APPLICATION OF ICT BY STUDENTS AT SELECTED UNIVERSITIES IN POLAND

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ABSTRACT
The aim of the study was to investigate access and use of computers and internet by students during their studies. The results are based on a survey conducted in 2009-2012 on groups of 320 to 405 students (each year) from two universities in eastern Poland. It was concluded that during the period under study access of students to computers and internet was at a relatively high level. In most of the years considered, there were statically significant differences in computer ownership and internet access between students from rural and urban areas. It was revealed that in students' opinion the application of ICT by lecturers in the courses' delivery did not change significantly since 2009.

INTRODUCTION
Computer and online use has increased significantly in the recent years and today it is a major component in modern society. University students all over the world use information communication technology in their studies. It is due not only to the advances in computer technology but also to drastic drop in computers' prices and general use of the computers in everyday life. These technologies have altered the method in which people work, communicate, shop, and even learn. Correspondence courses, the traditional method of distance education, have been replaced almost entirely by e-learning. In fact, e-learning is penetrating all areas of teaching and learning; it comes to academic institutions as well as to corporate training, whether invited or not (Delgado-Almonte at al, 2010).

Almost all of current university students have grown up with computer and internet technology and are well familiar with their advantages. However, students from an underprivileged environment, either school or home, may tend to use computers less frequently due to their limited knowledge, exposure and experience prior to entering university.

There is a considerable variation of computer skills in European Union (EU) countries, both for the general population as well as within students' population (Kiss, 2012). However, Poland is considered to be one of the countries with relatively high level of ICT efficiency despite being one of the less developed EU countries (Aristovnik, 2012). In 2011 66.6% of households in Poland had access to internet with regular use reported at 57.9% (Społeczeństwo informacyjne w Polsce 2012). Not surprisingly it is people between 16 and 24 years of age who use internet most frequently. There is also no doubt that it is the students who most often access internet (Batorski, 2011; Sahin, 2011). It has to be noted that both computer equipment and internet access is still not as common in Poland as in developed countries and is below the EU average. Data for 2011 for Poland indicates that 64% of people at the age between 16 and 74 used computer (EU average – 73%) and 55% internet (EU average – 71%). Within EU, the Scandinavian countries and the Netherlands had the highest indicators (above 90%) and Bulgaria had the lowest (below 50%) (Information sociaty 2012).

However, it is questionable whether computer technology is used properly, which highly depends on level of computer skills. Students are normally regarded as the group with high level of computer abilities nevertheless that may also be an issue with those who do not own a computer and do not have an easy access to internet. There are also reports about very superficial use of IT. The above applies both to students and lecturers (Studenci i Internet, 2012; Dincer et al, 2011; Hong and Songan, 2011). University students tend to use computers for

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entertainment and the internet for social communication (Jones, 2002). On the other hand, many teachers do not have all the necessary skills to integrate ICTs in teaching processes and consequently use the technology only as a tool to improve the visualization of their lectures (Andreu & Nussbaum, 2007).

Regarding computer skills, even casual use of technology, not necessarily directed at educational needs, may and should improve users' ability. As stated by Oliver (2002): "The growing use of ICTs as tools of everyday life have seen the pool of generic skills expanded in recent years to include information literacy and it is high probable that future development and technology applications will see this set of skills growing even more".

Advances and prevalence of ICT in the society mean that universities have to adopt and find possible roles of ICT in higher education. The aim of this study was to assess the use of ICT technologies by students during their studies and also the willingness of lecturers to apply such technologies in the educational process.

METHODS

Subjects

The study population consisted of 1,417 students from two universities in eastern part of Poland; the University of Life Sciences in Lublin and the State School of Higher Education in Chełm. Data was collected in the first quarter of 4 consecutive years from 2009 to 2012 with a group of 320 to 405 students each year (Lorencowicz & Kocira, 2009, 2010, 2012). The survey covered undergraduate students registered for the following programmes: education in technology and information technology, agriculture, agriculture and forest engineering, transport, and management, and production engineering. The highest number of participants was Year 1 students and the least – Year 5. In one of the years (2009) there was no data for students from year 2. The study population is presented in Table 1.

