

Electronic Devices and Web 2.0 Tools: Usage Trends in Engineering Students*

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Personal Learning Environments or PLE are student centred spaces, which take into account their needs, learning styles and preferences. These spaces appear as important alternatives to overcome the shortcomings encountered with the use of institutional platforms. On the other hand, there is widespread use of mobile electronic devices and Web 2.0 tools among university students, mainly for communication and leisure activities, but that could be used for educational purposes. This research aims to make a diagnosis on access to and use of electronic devices and the web tools by students of the degree of Systems Engineering and Computer Science at Faculty of Engineering at the National University of Chimborazo in Ecuador, from the viewpoint of PLE. A methodological level corresponds to a quantitative and non-experimental research, ex-post-facto. The results show certain trends in the types of devices and their frequency of use, as well as their preferences for the tools to obtain and to find information, not only to create but to edit content and communicate with others, where they prioritize the use of certain social networks and some tools of synchronous and asynchronous communication. One of the main conclusions of this study mentions the huge potential currently offered by Web 2.0 tools to structure the PLE of college students, as well as the great potential for integration with mobile device.

Keywords: Personal Learning Environments (PLE); mobile learning; Web 2.0; ICT; higher education

1. Introduction

In recent years, the information and communication technologies (ICT) are influencing many human activities such as education. At the university level, massive adoption of ICT by students is observed [1], such as the widespread use of laptops, tablets, smart phones and other mobile electronic devices. From these devices, users consume and produce multimedia content (texts, images, videos, photographs, etc.), using the tools of Web 2.0 [2, 3], as resources that enable this information to flow. Although the main uses given to these resources correspond to activities of the communication (voice and SMS) and entertainment (games, social networks to name a few), they have also begun to be used for educational purposes [4].

In this sense, there are several lines of research studying these aspects, such as mobile learning, defined through the use of mobile devices in the learning process [5–7], or initiatives of collaborative learning and networking learning through the use of Social Web tools in education [8, 9].

On the other hand, the higher education institutions insist on centralising the student learning, through virtual platforms implemented by means of Learning Management Systems or LMS [10–13],

without obtaining the desired results. This is because students do not leave their informal personal and social learning spaces from where they communicate and interact naturally, as well as by the sense of obligation they perceive when they participate in institutional platforms [14].

In this context, the Personal Learning Environments or PLE appear as an alternative to overcome the perceived limitations when the LMS as virtual learning platforms are used [15, 16]. There are two trends to define the PLE: the first with a more technology-orientated and another that focuses it from the pedagogical side [17]. In a later stage, Adell and Castañeda categorize the resources that should have a PLE according their roles; for which tools, mechanisms and activities are defined, to read/access to information, to create/reflect and moreover, to share information and content [18].

These personal learning spaces have always been present throughout the development of humanity but they are more relevant today because ICT enable greater access to contents, interactions and socialization of information.

Moreover, individualities of the students about needs, constraints, preferences and learning styles, make learning processes not to be effective when it is generalized. In this sense, it should take advantage

of these individualities to achieve personalized learning where the students sets their own goals, routes and resources [19].

To promote the development of PLE in an educational group is necessary to know the levels of access of how students use technology, because these levels vary from one context to another [20].

Thus, the aim of this study was to make a diagnosis from PLE approach, of the use of electronic devices and Web 2.0 tools, by students of the Engineering Systems and Computing at the National University of Chimborazo (UNACH), as a prerequisite for future implementation of mobile PLE in this institution of higher education.

The structure of the paper is as follows: in section 2 the contextualization of this research is presented, section 3 shows the methodology applied, section 4 describes the main results and finally section 5 presents the discussion and conclusions.

2. Contextualization

An initial review of the literature indicates that studies on PLE and mLearning are topics new [21–23], and there are few studies that address the issue of Mobile Personal Learning Environments or MPLE as they called some researchers through their contributions made at European universities [24–27]. In Latin American countries, research related to this subject are in their initial stages of implementation [28–31].

So, in Ecuador has promoted recently the integration of virtual classrooms to supplement classroom teaching, in order to transform the presencial classrooms to environments with blended learning (b-learning), which combines the face-to-face instruction with computer-mediated instruction. [32]. However recent studies [14] indicate that these virtual spaces are not enough to promote the learning of students, because many activities and educational processes take place outside the formal college through social tools available on the internet. Also, access to these resources is given from various contexts including mobile devices.

In this sense, the present study is performed at the National University of Chimborazo (UNACH), Public Institution of Higher Education of Ecuador, located in Riobamba, which is the capital of Chimborazo province, located 165 km south of Quito the capital of Ecuador.

