds' chats. It is also included aspects raised about the news tab, events tab and general information tab.

Example code: Guild chat - "As it is, the guild chat log does not really survive too long, especially in a chat guild, and many of our discussed team formations get pushed out of discussion frame within matter of days.".

<u>Category 13: Updates on mini games</u> – Many codes talk about the mini games in Gems of War. The game has two mini games. The Battle Arena and another kind of puzzle game called "Treasure Hunter". Both differ from the normal game mode.

Example code: Mini games - "I have three troops in Arena which are level one. After the battles I can buy them for a certain amount of gems, meaning that they will be level 10 after the Arena. Is that worthwhile, or is it exactly the same amount of gems as when I buy souls for gems and level them up manually?"

Category 14: Updates on animations and effects – Animations and effects have changed. The codes comprising this category are related to changes in the movement of pieces of monsters and cards on the screen. Note that Category 2 (updates on speed and combination of pieces) is related to this category. However, Category 2 was established exclusively for the speed of pieces animations, since the players have focused on this aspect, whereas this category includes any other animation present in the game (the animation of draging a key and a treasure chest opens, the animation of the trophy that appears after a victory and others).

Example code: Combat Animation "The combat animation is terrible. It takes all the pleasure out of this game. This damn hustle and bustle during the battle gives me headache and high blood pressure. I want my gems of war back.".

<u>Category 15: Updates on story – Codes that refer to the story of the characters and kingdoms of the game.</u> The player's speech below indicates his/her satisfaction with the update in the story and, therefore, illustrates an update that was well received.

Example code: Kingdoms story - "I just personally enjoyed the stories and would love to replay some of the more epic moments again (Khaziel, anyone?).".

mastery in Gems of War. A player improves a mastery for a particular color when he or she increases the character's level. The bonus coming from a kingdom is applied at the time that occurs a "Mana surge". For example, a player matches three green pieces. He or she earns 6 green mana (double of mana) + the kingdom bonus for the first creature that uses the color green on his/her team (from top to bottom).

Besides analyzing the topics commented by players, we also wanted to have an indicator of the acceptability of the updates by the users. Thus, we also classified each of the 477 comments regarding how they expressed players' acceptability, labeling each one as having a bad, neutral or good acceptability. Comments were labeled as neutral when players did not express whether they liked or disliked the changes, and usually represented explanations about some game feature in response to another player's question. When comments presented negative aspects of the updates, they were labeled as bad, and if they expressed satisfaction, they were then labeled as good. Figure 6 shows the distribution of comments regarding players acceptability. Notice that almost half of the comments (48%) are neutral, about 35.4% are bad, and only the 16.6% left is positive.



Figure 6: Representation of players' acceptance level regarding update 1.0.7 of Gems of War, based on 477 replies coded.

In the next section we contrast and discuss the results obtained with SIM and the analysis of the forum.

6 TRIANGULATION AND DISCUSSION

The application of a single qualitative method can not generate adequate evidence for a phenomenon [10]. Thus, the use of several methods or the comparison of results may provide a deeper understanding. Triangulation allows the comparison of the results of two or more methods and increases the degree of reliability of the results. In this work, two methods have been applied in different sources to establish different perspectives about the same context. First, we performed the analysis of the Gems of Wars metacommunication through the game interface and, then, we generated categories based on discussions related to game's update. As a result, when we contrast the results we can see which classes of sign were impacted by each update category. In other words, we can see what aspects of the Gems of Wars meta-communication was affected by the updates.

In Table 1 we show for each update category, which classes of sign were involved in the update and, thus, affected by it. We can notice in Table 1 that while some update categories have involved only a single class of sign, others involved a number of them. For instance, updates regarding communication options, only affects the Communication signs. On the other hand, updates on artificial intelligence and game logic impact the classes of signs: Enigma, Interaction mechanisms and Continuity.

