Applying User Stories as Game Elements and Interactions in a Game of Games Design Proposal

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Abstract—Several game design strategies have been proposed over the years to assist the fast conception and production of digital games. One of them is the Game-of-Games (GoG) initiative, which can be defined as a game developed to guide game developers through the design process of developing a game. This paper presents Gamificália, a GoG proposal that defines a gamified design approach based on game design questions. Each game design answer follows game design tricks in user story formats, which are able to be distributed on a Game Design Canvas (GDC) according proposed game rules to get points and decide the game winner. As a result, for each Gamificália match, a final GDC is produced for a proposed game, making it an interesting GoG solution to provide desired games in a quick and fun way.

Index Terms—game design, unified game canvas, user stories, game of games

I. INTRODUCTION

Several game design strategies have been proposed over the years to assist the fast conception and production of digital games [1]. In fact, Game Design Documents (GDD) [2], Game Design Canvas (GDC) [3], game design models [4], game design features [5], game design tricks [6] and game design questions [7] are some examples of possible strategies that have been commonly used by game professionals during the game development process.

Considering the agile production of software systems, User Stories (US) are the predominant method to capture requirements [8]. They are represented as short pieces of text (templates) that describe an US that captures the essential elements of a requirement: *who* it is for; *what* is expected from the system; and, optionally, *why* it is important [9].

For the agile software development, multiple authors have linked US with goals [10], a common requirement identified in game design methods. Regarding game design strategies, some of them follow a similar US approach to document game requirement characteristics, defining fine-grained game requirements structured in a natural language way. As possible examples, *Player*, *Goal*, *Constraints* and *Prize* templates were used to define game missions for smart cities [11], and *Space*, *Actors*, *Items* and *Challenges* templates were applied to guide a fast conception of quest games [6].

Another interesting initiative to design new games is the Game-of-Games (GoG) proposal, which can be defined as a game developed to guide game developers through the design

process of developing a game [12]. The main idea is to provide a meta-game able to deliver the desired structure of games, working as a student guide for the initial development of serious games prototypes [12].

As an attempt to integrate different types of game design strategies, this paper presents *Gamificália*, a GoG proposal that defines a gamified design process based on game design questions according to game design topics. Each game design answer follows game design tricks in proposed US templates, which are able to be distributed in a game design canvas board, according proposed Gamificália rules to get player points and decide the final game winner. As a result, for each Gamificália match, a final GDC for a proposed game is provided, with a "collection of clear-cut US able to produce more accurate results than a single, larger and more opaque US" [13] of a related game.

II. THEORETICAL FOUNDATION

User Stories (US) are simple sentence in natural language to describe with sufficient detail the content of a feature to implement [14]. The sentence usually contains three descriptive elements of functionality: who, what, and why, being enough to write a sentence with the following structure: As a "who", I want to "what" so that "why" [15]. As a result, an US describes a desired functionality involving role ("As a <role>"), product features ("I want to <goal>") and the benefit provided to the user ("so that <reason>") [16].

US are also traditionally written on note cards, and cards may be annotated with estimates/notes according a proposed template [15]. In this sense, considering the notation for expressing requirements and following requirements modeling approaches with note cards, CRC Cards (Class, Responsibilities, Collaborators) is typically used when object-oriented design and development is preferred [17]. By this technique, team members first write names of critical classes involved in the feature on index cards. Second, the cards are fleshed out with lists of responsibilities for each class and the names of collaborators (i.e., other dependent classes). Third, team members perform a role-playing exercise and assume the role of one or more classes [17].

Another approach to define fine-grained US specifications for the behaviour of a targeting system, in a way that they can be automated as executable specifications of a system, is the Behavior Driven Development (BDD) [18], [19]. It is an "increasingly prevailing agile development approach in recent years, and has gained attentions of both research and practice" [19]. BDD uses the Gherkin language to describe software behaviors [20], providing a specific ubiquitous language that helps stakeholders to define their system tests [19]. It starts with textual descriptions of the requirements using specific keywords that tag the type of sentence (Given, When, Then), indicating how the sentence is going to be treated in the subsequent development phases [20], [21].

Regarding possible templates to represent fine grained US for games, a challenge generator was proposed to define all challenges in a urban mobility game related to improve the sustainable mobility behavior of players [11]. For instance, the template is represented as a tuple: <P, G, C, Pz> : <Player> <Goal> <Constraints> <Prize>, where a challenge example can be like: "Player P, try to double your trips using Public Transport next week to win 100 bonus Green Leaves". This example can be generated from the proposed template in which the Goal G is improve by X% user state variable V in mode Y, the Constraint C is within time interval TI, and the Prize Pz is a quantity Q of game concept GC [11].

