The Use of Communication Technologies in Personal and Learning Contexts: The Influence of Gender in Higher Education Students in Portugal

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Abstract This article presents and discusses the main findings of a nationwide survey that aims to obtain a deeper insight into the way students of the Portuguese Public Higher Education (PPHE) use Communication Technologies (CT), with particular emphasis on gender issues.

An analysis model was created and used to develop the nationwide online survey used to collect data. This descriptive and exploratory research enabled knowing students' perception on the use of CT, how often they use them and its perceived usefulness in personal and learning contexts. Findings point towards the existence of relevant gender differences in terms of use and perceived usefulness of CT, whether in learning situations or in more personal contexts.

Keywords Gender • Higher Education • Students • Communication technologies • Portugal

1 Introduction

Nowadays, it is clear that technologies are already part of students' daily life in Higher Education (HE) and they are used in a variety of contexts, whether in personal or leisure activities or as a support to learning. The importance of studying the way students use the available technologies has been shown in the diverse works that aim to understand CT use on a national scale (Costa et al. 2011; Coutinho 2008, 2009; Coutinho and Junior 2008; Gomes et al. 2011; Marques and Carvalho 2008)

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and international (Franklin and Harmelen 2007; Grodecka et al. 2009; Grosseck 2009; Hemmi et al. 2008; Selwyn 2007). On the whole, these studies show that CT are able to promote greater participation, collaboration and interaction on the part of students in learning situations.

Nonetheless, no broader nationwide survey in terms of Portuguese Higher Education (PHE) enabling insight into students' perception on CT use, or more specifically a study taking into account gender as a specific dimension of analysis, was identified. A large part of works developed are usually case studies reporting the use of specific tools in very specific situations, not allowing the development of a broader view on this subject.

Countless studies were carried out in Portugal aimed at studying the use of the variety of technologies, impact thereof and integration into learning contexts, but there are still few investigations dealing with the pair 'technology and gender'. The appropriateness of including the gender dimension during the analysis of this phenomenon concerns the fact that several government agencies, such as the European Commission (EC), are concerned with gender differences in terms of enrolment and training in fields such as technology (Wastiau-Schlüter 2005) on one hand and the existence of gender differences in terms of behaviour, preferences and use of ICT on the other, both in learning and leisure contexts (Tømte 2008).

Considering the above mentioned, a nationwide study was carried out that focussed on contributing to the characterisation of CT use, based on the perceptions of PPHE students and with particular emphasis on gender differences.

2   Gender and the Use of Communication Technologies

Within the scope of gender difference studies, several studies have shown significant differences between gender regarding access to and use of technologies.

In general, it is striking that males use ICT more than females and that gender influences the ways in which students use those technologies. Nonetheless, as argued by Selwyn (2004), access to ICT does not necessarily entail the use of those technologies and the fact that ICT are used does not mean that they are highly used.

Regarding technology access and use, mention can be made, on a HE basis, to the investigation conducted by Tekyi-Annan (2005), who sought to understand students' perception and identify gender differences regarding the use of computers for educational purposes. The study counted with the participation of 33 students from a Canadian university and findings showed that both boys and girls had their own computers at home, spending an average of 5 h a day in front of a screen, both for educational and leisure purposes. Girls regarded computers as a very important tool for increasing self-confidence and motivation when using computer programmes. The most common uses are information research, e-mail sending and receiving, and computer games. In the latter case, it was shown that females play as much games

as males, although the types of games played differ significantly. Nonetheless, Bussière and Gluszynski (2004), in a work aimed at identifying gender differences among 15-year-old Canadian teenagers when using software, concluded that boys used the computer to play games twice as much as girls and showed that they used the Internet and the computer at home and at school much more often than girls.

Imhof et al. (2007) monitored a sample composed of 48 students from the University of Frankfurt, in Germany, in order to check if it was possible to identify gender differences regarding access, motivation, performance and use of a computer. In general, no significant visible differences were found between boys and girls in terms of the time spent in front of a screen nor in terms of the activities they prefer doing. Nonetheless, it was possible to identify that males used the computer for private or non-learning-related purposes more often than females and it was observed that boys outperformed girls when using software applications, with girls having lower scores.

Although at a different education level, Volman et al. (2005) researched the access and interest in technology use by 213 secondary school pupils in Holland. They concluded that girls use a computer at home less often and find little interest in computer programming activities and games. In a school context, the same study demonstrated that computers are similarly used by males and females, the difference being that girls use their e-mail more often and boys prefer computer games. Fallows (2005) found similar results in a higher age group, when he sought to understand how North American men and women, ranging from 18 to 65 years old, used the Internet. Hence he showed that men used the Internet for leisure purposes more often and observed that women sent and received more e-mails than men. Caspi et al. (2008) also highlighted female preference for written communication and regarding ICT use. Identical results are also presented by Gil-Juarez et al. (2011), who mention a female tendency to use computers and the Internet for communicative purposes or to do school work, while males preferred creating web pages or programming and used ICT for leisure activities more often.

Moreover, Papastergiou and Solomonidou (2005) researched gender differences in Internet use with 340 pupils from 11 secondary schools in Greece. Results obtained point towards a more frequent use of the Internet by young people in non-school environments, such as at home and Internet cafes, and it was shown that boys had more opportunities to access the Internet. The most common activities relate to information research for personal and leisure purposes, with particular emphasis on the use of the Internet for leisure purposes and website creation mostly by boys. Nonetheless, regarding e-mail sending, conversations in chat rooms or through videoconference no significant differences were observed between males and females.

