

## The Impact of the New Technology of Teaching and Learning on the Higher Education

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*The paper aims to present the impact of the new technologies of teaching and learning on the present generation of students and teachers from higher education, based on a study which was a part of a research project of the Academy of Economic Studies Bucharest, concerning innovative teaching and learning methods and their impact in the learning activities of the students, in the context of the knowledge-based economy. The main focus of the analysis was the degree of access to IT by the students, the use of IT in the learning process and the use of e-learning platforms by the students, presenting the advantages of using them but also the problems encountered in their utilization*

**Keywords:** Higher Education, E-learning Advantages, E-learning Problems, Technology, Student Generation

### 1 Introduction

In a knowledge-based economy, information or knowledge creates economic value, and the higher education sector's role is therefore of increasing importance. In this context, considering that computers and Internet connections are becoming widely available in schools, in classrooms and at home, the higher education can nowadays no longer exclude the use of Information Technology in the learning, knowledge acquisition and creation processes.

### 2 The role of higher education in knowledge based economy

The term "knowledge based economy" is, according to a definition given by the OECD [9], an expression describing the trend towards increased dependence on knowledge, information and high skill levels, and the increasing need for access to all of these by the business and public sectors. The today's global economy is often described as one in transition to a "knowledge economy," as an extension of an "information society".

The knowledge economy is a term that refers either to an economy of knowledge focused on the production and management of knowledge in the frame of economic constraints, or to a knowledge-based economy. The essential difference is that in a *knowledge economy*, knowledge is a product,

while in a *knowledge-based economy*, knowledge is a tool. This difference is not yet well distinguished in the subject matter literature. They both are strongly interdisciplinary, involving economists, computer scientists, engineers, mathematicians, chemists and physicists, as well as cognitivists, psychologists and sociologists. Related to the use of knowledge technology to advance industry, production and job creation, knowledge technologies principally include and require computers and networking systems. Due to increased use of the Internet and computer technology in nearly all areas of modern industry, correlations are drawn between the digital age and knowledge-based economy.

Higher levels of education are needed not only just to better prepare knowledge workers. They also improve the likelihood of participation in further learning throughout adult life, and reduce the chances of long-term unemployment and marginalization.

Fundamentally, higher education is a process of imparting knowledge by means of lectures to those who want to acquire it.

One way to make learning more productive is for students to master a body of knowledge in less time. Learning that takes less time can cut the traditional costs carried by the institution, but also the opportunity costs of the student. Another way to make learning more

productive is to make it possible for students to get the courses they need when they need them.

### 3 Web-based training systems, advantages and disadvantages

The target group for the e-Learning is represented by scholarships and students. They need to accumulate a large variety of knowledge, to learn how to think, to connect all schools values with the life reality, to transform the theory into practice and so on. For this reasons, the e-content prepared to be delivered by ICT infrastructure, designed for self-learning or assisted by the teacher, has to be in full accordance with the didactical and pedagogical principles. [8]

- students participate from a variety of locations and may "attend" multiple learning institutions and/or their local school;
- students may determine the times when they access e-learning opportunities. Students can choose to work individually or collaboratively with people who may or may not be in their regular class;
- classes may be synchronous or asynchronous;
- students may take classes from more than one school;
- students may set their own objectives and explore their own learning needs and agendas;
- students can follow a non-linear path at a pace that meets their individual needs at that time, i.e. just-in-time learning;
- e-teachers can work in more than one school;
- students can proceed at their own pace;
- students can replay audio lectures or video clips;
- slower students do not slow down their classmates.

Of course there are also a few disadvantages like:

- the teacher has to work harder for a successful online course to replace verbal explanations;
- the course must be interactive otherwise the students lose interest and give up;
- the work must be done by teams of teachers, administrators and students;

- there has to be a good connection to the server so the clients can get the answers very quickly;
- the software doesn't have to be very expensive, and without implementation errors.