Table 1: Study population

Year	2009	2010	2011	2012	Total	Percentage
Number	334	320	358	405	1417	100.0
Institution:						
• University of Life Sciences in Lublin	270	272	260	284	1086	76.6
• State School of Higher Education in Chełm	64	48	98	121	331	23.4
Year of study::						
• Year 1	206	39	131	167	543	38.3
• Year 2	-	160	113	130	403	28.4
• Year 3	18	66	45	43	172	12.1
• Year 4	59	20	26	57	162	11.5
• Year 5	51	35	43	8	137	9.7

Instrument

Data was collected using a pre-tested, semi-structured questionnaire. The questionnaire was developed based on the literature and informal discussion with experts. It was pre-tested on a separate group of students registered on a different programme, hence excluded from the results of the study, and then modified accordingly.

The questionnaire consisted of three sections; (1) – computers usage and frequency of use, (2) - internet access, frequency and type of information sought, and (3) – the use of ICT technology in the educational process by students and lecturers. The survey mainly used closed-ended questions; either polar (i.e. yes-no) or multiple choice. However, for some of the question a 5-point Likert scale was also used.

The first section of the questionnaire included questions related to the place of residence of the student and ownership of a computer with the peripheral computer equipment. Questions related to the place of residence referred to the place of permanent residence (rural or urban area) and place of residence during studies (home, on-campus or off-campus residence).

The computer ownership question use 'yes', 'no' and 'home computer' responses to be selected by students. There were also an additional questions in respect to peripheral computer equipment (such as printer, scanner, etc.) and possible plans to purchase a computer.

The second group of questions was directed towards the internet use. The first issue covered was household internet access (yes-no), with a few options on the access for those with no access at home. Secondly, the students answered questions related to the purpose for internet use with several options to be selected, e.g. e-mail communication,

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seeking general information (like timetables, adverts, etc.), entertainment, social networking but also searching for professional information related to their studies. For each option, the respondents also provided information on the frequency of use (*every day*, *few times a week*, *once a week* or *hardly ever*).

There were also questions regarding the use of computers in terms of the application where the respondents had several options with no limit on the number of options selected. The possible answers included: writing and editing of the documents, performing calculations, writing computer programs, making technical drawings, preparing learning materials for classes, and also using computers for entertainment such as listening to music, watching movies or playing games. Once again each answer gave the possibility to indicate the frequency of use.

The usefulness of the computer and internet in learning process was assessed by two separate questions with 5-point Likert scale consisting of the following options: *very useful, useful, sometimes useful, only for entertainment, not useful*.

The way the computer was used in students' learning was evaluated with multiple choice question where the students were allowed to select several answers; there was also a possibility to give a free answer. The choices were: *I cannot use internet, I do not use internet as it is not required, I write my continuous assessment submissions using a computer, I perform calculations, I prepare projects reports, I collect and process information, I exchange information with colleagues through internet, I look up webpages of my university and lecturers* and *Use it for other reasons (specify)*.

The difficulties in access and use of internet and computers were assess in exactly the same way with the following possible answers: *I do not have access to a computer, I do not have access to internet, I do not know how to use a computer in my studies, I do not have enough time to look for information on the internet, I do not like to work on a computer, Using a computer is not safe for my health, Working on a computer tires me, Working on a computer isolates me from other people* and *Other reasons (specify)*.

There was a separate question in respect of students' valuation of quantity and type of educational information available on internet. The quantity was assessed as: *a lot, average, not a lot, not at all, I do not know*; whereas the type of information as: *announcements, timetable, curriculum and syllabi, lectures main points, project titles, lab instructions, source material, previous exam papers, current results, I do not know*.

The last two questions interrogated students' perceptions of lecturers' endeavour in application of information technology in teaching and lecturers' appreciation of students' competence in use of ICT.

