

USES OF INTERNET AND ACADEMIC PERFORMANCE IN THE CATALAN UNIVERSITY SYSTEM

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Abstract

Based on a social conception of technology, we can state that technology is adopted in different forms and for different purposes by users. The Internet in education is no exception, and different uses of this technology by students may lead to inequalities in academic performance. In some cases, these may be due to a continuation of “bad uses” that already existed before the student began to use the Internet, while in other cases these may be due to institutional obstacles to adapting the new forms of teaching to the new forms of learning.

Introduction

The development of information and communication technologies (ICTs) and their incorporation into different areas of our daily activities leads us to reflect upon the most important transformations brought about by the Internet explosion and what the consequences are, at least in the short term. This is why the Open University of Catalonia (UOC)¹ set up Project Internet Catalonia (PIC),² which aims to understand technological and organisational transformation in various areas of Catalan society, the Catalan economy and the institutions of Catalonia (Castells, 2007).

Within this framework, it was decided to analyse the relationship between the university system of Catalonia and the use of the Internet, and the project “La Universidad en la Sociedad Red” was created for this purpose.³ The main

¹ www.uoc.edu

² See: <http://www.uoc.edu/in3/pic/eng/>

³ The report of the investigation is available in Catalan at http://www.uoc.edu/in3/pic/cat/universitat_societat_xarxa.html. The abstract is available in English at: http://www.uoc.edu/in3/pic/eng/university_network_society.html

objective of the project was to identify and analyse the use of the Internet in the Catalan university community, especially in training, and to examine its repercussions. Our research shows us that the incorporation of the Internet into the lives of Catalan university students is an irrefutable fact, both in students' own academic activities as well as in more individual and non-academic activities. This is why there is currently an increasing interest in analysing the relationship between Internet use and academic results.

Thanks to the reasonable consensus between various studies on technology, a position has existed for quite some time that argues that this relationship is *social* (Di Maio et al., 2001), that is:

- Contrary to the arguments defended by technological determinism, technology is not an external force that serves to transform society, but rather the two are intertwined: the relationship between technology and society is co-evolutionary, and not causal.
- Technology is created by investors with specific interests, and may therefore be affected by social interests and conflicts.
- Technology is adapted or reinvented by its own users, who create many more functions than were imagined by the designers.
- Rather than exploiting the new, inherent possibilities offered by technology, users tend to use technology to do the things they already did, only more effectively.

The Internet is no exception to these trends. Created initially by academic and military institutions for specific purposes (Castells, 2001), eventually it was used by the wider society, and Internet users now use the Internet in many different ways. In the case of the Internet, the very design of the technology and its decentralisation gave it the inherent features to become one of the most flexible forms of technology that exist and for a wide range of uses to develop.

Given this conception of the technology, this paper presents some results that aim to highlight how *the different ways in which the Internet was adopted*, as seen in the different uses that exist, may generate certain types of *inequality* in education. The paper specifically analyses the relationship between the uses of the Internet and the academic performance of students at public universities in Catalonia providing face-to-face learning.⁴ This analysis will be based on the perspective of

⁴ The study did not take into account private universities and universities providing distance or online learning. The students included in this study, therefore, attended the following universities: Autonomous University of Barcelona (UAB), University of Barcelona (UB), University of Girona (UdG), University of Lleida (UdL), Technical University of Catalonia (UPC), Pompeu Fabra University (UPF) and Rovira i Virgili University (URV).

the students, without further analysis into the uses of the Internet by other direct stakeholders in the teaching-learning process, such as the institution, the lecturers, etc. We will also consider new lines of research emerging from this first study, which are already being developed.

Methods

The methodology used for the project *La Universidad en la Sociedad Red* focuses mainly on a study based on an electronic questionnaire completed by all students enrolled in 2004–2005 and all lecturers teaching in 2005–2006 at public Catalan universities. The Internet, therefore, is both the subject of the research and the medium used. The online questionnaire aimed at the entire population that was the object of the study was considered an appropriate tool, despite the doubts that existed on the representation of the sample and the appropriate response rates (Braithwaite et al., 2003). By taking the necessary technical methodological precautions, this tool can be a good alternative to other types of questionnaires (Dillman, 2000), reducing costs and avoiding substitution problems, which were predictably significant given the medium used to contact the students (e-mail) and the usually low response rates to online questionnaires.