In a survey conducted in 2010 among students of the Academy of Economic Studies about use e-learning platforms, 58,14% said they used e-learning platforms and 41.86% have not used this type of training (Figure 1 and Figure 2)

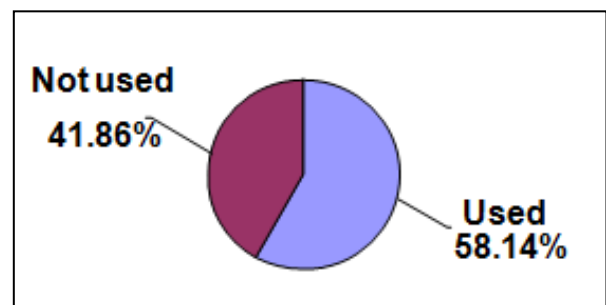


Fig. 1. The usage of e-learning

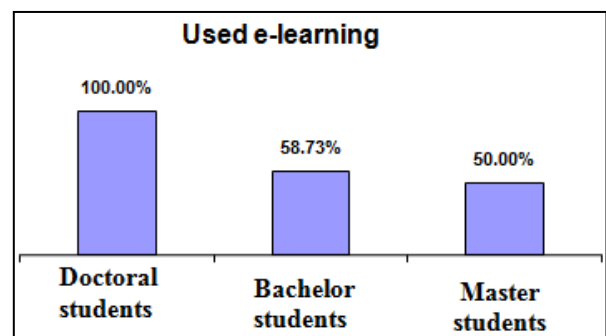


Fig. 2. The average number of students, on studies categories, that have used e-learning

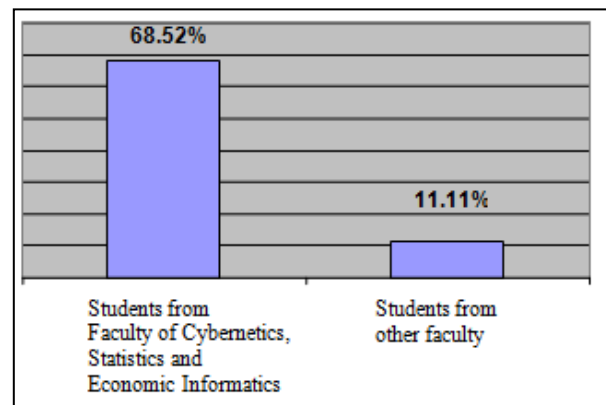


Fig. 3. The average number of students, on specialties, who have used e-learning

From Figure 3 we can see the vast difference between the average number of students with specialized computer and the students with other specialties regarding utilization of e-learning training.

In the same survey, regarding the advantages of using e-learning systems, the students have enumerated the following:

- study at their own pace
- winning time - travels to school were not necessary
- organization of individual time for completion of study materials
- permanent access to study materials
- through e-learning, there is a teacher to create their overview of the class and teach material based on class average intelligence, e-learning every student learn according to his ability.
- interactivity
- learning by pictures and examples

- access to a familiar environment (home) facilitates learning
- opportunity to learn from anywhere provided there is only an Internet connection (home, school, train, etc.).
- can select and print only certain passages of text, and have it in physical format.
- eliminating the problems related to volume of the books or courses.
- quick and effective testing
- better structured presentation of information, best exemplified by bringing visual memory of the learner
- portability, print possibility, rapid tests, visual and audio rich content, interactive, modularization.

In Table 1, are presented some of the difficulties encountered in using e-learning systems and some solving solutions enumerated by the students.

**Table 1.** Difficulties encountered in using e-learning systems and solutions

Difficulties	Solutions
Sometimes incomplete information	Searching for information in other sources
Like himself, is more difficult to understand some complex concepts	Online support
Limited number of lessons and modules	
Relatively high cost to develop good applications	
Download low speed	This comes from personal connection to the Internet, which can be improved by the provider
Problems viewing the formulas, because the file format could not be recognized by the system	Information should be provided in standard file formats or classic, like MSOffice 2003, to allow viewing from any PC or mobile device
Absence human factor to explain the meaning of each information	Trying to create the same material for different kinds of people
Very few lessons, materials in the Romanian language	Creating a center for translation of such materials
Many sources, sometimes unsafe.	A more careful selection.
Some materials were not available	
In case of doubt, I was not able to ask someone.	Opportunity to keep in touch with a tutor by e-mail.
Internet connection suddenly interrupted	
Communication with the server sometimes made more difficult	
Waiting times higher in some cases execution of	

