Computer Availability and Applications in Selected European Business Schools

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ABSTRACT

This article investigates the availability of computers and what they are used for by students enrolled in a cross-section of business classes at selected European universities. This research is important in that it will add to the literature used by educational administrators to improve curriculum that enhances instruction of important technology skills, as well as showing the importance of making computers more available to students. The subjects surveyed were undergraduate students taking business classes at six public universities in six European countries. Questions regarding secondary school computer experiences were also asked. Results indicate significant differences as to ease of computer accessibility. Only about half of the Belgian and Irish students felt their schools provided easy access to computers. This contrasts with the English students. Over 80 percent of them believed their school provided easy access. Significant differences were also found in regard to rates of usage between "assignments, research, email, entertainment and other." The primary computer use for all students was email. General computer usage was measured as follows: (1) to obtain information, (2) to communicate, and (3) to organize and present data. The Belgians, Germans, and Spanish used computers heavily for information gathering, the Irish – to communicate, and the English and French for organizing and presenting data. Secondary school computer preparatory work was reported most frequently from the English students, with applications and class assignments varying widely by country at the secondary level.

Keywords: Technology-based courses, lifelong learners, technology skills, IT literacy, computer accessibility

1. INTRODUCTION

Technologies underlying telecommunications have increased information flow between countries, thus speeding globalization and increasing the demand for personal computer accessibility by students of all ages. As more and more students, businesses and other organizations from different countries communicate, obtain, organize, and present data to each other; it was deemed important to make this a cross-country study. At the same time, the spread of free markets has promoted greater competition worldwide, creating strong incentives for domestic producers to adopt new technologies. International change and competition have created a need for workers who are educated and highly skilled. According to Sabo (1999) technology rules how business is conducted. The Web enables the delivery of highly personalized, individual products in a timely manner. In addition to demanding increased skills, employers will also demand a more flexible workforce (Editor, 2000).

The pervasiveness of personal computers in the business world places increased importance on the implementation of technology-based courses in secondary, as well as in higher education. A primary objective of university business schools is to prepare students for the world of business by giving them theories and tangible skills that can be applied to their future careers (Levsen and Goettel, 1997). Students must become lifelong learners of information in regard to emerging technologies (Rath, 1999). Because the importance of technology skills is widely accepted, governments are advancing agendas to enable students to become computer literate (Eisenberg and Johnson, 1996).

Computer literacy can be defined as "an understanding of basic hardware configurations and knowledge of applications software commonly used in the work environment" (Sabo, 1999). Information technology literacy includes the managerial, organizational, and social issues involved in the use of computers in information systems. Information technology literacy encompasses computer literacy (Levsen and Goettel, 1997), and is broadly defined as "the ability to recognize information needs and identify, evaluate and use information effectively"(Bruce, 1999). In this study communications technology (CT), computer technology literacy (CTL), and information technology (IT) are used interchangeably, as they are in commercial applications.

1.1 Continuing University IT Involvement:

Increasingly, universities are requiring the integration of computers into their curricula for all disciplines. Some universities require students to purchase computers prior to admission (Ceccucci and Gius, 1997). Furthermore, "It is expected that every student graduating will have a level of knowledge of information systems and computer usage that will enhance their attractiveness to potential employers" (Gardner& Carr, 1996).

The convergence of computers and digital technology is transforming the way we create, store, distribute, and retrieve information. Communication technologies have a dual capacity in organizations—the capability to automate (increase speed) and informate (increase efficiencies) (Gardner & Carr, 1996). These advances in telecommunications are affecting education in two ways: redefining what society expects of education while promising to transform the teaching and learning process within the classroom. Computer labs and multi-media centers can be found on most campuses, and universities worldwide are responsible for providing Internet access to millions of students (Gardner and Carr, 1996).

The digital revolution is definitely impacting higher education. Students exposed to computer-enhanced curricula will be better prepared to manage and use information technologies when they start their careers (Dickson and Segars, 1999). Increasingly, faculty are using Web-based courseware to post their syllabi, assignments, and examinations for students on the institution's intranet (Flynn and Kamm, 1999). Computer technology has become a necessity rather than a luxury in the classroom. The integration of IT in the classroom can promote more efficient teaching and better learning (Benbunan-Fich, 2001). Educators face a period of rapidly changing skills requirements, rising expectations, and high levels of investment, scrutiny, and accountability (Simpson, et al., 1999).

