LudoPor - Word Game Creation Platform

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Abstract. This thesis presents an approach for creating Word Games. We researched word games as Trivial Pursuit, Scrabble and more to establish reasons for their success. After this research we proposed a conceptual model using key concepts present in many of those games. The model defines the Game World with concepts such as the World Representation, Player, Challenges, Links, Goals and Performance Indicators. Then we created LudoPor - a prototype of a platform using some of the referred concepts. The prototype was made using an iterative design starting from paper prototypes to high fidelity prototypes using user evaluation tests to help define the right path. In this task we had the help of many users including persons of Ciberdúvidas (a Portuguese language community). Another objective of LudoPor was to create games for Ciberdúvidas that would be shown in their website.

1. Introduction
This thesis is an applied investigation to develop a conceptual model that can be used to create successful word games. To create such model, we first researched in successful Word Games to establish their reasons for success. Following, we elaborated our proposal of a model. Finally we create LudoPor, a platform that uses a trimmed version of such model to create Word Games. So our goals and contributions with this work are:

- A research work about success elements in Word Games;
- A conceptual model for a platform for creating games that incorporates those success elements,
- A platform with the key concepts of the conceptual model that can deliver word games.

This thesis was motivated by two factors: the increase in the interest in word games and the possible of their use for education and learning.

The increased interest in word games is visible with the success of many games in the Internet. We can see this popularity in the scores of the following figure 1.

Note that the score stated in figure 1 represents a formula for calculating the most popular games. It relates a genre of casual game with the top of most played games per week. In the figure we can see the added scores per year for the genre Word Games. The figure, statistics and the score can be seen in reference [1].

As we can see in figure 1 the scores of Word Games are conclusive about the popularity of the genre. But could this popularity be used not only for relaxing but also for learning purposes? Well recently a report about the use of games in schools has been conclusive about this issue.

As stated in “Games in Schools Report” [2], made for a partnership between the European Schoolnet (EUN) and the Interactive Software Federation of Europe (ISFE), games can provide a valuable resource in schools and education. They can even extend outside the classroom and provide a platform for study aids.

In this work we had the help of Ciberdúvidas. They are a community specialized in the Portuguese Language. In their internet portal, they answer questions
send about several subjects concerning all aspects of Portuguese, for example, the origin of words, grammatical issues, etc.

They want to add some dynamic and interactive content, such as games to increase diversity in the website. So they cooperated with us to provide information and help in creating a platform that allows them to create such games. The games themselves should not be the main reason the users go to the website, but to increase motivation for them.

Since the platform is to be used by this community, the generated games must have distinct characteristics, they should be able to be educational and use word games. They must be able to approach an adult audience (the main target of the website) and must be distributed over the internet.

The platform is focused to be used by a community that have little or none computer programming skills so the platform has to be graphical and should be easy to work with.

2. Related Work
In this section we present conclusions about our review of word games. The extracted information is important to the creation of our Model and LudoPor, our platform. We reviewed over 12 games like Scrabble, Trivial Pursuit, Crosswords, Bookworm, Chicktionary and more.

These games are played has a source of entertainment, but they also have an educational purpose. The most important characteristic to retain of those games is the way that they are played – its mechanics.

One of the first and more important conclusions that were taken was that all the games are simple and their mechanics are not complex at all. Another characteristic are that these are games hard to master. For example anyone can play Scrabble but the best have huge knowledge of their vocabulary.

In order to be good at those games requires learning a great amount of information and that’s one characteristic that we are very interested – the educational purpose.

A feature common to some is that they are the called Party Games. These games are made to be played in groups and require an amount of social interaction, making them adequate to be played in a community. This also adds an interesting aspect to games, the competition. Adding some competition to educational games is a good technique to try to push its players to learn but it’s also something to be careful about since not all players are competitive.

The individual word games are usually games with none or little pressure. They are made to relax the player while “teaching” them. Mechanics of such games are simple but have some sort interaction like searches on internet for hints or a possibility of losing based on the player performance. These techniques increase playability and decrease the monotony of these games when played for a long time.