At this university, more than 30 undergraduate programs and several graduate programs are offered. At the time of this study there were approximately 8,000 students [33]. These students were distributed in four academic units or different faculties: Educational Sciences, Humanities and Technologies, Health Sciences, Political and

Administrative Sciences, and finally Engineering where it belongs the group who participated in this research.

Moreover, this work is carried out as part of the doctoral thesis on “Mobile Personal Learning Environments (mPLE) in Higher Education” within the doctoral program PhD. Education in the Knowledge Society at the University of Salamanca (Spain).

3. Methodology

As mentioned above, the aim of this study was to make a diagnosis from PLE approach, of the use of electronic devices and Web 2.0 tools, by students of the Engineering Systems and Computing at the National University of Chimborazo (UNACH), as a previous step to the implementation of mPLE in this educational institution. Below it is presented in methodological content of this research.

3.1 Type of study

This research is non-experimental quantitative type since it is not intentionally manipulated any variable, but rather some trends in ICT use by the group of university students are observed, which are then analyzed [34]. The study design is simply descriptive, because the characteristics of the variables are studied through distribution of frequencies and it is also transversal because the data collection process occurs in a single moment of time.

3.2 Population and sample

We worked with the entire population, that it was integrated by students of the career of Systems Engineering and Computer Science, National University of Chimborazo in Ecuador, those who study in the biannual and annual modality during the process of collecting information, because the career in question is in a transition from annual to biannual mode.

So, the semesters that were in effect from first to seventh, whose academic period was from September 2014 to February 2015. In the year term program, only the fifth year was due in academic period from September 2014 to July 2015.

The number of students enrolled in this career in both programs of study were 140 [35], but only 127 were those who responded to the questionnaire. These students were attending classes regularly.

3.3 Variables and instrument

From a PLE approach, the variables that allow us to know the access and use of electronic devices and web tools by university students are those related to: use of electronic devices and Internet, use of technological tools for acquisition and management of

information, for creating and editing content and to connect with others [17], as well as about the use that students give to social services.

Thus, in order to gather information from these variables a questionnaire containing 86 items was used, it was an adaptation of the instrument on ICT skills to students/as published by Victoria Marín Juarros [36], considering that this questionnaire fits perfectly with the objectives of this study. This instrument was validated by a group of experts.

This instrument was implemented using Google Docs forms and was applied online during the month of December 2014. Subsequently, the data were processed using the statistical software SPSS 20, whose results are presented in the following section.

4. Results

The great majority of respondents are under 24 years of age (82.7%); similarly, in the group there are more men (77.2%) than women (22.8%). Moreover, 33.9% of students study and work, compared

to 66.1% dedicated exclusively to academic activities.

4.1 Using electronic devices and internet

Among the resources used by students to access the Internet, it is shown that: laptops are the electronic equipment most commonly used, followed by desktop computers, however a large group of students also connects to the Internet from their smartphones, as shown in Fig. 1.

This is because that 59.8% of students surveyed said that if they have a phone of this type. In this user group is also observed a massive presence of Android (76.3%) as operating system to manage these devices. This is shown in Fig. 2. A small group of respondents mention that they also use tablets to access the Internet.

On the other hand, to inquire how many a week time the students access the Internet? It is observed that, a little more than half (52% accumulative) connect between 7 and 20 hours a week and only 3.1% use a maximum of 2 hours for this type of activity.

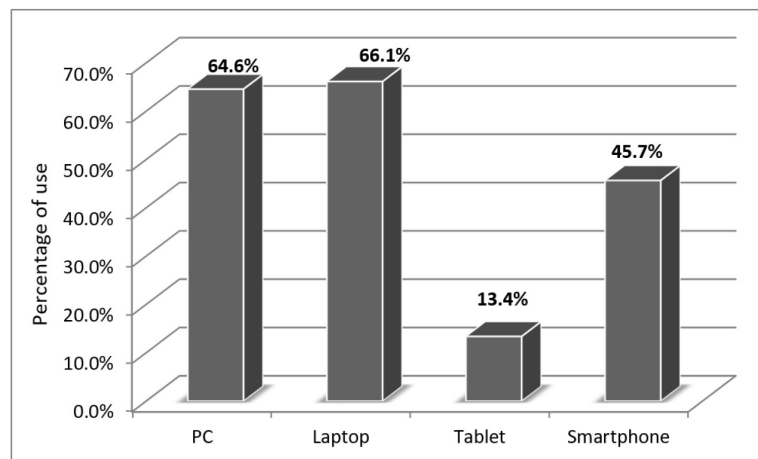


Fig. 1. Using electronic devices to access the Internet by students (n = 127).