A study conducted by the OECD (2007) set out to investigate the use of web services of Web 2.0 by young people and it was concluded that the paradigm of this second generation of the World Wide Web appeals to women and men differently. Therefore, boys are particularly driven by video creation and sharing online, whereas girls are rather drawn by writing and upload of photos to blogs and social networks.

The use of the Internet for communicative purposes mostly by women was also confirmed by Jones et al. (2009), in a survey involving 40 USA Universities and the participation of 7421 students. Besides the conclusion mentioned above, the authors also highlighted the following:

- Boys mentioned they used the Internet before girls and indicated they used wireless networks more often than girls;
- Males stated spending more time online than females;
- Boys are mostly online to entertain themselves, whereas girls prefer to be online for interpersonal communication and to do homework.

Technology access and use can also have a different impact on men and women, as concluded in the research by Colley and Maltby (2008), who analysed the posts of 200 men and 200 women, from a variety of countries, in the discussion forum of BBC News website entitled 'Have Your Say—Has the Internet changed your life?'. The analysis of message content suggested that a higher number of women made new friends or reunited with relatives or long-standing friends, as well as that more women mentioned making online purchases, easily accessing learning resources and easily finding information researched online. Men, on their turn, mentioned more often that Internet plays a major role in their professional life, having helped them find a new job. In the authors' opinion, these findings somehow mirror the concerns and motivations related to social roles played by men and women.

3 Analysis Model

The study carried out (Morais 2012) was aimed at gaining an insight into the perceptions of students from the PPHE regarding CT use and had the following general goals:

- Identifying CT used by students from the Portuguese Public Higher Education;
- Presenting the purposes, usage level and locations of access to and use of CT;
- Identifying usages promoted and knowing the opinion of students on the use of CT as a support to learning;
- Knowing the behaviour and preferences of students regarding CT use;
- Identifying differences between CT use for personal purposes and in a learning context;
- Analysing the extent to which CT use is influenced by gender.

Initially, an analysis model aimed at systematizing a set of important concepts within the scope of this research was drawn up. Therefore, the major concepts are: Gender, Higher Education and Communication Technologies. The components and indicators of each concept were identified, serving as a support to the work developed later on (Table 1).

Table 1 Analysis model of the study

Concept	Dimension	Components	Indicators
Gender			– Females
			– Males
Portuguese Higher Education	Institutional		– Identification of Portuguese public HEIs
			University-based subsystem
			Subsystem based on vocational higher education
			– Identification of the scientific areas covered by the courses provided at Portuguese Public HEIs using CT
	Students		– Age
			– Status
			– Institution where they are enrolled
			– Scientific area of the course they are attending
			– Year and stage of academic development
			– Number of enrolments
Communication Technologies (CT)	Identification		– Identification of CTs provided by the HEIs
			– Description and features of CTs
	CT Access and Use	Context	– Support learning and personal purposes
			– Identification of CTs used
			– Identification of the places of access to CT
			– Identification of CT access rate
			– Support learning
			– Provision of CT by the institution
			– Identification of the nature of the course using CTs
			– Teachers' perception on CTs
			– Identification of the type of learning activities performed using CT
			– Identification of the purposes of using CTs
		Overall advantages and disadvantages	– Perception of the benefits related to CT use
			– Perception of the problems arising from CT use
			– Perception of the impact of CT use
		Personal perceptions and expectations	– Perception of the skills for CT use
			– Perception of CT usefulness
			– Perception of the level of satisfaction on CT use
			– Attitudes (positive and/or negative) regarding CT use
			– Identification of preferences on CT use
			– Identification of expectations on CT use in the future

3.1 Concept: Gender

In the characterisation of the concept of Gender, given the nature of this study, we adopted the perspective of Tømte (2012), who regards this concept as a sexual category dividing people into two groups: men and women. According to this author, the features and roles culturally assigned to each gender make more sense when applied to the notions of masculinity and femininity. Actually, within the scope of this study, the concept of gender was characterised on the basis of the indicator regarding student sex, i.e. whether they belong to the female sex or male sex, which allowed us to characterise the gender of participants and thus analyse the influence of this variable in CT use.

3.2 Concept: Portuguese Higher Education

Given that this research regards the Portuguese Higher Education (PHE), it seemed important to us to know and characterise this context using two different dimensions: the Institutional aspect and that of Students.

The institutional dimension, as the name suggests, contributes to the obtainment of information on institutional aspects, such as the identification of PPHEI, location thereof, number of enrolled students, the subsystem to which they belong, etc. This institution-oriented data was obtained by means of document collection, particularly through documents provided by the Directorate-General for Higher Education (DGES)—Ministry of Science, Technology and Higher Education—, as well as through other documents supporting the characterisation of indicators related to the institutional dimension.

Still based on Higher Education, the Student dimension was particularly important in this study. Actually, as we intend to gain insight into the perceptions of these individuals regarding CT use, drawing their profile was highly important. To this end, it was essential to get information on a set of indicators such as: sex, age, PPHEI at which students were enrolled, scientific area of the course they attended, etc. (see Table 1).