Another template able to identify US for board games is proposed by the Quest 3x4 method [6], which consists of making a non-linear reading of a theme and conditioning it to the four aspects of a *Quest* (**Space**), **Actors**), **Itens**> and **Challenges**) and three Design Tricks of each quest aspect to build a board game, such as: *Progression*, *Exploration* and *Combat* for **Space**; *Markers*, *Characters* and *Customizable* for **Actors**; *PowerUps*, *Inventory* and *Status* for **Items**; and *Kill Quest*, *Coop Quest* and *Fedex Quest* for **Challenges** [6].

III. THE GAME PROPOSAL

Gamificália is a game designed for 3-6 players that can be played in 3 main stages. The first stage is the selection of a game theme and a game name that all players must follow during the match to design a final game. The second stage is the competition against the players to write faster than others US responses about questions in design topic cards pulled in "game rounds". The third stage is the player distribution of US game design responses by turns in limited areas of an available GDC board for the game.

As the first stage, some theme tokens [22] are available in the game to be randomly selected by the players, such as *Pets, Horror, Survival, Country, Aliens, Cars*, etc. Next, the players have 5-10 minutes to decide a common game name to be designed for all players during the match.

For the second stage, 15 design topic cards are available in a game deck to be pulled by the players in each "game round". Each design topic card presents an initial game design topic and possible design questions about it, such as:

- Main Characters: Who are the main characters in the game? Are there any villains in the game?;
- Character Actions: Is it possible to play the game with playable characters? Regarding the characters that the

- player does not control, what do they do in the game? Do the characters interact with each other in the game?;
- Conversations/Character Stories: What do the characters talk to each other about? What stories do they tell? What different conversations happen in the game?;
- Character Feelings: How do characters feel when they talk during the game's story? How do they behave during a conversation?;
- Game Scenarios: Where do the characters live? Where is the story told? Where does the game action take place?;
- View of the Characters in the Game: What do the characters observe in the environment where they live during the game? What objects can the characters see during the game?;
- Game Environments: Can characters change environments during the game? Are there different environments in the game?;
- Game Elements: Do the characters interact with the objects and the game environment? What can the characters do with the elements of the game? Are there objects that do something interesting in the game?;
- Game Sounds: What are the sounds that appear in the game environments? Does any character or object make a particular noise?;
- Game Skills: Do characters/objects have different skills in the game? Do character/object skills evolve as the game progresses?;
- Game Control: How does the player control the game?
 Which commands do the characters/objects respond to during the game? How many players control the game?
 Who plays first in the game?
- **Purpose of the Game**: What is the ultimate goal of the game? How do I win/lose the game? What happens when the player wins/loses the game? Is it easy to score/advance in the game? How do the player progress in the game?;
- Rules of the Game: What can the player do/can not do during the game? What are the rules of the game? Are there actions that the character can only do in a certain environment/time/game situation?;
- In-Game Rewards: Are there any points/coins/resources in the game? How do you earn points/coins/resources/special items in the game?; and
- Trade in the Game: How can the points/coins/resources/special items obtained in the game be used?.

These questions are related to distinct game perspectives, which were documented and organized by a simplified game design process [23], that aim to guide the players to write US for the proposed game in each Gamificália "game round".

The number of players responses can be limited by 2-3 "correct" answers per round according pulled design topic. For this game mode, each player's response must be evaluated by the other players in the end of the round to decide if it is a

Space As a <World/Location> It has <Explorations> To provide <Achievements> To provide citizens to be protected

Actor	
As a <token mark="" tag=""> It represents a <character> With <customizations></customizations></character></token>	As a 32x32 sprite of a men It represents a police officer With a uniform and weapons

Item	
As a <pickup element="" powerup=""> It exists as <inventoryitem></inventoryitem></pickup>	As a blue pill It exists as a health item
For <status></status>	For a citizen energy recovery

Interaction	
As a <player actor="" character=""> Given <actions> When <constraints> Then <actions> So that <constraints></constraints></actions></constraints></actions></player>	As a police officer Given press space and release When touching a citizen Then the citizen is pulled So that he goes to the opposite direction

Rule	
As a <player actor="" character=""> It wants to <goal> Where Given <actions> Then <actions> So that <constraints></constraints></actions></actions></goal></player>	As a police officer It wants to move the citizens to a safe place Where Given open houses in the city When a citizen enters a house Then the house is closed and the citizen is safe

Challenge	
As a <player actor="" character=""> In order to <prizes> Given <actions> When <constraints> Then <actions></actions></constraints></actions></prizes></player>	As a police officer It order to protect the citizens against the virus Given the virus spread on the street When it touches a citizen
Then steadills	Then the citizen is contaminated

Fig. 1. US templates for game design responses.

valid US response or not. Similar responses can be accepted at this point, suggesting that the players must hide their answers until the round ends. Another approach is to represent game rounds as a time event, limited by 2-3 min for example, to pull out a new design topic card. In this mode, there is no limited number of player responses, which will be evaluated when they are distributed on the game board during the next stage of the game.