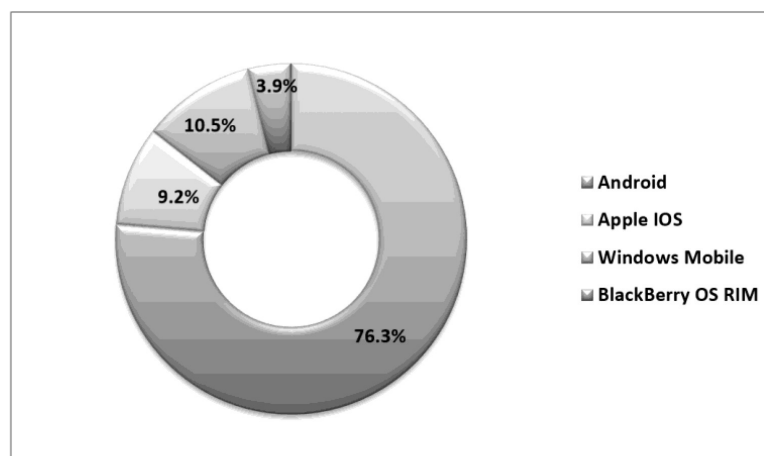


Fig. 2. Distribution of mobile operating systems among students who have a smartphone (n = 127).

Among the main activities carried out by students on the Internet in the last three months, it appears that the email is the most commonly used application (96.9%) and the least use the internet is for travel related and hotels services (4.7%).

4.2 Use of technological tools

Taking into account the three types of tools that are parts of PLE according to the criteria of the authors Adell and Castaneda [17], Below is a table where the tools of each type mostly used by students are presented.

The three tools with percentage more high values are presented. Moreover, the use preferences were differentiated according to the fields of application: for academic, personal or combined use, as seen in Table 1.

4.3 Use of social services

Regarding the use of social services by students, shows that the main activities performed daily are: write/chat with close friends (66.1%); listening to music (59.8%) and find useful information (53.5%), as well as to see if somebody else has written. In this sense, the communication channels managed through chat services of social networks like Face-

book or Gmail chat (Hangouts) could well be used for educational purposes.

As for the frequency of access, it shows that weekly the students use social services for educational activities (36.2%), to write/chat with friends (36.2%), for professional purposes (33.1%) and to find useful general information (31.5%). Monthly, students are dedicated to edit their user profiles (56.7%), upload photos (52.0%) and personalize pages (50.4%). And the activities that rarely or never performed by students through social services are the activities for political purposes (78.0%), those relating to contributions (59.1%) or to flirt/falling in love (58.3%). In this sense, activities such as making gifts by social media, chat or write to strangers or upload movies or videos, rarely carried out by five out of ten respondents.

5. Discussion

Differences between countries in the level of access to technologies [20] could influence the design and implementation of innovative educational projects [37]. There exist a variety of tools and resources that are more acceptable in some educational contexts than others. In the case of research on mPLE, is

Table 1. Most used tools by respondents' students (n = 127)

Type of tools	Academic use	Personal use	Combined use
Tools of acquisition and information management	<ul style="list-style-type: none"> Specific search engines (e.g.: Google Scholar), with 59.8% Academic databases (e.g.: Dialnet, Redined), with 32.3% Scientific repositories (e.g.: Merlot, Gredos), with 24.4% 	<ul style="list-style-type: none"> Organizational (e.g.: Evernote, Google Calendar), with 17.3% Social Search engines (e.g.: Whostalkin, Social Mention), with 12.6% Generic search engines (e.g.: Google), with 9.4% 	<ul style="list-style-type: none"> Storage of files (e.g.: Dropbox, SkyDrive), with 66.9% Generic search engines (e.g.: Google), with 65.4% Organizational (e.g.: Evernote, Google Calendar), with 32.3%
Tools for creating and editing content	<ul style="list-style-type: none"> For creating conceptual/mental maps (e.g.: CmapTools, MindManager, Mindomo), with 63% For creating visual presentations (e.g.: Powerpoint, Prezi), with 42.5% Blogs and tools for creating educational activities (e.g.: Ardora, JClíc, Hot Potatoes), with a 39.4% 	<ul style="list-style-type: none"> For the creation/editing (e.g.: Photoshop, Instagram, Picnik), with 22% To create audio/podcasts (e.g.: Audacity, Spreker), with 19.7% For creating and editing videos (e.g.: Animoto, JayCut), with 15.7% 	<ul style="list-style-type: none"> Word processors and spreadsheets (e.g.: Microsoft Word and Excel, LibreOffice/OpenOffice Writer and Calc), with a 63.8% For the creation/editing of images (e.g.: Photoshop, Instagram, Picnik), with 52% To create visual presentations (e.g.: Powerpoint, Prezi), with a 49.6%
Tools to connect with others	<ul style="list-style-type: none"> To share visual presentations (e.g.: Slideshare), with a 29.9% Thematic virtual communities (e.g.: Yahoo groups), with 25.2% To share documents (e.g.: Scribd, Issuu), with 24.4% 	<ul style="list-style-type: none"> For synchronous communication (e.g.: chats, instant messaging: Whatsapp), with 29.9% For videoconference (e.g.: Skype, Google Hangouts), with 22.8% To share pictures (e.g.: Flickr, Picasa), with 22% 	<ul style="list-style-type: none"> Generic social networks (e.g.: Facebook, Twitter, Tumblr), with a 74.8% For asynchronous communication (e.g.: forums, mailing lists, email: Hotmail, Gmail), with 74.8%