Finally some of the games reviewed are “training” games – where the player has the perception that he has problems in some Language aspect (like grammar) and wants to train that aspect. These games are made to be educational. Players do not play often and if they do is for little time. They may lack motivation to play or they just finished training the subject there were looking for.

We also reviewed some platforms and it was visible that the most common problem was the complexity made by using many mechanics and the huge possibility of possible content. There were problems in using different layout and customization of the games for non-experts.

Other these conclusions, we reviewed the way that those games are played. The Related Work now present a list of Word Game mechanics used in those games which are:

- Question and Answer (where someone, player or not, asks a question to a player that he must answer)
- Multiple Choice (faced to a question the player must answer one in a set of predefined answers)
- Matching (the player is asked to connect two or more items)
- Filling in the Gaps (consists in a text or phrase with open spaces that the player must fill to complete)
- Word Forming (using a limited number of letters the player must form words)
- Word Searching (the player must search and find words in letters disposed on a grid)

These mechanics are used as the main challenges in the platform.

3. Conceptual Model
The following section shows and discusses the concept of Game World. We also divided this concept in 5 components which are World Representation, Performance Indicators, Goals, Challenges and Player.
We believe that concept and components are a foundation for creating successful Word based games.

Most of the games reviewed do not have only the word mechanics but also players, board, goals, story and more. These concepts constitute the game world. The game world is, basically, everything that is represented in the game and all games have its own game world.

We researched about the Game World and elaborated a list of 5 key concepts that successful word games have. They are: a World Representation (in our model we chose a Board), Players, Challenges, Performance Indicators and Goals.

![Figure 2 A example of a possible Game World](image)

The World Representation is basically the environment where the action takes place. In this thesis we chose the board as world representation since it is a common, flexible and familiar representation.

The game world can have one or more Boards which can be dynamic or static. Dynamic board change independently of the player actions while static do not. A very important aspect about the world representation is its layout. Deciding where to put challenges and defining links to create paths is critical and often decide if a game is good or bad.

Game goals are the objectives that the player must accomplish in the game.

This objectives can be dynamic (depends on the performance of the player) or static (pre-established by the designer). Goals can also be primary, secondary or final. The distinction between these goals is how affects the progress of the player in the game. Primary goals the player progresses towards the finish, secondary goals do not advance the player (they exist to reward the player and extend the game playability), and finally final goals where the player finishes the game.

The performance indicators are statistics to establish the performance of a player throughout the game or a challenge. These indicators can be score, game time and items.

Score are usually a numeric counter that may increase or reduce depending on the player performance on a challenge. Game Time is the representation in the game world of real time. Since it is only a representation the game time can be distorted, illogical or even with its own economy. Finally items, which are objects representations in the game world. They can be collected and used by the player. Some players can see items as trophies which add motivation to collect them.

Challenges are the tasks that the player must perform in the game world that allows them to accomplish a goal. They are based on the mechanics retrieved from the Related Work.

Challenges can be adaptive or not depending of the state of the game world. If the challenge changes depending this state like, for example, the performance indicators then it is adaptive. Otherwise it is a static challenge.

Since challenges are the basic tasks of the game they are responsible for providing feedback. This feedback can be to the game word where they inform the performance indicators of the player performance in that task. Or this feedback can also be to the player (when certain actions or conditions are met they warn or inform the player)

Finally the player, the most important component of the game. Two important aspects of players are their state and representation on the game world.

The state can be always remain the same. This means that player does not change throughout the game and it a static player. The player may also adapt changing depending on the progress and performance of the player on the game world. For example, in Trivial Pursuit the number of wedges on the piece is a mark of the state of that player towards the final goal. The player representation is called avatar and can be customized to reflect the state or simply to motivate players.

Also a very important aspect of the player is its movement on the World Representation. The player’s movement can be linear or random like in Trivial Pursuit. It can also be dependent of player performance or even hybrid (random movement with bonus for good performance). Movement can also be predictable or unpredictable. Predictable movement is if the player can understand that by achieving a certain performance he will go to a certain point of the world. This implies that the player as enough knowledge of the world to understand where will he go. In unpredictable movement the player does not understand where he will go, for example, in random movement. Unpredictable
movement remove control to the player which may leave him or enthusiastic depending on the player personality.

