Android App Based on Gamification Techniques for Learning Reading, Support for Education and Illiteracy

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Abstract. According to international and national indicators in Mexico are more than four million of people who cannot read and write. Moreover, reports of Standouts, such as United Nations Educational, Scientific and Cultural Organization (UNESCO) and World Economic Forum (WEF) make suggestions to improve use levels of Information and communications technology (ICT) in order to collaborate to solve these problems so the aim of this investigation is develop a mobile application (APP) with Gamification techniques (game based learning), which will help people to improve their reading skills. This software is constructed with Scrum methodology and it consists in three phases: 1) pregame (planning), 2) game (construction and testing), 3) postgame (deployment), in addition, this APP contains digital material such as audio, images and some tests are included to measure progress over time increase.

Keywords: Gamification, app, android, learning, reading.

1 Introduction

1.1 Technology Issues in Mexico

Several authors mention that the world is involve in a new kind of culture defined as society of knowledge and information, where ICT and its development heads the future of the majority of economies [1]. This sort of society is characterized by take advantage of the ICT to solve old and new problems, create, disseminate and transmit new knowledge [2]. According to these definitions the WEF [3] suggests working in the development of ICT, and making strategies to implement them. As well, it offers many solutions and examples of policies to help countries to improve the use of ICT in different sectors such as government, education, and business [3]. Although different international organizations indicate that ICT is a crucial component to achieve development objectives of societies in those sectors [4], the technological development in Mexico is not optimal according to official international reports.

In 2015 the average development in the 143 countries evaluated by WEF [3] in the Global Information Report 2015, Mexico was 4.07 points, in a scale from 1 to 7; the top ten of economies such as Finland, and Sweden, are located on 1.6 points above average. However, Mexico got 4.0 points with only 0.7 points below. In 2014, Mexico was 79th in this ranking, by 2015 raises ten places, located in number 69th. With this information, Mexico had an apparently improvement in this ranking, but analyzing the numbers, it is concluding that Mexico has been improved, but not to overcome others economies, the real reason is because from 2014 to 2015 five countries got out from the list. In 2014, 148 economies were evaluated and in 2015 this number were reduced to 143, which immediately makes changes in the positions.

This problematic not only was exposes by the WEF, also the International Telecommunication Union (ITU) who in its Development Index Technology, emphasizes that Mexico has a problem in the use of ICT in all sectors include the educational, due to in 2015 edition of IDI the country has dropped 9 sites from the place number 86 to the place number 95 [5, 6].

It has become manifest the importance and the great impact of ICT in the new era of information society and knowledge. Despite this fact which is recognized internationally, by various institutions, Mexico is lagging considerably behind of other countries. The use of ICT is an infallible part for the creation, operation and growth of societies.

1.2 Illiteracy in Mexico

The use of ICT is one of the biggest issues that Mexico should solve quickly; other important topic is the problem of Illiteracy in the country. Nowadays according to National Institute of Statistic and Geography (INEGI) [7], Mexico has approximately 5.48% of people aged 15 and over in illiteracy. That percentage is equivalent to 4,749,057 millions of people who doesn´t know how to write and read.

UNESCO [8] also believe that the literacy faces huge problem, and one of the main challenges of Mexico about this issue is reduce illiteracy.

México is aware of its weaknesses in these two important topics; therefore, in the National Development Plan 2013 – 2018 [9] , are proposed strategies to face those problems. Barbera Cebolla [10] confirms the importance of the ICT to innovate and improve quality in the education, and finally, UNESCO [11] suggests the use of ICT in the education sector as a key point to increase literacy, as a result is appropriate to create a mobile application in one of the most used operative system (Android) for smart devices, this app include Gamification – Game based Learning so that the benefit from doing that, involve giving motivation to the user, and creating a good environment where is possible to improve gradually the reading skills.

1.3 Gamification- Game Based in Learning Works with Reading Skills

Zichermann & Cunningham [12] define Gamification as "Use game mechanics to engaged users, and solve problems" in the context of game based in learning. This technique is useful because follows the pillars of Skinner [13] who says that trough

reinforcements and emotions, in a positive or negative way, can change the behavior of a person, and create and habit.

As said by these authors we can implement Gamification to solve the problem of ICT and illiteracy in México, motivating the user to keep in the game trough reinforcements that can help the users to improve their reading skills constantly, give them something more than knowledge. The game provides a complete experience to the user, but it has to follow some topics that are infallible to create a successful Gamification strategy.

