Application of Digital Educational Resources on Mobile Devices

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***Abstract*—** Manuela´s Beltran University has developed in their virtual unit specific projects that are focused in the creation of digital educational resources for the careers and post graduate studies. This article has evidence the develop of the virtual platform of learning called Virtualnet 2.0 for an special use of mobile devices with a WebApp, the impact that this device has become in the distance apprentice has been preceding by the digital tools, and the educational contents.

***Keywords*—** Communication; mobile learning; mobile platform; web app.

I. Introduction

THE reason of education in the context of virtuality has a sense of knowledge construction without depending fully on-campus classes were demanding that before hitting the digital age. The university Manuela Beltrán, unit virtual, has both modes of study and to support online teaching and everything involved in this learning process, is based on the project in the R + D project "Design of digital educational resources" framework to meet pertinences needs these scenarios educational. All of the projects that are develop in the virtual unit, this one is in search of a part contribute in the academic, educational and didactic way, focused in the technological advantages that digital resources gave. This OVA has been sent by an LMS call in the Virtualnet 2.0 platform that was created in the same University. The multimedia develop resources has an important issue for learning, because they are oriented to response the specific needs of each career and post degree based on the philosophy of happy learning.

A LMS is, primarily, a communicative scenario where the pretensions are educational. Digital tools and virtual learning objects allow communication. Involving in the subject of LMS, the Virtualnet platform has the basic characteristics of any other LMS, inside of her has been incorporated some tools like the synchronic and asynchronic communications, also this LMS has notifications, video commentary, calendar and online presentations.

In a technological and developing world, the creations of virtual access of education with de apps of different tools and resources like images, texts and videos that allows the Communication and information technologies.

It is a reality that the interaction of virtuality depends of the technological develops, but the communications has an important issue in a way that involves Pc, tablets or mobile devices. An issue that can occur will be, what it's in the mind of the companies about the high levels of constant information consume?, there are any technological gadgets that can measure the levels of Communication and information technologies, or for any commercial business?. We could say that both questions are associated with technological develop, so the terminals for digital content consumption are varied, and mobile devices are gaining ground against the desktop qualities. Cain y Sengupta [2] are those people that has been taken for a clear example of the creation of old fashioned business model that need changes. The main point of this digital consumption is the promotions of the mobile learning or M-Learning that can acquire and expands the knowledge of the students with the mobile devices.

If we compare the actual mobile devices with the olds ones there is a clear difference with the new functions and specifications like the internet connectivity and the data production in a short time at any place. But, the web search of the digital contents in mobile devices is not the same of the desktop devices.

In the virtual UMB has been develop an environment of apprentice called Virtualnet, it´s became necessary a creation of a digital tool that allows mobile devices to interact with the platform.

II. Literature Review

A. Communicative perspective

In a broad framework, the communication in virtual organizations are characterized by:

- "Semi-permanent structural units, geographically dispersed
- Performance level based on a common understanding of the business
- Continuous adjustment of organizational forms
- Intensive use of information technologies
- Information flows and allocation of resources in real time." [15].

In communication, all human beings possess an attribute to exchange ideas and knowledge that goes through a cognitive process to give a clear answer or message. Speech is a natural and effective way that the human have to transfer information but it is not necessary to depends in the communication process in detail and even if notice the importance of language

within these virtual environments to which must be referred to Bernstein "all courses, regardless the subject in question, consist in linguistic activities. Language is a central fact in schools. In our culture, teach is speak" [10]. The possibilities of technology expand from other forms of communication such as the interpretation of icons, emoticons and writing. The Importance of Teaching, which belongs to the teacher, has been characteristics [11] to improve the learning environment and mainly generated communication with students. On education, "every teacher must have a certain amount of support. This support is characterized by being individualized, and must allow a relatively wide range of activities" [17]

B. Another way to learn

First of all is important talk about mobile technologies and virtual organizations. It is necessary to start from the idea that a few years are being evident their impacts in society. Unhelkar stresses that "the mobile technologies and applications offer a lot of new opportunities for virtual organizations, they also presenting development and implementation challenges" [15].