complex queries	
I did not page loads because of a slow internet connection	
Oracle platform does not work in different browsers	Compatibilization with major browsers
Absence time framing	Should be put a status bar that shows what percent have completed from the course content
Interaction between student and instructor is limited	More frequent consultations
Absence of an extrinsic motivation	
There are many information and it is very hard to choose or to figure realize how accurate are them	
Navigating the e-learning platform was cumbersome	An design simple and accessible to all
We used e-learning platform for courses SQL and PL / SQL supported by Oracle. Courses required a good Internet connection.	
Unlike books, prolonged use of computer affects eyes	
It is difficult when I encounter a problem and I cannot find the answer in the e-learning platform.	
I am dependent on the computer and Internet.	
Without taking into account of the user profile like age or learning ability	Adaptive processes would be a solution, but currently are not very developed
Internet or application failure, which led to the postponement of deadlines	
Application blocking, which sometimes led to loss of actions performed	
Out of the possibility of demand of additional explanations on unclear concepts at the time	
Absence of instructor verbal explanations	High quality courses
Limitation in terms of hardware resources	Will disappear because new technologies
Abandon, if the material is not accessible	Interaction between teacher and student
Not all students are familiar with the method, concept and use of e-learning platform	Courses dedicated to assimilate how to work with e-learning platform

#### 4 The impact of the new technology of teaching and learning on generation of teachers and students

Academic institutions are often quite conservative and are not very flexible to radical changes. If they want to survive in the digital world they must reorganize their curricula, teaching methods and instruments and to re-define the role of the teacher, both to adapt to new technologies and new labor market requirements.

In his article "The New Generations of Students and the Future of e-Learning in Higher Education"[10], Angel Smrikarov define the influence of technology on the generations of students as can be seen in table 2 where consider generation X the generation of students born before 1980, generation Y the generation of students born between 1981 and 1993 and generation Z the generation of students born between 1994 and 2004.

**Table 2.** The influence of technology

<b>Digital Revolution:</b>	Generation X	<b>faced</b> the Digital Revolution.
	Generation Y	<b>came at age during</b> the Digital Revolution
	Generation Z	<b>were born in a Digital World</b>
<b>Digital Technologies:</b>	Generation X	<b>started using</b> Digital Technologies.
	Generation Y	<b>embraced</b> the Digital Technologies
	Generation Z	<b>cannot live without</b> Digital Technologies
<b>Internet:</b>	Generation X and Generation Y	<b>went</b> on-line.
	Generation Z	<b>were born</b> on-line...
<b>Which technologies shaped the generation?</b>	Generation X	As children were shaped mostly by <b>TV, Video and Video Games.</b>
	Generation Y	were shaped by <b>PC, Computer Games and WEB.</b>
	Generation Z	have at disposal <b>all the DT and gadgets available...</b>

The continuous interaction with Digital Technologies developed for generation of students born between 1981 and 1993 (a part of our generation of students but also a part of the current generation of teachers) certain abilities or characteristics such as: twitch-speed and multi-channel information processing, multi-tasking, non-linear visual thinking, expectation of immediate feedback and reward and expectation of continuous connection to WEB and immediate access to multiple information sources.

To find the best way of teaching this generation of students is important to consider how current and future students perceive the technologies. Teachers considers that uses the new technologies in their courses but stu-

dents do not perceive computer, mobile phone or the Web as the new technology but as a normal interaction way.

Some students of this generation are bored and detached from traditional forms of university education because they believe that the training is in a slow rhythm, presenting knowledge in a linear and sequential logic, that their efforts are not rewarded immediately and assimilating knowledge in a individually way requires reflection and creativity.

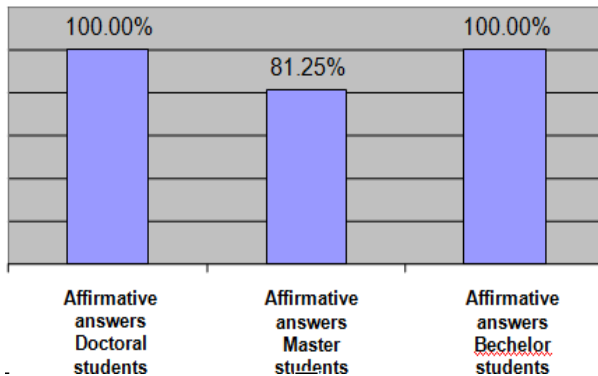
On the other hand, in a study organized in the Academy of Economic Studies, were obtained the data from the Table 3 (CSIE means Faculty of Cybernetics, Statistics and Economic Informatics).