3.3 Concept: Communication Technologies

As mentioned above, Communication Technologies are, under this study, technologies that enable communication and are based on the Internet. It seems important to us to delimit this concept, given that this study did not cover the analysis of information technologies or the use of devices enabling and supporting communication.

Table 2 Taxonomy of CT adopted in the study

Communication technologies	
Categories	Examples
Learning management systems	BlackBoard, Moodle, WebCT, etc.
Interpersonal communication technologies	email, MSN, Skype, etc.
Publishing and sharing technologies	Blogs, Wikis, Flickr, YouTube, Podcast, Social Bookmarking, etc.
Collaborative technologies	Google Docs, Social Bookmarking, Mind Maps, Wikis, Blogs, etc.
Content aggregation technologies	RSS feeds, Netvibes, Google Reader, etc.
Social networks	Facebook, Twitter, Hi5, LinkedIn, Ning, Academia.edu, etc.
3D virtual worlds	Second Life, Haboo, etc.

The first dimension of this concept is the identification of technologies, a task which, following the selection and thorough analysis of the proposals from varied authors and the joint collaboration with another researcher, who has also been engaged in work on the use of CT (Batista 2011), resulted in the proposal of a taxonomy (Table 2).

The taxonomy adopted covers seven different types of CT and a set of examples for each type which, in our opinion, suit the context and the goals of this research.

Therefore, the category named learning management systems encompasses a set of solutions that use the Web to provide, in an integrated manner, several features enabling content management and sharing, the use of communication services, collaboration tools, etc. Some of the most famous learning management systems are Moodle, WebCT or Blackboard.

The category focused on interpersonal communication technologies relates to technologies that enable synchronous or asynchronous communication. Synchronous communication is performed by means of CT enabling real-time contact among participants, such as MSN Messenger, Skype, among others. Asynchronous communication does not require simultaneous interaction. The most common examples of this type of communication are email service and discussion forums.

Technologies arise, inspired by the second generation of the World Wide Web—Web 2.0, which allow content posting and sharing, others enabling collaboration, making data aggregation easier, social networks and virtual worlds. Content posting and sharing are probably two of the best notions to characterise the Web 2.0 (Conole and Alevizou 2010) and are one of the CT categories covered by the study. Using this kind of technology, users can post and share different types of content on the Web, such as texts, pictures, videos, music, etc. In this context, it is worth noting blogs, sites such as YouTube and Flickr, tools enabling social bookmarking, Wikis, among others. The category of collaborative technologies relates to CT which enable users to work on a collaborative basis for content development, and thus we thought it was appropriate to highlight solutions such as GoogleDocs, Mindmaps and Wikis.

Web 2.0 also marks the development of content aggregation technologies. This type of CT is useful when users intend to aggregate, in a single site, information obtained in different websites. The varied tools enabling content aggregation include Netvibes and the now extinct Google Reader.

Social networks are probably one of the most successful phenomena in the Web 2.0 paradigm, enabling users to create digital spaces where they share contents with friends, such as messages, videos, texts, and where they can even play games (Conole and Alevizou 2010). Nowadays, Facebook is probably the most widely used social network, but there are others, such as Ning and Academia.edu, which are particularly used in academic contexts.

The category regarding 3D virtual worlds relates to the tools that allow users to surf in virtual spaces and interact with other users by means of characters named avatars (Conole and Alevizou 2010). In academic contexts, Second Life is probably the most widely known virtual world, thanks to the variety of studies carried out using this virtual world.

In addition to the identification of CT, different studies have highlighted the importance of researching areas such as access and use, attitudes and skills for the use of those CT, among others. Therefore, within the scope of this research, CT Access and Use is an important dimension. On the whole, the issue of access regards the possibility for students to physically access a CT, whether at the PPHEI, at home or at another location. The extent of access is probably a more basic issue that limits at a later stage the possibility for pupils to actually use CT according to given purposes (learning, leisure, etc.). In this respect, the access and use dimension is described in this study according to several indicators, organised into three different elements: Context, Assessment of advantages and disadvantages and Self-assessment of CT use.

Regarding the Context of CT use, focus is placed on the context of learning resource and an attempt is made to understand some trends regarding the use of CT in personal contexts. To this end, it is important to consider indicators enabling us to obtain information on: which CT do students use? How often and for what purpose do they use it? Where does this take place? Which CT are provided by PPHEI? Which activities are promoted by teachers using CT?

Still in terms of the dimension of CT use, the Assessment of the advantages and disadvantages is another perspective we intend to understand by means of this study. In this respect, the indicators proposed for this element of assessment of CT use must allow gaining insight into the perceptions of students on the benefits, issues and impacts arising from the use of CT in learning contexts.

Lastly, issues related to Perceptions and personal expectations of students regarding their use of CT are explored. In this context, indicators that seek to identify preferences, expectations, attitudes, level of satisfaction regarding the use of CT and those related to the skills of students and their perception on the usefulness of those CT become especially relevant.

4   Methodology

The analysis model which guided the study is followed by the presentation of methodological choices. From a methodological point of view, it is considered appropriate to connect this study to the quantitative paradigm, although it also has features belonging to the qualitative paradigm, particularly those regarding understanding, interpretation and description of findings on the perception of students in terms of CT use, as well as document collection that supported the review of the state of the art.