Та	ble	1:	Rel	lation	between	SIM	results	and	Coding	result	S
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Categories	Classes of Signs			
Updates on artificial intelligence and game logic	Enigmas, Interaction Mechanisms, Continuity			
Updates on speed and combination of pieces	Interaction Mechanisms, Visual Effects,			
Updates on bonus	Items and skills, Bonus and Rewards,			
Updates on types of monsters and troops	Interaction Mechanisms, Evolution of Character			
Updates on bugs	Evolution of Character			
Updates on search filters	Interaction Mechanisms			
Updates on weapons, heroes	Items and skills,			
and armors	Bonus and Rewards,			
Updates on layout of the elements	Layout			
Updates on difficulty level	Interaction Mechanisms			
Updates for advanced players	Interaction Mechanisms			
Updates on card design and troops design	Visual Effects			
Updates regarding the communication options	Communication			
Updates on mini games	Mini Game			
Updates on animations and effects	Visual Effects			
Updates on story	Story			

Analyzing Table 1 we can see that the 1.0.7 update of Gems of Wars affected all the classes of signs that are relevant in the game. A review that changes all the classes of signs, even if slightly can be perceived as a review of the designers' view as a whole, that is, of the whole meta-communication. These changes require players to review their understanding of the meta-message and the meanings. As was noticed in our acceptability analysis, almost half of the comments are explanations, in other words, players helping each other understand these change and their impact on the game (i.e. the designers' meta-message).

Next, we present for each update category what classes of signs it involves, what players thought were the most relevant aspects of the update, and the number of positive, negative and neutral comments. Once again we present the categories in order of their impact, i.e. from the most commented ones to the least commented categories.

Category 1: Updates on artificial intelligence and game logic

Comments: Good: 15; Bad: 36; Neutral: 79; Total: 130;

Changes in the this category affect the classes of signs enigmas, interaction mechanisms and continuity. The changes affect how to access missions or end them (class: enigmas), terminating a mission and being able to go back to a kingdom or to be able to maintain or save executed actions (class: continuity), as well as how a player can battle other players or interact with a board game (class: interaction mechanisms).

Analyzing players comments, most of them were neutral, that is explanations about how the game works after the review or suggestions of new features or improvements. Players expressed their approval of the changes regarding new manipulation tools, the ability to skip battles before starting them and improvements in the difficulty levels of these battles. Nonetheless there were more comments of dissatisfaction with the logic of the game than of approval. Players did not like the changes involving the enemy-computer behavior, when the computer assumed the role of a enemy. Other problems discussed were the new selection of teams, that requires players to select the team each time they start a battle, even if players has not made any changes since their last fight; and the allocation of PvP (Player versus Player) battles, in which players of different levels are put to fight.

Category 2: Updates on speed and combination of pieces

Comments: Good: 22; Bad: 19; Neutral: 34; Total: 75;

This category involves signs that represent visual effects of actions within the game and interaction mechanisms. The presence of visual effects is an important aspect of fun in a game. Players of Gems of War would like to decide some aspects such as the speed at which the pieces move. Most neutral reviews suggest some kind of option to set the speed at which the board pieces should be combined. While some players thought that increase in speed in the new version made the game more dynamic, others thought that it was stressful and too much of a change.

This category is related to the animation category - which also is generated by speed and combination of pieces. However, since there were many comments specific about the speed and piece combination we separated this category from the animation category.

Category 3: Updates on bonus

Comments: Good: 6; Bad: 18; Neutral: 44; Total: 68;

Updates on bonus involve changes in the classes of signs items and skills and bonus and rewards. In the 1.0.7 review, there were new opportunities to get bonuses. Players liked the new combinations of troops and kingdoms, but complained about the lack of consistency in the status of some of the creatures after applying specific bonuses. The new bonuses benefited advanced players and those with evolved kingdoms, which made battles against them very difficult, which was perceived as the game becoming unfair for beginners. Neutral comments focused mainly on suggestions for changes to these excessive gains. Some players even asked for a new quick update to fix these aspects specifically.