1.2 Expectations of Students

Students themselves recognize the importance of technology-based training. As technology evolves, so does the background of university students. According to Nagarajan (1996) students increasingly recognize the role information systems play in their chances for career success after graduation. Society is rapidly moving to the point where economic realities make IT literacy as fundamental to the job skills of the well-rounded employee as the ability to read and write (Shaw and Giacquinta, 2000). This leads to students' rising campus expectations of more computer coverage in their curricula and improved computer and library resources for their all-round exposure and experience in computer literacy (Nagarajan, 1996).

Despite increasing student expectations regarding computer resources on campus, it is presently unclear how long it will take for computer-based learning to become truly integrated into all courses in all business disciplines. Obstacles hindering technology implementation include the cost of hardware and software, resistance of professors to change, limited technology training for professors, and the controversy over technology's contribution to learning (Ceccucci and Gius, 1997). Eisenberg and Johnson (1996) report some encouraging signs, including the increasing popularity of integrating computers into content areas. Administrators are recognizing that computer skills should not be taught in isolation. Effective integration of information skills requires that the skills must directly relate to the content area and to classroom assignments, and that the skills themselves are tied together in a logical and systematic information process model. This application of computer skills as part of the learning process results in the development of true "computer literacy" (Eisenberg and Johnson, 1996).

In summary, this Introduction/Literature Review Section indicates the importance of computer-based education, both at the secondary and higher-educational levels. This fact is recognized by "Business," "Education," and the students themselves, as has been previously indicated by numerous examples. One data set that would prove helpful to administrators in determining how their institution ranks in this regard, would be to discover how accessible computers are to students at their university, what the students were using the computers for, and what kind of computer training the students received prior to entering college. That is

the purpose of this study, which will be more completely discussed in the following sections.

2. PURPOSE AND METHODOLOGY

The purpose of this study is to determine student computer availability, major applications made of computers, as well as secondary school computer preparatory work. A 25-question instrument was distributed to eight different business schools in the following countries: Ireland, England, Spain, France, Belgium, Germany, Finland, and the Netherlands. Questionnaires were returned from all of the schools with the exceptions of Finland and the Netherlands. The questions consisted of the following formats: "yes-no," ranking, multiple-choice, and "fill-in-the-blank". Professorial contacts in each of these schools were asked to distribute the questionnaires to students in one, or more, of their business classes. The six responding schools provided a total of 430 usable questionnaires: the University of Ireland (Galway) provided 61, or 14.2 percent; the University of Luton (England) - 86 (20.0 percent); the Universitat de Vic (Spain) 65 (15.1 percent); the University at St. Etienne (France) 67 (15.6 percent); Universite De Mons-Hairaut (Belgium) 93 (21.6 percent); and Bielefield University (Germany) 67 (15.6 percent).

About 82.5 percent of respondents were from colleges or schools of business. The others, while perhaps enrolled in a business course, were from other programs, such as health and applied sciences, education, and the natural sciences. There were 76 persons from nations other than the six host countries. Most Western European universities have structured their business programs as three-year degrees. Students participating in our study were as follows: 1st year - 24 percent; 2nd year - 31 percent, 3rd year - 41 percent, and 4th year and "other" - 4 percent, with 52 percent female and 48 percent male.

Only about 40 percent of respondents held jobs while in school, with the majority working 20 or fewer hours per week. Of those who work, 58.1 percent report using a computer at work. A copy of the questionnaire is in the Appendix.

3. RESULTS

Again, the primary purpose of this study is to determine if students have sufficient access to computers, the major applications made of computers, as well as secondary school computer preparatory work. The degree of access will have an impact upon the frequency of use, and therefore computer skills of students. It will also affect the demand for computer laboratory time, and the specific laboratory times needed for students to have reasonable access. Specific uses of computers (assignments e-mail etc.) and the importance of general computer usage (accessing information, communications, etc.) are also identified. Finally, the study examines secondary school computer preparatory work. It examines whether students have access to computers at the secondary level, the specific type of software they are exposed to, and which courses require computer usage.