We believe that the use of these concepts as the basis of the Word Games will allow designers to create games that can motivate players.

4. Implementation

In this chapter we review the complete evolution of the prototype.

Throughout the evolution there were six prototypes made and tested. The first was a low fidelity prototype made with pencil and paper as we can see in the following figure 3. This prototype had the main objective of establish if the concepts and their hierarchy were clear to the users.

This prototype was evaluated by five users being three of them teachers that use the computer at a regular basis. This focus on educators was because they were the main target of the platform. The other two were young adults that worked every day using the computer and are most efficient in capturing interface problems.

Users were provided with simple tasks reporting what they should do. It was recorded if either the users were able to perform tasks or if they needed help. It was measured the total time of the session. Besides these stats were recorded notes of issues that users had when trying the prototype.

The retrieved measures stated that users were unable to continue without help in some tasks and consistently failed in most of the first five tasks. Basically the users were lost and did not understood what was to be done and how would it influence the game. The medium time of completing the tasks were about 40 min which most were spend exploring the interface. After learning the interface users usually liked the prototype and tried to explore it.

Since users had problems in understanding the interface it was obvious that the interface had to be simplified. To simplify the prototype interface we chose to remove options that users would rarely use. We also fixed some consistency problems between windows.

After testing it with users and analysing its feedback we created a game prototype. The game prototype had the objective to establish if a possibly created game with the platform could be fun while supporting educational content.

The game was created using images altered in order to create a board with a path and challenges (figure 4) as well as characters, comments about the player’s performances. We used challenges focusing aspects of Portuguese language.

The evaluation of this prototype was made with a group of five young adult and later with more three young adults individually. The reason for testing in two different ways was that the group talked and interacted like if it was a party game.

It was not taken any measurement of the player’s performance, but notes were taken about the player’s feeling towards the game. They were also asked if they liked the game and if they would play it again later.

All the players had a visible sense of fun and they would play the game later.

With good indications on the Game prototype and the feedback on the first paper prototype we elaborated the second final low-fidelity prototype. Following we can see images of the presented challenges (Figure 5 and 6).

Evaluation of this prototype was done thought a set of four experts (collages and persons with experience using and creating interfaces) and contacting some of the previous users to establish if the changes were working. The evaluation was done by presenting the same tasks to users. The results were good with users
comparing the two prototypes and choosing the final as the easiest.

After some weeks tweaking the design and improving the game creation process with the help of experts and user interface tests it was ready to create a high fidelity prototype.

The first high-fidelity prototype could not be finished to a meeting held with person from the community of Ciberdúvidas. Therefore it was incomplete by the time it was presented. Testing of the prototype went pretty bad but some important changes were made.

After some months a version with the complete interface was completed and was set to test with the community of Ciberdúvidas. The interface was pretty different and much cleaner. Following in figure 6 we can see an image of it.

![Image of high fidelity prototype screenshot](Figure 7)

The prototype was tested through a series of conversations using email with a future user of this platform. It revealed that the platform were more difficult to users that we expected.

The platform was changed to include integration with the Operative System, performance tweaks and to adapt the mechanics interaction.

For last a final high fidelity prototype was made. This prototype was capable of creating word games and featured a reviewed interface. In figures 7 and 8 we can see it.

![Image of board with a path](Figure 8)

Evaluation was made with eight users and was taken notes and a video about the experience. Users were hand-picked and divided in three separate groups – group one is teachers or educators, the second is adults that spend 3-6 hours for week using a computer and finally the last group young adults that use the computer more than 10 hours per week. Also relevant for group 1, is that they spend about 1 to 2 hours a week with the computer and use it mainly for professional tasks.

In the user interface test they were faced with the following eight tasks:

- Create one challenge of multiple choice following an example available
- Create one challenge of matching following an example available
- Creating a path (choosing a starting and ending challenge and creating a link between them)
- Add Time and Score to the game
- Create comments to one of the challenges
- Create rewards and penalties to one of the challenges
- Customize images (character, board background and challenges)
- Save project, create a game and play it

The results were very good and motivating. As we can see in the following figure 9 in 10 tasks one task users only fail one task.

