Gender Differences in Internet Usage Habits: A Case Study in Higher Education

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Abstract:
The usage of information and communication technologies has been growing among students and teachers. In order to improve the use of the Internet as a tool to support teaching and learning it is necessary to understand the Internet usage habits of students. Thus, a study was conducted with 1397 students from five schools of the Polytechnic of Porto. The data was collected through an online questionnaire and was analyzed by age range, gender and scientific field.

In this paper, gender differences are analyzed and presented in 3 dimensions: type of Internet usage, communication tools and the role of the Internet tools in education.

Keywords: Technologies’ usage; eLearning; Higher education; Gender differences.

1. INTRODUCTION
The usage of information and communication technologies has spread widely in recent years, in higher education institutions (Gras, 2005; Mohammed and Al-Karaki, 2008). The Internet plays an important role in this field, being considered one of the most prominent technologies in this area (Loof, 2009; Gras, 2005; Prensky, 2001). Although the Internet has existed for many years, only recently has it emerged with mainstream popularity, motivating researchers and teachers to study and acknowledge its influence on the learning process (Misko et al., 2004; Gras, 2005).

As a result of this, Internet usage habits in higher education institutions have increasingly been the subject of many studies in the last decade (Minhsein, 2005; Gras, 2005; Tastle, 2005; Mohammed and Al-Karaki, 2008). These studies focus mainly on students’ Internet usage habits, analyzing their behaviour and expectations as target study population, but some of them describe differences in Internet usage habits according to gender, scientific field or age. The Internet usage habits in Portuguese higher education are not reflected in these studies, highlighting the need to characterize this population in order to better understand the behaviour and needs of Portuguese students with consequent improvement of learning activity, interaction between teacher students and eLearning.

In this context, this article attempts to characterize higher education students’ Internet usage by conducting a survey in the Polytechnic of Porto. Through this survey, the Internet usage patterns were analyzed in 3 components: type of Internet usage, communication tools and insights on the role of the Internet in education. Besides a descriptive analysis of the sample, in order to find possible differences in Internet usage habits by gender, the Mann-Whitney test was used in ordinal variables and the proportions test in nominal variables.
The second section of this paper focuses in the eLearning paradigm and its contribution to Internet usage in higher education. The third section describes the research methodology adopted in this study and the fourth section presents the survey’s results and their analysis. The fifth section draws some final remarks and points to some future research directions.

2. ELEARNING EVOLUTION AND INTERNET USAGE HABITS

Since the mid 90s, the spreading of technologies such as the Internet, e-mail, notebooks and mobile phones has caused several changes in the teaching and learning process in the majority of educational institutions. With an easier access to knowledge and information, academics needed to find new ways to study, learn, teach, research and even communicate (Gras, 2005). Indeed, Education was one of the areas where the Internet usage is increasing, changing the paradigm of the face-to-face learning to distance learning. The confluence of education with technology allows the appearance of the concept of electronic learning (eLearning). This concept can be defined as the delivery of educational content via any electronic media including the Internet, satellite broadcast, audio/video tape, interactive TV, CD-Rom and others (Tastle, 2005).

Despite some efforts (Harasim, 2006) to enhance remote education, the genesis of eLearning goes with the development of data communication in the late 60s, more precisely, with the invention of e-mail. These innovations contributed to the collaboration between teachers and students and began a new paradigm in education (Williams, 2005). In the 80s, there was a significant increase in the number of “non-traditional” students, older than 24 who returned to university to complete their studies, part-time working students, and others (Friesen, 2005). This growth made educational institutions seek new ways to meet these “non-traditional students”. At the end of the century, this need has been simplified with the advancement of Information and Communication Technologies (ICT) and the Internet.

In its first generation, eLearning systems were developed for a particular field of learning and had a monolithic architecture. Gradually, these systems have evolved and become domain independent, with reusable tools that could be effectively used in any virtual eLearning course. One such case is the Learning Management System (LMS) that aims to simplify the management of learning within an organization (Harman, 2007). In this type of system, students can plan their learning and collaborate with colleagues, while teachers may associate educational content and monitor, analyze and report progress of their students. Typically, these features are available through several tools included in the system (by default or by subsequent inclusion), such as forums, chats, resources, glossaries, tests, and workshops. These tools will recreate classroom learning and allow synchronous and asynchronous interaction between students and teachers. Despite their common use, these types of eLearning systems lack some important features such as the creation of learning content that implies the need to use third-party tools for the production of educational content and the content orientation (most LMS are divided into courses, rather than being learning object oriented, not promoting content reuse).