**Table 3.** The use of technology in training process

	Total affirmative answers	Affirmative answers Doctoral students	Affirmative answers Master students	Affirmative answers Bachelor students	
				Total	
<b>Computer-based learning or Web should play a greater role.</b>	85.88%	100.00%	100.00%	Total	81.25%
				CSIE	82.14%
				Other faculties	75.00%
<b>Web-based learning programs cannot replace traditional lectures</b>	83.53%	80.00%	18.75%	Total	15.63%
				CSIE	16.07%
				Other faculties	12.50%
<b>Computer aided training or web-based training must be available in addition to the classes</b>	82.35%	100.00%	68.75%	Total	84.38%
				CSIE	83.93%
				Other faculties	87.50%

<b>I have difficulty or I do not like to work with training programs in English language</b>	8.24%	20.00%	0.00%	<b>Total</b>	9.38%
				<b>CSIE</b>	10.71%
				<b>Other faculties</b>	0.00%
<b>E-learning should not be nothing more than distributing information through the Internet</b>	12.94%	0.00%	6.25%	<b>Total</b>	15.63%
				<b>CSIE</b>	12.50%
				<b>Other faculties</b>	37.50%
<b>I find it difficult to speak in class, so most times I fail to do so. It would be easier to participate in a discussion in online forums.</b>	17.86%	0.00%	12.50%	<b>Total</b>	20.63%
				<b>CSIE</b>	20.00%
				<b>Other faculties</b>	25.00%

Based on the data from Table 2 it can be concluded that computer-based learning or web-based learning should play a more important role (85.88%) but web-based learning programs cannot replace traditional lectures (83.53%) (is interesting to note that this statement was supported by 80% of doctoral students but only 18.75% of master students to and 15.63% of bachelor students) and computer aided training or web-based training must be available in addition to the classes (82.35%). This facts can be seen also in the Figure 4.



**Fig. 4.** Replies to the assessment that web-based learning should play a greater role

Appreciation, often unexpected, set by some students, are listed below:

- computer-based learning or Web-based learning should play a greater role.
  - No, the most important way of learning is that we learn information naturally
  - Yes, but should not abandon traditional teaching
  - I agreed, claiming the traditional teaching
- Web-based learning programs can replace traditionally courses?
  - No, I learn more from studying the

sheets

- I am not agreeing because we are not kept in touch with teachers.
- When somebody explain you in a direct mode is much better
- In a small proportion
- Not entirely, can support but not replace

### 5 The use of IT in the learning process

ICT can be used in many different ways, and how it is integrated into educational settings depends largely on teachers' instructional goals and strategies.

Representing and communicating complex problem situations is an important function of computer technology. Unlike problems that occur in the real world, technology can incorporate graphics, video, animation, and other tools to create problems that can be explored repeatedly. Multimedia representations are easier to understand than problems presented as text.

A second function of technology is locating information needed to solve problems or do other kinds of research. Now the World Wide Web brings a seemingly endless amount of information on almost any subject, and it is possible for students to choose topics based on personal interest rather than availability of resources. In addition to its function as a source of information, the Internet's capability for communication and interaction provides many innovative educational opportunities. The ease of publishing and accessing materials on the Internet increases the likelihood that students will encounter inaccurate or biased information.

Writing reports is still the most widespread use of ICT, teachers assigning students word

processing tasks. In addition to text, students also use computer-created graphics, video, and animations to communicate their ideas.

### 6 The impact of using IT by the students of the Academy of Economic Studies Bucharest

In the following, several conclusions of a study related to the impact of IT in the learning activities of the students at the Academy

of Economic Studies Bucharest (AES). The target group consisted of students of different profiles within the Economics specialization, at different levels (bachelor/undergraduate, master and doctoral students). The research was based on a questionnaire and the responses were collected and analyzed.

Table 4 shows several questions that are relevant for characterizing the IT use by students in their learning activities.