Study results are presented in tabular format, with accompanying explanations and Chi-square results. The first three tables summarize the study findings regarding access to computers at the university level. The data allows university administrators and faculty to compare the degree of access in their own countries to other European countries, the frequency of use by their students *viz a viz* other European nations, and the specific laboratory hours that best fit the needs of their students. The results of the survey indicate there are significant differences in the accessibility of computers on campus among the six countries. While almost 83 percent of English respondents reported easy accessibility, only about 55 percent of Irish respondents agreed. A Chi-square test indicated that the accessibility of computers was dependent upon the host country. The significance level was .001, with a chi-square statistic of 27.379 and 5 degrees of freedom. All of this data, plus additional details are displayed in Table 1.

The students were then asked if the accessibility to computers on campus affected how often they used them. While the majority of students responded that accessibility did affect how often they used computers, there were significant differences as to the extent of agreement. Over 90 percent of the Irish students responded "yes" to this question. Only about 53 percent of German students agreed. A Chi-square test indicated that the responses to this question were dependent upon the host country. The significance level was .000, with a Chi-square statistic of 27.379 and 5 degrees of freedom. Table 2 displays this data.

In an earlier paper by Gatlin-Watts, Kordsmeier and Markham (2001), it was found that while 93 percent of German students owned a computer, only about 38 percent of Irish students owned one. This is consistent with the responses to the question in this current study regarding accessibility. It would appear that Irish students, who generally lack access to computers at home, also lack sufficient access at the university level. German students, on the other hand, have easy access at home, and see little need for further access at the university level (Gatlin-Watts, Kordsmeier and Markham, 2001).

Students were also asked to express their preferences for preferred hours of access to computer labs. This is a real problem for many university students. They are usually active from 10:00 p.m. to midnight, whereas most university staff are not. This data should be kept in mind when administrators are scheduling lab hours. Students most prefer access between 4:30 p.m. and

Table 1: Computer Availability		
Country	**Yes**	**No**
Belgium (n = 93)	55.9%	44.1%
England (n = 86)	82.6%	17.4%
France (n = 67)	73.1%	26.9%
Germany (n = 61)	73.8%	26.2%
Ireland (n = 65)	55.4%	44.6%
Spain (n = 58)	69.0%	31.0%
Total (N = 430)	**Average = 68.3%**	**Average = 31.7%**

Table 2: Computer Availability and Usage		
Country	**Yes**	**No**
Belgium (n = 90)	72.2%	27.8%
England (n = 87)	70.1%	29.9%
France (n = 66)	80.3%	19.7%
Germany (n = 60)	53.3%	46.7%
Ireland (n = 64)	90.6%	9.4%
Spain (n = 58)	60.3%	39.7%
Total (N = 425)	**Average = 71.3%**	**Average = 28.7%**

Table 3: Computer Lab Time Preference					
Country	**8:00 a.m. - 12:00 p.m.**	**12:00 p.m. - 4:30 p.m.**	**4:30 p.m. - 12:00 a.m.**	**12:00 a.m. - 4:00 a.m.**	**4:00 a.m. - 8:00 a.m.**
Belgium	30.8%	37.4%	61.5%	4.4%	7.7%
England	30.6%	60.0%	60.0%	12.9%	8.2%
France	32.8%	57.8%	42.2%	4.7%	6.3%
Germany	48.3%	53.3%	55.0%	1.7%	0.0%
Ireland	29.2%	56.9%	58.5%	7.7%	4.6%
Spain	18.2%	16.4%	54.5%	9.1%	5.5%
Average	**31.7%**	**47.0%**	**55.2%**	**6.8%**	**5.4%**
Chi-Square	**12.621**	**36.309**	**6.870**	**9.232**	**5.487**
Df	**5**	**5**	**5**	**5**	**5**
Significance	**.027**	**.000**	**.231**	**.100**	**.359**

midnight and least preferred 4:00 a.m. - 8:00 a.m. Table 3 provides the details. (Note that the rows do not total 100% as students were asked to check all that applied.)

Tables 4 and 5 summarize the findings regarding specific and general computer uses by students. With respect to specific computer tasks, as anticipated, students use the computer most frequently for e-mail. Students indicated "entertainment" as their least preferred computer task. With the advent of music-sharing services, chat rooms, games, news retrieval, and other services, this latter finding was surprising. Perhaps teachers and administrators could put this information to practical use by making more Internet assignments in the form of games, as this is something with which some of the European students do not appear to be familiar. They would probably enjoy this new approach to assignments. Students differed significantly with respect to e-mail, assignments, and research at the .05 level. There are no significant differences in the extent of use for entertainment. Table

As indicated in Table 3, the preferences for certain lab hours are dependent upon the country of the respondent. However, these differences are not easily explained.
4 follows with the breakdown of the information. (Note that the rows do not total 100% as students were asked to check all that applied.)