It is a research that comes under a descriptive dimension, with many similarities with survey-based studies, particularly if we consider the fact that the questionnaire was the main method for data collection aimed at investigating individuals on their perceptions, attitudes and behaviours (Coutinho 2011). In fact, investigation by means of survey enables the obtainment of information on participants in a study and is mostly used when the aspects one wishes to study cannot be verified directly (Ghiglione and Matalon 2005).

The choice of developing a questionnaire was based on several reasons. On one hand, given that it consists of a descriptive research, an investigation by questionnaire is one of the methods chosen to collect data in this type of research. On the other hand, given the proposed goals, the development of a questionnaire proved to be the most appropriate option within the scope of the study. In fact, it would be impossible to obtain necessary information on student perception, for instance, by means of direct observation or interviews (Ghiglione and Matalon 2005). The same authors also consider that the use of questionnaires is appropriate when one intends to know the opinions, attitudes, perceptions and preferences of respondents (purposes also included in this study). Given the above, we regarded the use of questionnaires as the most suited option within the scope of this research.

The questionnaire was developed on the basis of the indicators proposed on the analysis model (see Table 1). It was duly tested and validated and participants could answer it within 4 months, period in which several diffusion strategies were adopted to promote a high participation on the study.

Regarding the dissemination of the questionnaire, the strategy was based on:

- Institutional dissemination, through the official contacts of PPHEI;
- Dissemination in social networks, in particular through Facebook;
- Dissemination through other means (mailing list, personal contacts, etc.).

In terms of participation, the questionnaire was accessed 4738; 2429 answers were submitted and 2207 answers were validated. Upon close of the participation period, results were analysed and interpreted using statistical methods for data analysis. Regarding questions that tried out gender differences, it was decided to use nonparametric statistics (*Mann-Whitney U* test), inasmuch as dependent variables are qualitative.

Although participants are not a perfect representation in statistical terms of the universe to which they belong, and therefore results cannot be generalised, the conclusions drawn from this study are considered significant in terms of the characteristics

of the current reality on CT use by students of the PPHEI. Effectively, a high number participated in the questionnaire, and most PPHEI are represented. Moreover, several similarities between statistical characteristics of participants and the universe under study were identified (Morais 2012).

5 Results

Although the work carried out enabled reaching several conclusions, this study highlighted those related directly to:

- How often CT were used in personal and learning contexts;
- Places of access to CTs in personal and learning contexts;
- The perception of the usefulness of CTs for the development of personal and learning activities.

In order to make the presentation of results easier, the following abbreviations were chosen:

- $\overline{X}_{ls}$—the mean value for learning support, used to present results regarding the learning context;
- $\overline{X}_{PP}$—the mean value for personal purposes, used to present results regarding the personal context;
- $\overline{X}_{sm}$—the mean value of the answers from male students;
- $\overline{X}_{sf}$—the mean value of the answers from female students.

The presentation of results regarding gender differences includes the score of the *Mann-Whitney U* test and corresponding level of significance, as suggested in Coutinho (2011).

5.1 Frequency of CT Use

Regarding the frequency of use of the varied CTs (Fig. 1), it is observed that learning management platforms ($\overline{X}_{ls} = 3.75$ vs. $\overline{X}_{PP} = 2.69$) and collaborative technologies ($\overline{X}_{ls} = 3.35$ vs. $\overline{X}_{PP} = 3.15$) are more used as learning supports than in personal contexts.

Social networks become especially relevant for personal activities ($\overline{X}_{ls} = 2.75$ vs. $\overline{X}_{PP} = 3.92$) and technologies enabling interpersonal communication also have a slightly higher average than that observed in learning support activities ($\overline{X}_{ls} = 4.23$ vs. $\overline{X}_{PP} = 4.62$). The same applies to publishing and sharing technologies, whose use averages are higher in a personal context ($\overline{X}_{ls} = 3.13$ vs. $\overline{X}_{PP} = 3.60$).

Content aggregation technologies ($\overline{X}_{ls} = 2.25$ vs. $\overline{X}_{PP} = 2.22$) and 3D virtual environments ($\overline{X}_{ls} = 1.28$ vs. $\overline{X}_{PP} = 1.30$) are infrequently used, both as a learning support and for the development of personal activities.
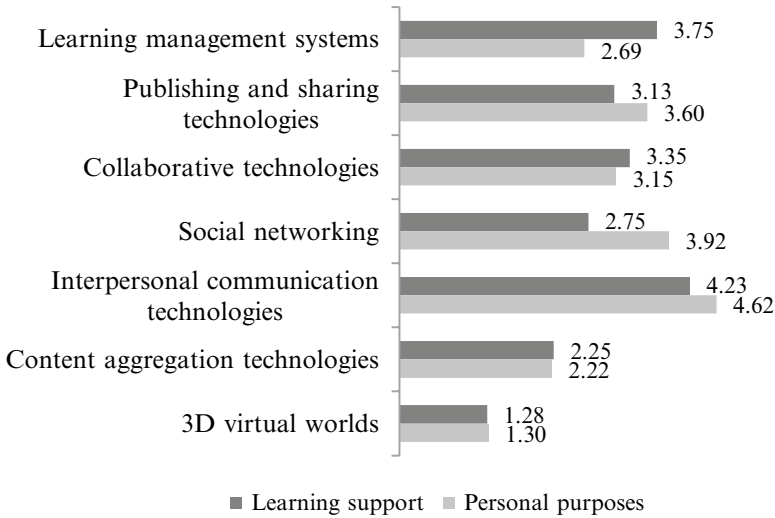
Fig. 1 Frequency of use of CTs as a learning support and for personal purposes
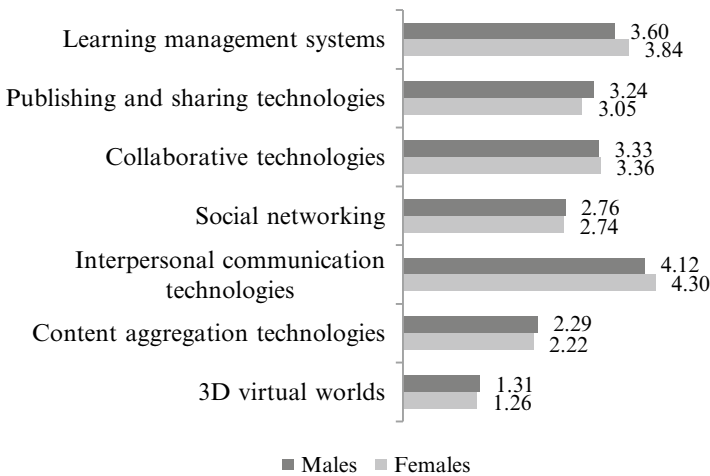