To understand all these changes and to see how students are dealing with them, several studies were conducted to characterize Internet usage patterns in higher education, based on several criteria such as age, gender, scientific field, hours of Internet use and others. Focusing mainly on gender criteria, a survey (Loof, 2009) was made on ICT usage in households and by individuals. In this study regular Internet use by men and women increased by more than 10 percentage points in each age group between 2006 and 2009, but the generation gaps remained.

Some other studies reinforce these differences highlighting the male predominance in Internet usage (Minhsein, 2005; Lall, 2000; Attwenger, 1997; Misko, 2004). One of these studies enhances a difference of over 10% favoring the gender male in the gender gap in Internet usage (Misko, 2004), however there is a tendency for this gap to decrease over time.

A study in Japan confirmed this trend (Kubota, 2001) revealing gender differences about time spent on Internet, e-mail frequency usage, number of messages sent or received daily and the kind of Internet usage. In fact, according to this study, men spend more time on the Internet than women, and thirty-six percent of men access the e-mail several times a day, in contrast with thirty-three percent of women. The number of messages sent and received is clearly greater in men (fifty messages daily in average) than women (thirty-one messages daily in average). Another gender
difference concerns the kind of Internet usage: men have more work-related activities on the Internet; on the other hand, women spend more time with private matters, namely talking with friends (seventy percent do so often).

Finally, some studies also revealed significant gender differences in Internet usage (Al-Mannai, 2003; Al Omary, 2002; Tsai, 2005). Female students, when compared to male students, tend to prefer the Internet-based science learning environments. This triggers new opportunities to explore science in realistic contexts and get helpful guidance for further learning.

Whereas the studies of Internet usage habits do not necessarily reflect the reality of Polytechnic of Porto, a survey was conducted with the objective of characterizing the behaviour and needs of Portuguese students concerning the Internet technologies, in order to select the suitable tools and techniques in the teaching-learning process.

3. RESEARCH METHODOLOGY

To characterize Internet usage patterns in Higher Education students, a descriptive case study with students from IPP was conducted. Their Internet usage patterns were analyzed according to three components: type of Internet usage (e.g.: location, frequency, type of use, motivation), communication tools (e.g.: social networks, chat, email: frequency, activities, benefits) and insights on the role of the Internet in education (e.g.: LMS, chat, email: frequency, easy of use, perceived importance).

Data was collected through an online questionnaire distributed to students of five IPP’s schools: ESEIG, ESTSP, ESTGF, ISCAP, and ISEP. This instrument was chosen because it allows the collection of a large number of answers at a reasonable cost. In the first week of June of 2009 a pilot test was carried out with 15 students from various programmes and academic years of ESEIG. This test validated the questionnaire’s objectivity, understanding and also the web form’s accessibility.

In the second week of June the dissemination of the questionnaire, in the various schools of IPP, began. The announcement was the same in all schools and was made by: announcements on the school website, announcements on the school learning management system, email messages sent to students and teachers (so they would ask their students to answer the questionnaire) and requests to teachers, who used computers in classrooms to free class time so students could complete the questionnaire. The questionnaire was open from June 5th until the end of July. In July, the schools’ academic services were contacted in order to gather descriptive data about the population.

Similar to other studies (Walker, 2007), the case study methodology was adopted for this study. Students from five IPP’s schools compose the universe of this study. The study included students from technological specialization programmes and also from undergraduate and graduate programmes. In 1416 answers, 1397 were considered valid (11% of IPP’s population). In Table 1 more data about the population and sample of this study is presented.