Regarding US to be documented by the players in each Gamificália round, six US templates (see Fig. 1) were defined according to a US mapping proposal to represent game scenes. This US mapping was performed by replacing US sentences on described US notations by fine-grained requirements specifications for game design elements.

As a result, CRC elements were mapped as: <Player/ Entity> representing the class name; <Actions> defining player/entities responsibilities; and <Actors/ Elements> as possible collaborators to perform documented actions. For US notations in agile processes, the "As a <role>, I want to <goal>, So that <reason>" template was represented as "As a <Player/Entity>, I want to <Goal>, so that <Prize>". For the BDD keywords "As a ..., In order to ..., I want to ..., So that ..., Given-When-Then", they were replaced to a "<Player> <Prize> <Goal> <Constraints> <Actions>" template. Finally, the template tuple for smart city challenges $(\langle Player \rangle \langle Goal \rangle \langle Constraints \rangle \langle Prize \rangle)$, together with the four aspects used by the Quest 3x4 method (<Space> <Actors> < Itens> < Challenges>), completed the necessary fine-grained requirements to provide a final sentence to represent game scenes, where:

- For each < GameScene>: As a < Space>, it has < Actors>, < Items> and < Interactions/Rules/Challenges>;
- For each <Space>: As a <World/Location>, It has <Explorations>, To provide <Achievements>;
- For each <*Actor*>: As a <*Token/Tag/Mark*>, It represents a <*Character*>, With <*Customizations*>;
- For each < Item>: As a < PickUp/PowerUp/Element>, It exists as < Inventory Item>, For < Status>; and
- For each <Interaction/Rule/Challenge>: As a <Player/Actor>, In order to <Prizes>, It wants to <Goal>, Where Given <Actions> When <Constraints> Then <Actions> So that <Constraints>.

For the third stage, a GDC game board is provided to be fulfilled by the players responses. It will provide canvas sections, such as *Game Play*, *Game Core*, *Game Impact* and so one, based on the Unified Game Canvas (UGC) model [3], with specific scores in each canvas section to be obtained by the player for each attached response (Fig. 2). Considering *Game Impact* and *Game Business* as possible "out of the box" canvas sections for the proposed questions in the design topic cards, the player will receive a higher score for stories successfully allocated on them.

The player with more game design responses starts the response distribution over the canvas sections (only one response per player turn). A possible die can also be applied at this moment to decide the first player for each round of the game, inserting as a result a component of luck in the game.

Players will decide if the player response in a canvas section will be valid or not. For example, if the response describes a game platform characteristic, but the player decides to put it in a Game Business canvas, it is possible that the response can be contested by other players, being removed and returned to the player or not. Similar responses will not be accepted in a same canvas section, making the player lose the turn and receive back the "invalid" response allocation.

The game ends when one player distributed all of yours responses, or all players can not put more responses on the game board. The game winner will be the player with the

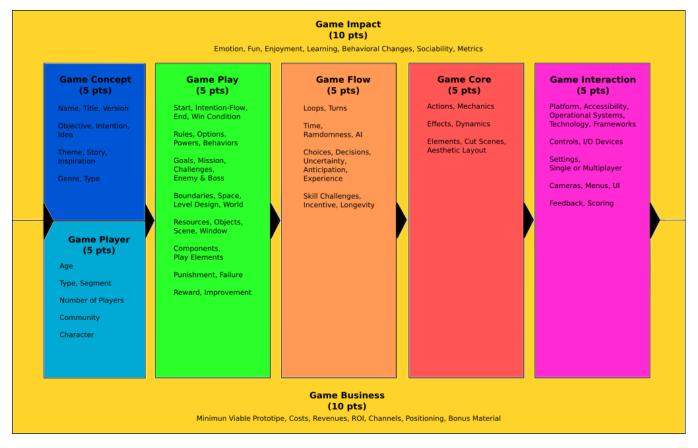


Fig. 2. Gamificália game board based on UGC sections.

highest score after sum all points obtained for each response allocated in each canvas section.