**Table 4. Questionnaire**

	<b>Do you have access to a computer during your learning activities?</b>
1	a Yes – my own computer
	b Yes – a computer that is shared with the family / room mates
	c Yes – a computer with public access (e.g. at the University)
	d No
	<b>Does the computer have internet access ? Which kind of connection ?</b>
2	a Yes - modem (phone line)
	b Yes - ISDN or similar
	c Yes - broad-band internet access
	d Yes – via LAN (e.g. at the University)
	e No
	f No – I don't have access to a computer
	<b>How often do you use the computer for learning ?</b>
3	a at least once a week
	b at least once a month
	c at least once per semester
	d less frequently
	e never
	<b>Which one of the following content types do you find most useful for learning ?</b>
4	a picture archives (with some explanatory text)
	b hypertext (e.g., documentation on the web)
	c simulation (e.g., laboratory simulation)
	d test questions and answers
	e animation
	f encyclopedia
	g online forums of other students
	h e-learning platforms (for web-based lectures)
	<b>How often do you use the computer for the following activities ? (every day, several times a week, several times a month, less frequently, never)</b>
5	a Text editing
	b Organize meetings, activities, keep notes

c	Spreadsheet applications / Calculations
d	Picture (Photo) editing
e	Playing computer games
f	Communicate via e-mail
g	Communicate via chat/instant messaging
h	Take part in discussion on online forums
i	Search for information on the Internet
j	Publish information on the Internet

An analysis of the replies related to having access to a computer shows that 98.82% have their own computer, 1.18% work on a shared computer and 2.35% have access both to an own computer and to a shared computer.

Related to the internet access, 87.21% of the students have access from home, and 11.46% can access the internet only from the university campus. Regarding the connection type, 21.18% use a modem (phone line), 7.06% have an ISDN or similar connection and

60.00% have broadband access via cable or DSL. Concerning the use of the computer in the learning process, 91.86% declared they use it at least once a week and 6.98% at least once a month. The responses structured by the study cycles are shown in Table 5. Generally it can be noticed that the degree of use is very high (on average over 90%), and bachelor students tend to use computers in their learning more frequently than master students.

**Table 5.** Using the computer in the learning process, by study cycle

CYCLE	at least once a week	at least once a month
<b>Doctoral study</b>	100.00%	0.00%
<b>Master</b>	87.50%	12.50%
<b>Bachelor</b>	92.31%	6.15%
	<b>91.86%</b>	<b>6.98%</b>

Related to the preferred content type, the responses were summarized in Table 6.

**Table 6.** Preferred content type

	“Yes” replies, on average	“Yes” replies, doctoral students	“Yes” replies, master students	Average “Yes” replies, bachelor students		
				Total	Business Informatics	Other specializations
picture archives	40.00%	33.85%	35.71%	22.22%	25.00%	32.56%
hypertext	80.00%	33.85%	35.71%	22.22%	31.25%	36.05%
simulation	80.00%	38.46%	37.50%	44.44%	43.75%	41.86%
test questions and answers	40.00%	21.54%	25.00%	0.00%	25.00%	23.26%
animation	20.00%	47.69%	51.79%	22.22%	37.50%	44.19%
encyclopedias	0.00%	24.62%	26.79%	11.11%	6.25%	19.77%



online forums of other students	60.00%	27.69%	32.14%	0.00%	18.75%	27.91%
e-learning platforms	40.00%	36.92%	41.07%	11.11%	31.25%	36.05%

It can be appreciated that the students consider as useful information sources mostly hypertext documents and simulations (with 80% of responses), whereby the master and

doctoral students have similar preferences, with an emphasis on computer animation. Figure 5 reflect the content type that is preferred by the students.