Category 4: Updates on types of monsters and troops

Comments: Good: 7; Bad: 17; Neutral: 17; Total: 41;

This category involves the signs of the class character evolution and interaction mechanisms. Although some players liked the new types of troops added to the game, many players complained about the difficulty of winning with certain monsters and unfair skills. Neutral comments were mainly explanations and tips to those that expressed dissatisfaction or doubt with a new monster/troop.

Category 5: Updates on bugs

Comments: Good: 1; Bad: 31; Neutral: 9; Total: 41;

The bugs fixed in the 1.0.7 review of the game were more expressive in signs of evolution of character. Also, users commented on the identification of new bugs and the difficulty to understand the designer's message.

Only one comment was identified as positive. A player thanked designers for solving a problem. Negative comments are the majority in this category, such as low performance of the game on older devices and game crashes or bugs in some features. The neutral comments are general explanations to other players about the causes of bugs found and tips on how to deal with them.

Category 6: Updates on search filters

Comments: Good: 3; Bad: 3; Neutral: 26; Total: 32;

This category generates changes to interaction mechanisms related to searching and filtering. The facility to conduct searches in the new version and filter results in different ways was appreciated by users. However, players still complained about the lack of a filter to search by types of troops in this game update. In fact this filter was added in this update, but it was not noticed by many players. This is an indication that some players missed part of the changes in the meta-message generated by designers. Neutral comments presented suggestions of other functions for future versions of the game.

Category 7: Updates on weapons, heroes and armors

Comments: Good: 0; Bad: 1; Neutral: 27; Total: 28;

Updates in this category referred to items and skills and bonus and rewards. Most of the comments reported weapons and abilities not being balanced with the teams' bonuses. Players also reported was the fact that there were different armors for the Xbox One and PlayStation 4 versions that were not available in the computer and smartphone versions. That is, when the game platform changes, some features are different, even though the game is the same.

Category 8: Updates on the layout of the elements

Comments: Good: 9; Bad: 5; Neutral: 9; Total: 23;

The improvement in the presentation of the rewards that a hero character receives generated positive reviews. Other positive comments were about the layout of the building battle teams screen, the hero display screen and the kingdoms information screen. On the other hand, the negative comments complained about too much information on the same screen, lack of clarity on the screens and information architecture. Players like the variety of options available in the game which allows them a greater control over some game aspects. Nonetheless, they did not like when these control screens changed a lot what they were used to.

Category 9: Updates on difficulty level

Comments: Good: 4; Bad: 7; Neutral: 12; Total: 23;

The possibility of choosing the game's difficulty level is directly related to the signs of interaction mechanisms. Players like to have control over the difficulty level of the game. While in an easier level they can have more fun with less pressure, in a more difficult level, the challenges and rewards are greater. However, the highest level of difficulty has not been approved by the players and has been considered impossible to win. Another point that generated comments was the amount of bonuses that are earned when playing at different levels. Players considered that battles in higher levels were not being appropriately rewarded. There were neutral comments about what players thought of each level and explanations about bonuses in each level.

Category 10: Updates for advanced players

Comments: Good: 4; Bad: 8; Neutral: 5; Total: 17;

Advanced level players are those who have played and, thus, have seen a lot of what the game can offer. These players tended to express their approval of the new features or improvements in battle modes. Nonetheless, some of these players felt that the game updates were not enough to keep their interest in the game, since they considered they already knew everything there was to know in the game. Other comments expressed that levels of difficulty created for advanced level players were too difficult even for those players. The neutral comments were mainly players' suggestions of functions they believed would make the game more entertaining and challenging.

Category 11: Updates on card design and troops design

Comments: Good: 2; Bad: 11; Neutral: 3 Total: 16;

Updates in this category refer to the class of signs of visual effects, and are related to game design and its composition (colors, layout, text and images). The change in the cards' design caused disagreements in the comments - while a few players enjoyed it, others did not. However, the consensus among the comments was that the cards contained more information, but the font size in some of them is too small, making it difficult to read. Some players also reported having difficulties in understanding the information on the cards and presented their suggestions on how to improve them.