<table>
<thead>
<tr>
<th>Schools</th>
<th>Population</th>
<th>Sample</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESEIG</td>
<td>1036</td>
<td>235</td>
<td>23%</td>
</tr>
<tr>
<td>ESTSP</td>
<td>1883</td>
<td>258</td>
<td>14%</td>
</tr>
<tr>
<td>ESTGF</td>
<td>868</td>
<td>77</td>
<td>9%</td>
</tr>
<tr>
<td>ISCAP</td>
<td>3261</td>
<td>298</td>
<td>9%</td>
</tr>
<tr>
<td>ISEP</td>
<td>5604</td>
<td>529</td>
<td>9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12652</strong></td>
<td><strong>1397</strong></td>
<td><strong>11%</strong></td>
</tr>
</tbody>
</table>

Table 1 - Population and sample data

According to the Ministry of Science, Technology and Higher Education (DGES, 2010), Portugal has ten study fields: Science (SCI); Health (HEA); Technology (TEC); Agriculture and Natural Resources; Architecture, Arts and Design (AAD); Education; Law and Social sciences (LSS); Economics (ECO); Humanities (HUM); Physical Education, Sports and Show's Arts. In Figure 1 it is possible to see the distribution of the population and of the sample by scientific field in the discussed study.

![Figure 1 – Distributions across scientific fields](image)

Figure 1 shows the distribution of female and male students per scientific field. Humanities, Health and Science programmes have a larger proportion of women and Technology programmes a large proportion of men.

![Figure 2 – Female and male students per scientific field](image)

4. DATA ANALYSIS

The data analysis was carried out on three components: type of Internet usage, communication tools and insights into the role of the Internet in education. Besides a descriptive analysis of the sample, the difference in proportions of several variables according to gender was also tested using the proportions test with the Chi-square distribution. In ordinal variables, the Mann-Whitney test was used to analyze the differences between genders.
4.1. Type of Internet usage

The majority of students access the Internet at home (91%) and at school (80%). Only 24% say they have mobile Internet access. Most students access the Internet several times a day (65%), 32% connect daily and the remaining 3% connect monthly, weekly and even more rarely. As we can see in Figure 3, on average, 51% of students are connected to the Internet between 1 and 3 hours per day. It is also observable that the students’ gender is associated to the session’s duration (p-value $\approx 0.000$). Male students stay connected for longer periods of time (p=0.013).

![Figure 3 - Daily average connection to Internet by gender](image)

On average, 48% of the time spent on the Internet is for personal leisure (the mode is 50%). As can be verified in Figure 4, the most used Internet tools are email (95%), search engines (92%) and instant messaging (58%).

Students’ gender is related to the usage of some Internet tools (Figure 4). Male students statistically use more instant messaging (p=$\approx 0.007$), forums (p=0.009), games (p=$\approx 0.000$) and wikis (p=$\approx 0.000$) and female students, statistically, use more social networks (p=0.000) and search engines (p=0.039).

![Figure 4 – Most used Internet tools](image)

According to Table 2, presented below, the two main reasons for Internet usage are research concerning class works/study (94%) and accessing documents in Moodle or another LMS (77%). Email exchange is also a very important activity (77%).
### Table 2 - Internet usage’s main reasons

<table>
<thead>
<tr>
<th>Internet usage’s main reasons</th>
<th>Total</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researching concerning class works / study</td>
<td>94% p=0.000</td>
<td>96%</td>
<td>90%</td>
</tr>
<tr>
<td>Accessing to documents in Moodle or another LMS</td>
<td>77%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exchanging mail</td>
<td>77% p=0.000</td>
<td>82%</td>
<td>73%</td>
</tr>
<tr>
<td>Connecting with friends</td>
<td>72% p=0.000</td>
<td>78%</td>
<td>66%</td>
</tr>
<tr>
<td>Reading newspapers, magazines and portals</td>
<td>52% p=0.000</td>
<td>43%</td>
<td>62%</td>
</tr>
<tr>
<td>Downloading music or films</td>
<td>50% p=0.000</td>
<td>44%</td>
<td>57%</td>
</tr>
<tr>
<td>Searching info (other than school issues)</td>
<td>47%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharing information (documents, music, films, etc.)</td>
<td>28%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessing friends’ social networks</td>
<td>24% p=0.000</td>
<td>30%</td>
<td>18%</td>
</tr>
<tr>
<td>Gaming</td>
<td>19% p=0.000</td>
<td>14%</td>
<td>24%</td>
</tr>
<tr>
<td>Using Forums (post or read)</td>
<td>17% p=0.000</td>
<td>6%</td>
<td>31%</td>
</tr>
<tr>
<td>Shopping</td>
<td>12% p=0.000</td>
<td>7%</td>
<td>17%</td>
</tr>
<tr>
<td>Using Blogs (post or visit others)</td>
<td>9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Searching new friends / acquaintances</td>
<td>6% p=0.028</td>
<td>9%</td>
<td>10%</td>
</tr>
</tbody>
</table>

An overview of Table 2 shows that both male and female students use the Internet for several reasons. The reasons presented in bold in Table 2 are statistically related with the students’ gender. Female students statistically use the Internet more than male students to: research concerning class work/study, exchange emails, connect with friends and access friends’ social networks. Hence, male students use the Internet more than female students to read newspapers, magazines and portals, download music or films, play games, use forums (post or read) and shopping.