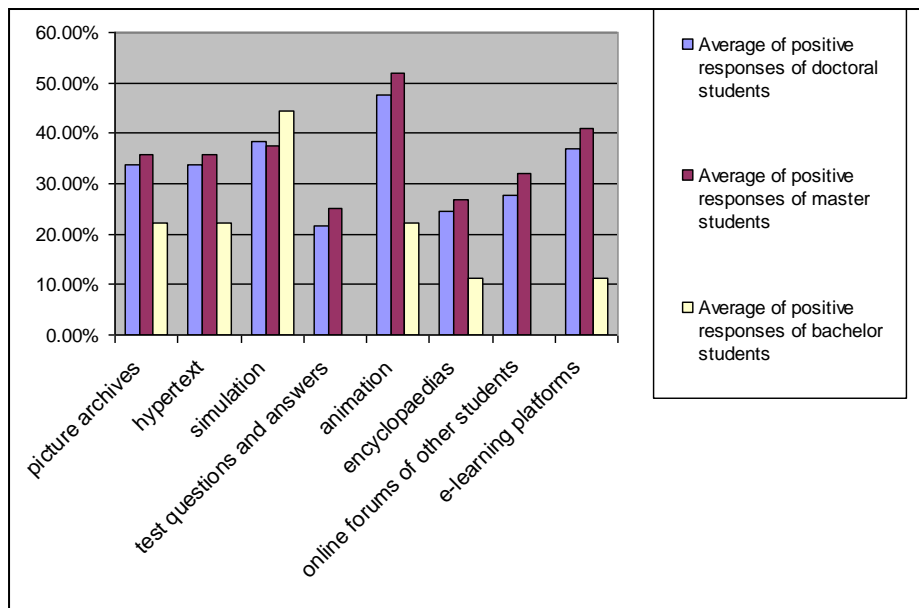


Fig. 5. Preferred content type

The data in Table 7 reflect the activities for which the computer is used and their frequency.

Table 7. Computer use by activity type

	daily	several times / week	several times / month	less frequently	never
Text editing	<b>69.41%</b>	25.88%	4.71%	0.00%	0.00%
Organize meetings, activities, keep notes	36.47%	24.71%	16.47%	16.47%	5.88%
Spreadsheet applications / Calculations	21.18%	24.71%	23.53%	29.41%	1.18%
Picture (Photo) editing	27.06%	23.53%	25.88%	23.53%	1.18%
Playing computer games	12.94%	14.12%	24.71%	<b>41.18%</b>	7.06%
Communicate via e-mail	<b>67.06%</b>	24.71%	4.71%	3.53%	0.00%
Communicate via chat/instant messaging	<b>70.24%</b>	14.29%	2.38%	9.52%	2.38%
Take part in discussion on online forums	11.76%	16.47%	20.00%	36.47%	15.29%

Search for information on the Internet	90.59%	9.41%	0.00%	0.00%	0.00%
Publish information on the Internet	12.94%	11.76%	8.24%	48.24%	18.82%

It is interesting to notice that computers are used on a daily basis by 69.41% of the students to edit text documents, by 67.06% to communicate via email and by 90.59% to search for information; also to be noticed is

the fact that 24.70% are publishing content on own websites or blogs etc., daily or several times per week. This facts can be seen, also in Figure 6.