In addition to questioning the students regarding specific computer use, their opinions were also asked regarding general computer use, i.e. – "Accessing Information, Communicating, and Organizing & Presenting Data." Students were asked to indicate on a scale of 1 to 5 how frequently they used computers for each of the specific tasks (1 = most frequent and 5 = least frequent). "Information Access" was the most popular usage, with "Organizing & Presenting Data" least popular. Either these students are not familiar with Excel, or other spreadsheet programs, or Power Point, or other presentation software, or they have not been instructed properly in their development and usage.

Table 4: Tasks to be Performed					
Country	**Assignments**	**Research**	**E-Mail**	**Entertainment**	**Other**
Belgium	75.3%	51.6%	52.7%	59.1%	17.2%
England	93.1%	65.5%	71.3%	52.9%	13.8%
France	56.3%	76.6%	75.0%	43.8%	25.0%
Germany	48.3%	85.0%	90.0%	61.7%	30.0%
Ireland	65.2%	62.1%	97.0%	65.2%	10.6%
Spain	48.3%	39.7%	56.9%	56.9%	15.5%
Average	**64.4%**	**63.4%**	**72.4%**	**56.5%**	**18.2%**
Chi-Square	**51.832**	**36.436**	**54.609**	**7.6629**	**11.621**
Df	**5**	**5**	**5**	**5**	**5**
Significance	**.000**	**.000**	**.000**	**.178**	**.040**

Table 5: Average Importance Ranking of General Computer Use (1 = most frequent use)			
Country	**Access Information**	**Communicate with Others**	**Organize & Present Data**
Belgium	1.86	2.91	2.56
England	2.12	2.56	1.91
France	2.15	2.23	1.92
Germany	1.91	2.09	2.02
Ireland	2.16	1.57	2.80
Spain	2.13	2.81	2.30
Average	**2.05**	**2.36**	**2.25**
Chi-Square	**10.688**	**83.535**	**38.128**
Df	**15**	**15**	**15**
Significance	**.774**	**.000**	**.001**

This would be another area upon which administrators and professors could concentrate. Chi-square tests indicate significant differences between the frequency of use with respect to "Communication with Others" (sig. = .000), and "Organizing & Presenting Data" (sig. = .001) among the six European nations included in the study. Table 5 follows with this data.

Tables 6, 7, and 8 summarize the data concerning student access to computers at the secondary level, the specific type of software they are exposed to, and which courses require computer usage. To better determine the computer background of students, the survey included a question concerning computer use in secondary school, prior to university enrollment. While about 81 percent of English students responded that they had used computers in secondary schools, only 41 percent of the German students responded affirmatively. A Chi-square test indicated that computer use in secondary schools differs significantly between countries. The significance level was .000 with a chi-square statistic of 29.7622 and 5 degrees of freedom. Table 6 contains the details.

The students were also asked to indicate the specific types of software which they used at the secondary level. They were most frequently exposed to word-processing software and least frequently to CAD/CAM software. Other computer applications – "Internet; Graphic Design; Spreadsheets; Database; and Presentations" – fell between the extremes of word-processing and CAD/CAM. Chi-square tests indicated there were significant differences between the frequencies of use in different countries with respect to all but graphic design and CAD/CAM. Table 7 contains the details.

Finally, students were asked about specific secondary classes which required computer applications. The class most frequently cited was English Literature. The class least frequently cited was Journalism. This is another surprising finding in that the most-required skill in Journalism is writing, and word-processing was the computer skill ranking highest with most students as was indicated in the previous table. Chi-square tests indicated that there were significant differences between the frequencies of subjects requiring computers in different countries, including English, Art, Math and PE. Table 8 has the findings

4. CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Due to the constant and rapid evolution of technology, universities are caught in an on-going balancing act. Universities strive to provide students with current technology to enhance technical skills as well as with computer hardware and software upgrades. Schools must also provide for instruction and instructional materials that further the knowledge and skills students