The number of responses obtained was quite high, meaning there was a good number of participants who answered the questions on the basic characteristics of the population (such as sex and age). In turn, this made it possible to select cases to adjust the responses to certain characteristics that did not apply to the entire population, such as the participants' university.

Furthermore, in the specific analysis on the relationship between Internet uses and academic performance presented in this paper, because the object of the study is Internet uses, by having information only from those who passed through the "filter" before answering the online questionnaire we were able to eliminate from our analysis those persons who do not use the Internet. This allowed us to reduce the bias compared with those studies that aimed to extrapolate from the entire population of Catalan university students.

It is also important to underline that the data needed for the specific analysis of academic performance came from two main sources: our own survey (including variables on knowledge and Internet uses) and the databases of the Catalan

government⁵ (including some social demographic and academic performance variables of those who responded to our questionnaire).

We therefore consider that, having obtained complete information from 14,936 students, we have a sufficiently broad, unbiased sample to establish a balance between internal validity, external validity and the viability of the research that generated the results we shall present.

The techniques used to analyse these data were prior descriptive analysis of the variables, bivariate analyses and data-association analyses, and subsequent multivariate analyses, with binary logistic regression used for high performance.

The method used to measure performance, though possibly not the best method, was the only one available to us. It was based on the number of subjects passed as a percentage of subjects enrolled. Academic performance was then classified as follows in order to carry out more analyses:

- High academic performance: more than 80% of credits passed.
- Medium academic performance: between 50% and 80% of credits passed.
- Low academic performance: less than 50% of credits passed.

Results

The analysis of the use of the Internet in universities reveals that new technologies are not the main factor behind students getting one academic result or another. In fact, an overall analysis of factors contributing to high academic performance shows that those variables related to technologies do not have an important effect on the academic performance of Catalan students, since, broadly speaking, aspects relating students with the job market and personal variables that are not related to technology are more significant.

Our analysis does show, however, that, at least over the past five years, Internet use has had an increasing influence on the academic performance of university students in Catalonia. Nevertheless, this relationship between performance and the Internet is a dual relationship, since it has no defined meaning. Therefore, how this technology is adopted and what it is used for may help or hinder good academic results among students in Catalan universities.

⁵ We would especially like to thank the Commission for Universities and Research (CUR) of the Government of Catalonia for their collaboration:
<http://www10.gencat.net/dursi/AppJava/home.jsp?area=0&idioma=>

Infrastructures, Knowledge and Non-Academic Uses

When analysing the capacity of students to use the Internet, we see that having good Internet infrastructure in the home has a negative effect on academic performance (Figure 1).

Figure 1: Academic performance according to type of Internet connection

	Academic performance			TOTAL
	Low performance	Medium performance	High performance	
Fast connection	18,5%	23,7%	57,9%	87,7%
Slow connection	14,7%	21,7%	63,6%	8,2%
Fast+Slow connection	18,1%	23,4%	58,6%	4,1%
TOTAL	18,1%	23,5%	58,4%	100.00%

N = 13881 $\chi^2 = 154.47$
 $p\text{-value} = 0,004$

Source: Duarte et al., 2008

Obviously those students with their own Internet infrastructure use the Internet in more places, especially at home, and therefore have diversified their Internet use. This means that these students use the Internet for more non-academic purposes, whereas those students without their own Internet infrastructure connect mainly at university, where they use it for academic purposes to complement and expand upon their classes. We should also remember that greater use of the Internet requires more time, meaning that students do not have the time to complete their academic activities more effectively, whether these activities involve the Internet or not. That is why, as can be seen in Figure 2, there is a negative correlation between the number of uses and academic performance.

Figure 2: Academic performance according to number of non-academic uses of the Internet

	Academic performance			TOTAL
	Low performance	Medium performance	High performance	
0-5 uses	15,4%	20,1%	64,5%	2,2%
6-11 uses	14,7%	21,0%	64,3%	23,1%
12-17 uses	17,9%	23,7%	58,4%	51,4%
18-23 uses	22,1%	25,5%	52,4%	23,3%
TOTAL	18,1%	23,5%	58,4%	100.00%

N = 14936 $\chi^2 = 115.75$
 $p\text{-value} = 0,00$

Source: Duarte et al., 2008

Figure 3 shows how the dynamics explained above for Internet infrastructure also applies to computer skills. The more competences and skills students have in using computers, the more uses they make of the Internet, and therefore the less time they have for other academic tasks. We see, therefore, that extensive use of the Internet is related to low academic performance in students. Similarly, using open-source software and participating actively and creatively in non-academic uses also hinders high academic performance.