Category 12: Updates regarding the communication options

Comments: Good: 3; Bad: 6; Neutral: 5; Total: 14;

Updates on communication options involve the communication signs. The positive comments were about the changes in the guild chat. The negative comments were about the lack of warnings to players about the new changes. Some players complained that they were caught by surprise, and that they did not appreciate it. The remaining reviews were suggestions of new functionalities for the guild chats. Category 13: Updates on mini games

Comments: Good: 3; Bad: 3; Neutral: 5; Total: 11;

Mini games are considered good places for beginners to get more gold and cards according to players' comments. Some players reported problems in the monsters raffle that would be used to battle in the Arena (one of the Gems of War mini games). Other players only responded to doubts of other forum participants.

Category 14: Updates on animations and effects

Comments: Good: 0; Bad: 3; Neutral: 4; Total: 7;

This category includes elements associated to animations and effects in the game, such as movement cards and switching screens. Mainly players complained about the animation being poor at some moments. For example, when players are looking for an enemy to battle, they did not like the appearance of the victory message and the card motion to illustrate an attack. In neutral comments, players suggested some changes to reduce animations they considered unnecessary or too long.

Category 15: Updates on story

Comments: Good: 1; Bad: 1; Neutral: 0; Total: 2;

As the game is consolidated and well accepted by users, the story plot and the way it appears did not have any significant changes. There were only two comments from players in this category. One comment approved the option to be able to see and play kingdom stories more than once. The other participant expressed his/her view that kingdoms were meaningless. Although designers changed many aspects of their meta-message, they did not make any significant change on the story plot of the game, which is a main aspect of their meta-communication to players.

7 FINAL REMARKS

Games are often updated generating new patches or versions. Often these updates can take place in short intervals of time, or change significantly aspects of the game. Although these updates impact the user experience, we have not found any works that focus on this impact. Our work is a first step in the direction of better understanding how updates can impact players' experience.

In this paper we have presented an in-depth analysis of the effects of the 1.0.7 update of Gems of War on its players. To do so, we have used the Semiotic Inspection Method to analyze the main communicative signs being used by the games' designers, analyzed players' comments about the updates and identified what were the main aspects updated and how they were received by the players.

Through the application of SIM we have identified 11 classes of signs used in Gems of Wars. Since these classes refer to features of Puzzle/RPG games, we would expect that they might also represent signs of these types of games. However, analysis of other Puzzle/RPG games would be necessary to consolidate them for this type of game, or identify whether any of the classes are specific to Gems of Wars.

In the game's online forum, comments related to the updates (477) were collected and coded through open coding. As a result, we have generated 15 categories based on descriptive codes of the participants' comments. By triangulating the results of the two analyses we were able to discuss the main aspects that impacted the users, and how it was perceived by players (positively, negatively or neutral - which usually meant the need for explanation).

Our analysis showed that Gems of War 1.0.7 update reviewed most of the designers meta-message to users. However, the changes in game logic, speed and combination of pieces and bonuses were the ones that generated the larger impact on users and were the topic of over half the comments analyzed. The update in general affected mainly Interaction Mechanism signs, which is an important part of the designers meta-communication conveying how to interact with the game.

This work contributes to the research on impact of updates on user experience by presenting a methodology that can not only indicate the main points changed in a specific update, but also how users reacted to them. Being a qualitative study, we do not claim that the classes of signs and categories of updates apply to other games or updates, respectively. Nonetheless, their identification can be a starting point in a similar analysis. Furthermore, future studies could aim at investigating their applicability in other gaming contexts.

