Playability Testing of Web-Based Sport Games with Older Children and Teenagers

Xavier Ferre, Angelica de Antonio, Ricardo Imbert, and Nelson Medinilla

Universidad Politecnica de Madrid
Campus de Montegancedo
28660 - Boadilla del Monte (Madrid), Spain
{xavier,angelica,rimbert,nelson}@fi.upm.es

Abstract. Playability occupies a central role in videogame design. Heuristics may help for establishing the game concept, but some testing is essential for ensuring a wide acceptance in the target user population. The experience of designing and testing a set of web-based sport videogames is described, focusing on the heuristics employed and the testing approach. The results show that an emphasis on a simple set of game controls and the introduction of humorous elements has obtained a positive response from older children and teenagers.

Keywords: videogame design, playability heuristics, testing with older children and teenagers, sport web-based games, Olympic Games.

1 Introduction

There are thousands of free online games out in the web, covering a wide range of game genres, and some of them hold a great appeal for children and teenagers. For example, servers like [1] and [2] host each one more than one thousand games, belonging to up to one hundred genres. They are quite popular between teens, who mainly use the Internet for fun, according to a Pew Internet Project survey (USA teen internet users' favorite online activity is game playing: 78% of 12-17 year-old internet users play games online [3]). Therefore, online game development targeting teens poses an important challenge because of the huge number of competing available games, but, at the same time, offers a broad range of opportunities because of the older children and teenagers' great interest in online gaming.

When designing web-based online games for teens, it is important to build onto their previous experience with both videogames in general and web-based online games in particular, so that the games they are offered match their expectations in terms of game control and ease of learning. Even if playability heuristics offer some helpful guidance, developing any videogame is still a tough endeavor. It implies creating the game concept, establishing an easy enough set of controls, establishing the pace and the responsiveness, and so on; but, at the same time, ensuring that the game is demanding enough on the player, so that he or she feels that it is fun and challenging to play. As Nolan Bushnell, the founder of Atari, summarized, "a good game should be easy to learn, but difficult to master" (quoted in [4]).

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For the purpose of designing videogames, as in any interactive software development effort, evaluation plays a very important role. Evaluation with representative users drives the whole design process, ensuring that the game concept is well understood and that playability reaches an appropriate level; and it may also provide some evidence about the degree to which the videogame is engaging and easy to learn for the target population.

In this paper, the process of developing a set of web-based online sport games about the History of the Olympics is described, emphasizing the evaluation approach taken and describing the results obtained so far.

The remainder of the paper is organized as follows. Section two describes the project structure. In section three, the development approach is presented. Section four includes the heuristics employed, while section five analyzes the usability testing carried out. Next, the main results of the evaluation through usability testing are presented in section six. Finally, section seven summarizes the findings and presents the conclusions.

2 Online Games about the History of Olympics

Modern Olympic Games started with the 1896 games in Athens, and they have taken place every four years since then, with some gaps due to world wars. Madrid is one of the four candidate cities currently bidding to host the 2016 edition of the Olympic Games.

The Playability Evaluation of Games about the History of the Olympics project aims to deliver the Olympic spirit and knowledge about the history of the modern Olympic Games, sponsored by the Madrid town council, through a series of web-based online games that portray the reality of the Olympics as they evolved starting in Athens 1896. The main target users of these games are older children (10-12) and teenagers (13-16), who will be in an appropriate age to become Olympic volunteers in 2016, when the Olympic Games might take place in Madrid.

In order to act as a support to the Madrid 2016 candidature by attracting the greater number of visitors to the website, the project intends to provide an entertaining experience to the online game player, considering playability as the primary focus throughout the development effort.

2.1 Games Structure

The website structure is organized around each Olympic Games edition. In a first phase, the project covers the first eight modern Olympic Games, from Athens 1896 to Amsterdam 1928. A particular sport has been chosen for every Olympic Games edition, recreating in the videogame the ambiance and rules at that time, but there are additional elements around the sport game contributing to the educational aim of the project, as shown in Fig. 1.