Figure 3: Academic performance according to computer skills

	Academic performance			TOTAL
	Low performance	Medium performance	High performance	
Very high ability	25,4%	22,3%	52,4%	2,8%
High ability	20,5%	25,8%	53,7%	28,4%
Medium ability	17,0%	22,6%	60,5%	51,0%
Low ability	16,6%	22,5%	60,9%	16,6%
Very low ability	14,5%	20,1%	65,4%	1,2%
TOTAL	18,1%	23,4%	58,5%	100.00%

N = 14936 $\chi^2 = 77.99$
p-value = 0,00

Source: Duarte et al., 2008

Academic Uses of the Internet

The relationship between academic uses and academic performance is less clear. It may seem, *a priori*, that greater academic use of the Internet leads to better marks. However, in our analysis we found that this is not always the case.

As can be seen in Figure 4, having a learning style⁶ that fosters the use of the Internet has negative effects on academic performance. Similarly, having a more favourable view of Internet information architecture also has a negative effect on the results of university students.

Furthermore, it was detected that there is a lack of support from universities to teaching methodologies that foster the use of the Internet. Assessment currently focuses more on traditional aspects of the teaching process than on those based on new technologies. In this context, it is important to remember that the progressive

⁶ The variable “learning style” is based on other variables that measure the extent to which students use the Internet for their academic activities: whether they use the Internet for academic assignments, whether they believe that the Internet enables them to complete their assignments more quickly and more easily, whether it enables them to complete their assignments without going to the library, whether they create bookmarks and whether they consider the information they find online to be reliable and accurate.

introduction of the European Higher Education Area (EEES) may shift this focus and adapt the teaching style to a learning style in which ICTs become a positive factor. But at the moment this is not the case, and this is probably the cause of the poorer performance of those students who have a learning style that fosters the use of the Internet.

Figure 4: Academic performance according to the extent of use of the Internet in one's learning style

		Academic performance			TOTAL
		Low performance	Medium performance	High performance	
Internet use propension in the learning style	Very high propension	22%	42,4%	35,6%	0,4%
	High propension	19,5%	27%	53,5%	11,7%
	Medium propension	17,9%	23,5%	58,6%	57,6%
	Low propension	17,9%	21,9%	60,3%	28,7%
	Very low propension	18,7%	19,1%	62,2%	1,7%
	TOTAL	18,1%	23,4%	58,5%	100.00%
		$N = 14936$			$\chi^2 = 43.15$
					$p\text{-value} = 0,00$

Source: Duart et al., 2008

In this sense, our study also points in this direction. If we analyse the relationship from an institutional perspective, we see that the technological environment of the institution in which students are studying is not an important factor in determining academic performance. However, in the few cases in which the environment greatly fosters the use of the Internet, students have a higher academic performance. This is probably related to the complementarity that exists between the new styles and dynamics of learning methods that foster the technologies of younger generations, or as Pedrò puts it, New Millennium Learners (Pedrò, 2006), and an environment that fosters the use of the Internet at university, especially in the teaching process (Prensky, 2001).

Along the same lines, perhaps the most surprising result is that although, as stated above, no relationship exists between non-academic uses and good performance, because there is a gap between teaching models and learning models, those students who, on their own initiative and without being required to do so by the

educational methodology, make “social and complementary” use of the Internet⁷ for academic purposes obtain better results than those who do not (Figure 5).

Figure 5: Academic performance according to social and complementary uses of the Internet in the teaching–learning process.

		Academic performance			TOTAL
		Low performance	Medium performance	High performance	
Social & Complementary uses of Internet	Very high uses	16,5%	22,1%	61,4%	40,3%
	High uses	18,6%	24,5%	57%	50,4%
	Medium uses	22%	23,5%	54,5%	7,7%
	Low uses	26%	23%	51%	1,4%
	Very low uses	33,3%	12,5%	54%	0,17%
	TOTAL	18,1%	23,4%	58,5%	100.00%
		$N = 14936$			
		$\chi^2 = 55.75$			
		$p\text{-value} = 0,00$			

Source: Duarte et al., 2008

We therefore believe that applying social websites and Internet 2.0 to teaching methods may be a useful way to improve the teaching process and prevent a gap from emerging between the learning methodologies of the new generations and the teaching methodologies of university institutions, which traditionally are resistant to change.