Common methods of teaching were recognized with traditional classes in classrooms with blackboard, the teacher and students space or within a learning environment where it was the only form to acquire knowledge and be certified by the presencialidad. With the advent of digitization of information took an unexpected turn and widely accepted in the context of education going on at this time, from E-Learning and B-Learning to M-Learning within which the latter mode of learning also resides evolving from a technological look and depends mainly on the characteristics of software for mobile devices.

The ability to access, consume and produce information using mobile devices, or intent would be the epicenter of the M-Learning with relevance to guide participants in the construction of knowledge. It´s necessary to understand that technologies are as means of interaction to achieve the acquisition of information and in the case of education is learner centered [3].

Students have the advantage of having access to different content at any time from their mobile devices, controlling his time and rate of learning at any moment [4], a personal educational process [5] is obtained.

C. Towards a conceptualization

The digitization of information to be used in many ways by different programs and applications which allow to be presented as addressing, depending each person want to give. In education it is important to have a pedagogical model that generates knowledge and digital tools will take concepts of providing the teaching. Although there are many theories that can be to conceptualize digital educational resources, it is pertinent to take them from specific organizations as in the case of UNESCO [6], referring to open as "materials of teaching, learning and research educational resource in any medium, digital or otherwise". With this first insight, we can now take another reference to clarify the intentionality and land at the project that has been in the Virtual UMB and taking Minguillón expressing other types of materials other than text and image to be adopted as tools [7], it is envisioned that the combination of virtual learning objects (educational component) and digital resources (components of technological tools) can be synthesized three key elements which are: learning activities, context elements and contents [8]. So, these three patterns are enclosing design oriented education resources. Maybe could be just take the tools and virtual learning objects to arrive at a definition but not merged may appear ghosts or segments of concepts that turn out to be inappropriate in education [9].

Other important features of mobile learning system are: Informal, contextual, situated and authentic; immediate, appropriate, just in time, everywhere and anytime; personalized; personal, individualistic, and learner centered; complementary; collaborative. [18].

D. Technologic perspective

"A mobile learning system consists at least of the three components:

- "Mobile devices (could be mobile phones, PDAs, tablets. Their size, input capabilities, display capabilities vary, and that is a major issue in developing m-learning applications)
- Mobile learning software (could be a simple mobile Web browser or a dedicated application)
- Mobile learning content (the mobile learning content has to be compatible with the mobile device capabilities, keeping in mind its limitations)" [15]

Different algorithms, programs, applications, extensions, programming languages, compilers, operating systems, plugins, etc., were considered to create the WebApp Virtualnet to be interacted in different mobile devices. However, the main technologies that were considered are:

Ajax (Asynchronous JavaScript And XML): to establish the correct transfer of data between the server and the users Ajax is used for the purpose of exploit better the potential and productivity of web creating Rich Internet Applications (RIA). Its main feature is communicating asynchronously between the client and the server in the background which makes it possible to make changes at any time without the need to recharge [12]. From a technological perspective is very useful to have this item to improve speed and interactivity instantly use the application.

Jquery Mobile: interface that produces the use of this application helps different users to manage and improve the interaction experience with the WebApp [13]. Therefore, to use the jQuery Mobile framework will be achieved show a continuous visualization and interactivity transition based on touch technology that we provide the mobile devices and most importantly its feasibility joining for different operating systems. However, the interface is not the only feature to be used for the application, also a JavaScript library [13] that help you operate the DOM tree, the interaction with the formats HTML, animation, event management will be incorporated on the requirements and create different interactions with Ajax.

WAMP Stack programming: the main use of this tool will

be primarily from the HTML help for the development of Virtualnet Mobile. Moreover, the references Acronym to: Windows. Understood as operating system. Apache: the server is open source. MySQL: acts as a database manager. PHP: programming language. Given the preceding oriented technical side of development, will the communicative level in which we have the following resources:

WebSocket: its design is oriented type Web servers and browsers using a technology that allows full-duplex communication using only one TCP socket. However, it is a recent technology which is not available in older versions of browsers and also could be a problem for the mobile application. This does not mean we cannot use the WebSocket but more add another kind of technology like Socket.io.

Socket.io: is a library that allows you to select the communication mechanism in the browser which is implementing the WebSockets and make a process or poll: Comet or Flash, hidden frames, Ajax, etc., for effective communication.