One of the essential parts of Gamification is the mechanic, this part of the game determines how the user interacts, wins or loses, and this is the part where the experience takes place [14]. The Dynamic is as important as mechanics due to the rules of the game, the dynamic and emotions animate the experience and motivate the user to change the behavior [15]. It can be identified three levels of benefactors with Gamification based – learning according to Prensky [16] 1) a business executive, school administrator 2) trainer or teacher 3) user, student or trainee.

Now the benefits of Gamification and ICT are manifested, such as, engagement, loyalty, motivation, and the growth of societies. Make a strategy that include these both topics is the opportunity of solve problems with ICT and illiteracy in Mexico. Finally, Hernández Salazar [17] mentions that virtual learning programs are conducive to include or generate knowledge with different types of message: visual (images), audio, join to Freire's methodology [18] what also say that the education requires three components: 1) a critical method, 2) a change of curriculum content and 3) specific techniques to encode and decode messages, these elements are "focused on the present, creating a context in which develop technological literacy tools to generate a kind of pedagogical highly functional and contextual knowledge" [19].

2   Methodology

The kind of methodology that has been used is "applied" which consists in three phases 1) Investigating the problem of illiteracy in various international and national organizations, to have evidence about the necessity to propose a technology development. After observing the statistics of people in situations of illiteracy is now built a prototype mobile application, constructed with the recommendations of Hernandez Salazar, Paulo Freire and Pallarès Piquer [17, 18, 19] and also with Gamification 2) alpha test with illiterate people, 3) Measure performance and find improvement points.

The mobile app is designed in a way that the user can use series of audio instructions; selecting colors and images, in addition the lessons are based on the teaching materials of the National Institute for Adult Education (INEA).

2.1   Gamification Methodology

The game is divided into 4 categories of player 1) Basic, 2) Intermediate, 3) Advance and 4) Upper, all these categories have 110 lessons in total. To complete all the lessons,

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the user needs to unlock levels, achievements, medals and in the final of the whole program the user will get some extrinsic incentives.

2.2 Scrum Methodology

The mobile app is developed under the Scrum methodology, which are used to obtain quality results in an optimum time. This methodology has a control mechanism which is used to manage the unpredictability and control the risk. Flexibility, responsiveness, and reliability are the results [20]. Below are described the phases which are applied to develop the software.

Pregame

Planning: At this point, many functional and nonfunctional requirements were defined and obtained by information gathering Techniques Such as surveys, questionnaires, oral conversation and interviews. All of them were answered by illiterate people, furthermore observations and comparisons helped to identify what end user really need. Some of the most important functional requirements which were identified are:

- Users who wish to use the system, must be registered to keep track of scores.
- It is necessary for the user to answer a test which will define user learning.
- Punctuation needs to be stored in a database associated with the corresponding user.

  Some of the most important nonfunctional requirements which were identified are:

- Availability: The system needs to be available when the user requires
- Data Control: data generated by the system must be reliable
- Time of development: total time for development and deployment of the application must be less to 5 months
- Implement a system in which hearing can hear the instructions for each exercise or navigation between screens.

Architecture: It consists in design how the requirements which will be Implemented, to do that was necessary to represent each functional or not functional requirements in user cases, sequence diagrams, and data modeling which includes Entity relationship diagram among others. It allowed to identify processes and actors which interact with the system for example:

Entity: user: It refers to the end user who will use the application, so its principals' actions are: login, listen to audios, solve tests, and practice. Entity: Support staff: Its main function is to register the new who will use the App, Entity: Database: It interacts with the system, its main function to save user data such as personal data, and scores.

Game

Development Sprints: This phase Focuses on the development of new features Considering the time, quality, cost and requirements, this phase has multiple development sprints Which have a mean interval time (10 days) when a sprint begin, a meeting team work is carried out in order to plan the development of it, define and

objective and it`s functionality. After that, all developers must be get together 20 minutes to synchronize activities and get a plan for the next 72 hours to develop. When the software is being programed and the sprint are underway, it must ensure that changes are not affecting the Sprint`s target.

Sprint Review: The development team discusses what was successful and what problems were and how they were solved.

Postgame

Closure: In a period of three months is expected to start the closure. This will include documentation such as the user manual and the technical manual, and some performance tests are also necessary to identify a possibility of software maintenance.