The data collected was verified and entered in a database and the analysis was done using a standard Excel spreadsheet. Chi-square test (χ^2 test) was used to perform statistical analysis of the data consolidated in a contingency table. The statistical testing was used to establish the relationship between variables, if the relationship was confirmed its strength was evaluated with the help of mean square contingency coefficient (coefficient φ); with the value close to 1 – strong relationship, close to 0 – weak relationship.
Since the sample was relatively large, the weak relationship (i.e. low phi-coefficient) can be statistically significant.
The results of chi-square test were interpreted using p-values; the p-value less than of 0.05 indicates the relationship significant (at the significance level of 0.05)

RESULTS

Computer Ownership

The results regarding the computer ownership (either own – personal computer or sharing it with the family – family computer) indicated that in all the years under investigations at least 97% of students from urban areas did own a computer. Unexpectedly, for students from rural areas this value was not much lower, as it was at least 92%, with maximum at 95.4% in 2012 and minimum – 92% in 2010. The minimum in 2010 was also for the whole population (94.1%). Looking at the results (Table 2), it can be seen that the number of students owning a computer generally increased.

Table 2: Computer ownership (either personal or family) in relation to place of residence

Place of residence	Computer Ownership											
	2009			2010			2011			2012		
	No	Yes	Total	No	Yes	Total	No	Yes	Total	No	Yes	Total
Urban Area [number]	2	144	146	3	116	119	3	137	140	5	160	165
[%]	1.4	98.6	100	2.5	97.5	100	2.1	97.9	100	3.0	97.0	100

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Rural Area [number]	12	176	188	16	185	201	15	203	218	11	229	240
[%]	6.4	93.6	100	8.0	92.0	100	6.9	93.1	100	4.6	95.4	100
Total [number]	14	320	334	19	301	320	18	340	358	16	389	405
[%]	4.2	95.8	100	5.9	94.1	100	5.0	95.0	100	4.0	96.0	100
Test Statistics for Difference between Urban and Rural Areas	-2.268			-1.990			-2.002			-0.788		
p-values	0.01167			0.0233			0.0226			0.216		

Source: own results

In Table 2 students possessing their own or family computer were combined together into one category "Yes". In such a case the chi-square test is equivalent to the test for equality of two proportions. The last two rows in Table 2 contain the values of test statistic for difference between urban and rural areas and p-values for one sided test. The fraction of students in category "Yes" coming out of the urban areas was significantly higher than the ones coming out of the rural areas in each year except 2012 year. That means that, except year 2012, there was statistically significant difference between computer ownership (either personal or family) between students' from rural and urban areas. However the strength of the relationship is rather low (the φ-coefficient is 0.12, 0.11, 0.11 in years 2009-2011, respectively).

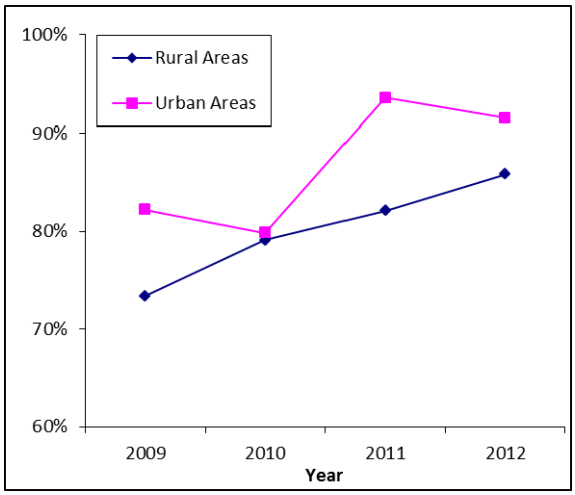

Fig. 1: Personal computer ownership in relation to place of residence

The percentage of students from rural areas owning a personal computer (not a family computer) increased steadily between 2009 and 2012 whereas the data for students from urban areas shows more fluctuation (Fig. 1). However, even for students from urban areas there is an increase in number between 2009, the starting year of collecting data, and 2012, the final year. As expected, the number for students from urban areas is always higher than rural areas.

Table 3: P-values for detailed comparisons for students with personal computers

	P-value	
Year	Rural Areas	Urban Areas
2009-2010	0.0931	0.687
2010-2011	0.218	0.0005
2011-2012	0.138	0.751

Source: own calculations

Table 3 shows p-values calculated for the null hypothesis that fraction of having their own computer students was the same in subsequent years versus alternative hypothesis that the fraction increased. As it can be seen from the results, the significant increase in personal computer ownership was only between years 2010 and 2011 for students from urban areas.