Node.js: the main objective of this application is to create network programs for Web servers. Node.js uses the JavaScript programming language with I / O data that drives the architecture to events. One of the features are oriented modules communicating through an asynchronous network and are typically installed with npm (Node Package Manager) in order to facilitate the updating and compiling these modules programming.

III. DEVELOPMENT PROCESS

The development process is performed considering the Design and Developmental Research (DDR). This model is composed by six phases: "(1) Identify the problem, (2) Describe the objectives, (3) Design & develop the artifact, (4) Test the artifact, (5) Evaluate testing result, and (6) Communicate the testing results." [16].

Below are described the develop process by step.

A. App selection

There are many viable options about the develop and adjustment of the Virtualnet platform mobile devices issue, there some apps that we take for granted, the native and Webapp, starting at the specific needs of the virtual UMB and their educational model has been analyzed and the result is that the creation of the native has to include some characteristic like capacity and technological advantages of the mobile device, but for his develop it will be taking into account the relationship between the operative systems and the creation languages of each mobile that has different appearances. (Fig. 1) That's why "the development of m-learning applications is different by the one of a normal application, because m-learning applications are designed starting from the mobile devices on which are used" [15].

Operational System	Language
Android	Java
iOS	Objective-C
Windows Phone	C #

Fig.1. Compare of operational Systems with languages.

For proper operation, it is inevitable to make lines of additional code for each operating system. An advantage of using WebApp is that it is not necessary to download from online stores or applications like iPhone or Play Store. Another advantage is that the device has the opportunity to download updates and to be a web page, you will always find the latest version. Finally, new standards for mobile Web have generated a version of installable apps Webapp flames, with the characteristic of being in the device natively, gathering the most advantages. Its disadvantage is that it requires access and necessarily need to have a stable internet connection.

Analyzing each option, the installable webapp was selected for development from the app stores (play store, iPhone), so do not pass the validation process to impose such stores. Neither need to download updates, because as a web page always access to the latest version. Finally, we mention that the new Web standards (HTML5/CSS3/Javascript) have allowed a particular version of the web app: **web app installable**, which are located in the cell as a native with nearly all of these benefits. The biggest disadvantage is that, unlike native, for access to web app (installable or not), an internet connection is inevitably required. From the above, it was decided to develop the installer web app.

B. The mobile application – Pilot

In the construction of the installable webApp it had to go through a series of steps to demonstrate its feasibility of implementation. Initially the application was made for consultation and chat was disabled while the mail could only read. This was done to know if people had access to Virtualnet since the launch of the mobile platform (Fig. 2)

Fig.2- First version Mobile platform general menu

The people entering the application were increasing with the passage of time. (Fig. 3)

	2012*	2013	2014**
Total revenue amount from users to the system	280.134	688.436	191.307
Revenue amount from mobile platform	4.181	22.745	11.553
Revenue percentage from mobile platform	1.5%	3.3%	6%

Fig.3. Access to VirtualNet 2.0 system

* Data taken between July 4 and December 31, 2012

** Data taken between January 1 and April 1, 2014

Source: google analytics, developed by the authors

Based on this first pilot, we were able to demonstrate statistically that it is feasible to develop an application for mobile devices.

C. Second version

The aim of web app developed is offer to the students a new way to access to the learning contents. In addition, UMB wanted to venture in the new modalities of learning. The requirements that were taken into account to develop this version are:

- The application should be nice and easy to use
- The contents should have an optimal viewing
- The contents should be performed under educational parameter
- Access should be possible from any device.

From the concepts and technical characteristics mentioned in section II, we can say that were used as well: WebSockets to make and improve communication and make real-time; Ajax that provides access to the contents in asynchronous times; HTML / CSS / Javascript for handling data-client and server communicate with; WAMP stack and programming. (Fig. 4)

Fig.4. New version. Mobile platform general menu

D. Some academic consideration to develop

A fundamental part of the process teaching-learning, in the virtuality, is the interaction that develops between students and even teacher engaged orientation which allows the proper construction of knowledge. The device potentiates this interaction is centered on everyday technological devices that people use every day, in our case are mobile.