Finally, we should also underline that although our data show us how the Internet, when used to complement the classical teaching-learning methods provided by universities, improves academic performance, this does not occur when this technology is adopted to substitute the classical methodology and a prepared pedagogical framework with the false hope of facilitating academic work. Those students, then, who attend fewer lectures or spend less time in the library and try to substitute this prepared, selected information for other information they obtained on their own or via the Internet clearly have a lower academic performance than the other students.

⁷ The variable “social and complimentary uses” is based on the social variables, including the following uses of the Internet by the students: communicating with lecturers, communicating with fellow students, subscribing to distribution lists in their field of study, participating in online discussions and using the Internet as a tool for collaboration, and variables on uses to complement lectures, such as reading the syllabus and looking at the course content, finding information and following the course (face-to-face subjects).

Discussion

Our analysis shows how the Internet may be used as a useful tool to achieve certain objectives: to improve teaching, and therefore to improve the academic performance of students. But like with any other tool, we must know how to use it correctly, otherwise the results may be the complete opposite to what we are hoping to achieve. Think about the effects that inappropriate use of explosives would have in the construction industry. The same is true for inappropriate use, whether by lecturers or by students, of the Internet in the teaching–learning process, since this can also “pull down” the pedagogical framework and be counter-productive by reducing academic performance. But like in the case of explosives in the construction industry, well-planned, appropriate use of the Internet can be very useful in achieving the objectives set.

There are currently four tendencies with regard to take up of the Internet, and therefore with regard to uses of the Internet. These four tendencies, listed below, are related to inequalities in academic results and success in the teaching–learning process:

- a) Students who have adopted the *Internet only as a form of recreation*, are intensively involved in extra-academic activities and have lower academic results than other students.
- b) Students who see the *Internet as a substitute to facilitate and simplify the learning process* prepared by the institution also obtain worse results than other students.
- c) Students with a *style of learning that fosters the use of the Internet and who tend to substitute the classical pedagogical methodology prepared by their university for new learning methods, without seeking to make their learning easier*. The students who use the Internet in this way also have a low academic performance, since they clash with the teaching methodology used by those universities which use a traditional form of academic assessment without fully incorporating the new skills developed by the students.
- d) *Students who follow the teaching–learning methodology prepared by their university, but who also complement this methodology with information obtained through social uses of the Internet for academic purposes*, leading to better academic results.

The students in categories a and b probably began using the Internet to continue doing what they already did (Di Maio et al., 2001), and would probably have already had a tendency to substitute academic activities for recreational activities, or to do as little work as possible, meaning that their performance would have been lower anyway. But to argue this point using empirical data, we would need to

carry out another, quasi-experimental study into the causes using the results of the questionnaire (Schneider et al., 2007) that analyses the influence of initial performance on the uses Catalan university students make of the Internet and analyses in detail the effects of each extra-academic use of the Internet on student performance.⁸

When we analyse those students who have adopted the Internet for academic purposes (categories c and d), we see a contradiction in the Catalan university system: although we have seen that the use of the Internet in teaching helps academic performance, provided that it is used to complement the teaching prepared in the pedagogical model (and not as a substitute) or is part of the pedagogical model, we have not seen sufficiently decisive institutional action by the universities to incorporate the use of the Internet into their pedagogical models, thus leading to the separation between teaching and learning that was detected some time ago by some authors (Pedrò, 2006; Prensky, 2001).

We believe that change is necessary in this area, since there is an increasing number of students with learning styles that foster the use of the Internet, and universities, as institutions, must adapt to meet the demands of the society in which they are based. Nevertheless, we believe we can be optimistic about the future. Though they were not widespread when we carried out our study, there are many proposals and there is an institutional desire to adapt and to move towards increasingly effective blended learning as part of the European Higher Education Area.

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⁸ The research group to which the authors of this paper belong are currently carrying out this study using the same Project Internet Catalonia (PIC) database as was used in this paper.

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