Table 6: Secondary School Computer Accessibility		
Country	**Yes**	**No**
Belgium (n = 93)	53.8%	45.2%
England (n = 86)	81.4%	18.6%
France (n = 67)	62.7%	37.3%
Germany (n = 61)	41.0%	59.0%
Ireland (n = 65)	70.8%	29.2%
Spain (n = 58)	60.3%	39.7%
Total (N = 430)	**Average 61.7%**	**Average 38.2%**

Table 7: Specific Applications in Secondary Schools							
Country	**Word Processing**	**Internet**	**Graphic Design**	**CAD/ CAM**	**Spread-sheets**	**Data-base**	**Presentations**
Belgium	81.1%	25.0%	25.0%	11.5%	51.9%	50.0%	26.9%
England	96.2%	60.4%	41.5%	20.8%	77.4%	71.7%	62.3%
France	78.8%	81.3%	34.4%	9.4%	46.9%	46.9%	78.1%
Germany	95.7%	69.6%	43.5%	30.4%	52.2%	43.5%	56.5%
Ireland	94.7%	39.5%	22.2%	19.4%	75.0%	58.3%	52.8%
Spain	80.0%	20.8%	33.3%	4.2%	8.3%	33.3%	62.5%
Average	**87.8%**	**49.4%**	**33.3%**	**16.0%**	**52.0%**	**50.6%**	**56.5%**
Chi-Square	**12.840**	**40.920**	**6.322**	**9.131**	**38.846**	**13.070**	**25.088**
Df	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Significance	**.025**	**.000**	**.276**	**.104**	**.000**	**.023**	**.000**

Table 8: Secondary School Classes Requiring Computer Use								
Country	**English**	**Art**	**Geog-raphy**	**Science/ Health**	**History**	**Math**	**Journal-ism**	**PE**
Belgium	21.2%	1.9%	15.4%	23.1%	9.6%	36.5%	1.9%	3.8%
England	55.2%	13.4%	23.9%	29.9%	19.4%	38.8%	0.0%	14.9%
France	21.1%	2.6%	13.2%	18.4%	7.9%	13.2%	10.5%	5.3%
Germany	47.8%	4.3%	13.0%	17.4%	21.7%	34.8%	4.3%	4.3%
Ireland	27.3%	0.0%	6.8%	25.0%	11.4%	13.6%	11.4%	0.0%
Spain	20.0%	3.3%	6.7%	20.0%	13.3%	20.0%	0.0%	0.0%
Average	**32.1%**	**4.2%**	**13.2%**	**22.3%**	**13.9%**	**26.2%**	**4.7%**	**4.7%**
Chi-Square	**25.747**	**13.714**	**8.429**	**2.778**	**5.098**	**16.025**	**13.892**	**14.980**
Df	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Significance	**.000**	**.018**	**.134**	**.734**	**.404**	**.007**	**.016**	**.010**

possess (Holmes, 1999). The major contribution of this paper has been to develop originaldata contrasting the use of computer technology among European business schools in six nations. We found significant differences among nations at the secondary level with respect to computer access, computer applications, and courses requiring computer assignments.

More specifically, this study reached the following conclusions which can provide educators with new insights enabling them to do a better job regarding computer availability and applications for their students, as well as determining the level of preparatory work possessed by the students prior to entering college:

- Students are very concerned about on-campus computer accessibility, especially regarding computer lab hours. Administrators should consider keeping the labs open until midnight.
- As an increasing number of students are playing computer games, educators could consider learning some software that would allow them to make one, or more, semester assignments in the form of a computer game, regardless of their discipline.
- Secondary school computer use ranged from about 40% of the students surveyed to 80%. Computer skills, like any other skill, are learned, and "practice makes perfect." Higher education administrators should conduct surveys of secondary districts in their primary draw areas and encourage computer usage if low rates are found.

Two follow-up papers are being formulated. One will be to determine the same data as was collected for this study, on business students at selected universities in the United States, similar in size and type to the sampled European universities. A second paper will contrast the European findings with those of their American counterparts. These papers may indicate differences between American and European business schools as to student computer availability and usage patterns, as well as secondary school preparatory work. These differences should provide both American and European educational administrators with information to determine if their current IT policies are appropriate, or, if they should be changed. If change is indicated, the papers should provide helpful direction.

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