Fig. 2 Frequency of use of CTs as a learning support (by gender)

Taking into account results from a gender perspective (Fig. 2), there are differences in the frequency of use between men and women in all types of CT for learning support.

Nevertheless, differences observed are statistically significant only in the following cases:

- Learning management platforms (Z=−3.824, p=0.000), where female students mention they use them more often than male students ($\bar{X}_{sf} = 3.84$ vs. $\bar{X}_{sm} = 3.60$);
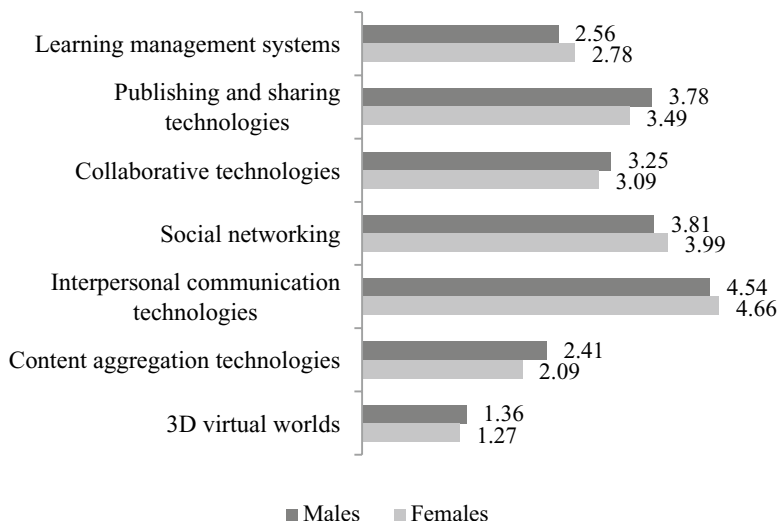
Fig. 3 Frequency of use of CTs for personal purposes (by gender)

- Publishing and sharing technologies (Z=−3.643, p=0.000), where men mention they use them more often than women ($\bar{X}_{sm} = 3.24$ vs. $\bar{X}_{sf} = 3.05$);
- Interpersonal communication technologies (Z=−3.768, p=0.000), where women perceive they use them more frequently than their male colleagues ($\bar{X}_{sf} = 4.30$ vs. $\bar{X}_{sm} = 4.12$).

Observing the use of CT for personal purposes in terms of gender, significant statistical differences are found between men and women in the frequency of use of all types of CT (Fig. 3).

Regarding learning management platforms (Z=−3.358, p=0.001), although an infrequent use was observed, it was found that female students use them more often than male students ($\bar{X}_{sf} = 2.78$ vs. $\bar{X}_{sm} = 2.56$). In the two types of CT that stand out regarding personal use, the female gender mentions using them more often than the male gender (Fig. 3):

- Social networks (Z=−3.481, p=0.000), female students use them more often than male students ($\bar{X}_{sf} = 3.99$ vs. $\bar{X}_{sm} = 3.81$);
- Interpersonal communication technologies (Z=−2.965, p=0.003), women use them more often than men ($\bar{X}_{sf} = 4.66$ vs. $\bar{X}_{sm} = 4.54$).

In the remaining categories, the trend was reversed and the male sex reports using more often the following CT:

- Publishing and sharing technologies (Z=5.835, p=0.000), male students use them more often than female students ($\bar{X}_{sm} = 3.78$ vs. $\bar{X}_{sf} = 3.49$);
- Collaborative technologies (Z=2.815, p=0.005), men use them more often than women ($\bar{X}_{sm} = 3.25$ vs. $\bar{X}_{sf} = 3.09$);
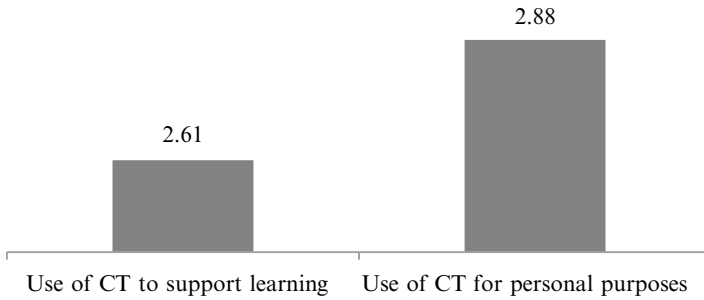
2.61 | 2.88