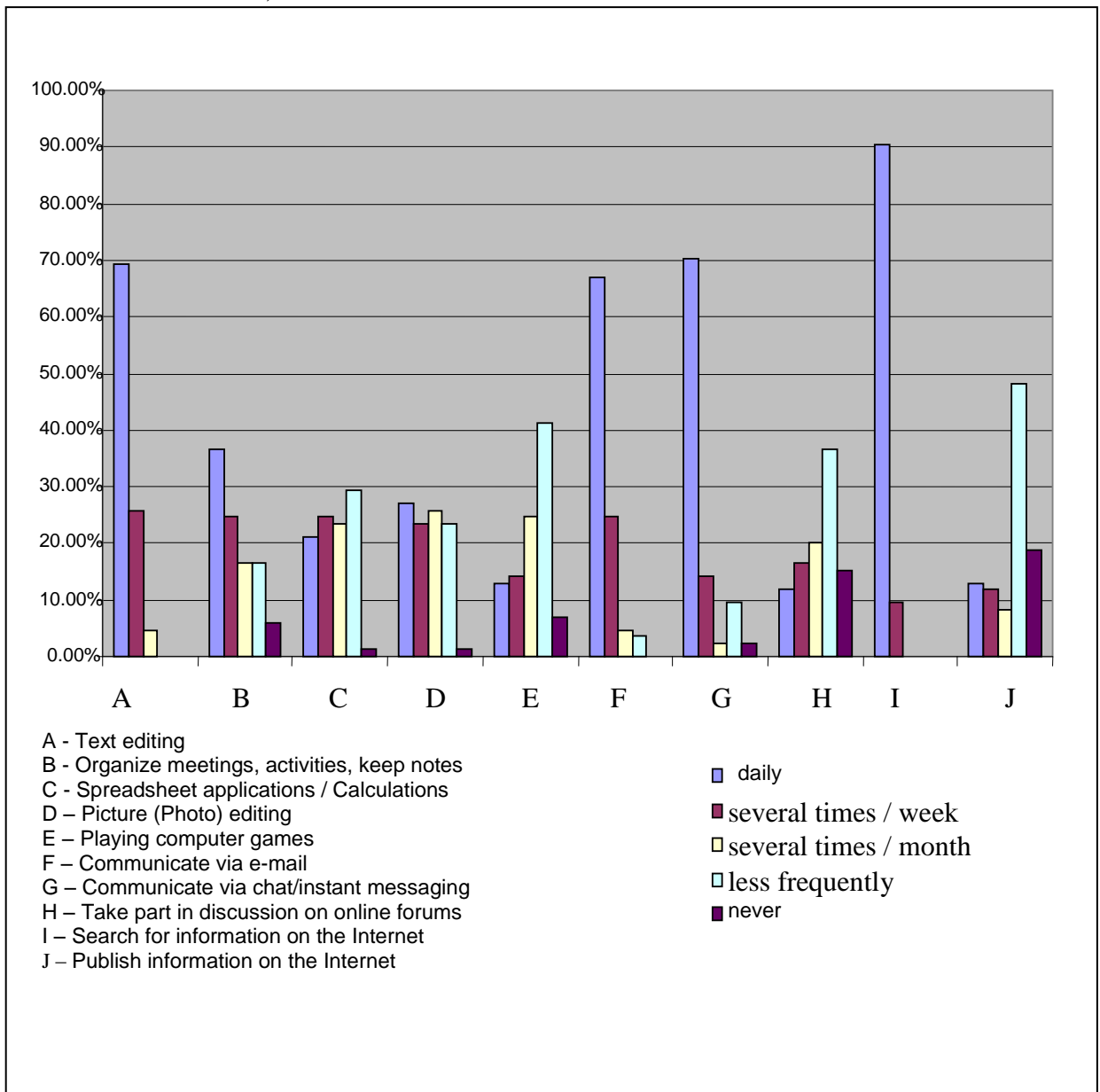


Fig. 6. The use of computer by activity type

Table 8 shows the data related to the daily use of the computer by students of different study cycles, for different activities.

**Table 8.** Computer use by activity type and study cycle

Daily activity	Cycle		
	Doctoral	Master	Bachelor
Text editing	100.00%	93.33%	61.54%
Organize meetings, activities, keep notes	60.00%	66.67%	27.69%
Spreadsheet applications / Calculations	60.00%	26.67%	16.92%
Picture (Photo) editing	40.00%	33.33%	24.62%
Playing computer games	0.00%	13.33%	13.85%
Communicate via e-mail	80.00%	86.67%	61.54%
Communicate via chat/instant messaging	40.00%	53.33%	76.56%
Take part in discussion on online forums	20.00%	6.67%	12.31%
Search for information on the Internet	100.00%	93.33%	89.23%
Publish information on the Internet	40.00%	20.00%	9.23%

An observation that can be made here is that the frequency of using the computer for social activities varies with the study cycle and is highest in doctoral students.

## 7 Conclusions

Advances in hardware and software have the potential to bring about fundamental changes in how technology is integrated and even in education itself. Computers formerly tethered to desktops by cables are being rapidly replaced by wireless laptop and palmtop models that free students to move about the school; collect, share, and graph data on field trips; and communicate their whereabouts and progress to teachers and parents.

Based on the presented study among the Academy of Economic Studies Bucharest students, it can be observed that there is a high level of accessibility to Information Technology, which has a significant impact in the daily personal and study life of students of all cycles, regardless of their specialization.

Further studies will be required in order to investigate the impact of IT on the teaching staff and the adoption of computer-based applications for both teaching and professional advancement, in order to observe possible usage profiles according to the field of specialization, teaching position and age.

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