IV. GAME EVALUATION

As an initial evaluation of the Gamificália game, an online game play was performed. For this, an initial proposal for a game to be designed was presented to five Computer Engineering students, together with the presentation of the proposed US templates for document game stories. Next, the design topic cards were presented as slides according to a time limit, given 2 minutes for the players to write their game stories according proposed US templates. After presenting all design topic questions, the players sent their answers inbox and the player with more answers started the answer distribution over the board game. For this, a collaboration tool was used to present the answers and define the distribution for each game canvas according player's indications. As an extra stimulus, a final gift was earned by the winner, bringing an extra immersion for the players. Fig. 3 illustrates this online game play with some documented US of each player together with the collaborative stories about the proposed game.

A. Logbook

As Gamificália was designed to be a board game in an interactive way, generating competition between individuals

or between teams, it was noticeable the loss of interaction between players during an online game without direct contact between players. Thus, it was under the responsibility of the game master to constantly coordinate and encourage the participation of players during the match, even generating some moments of confusion among them about which move to make in the face of the limitations imposed by the online environment.

Despite being computer engineering students, the players had some difficulty in thinking about game rules and elements in a US format. The 2-3 minutes for the presentation of each design topic also made it difficult for players to document them. Better results could be obtained if a short term tutorial section had been previously applied to the players.

The amount of design topics presented also hampered the game's dynamics, as it took more than 30 minutes for players to receive an initial feedback about what they were doing. In this case, a possible interruption in the presentation of the design topic after a certain time limit, going directly to the US distribution on the board, could improve the interaction and competition of the players during the game.

Another aspect of the online game environment refers to the fatigue that it presents to its participants, something that would not be different with the proposed game. Thus, even with an interval of 2-3 minutes for each design topic, the game became

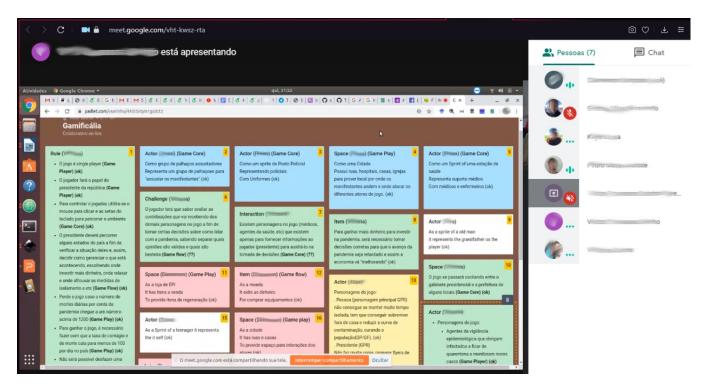


Fig. 3. Online match of the Gamificália game.

tiring after 30-40 min, limiting the quality of the obtained responses in the third phase of the game.

At the end of the game, only 2 players were able to effectively document representative US for the proposed game, mostly related to *Space*, *Actor* and *Item*. US related to *Interaction*, *Rule* and *Challenge* were not written, probably due to the greater number of rules to be documented that they demand. In this way, a possible simplification of them, together with a differentiated score for the identification of each one of them, can be a possible adjustment to be applied in the future.

B. Evaluation Questionnaire

As an extra evaluation about the game play, some usability questions were performed to the players, together with the indication of improving suggestions, and positive and negative aspects about the game. In this sense, questions like "Gamificália is a useful game?", "Gamificália is easy to play", "Gamificália is easy to learn?", and 'Did Gamificália meet your expectations?" were performed according to a Likert scale where 1 means strongly disagree and 7 means strongly agree. Fig. 4 illustrates the obtained results with these questions, which shows, despite the logbook annotations, a positive assessment of the game for most players.

As positive aspects described about the game, it: "Stimulates the development of games, putting ideas in an organized way"; "Makes a group of people spit games frantically"; "Encourages the production of other games, working with some theoretical concepts related to the creation and development of games"; "Assists in creativity and in the development of

quick thinking for the construction of a game, and provides greater clarity and understanding about which characteristics must be defined for the construction of a good game"; and "Encourages creativity, and helps to recognize aspects of the game in a natural way".

As negative aspects described for the game: "The game forces you to think about many points in a game too quickly"; "The question time is very short"; "Competitiveness by points is weak"; "The game does not have a defined style (strategy, quick play)"; "Confusing dynamics that if not controlled can make the game last for hours"; "I believe that the objective of the game lacks a greater focus"; "The time given for the creation according to the themes is very short, generating a brainstorming with many loose ideas and the lack of time ends up being demotivating for the players who are unable to finalize their goals"; "It could improve the form of filling by offering predefined US"; "Some questions do not seem to apply to all games, and you do not know what to do about it"; "It needs a little preparation before, due to the construction of the US"; "You need a slightly longer time for the US preparation"; and "The counting of points can be a little subjective, but I believe that in this case it was due to the lack of a US preparation stage".