Use of CT to support learning   Use of CT for personal purposes

Fig. 4 Daily rate of use of CT

2.91 | 2.86 | 2.67 | 2.49

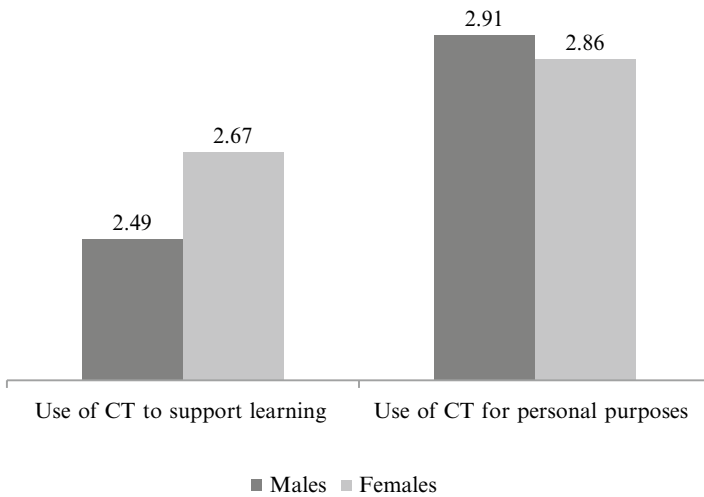Use of CT to support learning   Use of CT for personal purposes

■ Males   ■ Females

Fig. 5 Daily rate of use of CT (by gender)

- Content aggregation technologies (Z = 5.071, p = 0.000), the male students uses them more often than the female students ($\bar{X}_{sm} = 2.41$ vs. $\bar{X}_{sf} = 2.09$);
- 3D virtual environments (Z = −2.310, p = 0.021), male students use them more often than female students ($\bar{X}_{sm} = 1.36$ vs. $\bar{X}_{sf} = 1.27$).

On the whole, results obtained show that on average students from PPHEI use CT daily more frequently for the development of personal activities than as a support for the various learning activities ($\bar{X}_{PP} = 2.88$ vs. $\bar{X}_{ls} = 2.61$) (Fig. 4).

In terms of gender (Fig. 5), differences are observed, with women apparently using CT more often in learning contexts ($\bar{X}_{sf} = 2.67$ vs. $\bar{X}_{sm} = 2.49$) and men mentioning they use them for personal purposes more often than women ($\bar{X}_{sm} = 2.67$ vs. $\bar{X}_{sf} = 2.49$). Nevertheless, those differences are merely significant in a learning context, as shown in the results of the statistical tests carried out.
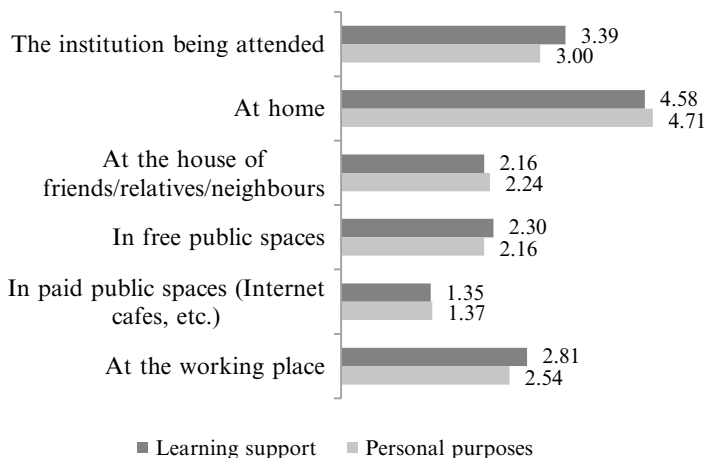
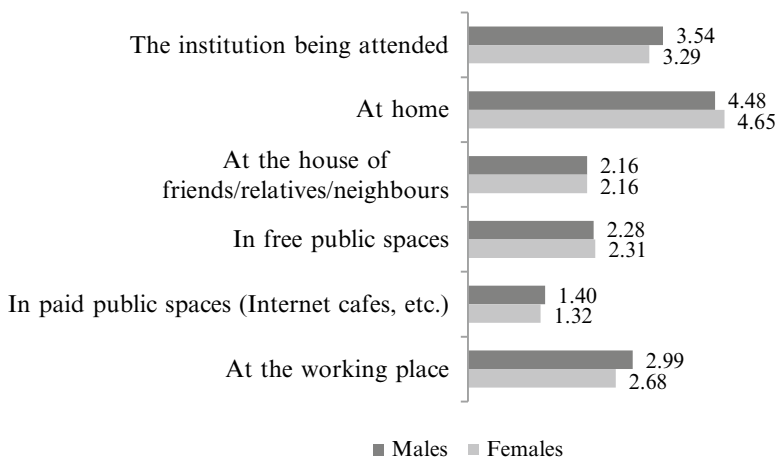**Fig. 6** Places and rate of access to CT

Fig. 7 Places and rate of access to CT as a learning support (by gender)

5.2 *Places of Access to CT*

The most common place used for accessing CT (Fig. 6) is home and students perform it both for personal purposes and as a learning support ($\overline{X}_{pp} = 4.71$ vs. $\overline{X}_{ls} = 4.58$).