Considering the mobile as the medium that will transmit the information desired, the functional requirements are present: user profile, email, chat -online and offline- content, comments, newsletters, calendar and score ratings. Thinking about the basic needs of students and teachers, the requirements were taken three times: the first would be to identify, to recognize who he would be talking; the second is to information found on results qualifications, dates and class topics; third time as the communication that are given to establish the conversation, as chat and email.

Finally, were not taken into account the qualification requirements, some content, forum, reviews, online presentations and more, because the Web App does not allow viewing on mobile devices because the information and decoding are presented more robust and would require that the devices were the latest technology, keep away the idea that on any mobile it can be used, significantly compromising the interaction.

IV. RESULTS

The features of the web app are described as follows.

- The first feature is access to some basic information, such as: Own profile, which can be edited. – Others participant's profiles. This option allows knowing some information of course members and promotes interaction between participants with similar characteristics.
- Activities schedule made by the teacher in calendar tool and option where ratings assigned by the teacher are recorded. Calendar tool was considered important because the content and activities are enabled for a specified time and because the mobile platform aims facilitate the organization of time.

The second feature is the reinforcement of asynchronous communication. The first tool is the newsletter through which the teacher can leave short notes on the course highlights. The second is email (Fig.5).

Fig.5. Email

Email users can send, reply and receive messages to and from the classroom participants. An important feature is that all email sent from platform have an immediate copy to the personal email account (Outlook, Gmail, Yahoo). This characteristic allows students to be informed all the time.

Another communication tool enabled is social chat (Fig.6). Unlike the previous tools, social chat enables talks in real time inside of platform. This allows communication to all users through the "Public Chat" or private one on one conversation. Some other tools allow this kind of communication, but this one does it in the same platform. That allows that the student feel in an academic chat room. Additionally, the general course chat promotes the support to and from others.

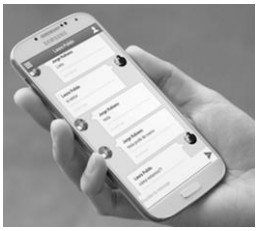

Fig.6. Social chat

Finally there are the contents (Fig. 7). The teacher has the option to decide if want that the contents can be seen only in desktop version or in mobile too. This alternative is offered considering that not all materials are suitable for mobile devices (eg flash format). Anyway, this new platform demands that the University develop their content in languages supported by mobile devices.

The types of content that can be posted are videos, audios, texts, animations. These can be played because of new web standards (HTML5/Css3/Javascript).

Fig.7. Contents

A new feature from content is the comments. This promotes interactivity around the contents with other users. Respecting content mobile aesthetics, comments have a character restriction.

V. PROJECTION

A. *WebRTC*

WebRTC is a new technology that allows makes video calls without plugins and specialized software. Right now is already being used in the desktop platform version, and will be incorporated in mobile version.

B. *Native application*

The google analytics data showed that the most used operating system is android. This would allow use more phone features.

VI. CONCLUSIONS

Mobile platforms enhance interaction and learning together. This, from the perspective of the zone of proximal development from Vygotsky [14], allows learnings that would not be possible individually.

The amount of hits to the mobile platform demonstrates the student interest for this study alternative.

Transfer the contents of the desktop version to mobile would make the same mistake that when was transfer the contents from traditional education to virtuality. It is important recognize that exist differences in presentation and develop content. At first, the mobile device screen is smallest than the desktop computer screen. From this, the contents (text, video, audio, image) should be compact, concrete and specific. At second, the mobile device cannot process some formats, like flash. So, the programming language must operate in those. And finally, the navigation is different when is done with mouse and keyboard, that when is done with fingers.

If platform versions for desktop and mobile devices are needed is important to think about programming languages that are suitable for the two scenarios. Take into account the possibilities for develop a mobile version from when the technologies choice for desktop computer develop is made, helps a lot in the unification.

The installable web app version has significant benefits for the mobile platform, for the development effort is less than if it were a native to each operating system, also because does not need updating, and because the only software that need is the navigator.

The mobile platform hasn't the capacity of the desktop version, but slowly the digital resources are being incorporated. Anyway, the mobile platform development is not intended replace the desktop version, but to offer a new access alternative to the system.

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