Regarding the use of search engines and email there appears to be a contradiction between the data where the students state which are the tools they use the most (Figure 4) and the reasons why they use the Internet (Table 2). We believe that these differences may be caused by two reasons. On one hand, “most used tools” and “reasons for using” are not quite the same. Hence, students might differentiate which tools they “actually use” from “why” they use them. This means that the reasons for using the Internet go beyond their duties. This last question is about motivation and the first one is about mandatory reasons for usage. This explanation has some support in data from Table 2. While female students use the Internet for socializing and “getting their homework done”, male students engage in more leisure activities. This data seems to reinforce the traditional idea about responsibility towards duties being stronger in girls than in boys.

On the other hand, the order of the questions in the survey may affect the answers given. The question about most used tools is more generic and appears firstly in the survey, whereas the question about reasons for Internet usage is more specific and appears secondly. The students may be led to be more discriminating in the last question, therefore the answers’ are different, revealing more detail / depth in the last question.

In general, it is noticeable that female students use the Internet to study, and to socialize with others. On the other hand, male students are more engaged in leisure activities and enrolled in activities by themselves that do not depend on other people.

### 4.2. Internet communication Tools

A huge usage of social networks among IPP’s students was observed. Of these, 91% have a profile in Hi5, followed by Facebook (23%). About 33% of the students use social networks to make new friends.

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2 *Hi5* is a social networking website. ([http://hi5.com/](http://hi5.com/)) among Portuguese young people.
Female students, as seen in Table 3, 78% have a profile in a social network. The importance of social networking is minor among males (30% do not have a profile). These differences are statistically significant (p=0.002).

<table>
<thead>
<tr>
<th>Social Networks</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>22%</td>
<td>30%</td>
<td>26%</td>
</tr>
<tr>
<td>Yes</td>
<td>78%</td>
<td>70%</td>
<td>74%</td>
</tr>
</tbody>
</table>

Table 3 – Social networks’ profile according to Gender

Analyzing Table 4, presented below, we can see that female students are, with statistical evidence, the ones most engaged in activities developed in Social Networks. Here, female students watch photos, try to find out what their contacts are doing, make comments, talk with other people and share information (photos, videos, music). Finding interesting things (other than school issues) is done by 33% of the sample students, regardless of their gender.

Male students admit more than female students that they meet new people, searching for new friends and acquaintances. Either, male students are meeting other or female students are less frank about their online activity feeling active regarding this activity whereas female students rather than actively trying to meet new people, don’t acknowledge this activity.

<table>
<thead>
<tr>
<th>Activities most developed in Social Networks</th>
<th>Total</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viewing photos</td>
<td>47% p&lt;0.000</td>
<td>54%</td>
<td>39%</td>
</tr>
<tr>
<td>Knowing what my friends are doing/what is happening</td>
<td>36% p&lt;0.000</td>
<td>41%</td>
<td>31%</td>
</tr>
<tr>
<td>Commenting</td>
<td>35% p&lt;0.000</td>
<td>44%</td>
<td>26%</td>
</tr>
<tr>
<td>Finding interesting things (search information - other than school issues)</td>
<td>33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chatting with other people</td>
<td>31% p&lt;0.001</td>
<td>35%</td>
<td>27%</td>
</tr>
<tr>
<td>Searching for information (photos, videos, music)</td>
<td>24% p&lt;0.000</td>
<td>30%</td>
<td>19%</td>
</tr>
<tr>
<td>Meeting new people (Search new friends/acquaintances)</td>
<td>15% p&lt;0.000</td>
<td>10%</td>
<td>19%</td>
</tr>
<tr>
<td>Informing my friends of what I am doing</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Searching for information about companies'</td>
<td>9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Updating CV</td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting personal meetings with network contacts</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sending Messages</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 - Most engaged activities in Social Networks

In order to connect synchronously, 98% of the students use MSN while Skype and Google Talk have small shares (15% and 11%, respectively). However, male students are more diverse in their choice of tools used (Google Talk, p=0.001 and Skype, p=0.021). Females are much more loyal to MSN hardly using any other synchronous tool (p=0.028).