Finally, as suggestions for improving the game: "The format of the US should already be ready, to streamline the process of writing ideas"; "Perhaps the knowledge of the US is something that needs to be worked on before the game starts"; "Implementation of a better system for writing US"; "Increase the US creation time or play the game in a round format,

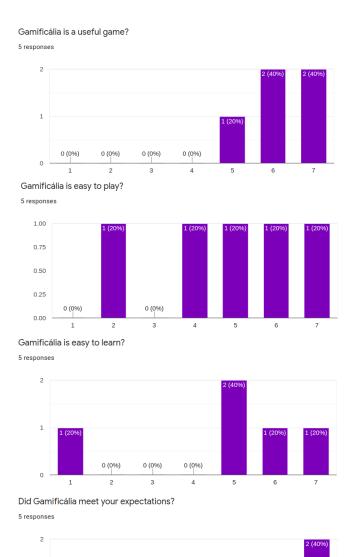


Fig. 4. Obtained results with usability questions about the Gamificália game play.

where in each round players have X minutes to make the US over a space on the board"; "Find some way to penalize the player that in a way left something very vague or ambiguous in the US"; and "Perhaps include a US step after the design questions to turn the answers into US model instances".

V. CONCLUSIONS AND FUTURE WORK

This paper presented Gamificália, a GoG proposal that defines a gamified design approach based on: game design questions, adapted US for the game design domain, and a GDC board with scores able to organize game stories in the design

of a final game. For this, three stages of rules and elements based on game design components and strategies in a GoG perspective were described, together with the presentation of an online case study and the evaluation of the proposed game play with Computer Engineering students.

Per Gamificália components, the design questions were provided from a game design process based on creative computing activities for kids to design games. As a result, simple questions were proposed for game design, becoming able to be applied in game mechanics and dynamics of a gamified process in a GoG proposal. Considering the proposed templates to represent game stories, they were integrated in an associative way, giving 6 game story templates able to represent fine-grained requirements for games. As a result, they provided a suitable response model for the proposed design questions available in each design topic card, as well as an initial pseudo language for a future requirement programming in a game design level. Finally, for the proposed GDC board game, the UGC model follows a 5W2H perspective, giving a practical contribution to organize design elements and canvas suggestions in the GDC universe. As a result, a practical design result, with a "correct" distribution of finegrained requirements for games, is expected in the end of each Gamificália game play.

Regarding the validation of the proposed game, an initial confirmation of the game usability and benefits in the design of digital games was obtained. It shows the Gamificália possibilities as a gamified tool to provide a quick and fun process for game design purposes. However, this evaluation was performed in a small group of Computer Engineering students, which have an initial experience in the design of digital games and the concept of US to document system requirements. As a result, it could be interest to evaluate the Gamificália game play with different types of players categories, such as nongame designers and non-Computer Engineering students, for example. Moreover, it is also important to increase the number of evaluated people with the proposed game, in order to get more improvement suggestions, identify possible flaws in its design, and confirm the initial conclusions obtained with the game.

Despite the documented difficulties in the logbook about the online match, different game play possibilities were also identified to solve them. These difficulties were also described in the qualitative answers for the negative aspects and improvement suggestions pointed out for the game. One of them was the lack of a clear objective and a well-defined style of play, which represents a significant limitations of Gamificália that need to be overcome. In this sense, to avoid the classification of the GoG proposal as a "class dynamic with board game elements", it is necessary to create new variants for the game, by the inclusion of predefined US for game themes together with new mechanics and dynamics able to enhance the interaction and the competitiveness between players. Another identified problem for the GoG proposal was the difficulty in thinking about a game design based on US, which can be adequately compensated by the preparation of predefined US or with the inclusion of an intermediate activity just to model the US during the game steps. Finally, issues related to US formatting, available preparation time and confusing dynamics applied, these can be properly compensated with the application of the game dynamics in a real environment, without the interaction limitations of the online environment used for the initial case study (Google Meet¹ and Padlet²).

As future work, a board game version of the Gamificália game will be produced, along with a more complete assessment of groups of players about the game usability and the obtained benefits with its usage. The use of the proposed Gamificália US models as a pseudo language to indicate game elements and game interactions by automated tools to support a generative approach for game design is currently in course. Moreover, the development of a multiplayer Gamificália environment will also be carried out in the future. The idea is to improve the player's experience and evaluation in an online service able to provide in a gamified way: the design and distribution of obtained GDCs, the indication of the player's rating, the creation of game rooms, the storage of private content, the integration with social media, and so on.

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