When accessing a particular Olympic Games edition, the player is presented a world map where it is to be located the place where the Olympics took place. In case the player chooses a point that is not close enough to the target city, the player is redirected to a card game where points can be gained in order to get additional clues

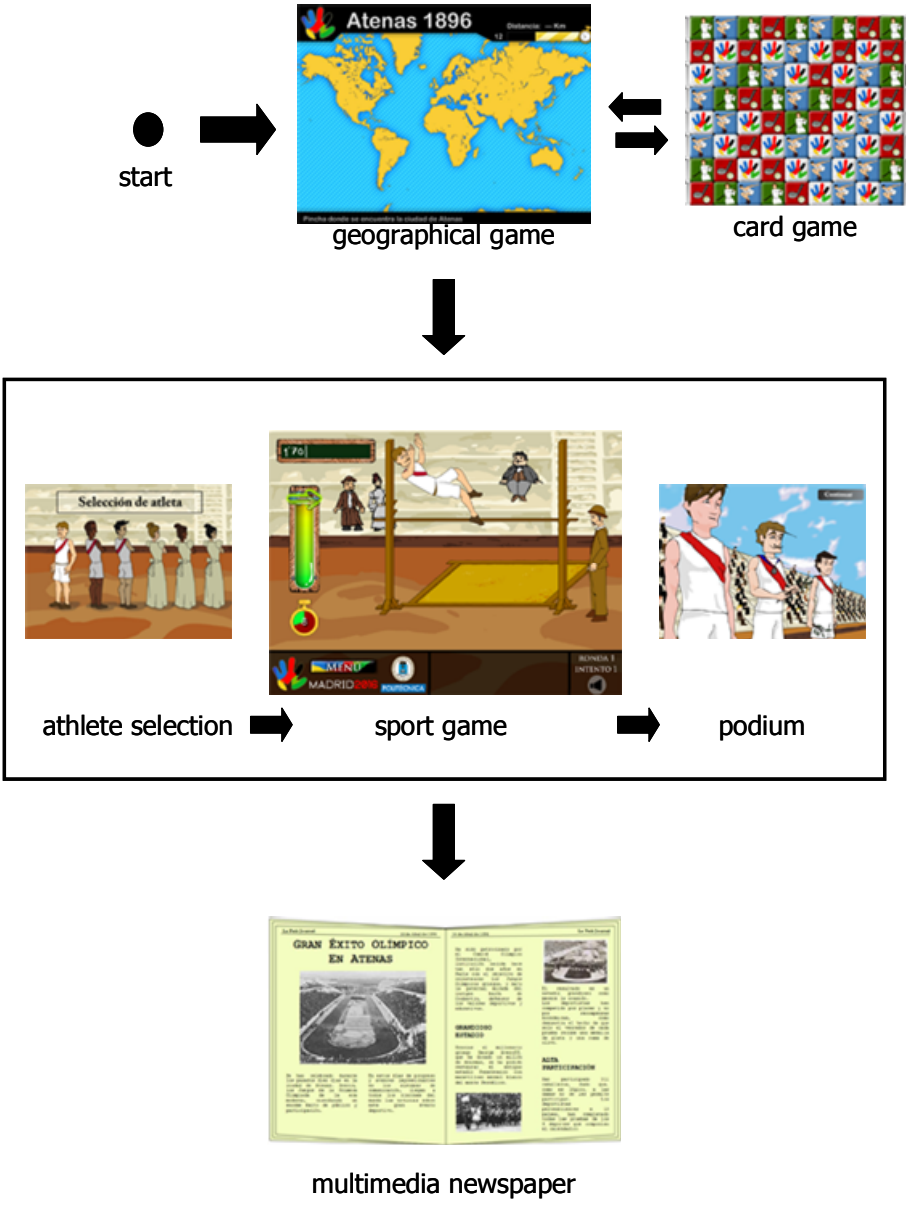

Fig. 1. Game structure for each Olympics edition

in the world map. The card game is based on swapping adjacent cards to form horizontal or vertical combinations of three or more cards with the same design.