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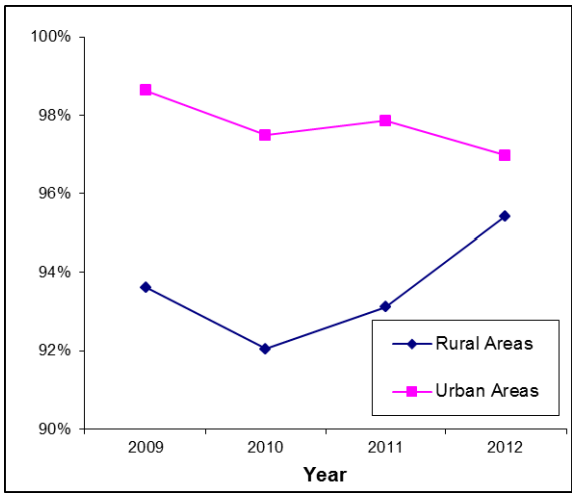

Fig. 2: Computer ownership (either personal or family) in relation to place of residence

Since 2010 the gap between the number of students owing a computer (either personal computer or family computer) from rural and urban areas was reducing (Fig. 2). It is only reasonable to assume that such tendency would continue making no difference between the two groups soon. Statistically, for those two groups there was no significant difference between subsequent years of the study.

Table 4: Internet access in relation to place of residence

Place of residence	Internet Access											
	2009			2010			2011			2012		
	No	Yes	Total	No	Yes	Total	No	Yes	Total	No	Yes	Total
Urban Area [number]	6	138	144	6	110	116	6	131	137	5	155	160
[%]	4.2	95.8	100	5.2	94.8	100	4.4	95.6	100	3.1	96.9	100
Rural Area [number]	18	158	176	22	163	185	13	190	203	8	221	229
[%]	10.2	89.8	100	11.9	88.1	100	6.4	93.6	100	3.5	96.5	100
Total [number]	24	296	320	28	273	301	19	321	340	13	376	389
[%]	7.5	92.5	100	9.3	90.7	100	5.6	94.4	100	3.3	96.7	100
Test statistics		-2.048			-1.953			-0.797			-0.199	
p-values		0.0203			0.0254			0.2127			0.4210	

Source: own results

During the period of the study students from rural areas had lower access to internet than students from urban areas; statistically significant differences in years 2009 and 2010 (Table 4). In 2010, 5.2% of students from urban areas did not have access to internet whereas the same percentage for students from rural areas was almost 12% (Table 4). The percentage of students from rural areas with access to internet increased from 2010 and 2012 reached almost the same number as for students from urban areas. The increase was statistically significant in year 2011 in comparison to year 2010. In 2012 the number (96.5%) almost equalled that for students from urban areas (Fig. 3). Similar results were obtained by the computer manufacturers (Sprzęt IT wykorzystywany przez studentów w Polsce, 2009)

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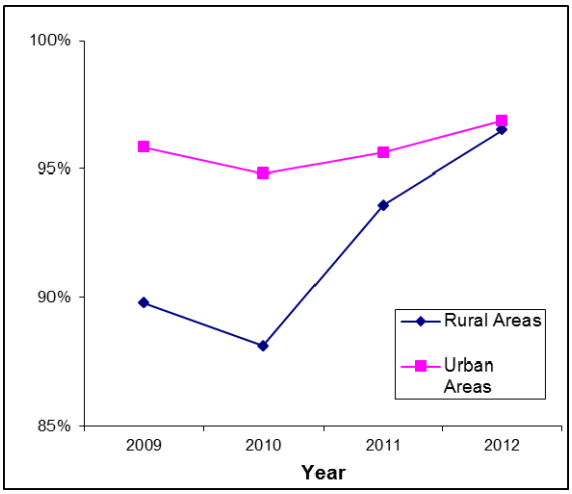

Fig. 3: Internet access in relation to place of residence

Table 5 shows p-values in one-sided test for equality of fractions of having internet access students in subsequent years. The fraction of students from urban areas with internet access is significantly higher than the ones from rural areas only in years 2009 and 2010. However the strength of the relationship is rather weak. The φ-coefficient is approximately 0.11. In 2011 and 2012 the relationship between the place of residence and internet access is statistically not significant.