Also, our results indicate that there are many factors that game designers should consider when deciding the frequency with which to update a game. Players participation in the game forum could be taken as a sign of their interest to support the updating process and the evolution of the game as a whole. Almost half of the comments were classified as neutral, which consisted of explanations about the changes or suggestions of how to improve the game or solve perceived problems. Also positive and negative feedback from players can be useful to game designers in identifying new evolving directions for the game.

The next steps in our research involve applying this methodology to other Puzzle/RPG games in order to collect further data that could allow us to consolidate classes of signs and update categories identified in this paper. Some of the comments referred to different experiences users had of the same game in different platforms. Thus, it would be interesting to investigate issues related to crossplatform gaming experience.

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REFERENCES

- L. Aarhus, K. Holmqvist, and M. Kirkengen. Generalized two-tier relevance filtering of computer game update events. In *Proceedings* of the 1st workshop on Network and system support for games, pages 10–13, 2002.
- [2] V. S. Andrade. Avaliação da comunicabilidade em jogos de dispositivos móveis: um estudo da relevância dos signos em jogos tower defense. Projetos e Dissertações em Sistemas de Informação e Gestão do Conhecimento. Universidade FUMEC., 2(2), 2013.
- [3] R. Bernhaupt, M. Eckschlager, and M. Tscheligi. Methods for evaluating games: How to measure usability and user experience in games? In Proceedings of the International Conference on Advances in Computer Entertainment Technology, pages 309–310, 2007.
- [4] R. Bernhaupt, W. Ijsselsteijn, F. F. Mueller, M. Tscheligi, and D. Wixon. Evaluating user experiences in games. In *CHI '08 Extended Abstracts on Human Factors in Computing Systems*, pages 3905–3908, 2008.
- [5] A. Brandao, J. Brancher, D. Tortelli, D. Bandeira, L. Meneguini, M. Aguiar, N. Mizukawa, and C. Padilha. Planejamento gráfico de interface para um jogo rpg educacional para computadores. In Proceedings of V Brazilian Symposium of Games and Digital Entertainment, 2006.
- [6] C. T. K. D. O. Buede and M. Silveira. Avaliando a usabilidade de um jogo através de sua jogabilidade, interface e mecânica. In *Proceed*ings of VI Brazilian Symposium of Games and Digital Entertainment, pages 187–196, 2007.
- [7] J. Corbin and A. Strauss. Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory. SAGE Publications, 2014.
- [8] L. P. D. Corrêa, F. R. S. Coutinho, R. O. Prates, and L. Chaimowicz. Uso do mis para avaliar signos sonoros: Quando um problema de comunicabilidade se torna um problema de acessibilidade. In *Proceedings of the 11th Brazilian Symposium on Human Factors in Computing Systems*, pages 47–56, 2012.
- [9] F. Coutinho, R. Prates, and L. Chaimowicz. An analysis of information conveyed through audio in an fps game and its impact on deaf players experience. In *Proceedings of X Brazilian Symposium* of Games and Digital Entertainment, pages 53–62, 2011.