After successfully locating the city in the world map, the player chooses the gender and race of the character he or she will play with, and the competition begins in the

sport game. After winning a medal or a trophy[1], a multimedia newspaper is presented to the player, with a voice-over reading its contents, so that interesting historical facts are presented to the player. Afterwards, the player is given access to the following Olympic Games edition in chronological order.

3 Development Approach

Before starting the development of the sport games, a study was performed about existing similar games freely available on the World Wide Web. The great majority were written in Adobe Flash, as it is a multimedia platform that eases the tasks related to animation graphics and interaction in a web environment, so Flash was chosen as programming platform.

Regarding the game size (in pixels) in the web pages where they are embedded, the average size in the analyzed web-based sport games is around 550x400. A slightly bigger size has been decided for this project, 640x480, in order to allow games with a greater interactive area, while still fitting the great majority of desktop PC screen resolutions. With respect to Flash file size, the chosen game size is still between reasonable limits in terms of user bandwidth consumption.

Concerning ease of learning, while the majority of the analyzed games did not provide a training mode, a significant minority did.

For the development of each game, guidance was provided by a team of sport history experts. This guidance included a detailed description of the scenery where the sport event depicted in the game took place, of judges, sportsmen and sportswomen equipment, including their attire; the content of each Olympic Game newspaper (pictures, video and text); and the rules for the chosen sport at that time. The choice of the sport to depict in each Olympic Game and the design of the game concept was performed jointly by the technical team and the team of sports history experts. Particularities or special events that characterized the chosen sport in such edition of the Olympic Games were introduced in the game concept, in order to improve the game in terms of historical resemblance (see section 6.1). Playability heuristics were considered in the early design of each game (see section 4).

According to the historical guidelines and the game concept definition, a first prototype was designed, running in parallel with the design of the graphical elements and decorations. The aim of this first prototype was just allowing the game to be played, with graphical aspects reduced to a sketch level, and without additional elements like instructions, podium screen, educational newspaper and so on.

With the first playable prototype some evaluation was performed with children and teenagers at collaborating schools and high schools, in order to check the understandability of the game mechanics, and the operability of the game controls. After feedback had been gathered from this first playability test, the game mechanics and controls were reconsidered, along with the development of the whole graphical part and the inclusion of the remaining details in the game. A second round of playability testing was performed afterwards with a new set of test participants in the target age range, in order to check if the objectives had been met. Sections 5 and 6 detail the usability tests carried out for playability evaluation and the results obtained.

[1] Depending on the particular Olympic Games edition, event winners were awarded either trophies or medals.

4 Heuristics

Several sources have been considered for choosing the playability heuristics to be taken into account in early design activities: Generic ones for any kind of game [4][6], and heuristics for mobile games [7]. Chosen heuristics are the ones that better fit the kind of simple games to be developed in the project (see Table 1).

Table 1. Chosen playability heuristics and their sources

#	Heuristic description	Source
1	The player should be always able to identify the score/status and goal in the game. The player sees progress in the game and can compare results with other players.	[4] (IA), [6] (M3), [7] (GP2)
2	The interface embodies metaphors with physical or other systems that the user already understands.	[4] (IIB)
3	The interface uses randomness in a way that adds variety without making controls unreliable.	[4] (IIIA2)
4	The interface uses humour appropriately.	[4] (IIIA3)
5	Player's fatigue is minimized by varying activities and pacing during game play.	[6] (GP1)
6	The game is enjoyable to replay	[6] (GP5)
7	The game is fun for the player first, the designer second and the computer third (put non-expert player's experience first).	[6] (GP10)
8	The first player action is painfully obvious and should result in immediate positive feedback.	[6] (GP13)
9	Pace the game to apply pressure but not frustrate the player. Vary the difficulty level so that the player has greater challenge as he or she develops mastery (easy to learn, hard to master).	[6] (GP15), [4] (IB)
10	Challenges are positive game experiences, rather than a negative experience (results in their wanting to play more, rather than quitting).	[6] (GP16)
11	Mechanics/control actions have consistently mapped and learnable responses.	[6] (M4)
12	Shorten the learning curve by following the trends set by the gaming industry to meet user's expectations.	[6] (M5), [7] (GU7)
13	Provide immediate feedback for user actions.	[6] (U1), [7] (GU9)
14	Upon initially turning the game on the player has enough information to get started to play.	[6] (U5)
15	Sounds from the game provide meaningful feedback or stir a particular emotion.	[6] (U7)
16	Players do not need to use a manual to play the game.	[6] (U8)
17	The interface should be as non-intrusive to the player as possible.	[6] (U9)
18	Art should be recognizable to player, speak to its function and support the game.	[6] (U12), [7] (GU1)
19	Indicators are visible	[7] (GU4)
20	The player understands the terminology	[7] (GU5)
21	The player does not have to memorize things unnecessarily	[7] (GU11)
22	The game contains help	[7] (GU12)
23	The player is in control.	[7] (GP4)