In terms of the places of access to CT in learning contexts, significant statistical differences are found between genders, with male students using CT more often than female students in the various environments considered (Fig. 7).

Concerning the use of CT in the institution they are attending (Z=−5.020, p=0.000), male students report a more frequent use than female students
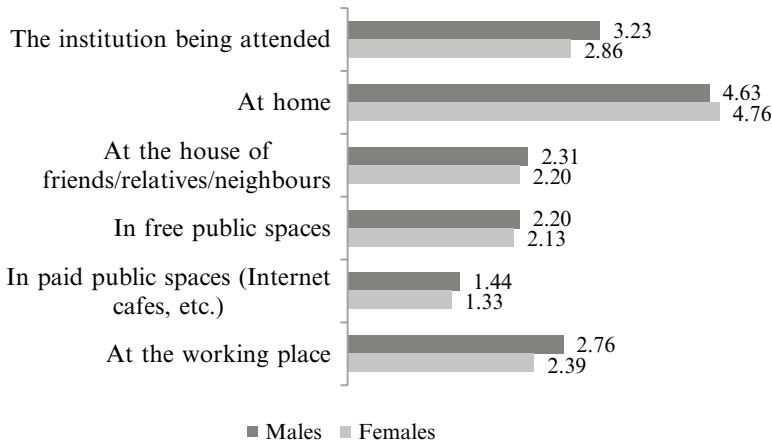
Fig. 8 Places and rate of access to CT for personal purposes (by gender)

($\bar{X}_{sm} = 3.54$ vs. $\bar{X}_{sf} = 3.29$), a trend that is also observed in paid public spaces (Z=−2.100, p=0.036) where, despite being places of infrequent use, males still have an access rate slightly above that of the females ($\bar{X}_{sm} = 1.40$ vs. $\bar{X}_{sf} = 1.32$). Results from the statistical test (Z=−4.070, p=0.000) also point to the fact that men access and use CT more often than women at their working place ($\bar{X}_{sm} = 2.99$ vs. $\bar{X}_{sf} = 2.68$). In turn, at home (Z=−5.040, p=0.000) females access and use the varied CT more often ($\bar{X}_{sf} = 4.65$ vs. $\bar{X}_{sm} = 4.48$) as a learning support.

Similarly, significant statistical differences are found between genders in the places and frequency of access to CT for personal purposes (Fig. 8).

Data illustrate that men use CT more often than women for personal purposes ($\bar{X}_{sm} = 3.23$ vs. $\bar{X}_{sf} = 2.86$) at the institution they are attending (Z=−6.238, p=0.000), as well as at paid public spaces (Z=−2.526, p=0.12), where the frequency of use by the male sex surpasses that of the female sex ($\bar{X}_{sm} = 1.44$ vs. $\bar{X}_{sf} = 1.33$). Male students showed a frequency of use higher than that of female students ($\bar{X}_{sm} = 2.76$ vs. $\bar{X}_{sf} = 2.39$) at their working place (Z=−5.191, p=0.000). Nonetheless, at home (Z=−4.149, p=0.000) female students are the ones that use CT more often than male students ($\bar{X}_{sf} = 4.76$ vs. $\bar{X}_{sm} = 4.63$) for personal purposes.

5.3 Perception of CT Usefulness

Regarding the perception on CT usefulness (Fig. 9), it was found that the learning management platform is the category that gathers the most favourable opinions in learning contexts ($\bar{X}_{ls} = 4.13$). As for personal purposes, the usefulness of technologies enabling interpersonal communication stands out ($\bar{X}_{pp} = 4.31$), as well as that of publishing and sharing content ($\bar{X}_{pp} = 3.64$).
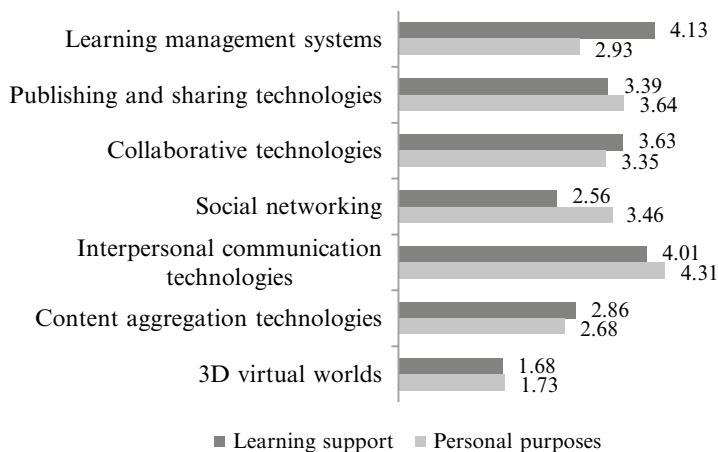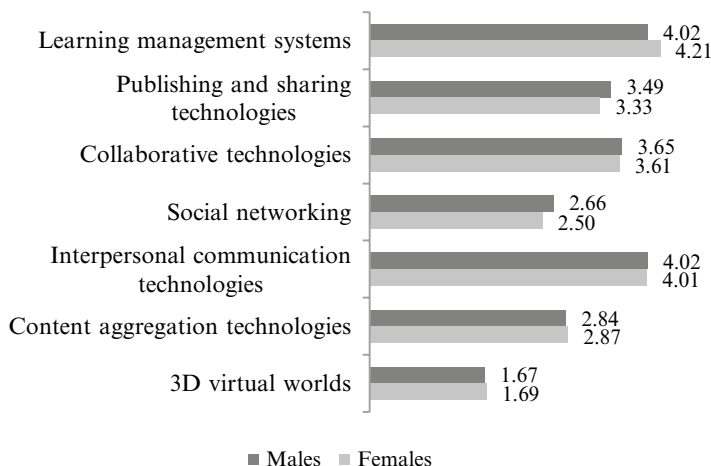
Fig. 9 Perception of CT usefulness