Table 5: P-values for detailed comparisons for students with internet access students in subsequent years

	P-Value	
Year	Rural Areas	Urban Areas
2009-2010	0.6927	0.6496
2010-2011	0.0297	0.3838
2011-2012	0.0802	0.2841

Source: own calculations

A seperate investigation was done regarding internet access in relation to place of residence during studies (home, on-campus or off-campus residence). Due to low number of cases for on-campus and off-campus residence (much lower than students staying at home) the statistical analysis was done using Fisher's test instead of Chi-squared test. In neither year there was no statistically significant difference for interner access between different places of residence (Table 6)

Table 6: Internet access in relation to place of residence during studies

Place of residence during studies	Internet Access											
	2009			2010			2011			2012		
	No	Yes	Total	No	Yes	Total	No	Yes	Total	No	Yes	Total
On-Campus												
[number]	6	54	60	2	38	40	3	30	33	2	55	57
[%]	10	90	100	5	95	100	9,1	90,9	100	3,5	96,5	100
Off-Campus												
[number]	4	81	85	6	48	54	5	85	90	5	124	129
[%]	4,7	95,3	100	11,1	88,9	100	5,6	94,4	100	3,9	96,1	100
Home												
[number]	14	160	174	19	181	200	11	200	211	6	194	200
[%]	8	92	100	9,5	90,5	100	5,2	94,8	100	3	97	100
Total												
[number]	24	295	319	27	267	294	19	315	334	13	373	386
[%]	7,5	92,5	100	9,2	90,8	100	5,7	94,3	100	3,4	96,6	100
p-values		0,464			0,6156			0,6221			0,9274	

Source: own calculations

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Use of Internet

With regard to the frequency of use of internet, both group of students (with no statistical relation to the place of residence observed) most often looked for the information with respect to their educational programmes on internet, *few times a week* (Table 7). Similarly, both groups of students reported on performing the calculations with the use of a computer (again, no statistical relation to the place of residence observed). Interestingly, the majority of students (irrespective of the place of residence) used ICT every day to prepare for classes. In 2012, the last year of study, 73% and 76% of students from rural areas and from urban areas, respectively used computer and internet every day. That clearly proves that a computer becomes an unavoidable tool in the educational process.

Table 7: Use of ICT for studies (numbers in percentages)

Year	Searching Internet				Performing Calculations				Preparation to Classes			
	Every day	Few times a week	Once a week	Hardly Ever	Every day	Few times a week	Once a week	Hardly Ever	Every day	Few times a week	Once a week	Hardly Ever
Rural Areas												
2009	7.1	44.8	23.1	25	6.7	27.4	20.7	45.2	62.4	21.7	7.6	8.3
2010	12.7	47.8	20.4	19.1	10.5	34.2	22.8	32.5	61.3	25	6.3	7.4
2011	11.8	45.9	24.7	17.6	7.0	33.3	27.2	32.5	70.2	22.5	4.2	3.1
2012	12.5	54.7	20.3	12.5	9.8	31.1	25	34.1	72.6	21.9	2.3	3.2
Urban Areas												
2009	7.0	47.2	25.6	20.2	2.7	20.7	29.8	46.8	76.6	16.8	4.4	2.2
2010	6.9	55.2	23	14.9	9.7	27.8	22.2	40.3	68.7	24.5	2.9	3.9
2011	14.7	45.7	17.2	22.4	15.7	31.3	16.9	36.1	83.2	13.6	1.6	1.6
2012	13.2	51.5	14.7	20.6	13.5	31.3	16.7	38.5	76.0	20.7	1.3	2.0

Source: own results

Great majority of students confirmed that there was enough ready available material for their areas of studies on the internet; close to 92% of students assessed the amount of material as - *a lot* or *average*, 5.5 % as - *not a lot*, 0.4% as - *not at all* and 2.5% indicated *I do not know*. That information confirms a study done 10 years ago (Feiner, 2003) in which 83% of engineering students assessed the amount of internet material as large or average.