5 Usability Testing for Playability Evaluation

Every game has been evaluated through usability testing [8]. Representative users play with the game while test facilitators observe their performance, taking notes about their comments, and about the problems they experience when trying to play the games. After the test each user is asked to fill a satisfaction questionnaire to gather his or her impressions about the game. A total of seven test sessions have been carried out, with the participation of 148 older children and teenagers in the 10-16 year old range, belonging to five schools and high schools.

This section presents the methodology followed for the usability testing.

5.1 Previous Planning

Test participants fall in the defined target age range, and the task they are asked to perform is to play the game in order to be the Olympic winner. Tests are always performed in the test participants' educational institution, usually in the computer classroom.

Test planning involves preparing in advance the following materials: Content of the questionnaires for test participants to fill in; selection and preparation of any promotional gift offered to thank them for their participation; consent forms to be distributed between parents; and a detailed description of test procedures, including a script for the verbal instructions to be offered to participants.

Games are previously tested in the computers where the test will take place, in order to avoid possible problems either with the Internet connection or related to software compatibility. Whenever possible a pilot test is performed in order to review test setup and planning.

5.2 Test Sessions

Before granting them access to the game, test participants are given a brief introduction to the project objectives and their role as game testers is highlighted. They are asked to follow the instructions on the screen and to ask about any aspect of the game that feels strange or incomprehensible to them.

Test sessions usually cover the testing of two different games. A fixed time of around 15 minutes is established for playing with each game, but test facilitators may suggest a particular participant to advance to the following game (after filling the corresponding questionnaire), in case he or she gets tired of the previous game or is winning easily. Test facilitators observe test participants, taking notes about any comment or remarkable behavior from them; and answering any question test participants may ask. After playing with each game, test participants are requested to fill in a satisfaction questionnaire, and when the test session ends they are thanked for their participation and the gifts are distributed.

5.3 Usability Report

Data gathered in the test session includes test participants' performance with the games (automatically logged during the test session), their answers to the satisfaction

questionnaire and notes taken by test facilitators. These pieces of data are analyzed and presented in the form of a usability report that details the main usability problems identified, and the positive and negative comments to different parts of the game. When suggestions for improvement have been mentioned by test participants they are also included in the document. The report is discussed by the development team in order to evaluate the priority and severity of the problems identified, and an action plan is established in order to make the appropriate changes to game design. When test results are satisfactory according to project objectives, the game is released in the project website [5].

6 Results

The tests carried out with the different versions of the games have allowed for an important improvement in terms of playability, both between the final version of a specific game compared to the previous versions tested, and between the first games developed and the rest of them.

Children and teenagers who have tested the games have liked them in general terms, with the answers to the satisfaction questionnaires showing that they agreed to the sentence "I would like to play often this game" to a high (47% of participants) or very high extent (32% of participants). Additionally, most of test participants showed reactions when playing with the final version of the games that suggested they were actually enjoying the games in the test sessions.

The main two issues raised in the usability testing are related to the particular elements introduced in the games to increase the "fun" aspect, and to the appropriateness of including a guided training tutorial.

6.1 Inclusion of Funny Elements

In certain games, funny or peculiar elements that attract the attention of the player have been introduced in the game concept, in order to make the overall player's experience more enjoyable. Whenever possible, these elements highlight particularities of the sport event as it happened in the corresponding Olympic Games edition, specially those ones that may be considered striking nowadays. This is part of the educational aim of the project, for the users to know the reality of the first editions of the modern Olympic Games.