![Pie chart of average success rate](Figure 10)

Average Success; 90,63%
Average Insucess; 9,38%
Also there were good results in the number of errors (figure 10) where the average number of mistakes made by the users of group 1 is 1.5

As we can see in figure 11, the time taken to complete the tasks was average 6 minutes and 11 seconds by task for the group 1 of users.

There are some comments about the results, first it was visible that the group of educators had more mistakes and spend more time in the tasks.

An interesting fact is that the task of creating comments was more easily understood by educators and teachers than by the rest of the users.

The task with more problems was the creation of challenge of matching, followed by the creation challenge of multiple choices and creating a path which revealed some problems in the core of the platform.

These tasks were happened more problems are the core of the process. The fact that these were the most troubled indicates that we must review and further work on these tasks.

The notes and analysis of the video taken allowed resolving problems and issues on the platform so iteration with the results is being elaborated.

Users also played the games that they generated and seemed to not be disappointed by the outcome. The overall quality of the generated games was pretty good. We can see the following figure 10 a screenshot of one of those games.

The architecture of the platform is divided in 3 main modules: the java module, the editor module and the game module.

The Editor module is the actual program and is responsible for creating the model that will be used to make the games. This model is in a XML format and it describes everything that it is on the game.

The functionality of the Game Module is to provide the code to generate a game according to the specifications on model created by the Editor.

The Java Module is basically an a Command Proxy, a module that only receives commands from the Editor Module and it is responsible in creating a “bridge” between the Editor module and the Operative System.

The final game is created using the Flex Compiler. The compiler is called by the Java Module and uses the Game module using the model made by the Editor. The whole process is hidden of the user and is managed by the java module.

5. Conclusion

The preceding sections have discussed the creation of a platform for making word games. They showed many possibilities to create such games and proven that such a platform was possible and that it works. Unlike other platforms LudoPor has enough flexibility to enable anyone to create successful word games.

We started by establishing the reasons for successful word games, the mechanics that make them
work this way and being so successful such as Multiple Choice, Matching or Word Forming among others. The result of work was a research work about success elements in Word Games.

It has also been researched about the use of components of the game world that we identified while researching for successful word games. From that work we made the Conceptual Model. This model consists in several concepts like the world representation that should be used (the proposed was a Board representation), the player, the challenges, performance indicators and goals. Also it was discussed of how the use of those concepts influences gameplay and players.

Creating a game world by the use of a board consists of establishing 6 concepts:

- Establishing the game world representation (dynamic vs. Static boards, number of boards necessary) as well as the size of the board.
- The performance indicators (score, time and the use of items)
- Game goals, establishing the primaries goals (needed to advance in the game), secondary’s (to increase motivation on players) and the final goals.
- Challenges, where we have to choose where they should be (forming the base layout of the board), what mechanic does it use and how it is used. The designer must also choose the feedback given to the player and to the game world as well as challenges are adaptive or not.
- Defining the layout of the board, after choosing where the challenge would be, we need to define the links between challenges. Choosing the type of each link (directional, bidirectional or conditional) and how they connect completes the layout of the board
- Finally deciding where the player will start and if applicable where will the player end, as well as defining the player movement, the feedback the game on the player

Finally to demonstrate that the conceptual model and to supply the Ciberduvidas community we constructed a prototype - LudoPor. This prototype was created in an iterate design using user test as drive for evolving the prototype. Also we have been helped by the community of Ciberduvidas that tested the prototype helping indentifying bugs, problems with the interface or problems with the process of creating games.

The implementation has shown that is possible to make a platform based on the model that works and the results of interface tests were very good. Almost all of our users being able to create games, they also played the games and enjoyed them.

In the future it is planned that this platform could grow to use more concepts present in the conceptual model such as items, different links and goals as well as multiplayer mode to induce the party games that was a reason of success reviewed in the Related Work. Also it was planned the implementation of more mechanics such as Word forming or Fill in the Gaps to support more and different games.

References