Apart from educational purposes, almost half of the students used ICT every day for entertainment (Table 8); irrespective of their residence.

Table 8: Use of ICT for entertainment (numbers in percentages)

Year	Every day	Few times a week	Once a week	Hardly Ever
Rural Areas				
2009	42.4	30.0	11.3	16.3
2010	37.5	36.0	9.9	16.6
2011	44.3	34.3	10.0	11.3
2012	44.3	38.2	9.5	8.1
Urban Areas				
2009	44.7	30.9	11.0	13.4
2010	44.3	29.3	11.5	14.9
2011	44.5	32.1	11.5	12.0
2012	45.3	37.6	6.2	10.9

Source: own results

Usefulness of computers in learning process

For the purpose of the analysis two optional answers of *not useful at all* and *only for entertainment* was combined into one option of *not useful*. From the results (Fig. 4) it can be seen that there was a steady increase in

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the number of *very useful* answers; between 2009 and 2012 that increase was significant as p-value in one-sided test comparing two fractions was ca 0.007.

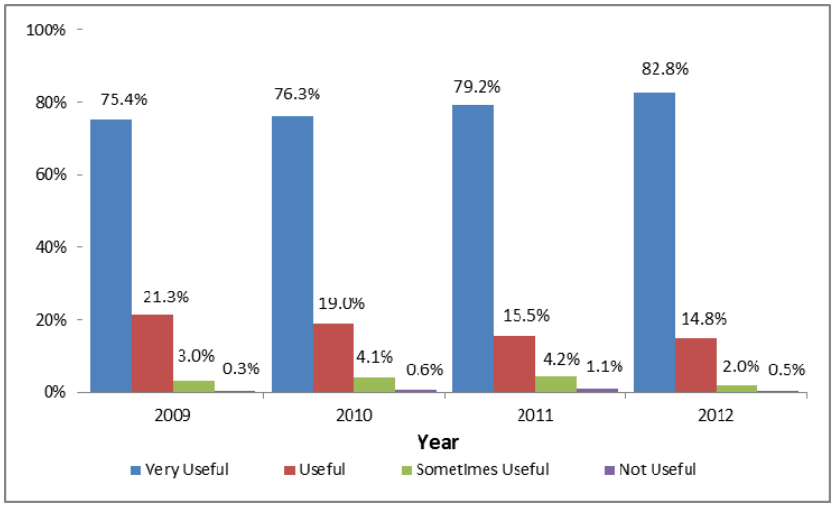

Fig. 4: Usefulness of computers in learning process

Use of information technology in teaching

Students' assessment of the use of ICT in teaching was done by specifying the percentage of lecturers who employ this technology in their classes (that aspect was investigated starting from 2010). The results are shown in Fig. 5, where each bar of the histogram indicates the frequency of answers, e.g. in 2010 44% of students assessed that less than 50% of lecturers used ICT in teaching. As indicated in the figure, there is no much change in the percentage of lecturers applying ICT in their teaching (as seen by the students). The results are indicating not much progress in applying technologies and also quite low level. For three years only around 55% of students indicated that more than half of the lecturers indeed utilized ICT in the teaching process.