- [10] J. Creswell. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. SAGE Publications, 2009.
- [11] C. S. De Souza. *The semiotic engineering of human-computer interaction*. MIT press, 2005.
- [12] C. S. de Souza, C. F. Leitão, R. O. Prates, S. A. Bim, and E. J. da Silva. Can inspection methods generate valid new knowledge in hci? the case of semiotic inspection. *International Journal of Human-Computer Studies*, 68(1):22–40, 2010.
- [13] C. S. de Souza, C. F. Leitão, R. O. Prates, and E. J. da Silva. The semiotic inspection method. In *Proceedings of VII Brazilian symposium on Human factors in computing systems*, pages 148–157, 2006.
- [14] H. Desurvire, M. Caplan, and J. A. Toth. Using heuristics to evaluate the playability of games. In CHI '04 Extended Abstracts on Human Factors in Computing Systems, pages 1509–1512, 2004.
- [15] S. Deterding, M. Sicart, L. Nacke, K. O'Hara, and D. Dixon. Gamification. using game-design elements in non-gaming contexts. In CHI '11 Extended Abstracts on Human Factors in Computing Systems, pages 2425–2428, 2011.
- [16] B. J. Gajadhar, Y. A. De Kort, and W. A. Ijsselsteijn. Shared fun is doubled fun: player enjoyment as a function of social setting. In *Fun* and games, pages 106–117. Springer, 2008.
- [17] B. Galiza and C. Rocha. Príncipes da pérsia: experiência e representação em uma visada semitica. In *Proceedings of VIII Brazilian Symposium of Games and Digital Entertainment*, 2009.
- [18] C. GauthierDickey, D. Zappala, V. Lo, and J. Marr. Low latency and cheat-proof event ordering for peer-to-peer games. In *Proceedings of the 14th international workshop on Network and operating systems support for digital audio and video*, pages 134–139, 2004.
- [19] I. Gurgel, R. L. Arcoverde, E. W. Almeida, N. B. Sultanum, and P. Tedesco. A importância de avaliar a usabilidade dos jogos: A experiência do virtual team. In *Proceedings of V Brazilian Symposium* of Games and Digital Entertainment, 2006.
- [20] T. Iimura, H. Hazeyama, and Y. Kadobayashi. Zoned federation of game servers: a peer-to-peer approach to scalable multi-player online games. In *Proceedings of 3rd ACM SIGCOMM workshop on Network* and system support for games, pages 116–120, 2004.
- [21] W. IJsselsteijn, Y. De Kort, K. Poels, A. Jurgelionis, and F. Bellotti. Characterising and measuring user experiences in digital games. In *International conference on advances in computer entertainment technology*, volume 2, page 27, 2007.
- [22] C. Klimmt, T. Hartmann, and A. Frey. Effectance and control as determinants of video game enjoyment. *Cyberpsychology & behavior*, 10(6):845–848, 2007.
- [23] H. Korhonen and E. M. Koivisto. Playability heuristics for mobile multi-player games. In *Proceedings of the 2nd international conference on Digital interactive media in entertainment and arts*, pages 28–35, 2007.
- [24] F. O. Martinelli and J. A. Valente. A história do jogo vista pelo jogador: um estudo empírico sobre como os jogadores contam histórias. In Proceedings of XIII Brazilian Symposium of Games and Digital Entertainment, pages 347–350, 2014.
- [25] M. E. Moore and J. Novak. Game Development Essentials: Game Industry Career Guide. Delmar Learning, 1st edition, 2009.
- [26] J. Newman. Ports and patches: Digital games as unstable objects. Convergence: The International Journal of Research into New Media Technologies, 18(2):135–142, 2012.
- [27] D. N. Nogueira, F. R. Coutinho, W. A. Junior, R. O. Prates, and L. Chaimowicz. Analyzing the use of sounds in fps games and its impact for hearing impaired users. In *Proceedings of XI Brazilian Symposium of Games and Digital Entertainment*, pages 127–133, 2012.
- [28] R. O. Prates and S. D. J. Barbosa. Introdução à teoria e prática da interação humano computador fundamentada na engenharia semiótica. *Atualizações em informática*, pages 263–326, 2007.
- [29] J. Saldana. *The Coding Manual for Qualitative Researchers*. SAGE Publications, 2012.
- [30] A. K. O. Sato and M. V. Cardoso. Além do gênero: uma possibilidade para a classificação de jogos. In *Proceedings of VII Brazilian* Symposium of Games and Digital Entertainment, pages 54–63, 2008.
- [31] M. Ximenes, L. M. F. Malcher, and A. N. F. Campos. Redesign de jogos clássicos. In Proceedings of VII Brazilian Symposium of Games

and Digital Entertainment, pages 48-53, 2008.

[32] M. Zhu and X. Fang. Developing playability heuristics for computer games from online reviews. In *Design, User Experience, and Usability. Theories, Methods, and Tools for Designing the User Experience*, volume 8517, pages 496–505. Springer International Publishing, 2014.