important to know in advance the access and usage preferences to electronic devices (computers, tablets and smartphones) as well as also the web tools most used by university students.

This research presents some important data on this subject, however it cannot be generalized because of the nature of the study. These results summarize the particular views of the college students investigated [38], which are very valuable for the future implementation of the mPLE in the UNACH.

It has been found that students using laptops mostly for their academic activities [39], as well as shows that smart phones are beginning to be used for these purposes. Also, university students prefer these communication devices, this agrees with other similar studies [40]. Similarly these usage preferences are consistent with the trends reflected in recent reports of the International Telecommunication Union [41, 42].

The use of the tablets appears with a lower level of use despite the new features incorporated and the customer friendly price.

Likewise, the Operating System Mobile most used on devices of respondents is Android. Apple IOS appear in lesser numbers like Windows Mobile. This trend is confirmed by international studies, where it puts Android as the OS with increased adoption by manufacturers of mobile devices [43, 44].

In this sense, you can see the present and future potential of using mobile devices in educational tasks at the university [45], taking advantage of its multimedia features, of messaging and connectivity.

As for the web tools and applications (apps) that respondents use, it is noted that they prefer generic search engines, databases and scientific repositories for the tasks of search and data acquisition.

For the tasks of creating and editing content, the students use mainly tools for creating presentations, word processors, spreadsheets, concept maps and blogs, the latter type of resource, is best suited to use since mobile devices, by the best performance under current resolutions that offer screens.

To communicate with others, the students prefer to use of social networks and networks for sharing: videos, visual presentations, images and documents, as well as the email.

Regarding the use that the college students give to social services, it is noted that working with these tools is part of their daily [46], because by means of the resources of Web 2.0 can be perform activities both personal, academic or both. Given these preferences use, we can say that generic social networks like Facebook, could be an important resource in the design of mPLE of college students. Since they are environments where peer interaction flows natu-

rally, but should be handled carefully by security and privacy issues [47].

6. Conclusions

The present study allowed to have a baseline on the use of electronic devices and Web 2.0 tools in the university education context studied. This information will allow to the future to be able to propose the development or adoption of new platforms and educational resources based on this type of technologies.

In these new learning contexts, which have been identified in Ecuadorian university students, mobile devices are the preferred electronic resources, not only for communication tasks but also as tools to access varied information (academic, personal, leisure, etc.) and for the generation and edition of multimedia contents. However, when it is required to process information in greater volume and to respect some standardized editing and publishing formats, office applications (word processors, spreadsheets) are still used, which are accessed from desktop computers. This is understandable due to the small screen sizes of the mobile devices, as well as their typing limitations due to the lack of conventional alphanumeric keyboards.

Regarding the type of Web 2.0 tools that college students prefer, their preferences for using social networks to interact and exchange content are evident. This is in line with global trends in the use of these resources. Although these tools constitute the natural way in which students communicate, it is worth mentioning the growing use of specialized academic sites (databases and scientific repositories) as primary sources of access to academic documents as the best alternative to generic search engines.

These findings that are common in different university contexts, as revealed by some publications, support the notion that thanks to globalization, ICTs are being massively adopted especially in the young population such as the case of the student's university.

Finally, it should be noted that the results of this study are the base for the implementation of mPLE in the UNACH, institution where the research was conducted and would be a valid reference for future researches, but, should raise the possibility to replicate this study in other university groups, including different geographical contexts.

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