Fig. 10 Perception of CT usefulness to support learning (by gender)

Social networks also gain relevance in a personal context ($\overline{X}_{pp} = 3.46$), as opposed to what occurs in learning support ($\overline{X}_{ls} = 2.56$), a context in which the perception of their usefulness is weak. Content aggregation technologies ($\overline{X}_{ls} = 2.68$ vs. $\overline{X}_{pp} = 2.86$) and 3D virtual environments ($\overline{X}_{ls} = 1.68$ vs. $\overline{X}_{pp} = 1.73$) have, in both contexts, average values below those of the remaining categories, suggesting that participants do not attribute to them a high usefulness, both as a learning support and for the performance of personal activities.

The perception of CT usefulness for learning support seems to be similar between men and women (Fig. 10).
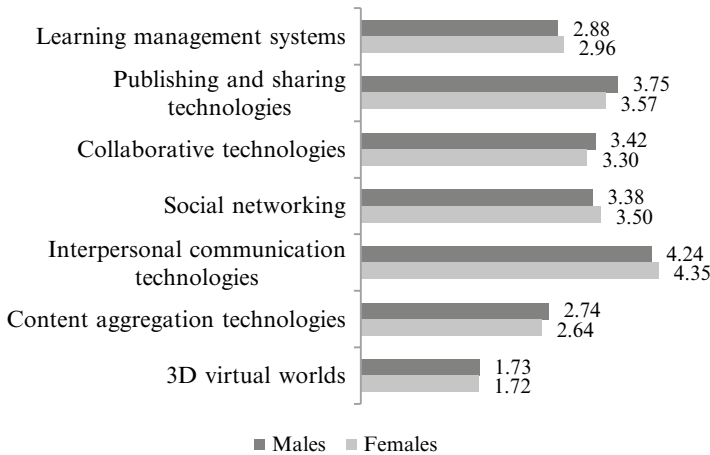
Fig. 11 Perception of CT usefulness for personal purposes (by gender)

Nonetheless, women regard learning management platforms (Z=−4.572, p=0.000) as more useful technologies ($\bar{X}_{sf} = 4.21$ vs. $\bar{X}_{sm} = 4.02$) and men, in their turn, regard publishing and sharing technologies (Z=−4.177, p=0.000; $\bar{X}_{sm} = 3.49$ vs. $\bar{X}_{sf} = 3.33$) and social networks (Z=−2.882, p=0.000; $\bar{X}_{sm} = 2.66$ vs. $\bar{X}_{sf} = 2.50$) as being more useful for learning activities. The remaining categories show extremely similar results between men and women, and the slight differences found were not statistically significant.

As for the perception of CT usefulness for the performance of personal activities, more gender differences were observed in comparison with what was found in learning contexts (Fig. 11).

Male students consider that publishing and sharing technologies (Z=−4.864, p=0.000; $\bar{X}_{sm} = 3.75$ vs. $\bar{X}_{sf} = 3.57$), those enabling collaboration (Z=−2.880, p=0.004; $\bar{X}_{sm} = 3.42$ vs. $\bar{X}_{sf} = 3.30$) and those enabling content aggregation (Z=−1.992, p=0.046; $\bar{X}_{sm} = 2.74$ vs. $\bar{X}_{sf} = 2.64$) are the most useful. On the other hand, female students classify social networks (Z=−2.275, p=0.000; $\bar{X}_{sf} = 3.50$ vs. $\bar{X}_{sm} = 3.38$) and interpersonal communication technologies (Z=−2.727, p=0.000; $\bar{X}_{sf} = 4.35$ vs. $\bar{X}_{sm} = 4.24$) as the most useful in their personal life.

6　Final Considerations

In the light of what was stated throughout this paper, we can identify a set of differences between the use of CT in a personal context and in a learning context, as well as find significant statistical differences between men and women in the use of CT as a learning support and for personal purposes.

In learning contexts, female students use more frequently learning management platforms and interpersonal communication technologies. On the other hand, publishing and sharing technologies are more often used by male students.

In a personal context, the study indicates the existence of gender differences in the use of all types of CT. In this domain, women use more frequently social networks and, as in the case of learning support, they also use learning management platforms and interpersonal communication technologies more often than men. In turn, men use more often the remaining types of CT than women.

Regarding the perception of usefulness of the varied CT for learning support, results suggest that female students consider learning management platforms more useful than male students. The trend is reversed in the perception of the usefulness of social networks and publishing and sharing technologies, in which case men regard them as more useful for learning.

As for CT usefulness in a personal context, women express a more positive view on the usefulness of social networks and technologies enabling interpersonal communication. Men, in their turn, agree that publishing and sharing technologies, technologies enabling collaboration and those enabling content aggregation are useful more often than women.

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