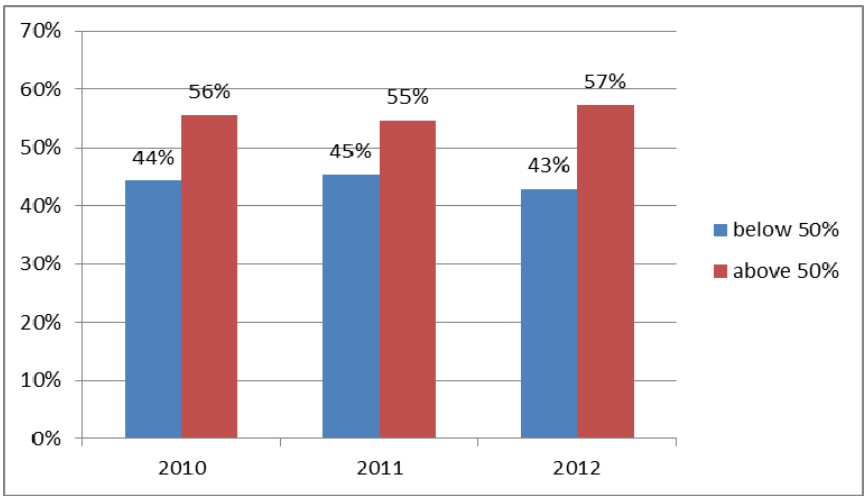

Fig.5: Students assessment of the percentage of lecturers using ICT in teaching

The survey questioned students on their perception of lecturers' appreciation of students' competence in information technology. The students were to indicate the percentage of lecturers who valued students' skills and knowledge in that area. The results are presented in Fig. 6 and show that, according the students lecturers do not much appreciate students' competence in information technology. Consistently over a period of 3 years more than 60% of students were of the opinion than less than half of the lecturers do not value students' ICT skills and knowledge. The weighted average of the percentage of lectures appreciating students' ICT skills was 43.3% in 2010, 41.2% in 2011, and 44.0% in 2012; these differences were not statistically significant.

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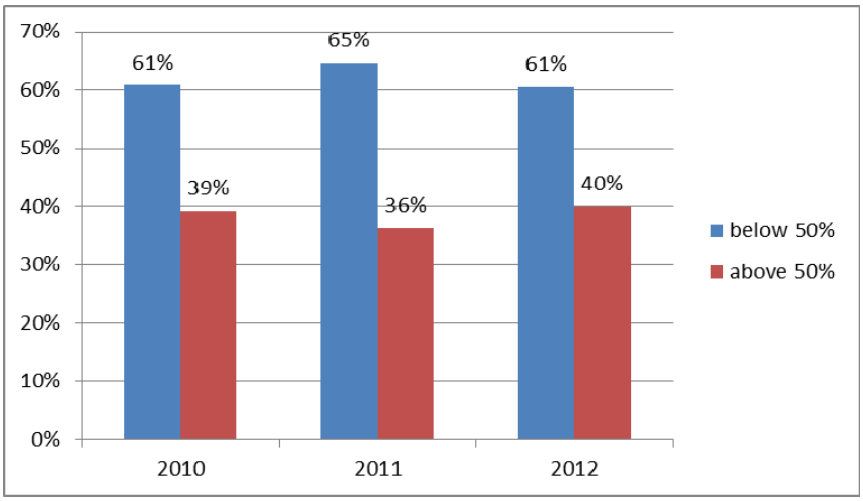

Fig. 6: Students assessment of the lecturers' appreciation of students' competence in information technology

Difficulties in use of ICT

The survey indicated that students were not always enthusiastic about using ICT. Students implied some possible obstacles and difficulties in use and access to internet and computers (Table 9).

Table 9: Difficulties and limitation in internet and computer use during self-study (numbers in percentages)

Year	I do not have access to a computer	I do not have access to internet	I am unable to use a computer in my studies	I do not know how to use a computer in my studies	I do not like to work on a computer	Using a computer is not safe for my health	Working on a computer tires me	Working on a computer isolates me from other people	Others
2010	1.6%	5.0%	2.2%	10.3%	11.3%	15.3%	20.3%	23.1%	0.3%
2011	1.1%	1.7%	0.6%	12.3%	9.2%	12.3%	12.6%	17.0%	1.7%
2012	1.7%	2.7%	1.2%	10.6%	7.2%	17.0%	19.8%	21.5%	1.5%

Source: own results

Since the students participating in the study were registered for engineering programmes it was surprising to find out that in 2012 survey1.7% of answers indicated *I do not know how to use a computer in my studies*, and 7.2% answered *I do not like to work on a computer*. Additionally, 19.8% of participants implied that working on a computer made them tired. The above can bring a serious concern whether those future graduates will be able to execute engineering tasks in their workplaces. On the other hand there are reports on students' internet addiction which may lead to personal, family, academic, financial, and occupational problems (Lis, 2010; Sahin, 2011)

DISCUSSION AND CONCLUSIONS

The results of the study on the use of the ICT for years 2009-2012 indicate changes taking place in the students' population. There was a considerable high level of computer ownership between students; that applies to both personal computers (own by students) and family computers (shared withing family). There was also increase in computer ownership and internet access, however those changes were mostly not statistically significant. In 2012 96% of students had either a personal or family computer, and 97% of students had internet access. Interestingly, there were no significant differences in computer and the internet access between students from rural and urban areas. Also, there was practically no difference in internet access in relation to students' residence during their studies (on-campus, off-campus, and at home).