According to Figure 6, 28% of the students use instant messaging several times a day and 34% use it at least daily. Male students are more frequent users (p=0.004).
As seen in Figure 4, email usage is more adopted (95%) than instant messaging (58%). Even though there are not statistical gender differences regarding whether students use email, when it comes to the frequency of email usage male students use email more often ($p \approx 0.000$). According to Figure 7, 59% they use it several times a day against 44% of the female students.

Concerning LMS usage, Moodle is used by 98% of the students. According to Figure 8, 14% of the students visit Moodle more than once a day, almost half the students (46%) visit it daily and 29% only visit it on a weekly basis.
Regarding the LMS’s usage, male students use it more often than female students (p=0.006). This difference is not so clear in Figure 8 but is a significant difference. When it comes to usability, 45% of the students consider Moodle "relatively easy to use" and 32% consider it "very easy to use". This difference is not significant between genders.

According to Figure 9, more than a third of the students consider Moodle to have a "very important" role in education/learning and 41% consider it "relatively important". Of the female students, 42% say LMS has a relatively important role in education (against 39% of the male students). There is no statistical evidence of differences between genders, as also shown in Table 2 (Internet usage’s main reasons) that both genders use the Internet to access documents in LMS platforms frequently.

As shown in Figure 10, IPP’s professors use other Internet tools in addition to LMS. Email usage was emphasized (91%), followed by search engines (38%) and by forums (24%). It is noted that some professors have come to use tools such as: games, social networks, blogs and wikis. The approach used by professors to interact with students is changing with the growing use of Internet tools namely: instant messaging, forums and wikis.
Emailing and instant messaging with colleagues and professors is considered “very important” or “relatively important” in the education/learning process. However, the exchange of emails is still considered more important (46%) than instant messaging (30%).

5. DISCUSSION AND FINAL REMARKS

The results presented here are important because they are from the first study made in Portugal about the Internet habits in the Polytechnic of Porto. The results show that 91% of the students have Internet access at home and 80% at school. They also show that 90% of students’ access the Internet every day. Such facts may indicate that teachers should exploit the use of teaching and learning methodologies supported on the Internet.

Regarding the Internet tools used by students, data shows that e-mail consulting and the use of search engines are the most used and there are no significant differences by gender. Another tool that shows no statistical differences between male and female gender is the use of Blogs. Thus, to have more impact in interacting with students these tools should be, ideally, used by teachers. Men use all other Internet tools (wikis, forums, games, instant messaging) except social networks more than women. When the students were asked about the reasons for accessing the Internet, most of them answered that the main reasons are academic. They use it to carry out research to do class work or to study. They also use it to access Moodle (or another LMS platform). For these reasons there are no significant differences by gender. Other reasons mentioned by females are being connected with friends and access to friends’ social networks. Conversely men prefer to use the Internet to read newspapers, download music or videos and play games. The reason for this difference in behavior can be explained by psychological differences between the two genders. Women tend to exhibit a more social behavior than men, who usually have a more individual attitude. These results are in agreement with a study made by Madell and Muncer (2004).

Regarding Moodle (or other LMS platform), data show that both genders consider this platform very important to help them in their learning process. This is consistent with the fact that the frequency of use of these platforms is high (more than 50% of students checks out the LMS platform at least once per week and there is no differences between genders).

Following the example of the University of Minnesota (Walker, J. & Jorn, L., 2007), we intend to carry out a bi-annual analysis of the habits of Internet usage among students of the Polytechnic of Porto to study its development, as well as the evolution of “new technologies” usage in teaching and learning activities. This information may have a relevant role in defining technologies planning and thus, to the success of higher education proposes.

In future studies, it would also be interesting to study the habits of Internet usage for teaching: what Internet tools teachers use to interact and promote learning among their students. It would also be interesting to study the habits of Internet use in teaching and non-teaching staff and, with all the data, to establish orientation guidelines for the use of technologies in Higher Education institutions.
6. REFERENCES