For example, in the marathon game - for London 1908 - there are some bottles and sponges with water, which have to be picked by the player in order to maintain the stamina and be able to win the race. But a glass of champagne appears randomly as well, with the effect of losing all the stamina (see Fig. 2). In this way it is shown to players that it was not uncommon for sportsmen to receive any kind of drink from watchers willing to help. In the tests performed with the marathon, children commented about how much they liked having objects appearing on the road, and that they would have liked having even more objects appearing in the game.

Fig. 2. Objects in the marathon game: Champagne glass, sponge and water bottle

Whenever these elements are funny, the reaction from older children and teenagers is even better. In the high jump game - Athens 1896 - there is a preparation phase before the actual jump where a correct posture must be achieved, and getting the sportsman to lean forward too much makes him fall to the ground, as shown in Fig. 3.a. In the sack racing game - Saint Louis 1904 - there is a chicken appearing randomly between the sportsmen or sportswomen (see Fig. 3.b). The observed reaction of young test participants to these elements has been very positive, since they cheered out loudly and they hurried to tell their friends about these particular elements, showing that they took their attention.

With the inclusion of these funny ingredients, the objective of offering players an enjoyable experience has been reinforced, since these elements have been very well received by test participants, who seemed to appreciate startling elements in the game.

6.2 Training Tutorial vs. Simple Set of Controls

For a web-based online game, ease of learning plays an important role, since players need to be enjoying their playing experience from the very beginning. When the player does not understand the game concept or gets stuck because of ignorance about game controls, there is a high risk that he or she will abandon the game to go to any of the thousands of other games freely available on the Internet.

In the first game, the high jump, a relatively complex game concept was designed, since there is a preparation phase before the actual jump where a correct posture must be achieved, and there is a jump phase where accurate pressing of control keys influences the jump result. For it to be challenging, the jump phase happens very quickly, but this makes it hard for the novice player to grasp the game concept. Therefore, a guided training tutorial was introduced at the beginning of the game. In this tutorial, the player may try to perform a jump slower than in competition, and feedback is offered about the posture and key pressing. Comments from test participants about this game have shown that, while they enjoyed the actual competition, they did not specially enjoy having to go through a training tutorial.

Fig. 3. a) Fallen sportsman in high jump game; **b)** chicken in sack racing game

In the following games tackled, the design of the game concept was focused on reducing to a great extent the complexity of controls, so that there was no need for a training tutorial. A screen with brief instructions is presented instead, which is shown the first time the game is played.

Test participants were asked in the satisfaction questionnaire if the game was easy to understand and play, and results showed that the first game including a training tutorial was perceived as less easy to understand and play (by 11%) than the average of the other games, which were designed with a simpler and common set of controls. Additionally, test participants had a better initial performance in the games with a simpler set of controls that didn't need a training tutorial.

7 Conclusions

In the frame of the Playability Evaluation of Games about the History of the Olympics project eight games have been developed and evaluated through usability testing with older children and teenagers.

Even if further testing should be done in order to discover why some particular elements work better than others, results already show some hints that could help developers of web-based simple games, similar to the sports games developed in the project. When the game concept is kept simple, it seems to favor game acceptance between users in the 10-16 age range, especially in terms of game controls. In that direction, when the game is simple enough so that basic controls may be explained in an introductory screen and no training tutorial is needed, players tend to perceive it as easier to control and their initial performance improves.

Startling elements included in a game have been highlighted by test participants as funny, showing their appreciation by cheerful comments with peers.

The project will go on evaluating the educational potential of the developed sport games. It is planned to carry out an experimental study in physical education classes, comparing the knowledge about the history of the Olympic Games between a group of children taught in the traditional way (lectures) and a group of children that use the games as a way to actively learn about this subject.

Only the first eight editions of the modern Olympic Games have been covered so far, with encouraging partial results, but the development of additional games to cover the rest of Olympics editions will be conditioned by the results obtained in the experimental study.

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