Although not studies in detailed, the survey, especially in open ended questions, revealed that the application of ICT becomes broader; students search information on internet, use electronic banking, and especially benefit from electronic communication students used ICT in different applications including searching internet, performing calculations, listening to music, playing games but also for class preparation. The application of ICT by university administration (university portals for on-line registration, checking of the grades, class schedules etc) forces students to become more aware of the technology. In that respect, most of the students used the internet a *few times a week* to access information with respect to their educational programme.. The majority of students (irrespective of the place of residence) used ICT every day to prepare for classes. They judged thet there

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was enough ready available material for their areas of studies on the internet (92% assessed the material to be *a lot* or *average*). It is expected that in the next 2-3 years all the students will be using technologies. The above conclusion is supported also by other authors (Tutkun, 2011; Kirkup and Kirkwood, 2005).

Quite unexpected results were obtained in terms of the frequency of use of the computer for calculations. It was expected that since all students taking part in the survey were registered for engineering programmes they would spent more time computations. One of the possible reasons for students not actually using computers for calculations may be the lack of knowledge and expertise in both basic and, most likely, professional software. The above may indicates the need to provide more elements of computer applications studies in the curriculum, either as increasing such components in existing, specialized engineering courses or by introducing new courses solely dedicated to computing.

The current study assessed the frequency of students' use of internet but unfortunately did not estimate the time students spend using internet; that aspect will be considered in the next survey. However, it can be only presumed that as similarly to ca 60% of students in Poland the population of study spend 3 hrs. up to even 7 hrs. using internet.

Some of the responses received in the part of survey regarding the difficulty in using the ICT may indicate over use of internet and computers. That may explain considerably high number of answers indicating health (including tiredness) and social issues as limitations in the use of ICT. Such problem has been already noted by other authors (Lis, 2010; Nie & Erbring, 2002) and will be worth investigating in detail in the future. Especially that some other authors concluded that application of computer technology increases communication between internet users and can create social interaction (Ruso, 2012; Szponar 2005). As also reported it is a general trend leading to the formation of interest groups, also within a particular course or educational programme (Oliver, 2002; Patel at al., 2011).

In general, the overwhelming majority of students (average of 96% over a period of 4 years) considered computers to be either *useful* or *very useful* in the learning process. Unfortunately, the opinion of students in terms of number of lecturers using ICT in teaching was below expectations. In three consecutive years (2010-2012), only approximately 55% of students assessed that more than 50% of lecturers indeed use ICT in teaching. It is a worrying finding and it is worth investigating much deeper. There may be several factors contributing to majority of lecturers not applying ICT. Some of the obvious reasons may be lack of knowledge and skills and also the fact that the universities are not trying to improve that aspect of lecturers' preparation for teaching. Neither of the two universities covered by the survey uses any dedicated eLearning software like, proprietary Blackboard (Blackboard, 2013), or, open access, like Moodle (Moodle, 2013). It would be highly recommended that such learning/teaching platforms are used in the pedagogical process. They were proved to be effective in course deliverey and also well accepted by students (Uziak, 2009). Some incentives for lecturers actually using, starting to use or attempting to use ICT in teaching should also be recommended. Additotional resources should be provided for technical support to lecturers.

The current study assesses only the use of computers and internet. However, there is only very limited insight to the actual purpose of internet usage and related practices and habits. Such studies are planned to be conducted in the future. Another aspect which requires further investigations is the application of ICT in the learning process, mainly related to preferences of the students in terms of ICT-based learning material. Also, future investigations should study the implications of increased access to computers and internet.

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