User manual: It will content. A section Installation and Configuration, A guide to using at least the main functions of the system, i.e. its basic functions, A troubleshooting section detailing any errors or problems that may arise, along with ways to fix them, A FAQ section. Technical manual: It will contain. General diagram (Entity relationship diagram), User cases, Data Dictionary, Sequence diagrams, Relational diagram, Definition of environment variables and libraries, Restrictions or limits programming.

3 Results

As a final result, it was obtained an APP in phase two which means that the APP is ready for an alpha test in a national institution INEA. The Fig. 1 is showed some screens on the app. Due the fact these screens are prototypes; they could have a different look later in the final version of the project.
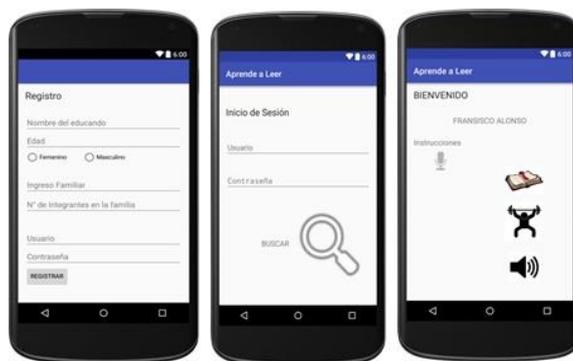
Fig. 1. Registration screens, login, and welcome /main.

Registration Screen: This screen is used to save user data and is a way in which the user can monitor their progress while using the application. Login Screen: With the development of this screen is only granted access to enter the security key (username, password). With the purpose of preventing the user's progress will be modified by

another person. Welcome/Main Screen: This screen shows an example in which the user is logged and can select from a number of options (content and exercises).

3.1   Exercise Screens

The app has a several number of exercises which help the user to identify sounds, pronunciations, and words. Also the app can evaluate the answers given with a number of stars. Fig 2 Show some of these screenshot examples in three different exercises. The user has the opportunity to get from one to five stars, being five stars the equivalent of a 10 and one star the equivalent of 6. The user can do the same activity only three times, in order to pass or improve the average already obtain, after three times the software save the highest level obtained and lock the activity.

Fig. 2. Exercises to identify sounds, syllables, and images, and ranking screen.

Only if the user completes the whole lessons with a minimum grade of 8, can unblock the next level (intermediate, advance or upper) respectively. To finish the whole course, the user has to pass all the levels with the minimum average score (stars). At this moment the application is in "Alpha mode" with no problems of execution neither manipulation, in the next phase is necessary to measure performance and find improvement points through intrinsic reinforcements, such a special point if the user get the highest average in the first attempt, in fact the game will have temporal modifications in special seasons as Christmas or Halloween with some extra exercises to improve the level of the user.

3.2   Reinforcements

The user can have access to his personal information in the game where can notice the status of his level, obtain special missions, and also can see the progress in a level bar in the top of this section and with different medals Gold, Platinum, Titanium, Silver and Steel, which means that the user have more than 10, 9, 8, 7 as a general grade. In

the whole game the motivation is intrinsic on every exercise, but in the final mission the reinforcement could be extrinsic if the user has an excellent performance which means the user have to get 10 or more than 10 in the final grade.

4   Discussion

The alpha mode shows that the interaction with the app has no problems to understand or the mechanic of the mobile phone or tablet, so according to UIT [4] and WEF [3] is real that ICT is a good mechanism to increase the competitively of society, also is a great support to people to achieve basic objectives that have a direct impact of the illiteracy problem in Mexico. This problematic can be supported with a simple game into the app that motivate people to learn using the intrinsic and extrinsic reinforcement. Showing the problem of illiteracy and ICT as a game, could give a new perspective and meaning to the word learn. Prensky [16] people need to stop perceive the process of learning as a boring, and Gamification is an excellent way to do this real. The propose of game include all of the characteristics that Zinchermann [12] proposes which give the student the opportunity to learn and try to do better more than one time. This software also has resources recommended by Pallares [19] like images, and sounds. So far the app has been test with a group of 20 people between 30 and 45 years old, who improve their reading skills in a basic level (sounds, identification of syllables and vowels), the test will continue with a bigger and mixed group, and the current students have been monitoring in order to introduce the game into the app, to analyze the behavior.

5   Conclusion

The benefits of Gamification and ICT were exposed in this paper, now is possible to confirm the advantages from apply this technology in areas that need this support so it is expected that this App would help areas in Mexico where people's illiteracy are located. Finally, is demonstrated that whit different techniques and methodologies is possible to contribute in the development of our country.

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