PERCEIVED COMPUTER LITERACY AMONG DIFFERENT TYPES OF (UNDER)GRADUATE STUDENTS: FINDINGS OF A SURVEY.

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Abstract

To date, students in higher education become more and more responsible for the management of their own information processes. After their graduation, the job market also expects them to function as mobile knowledge-workers. Despite the need for increased ICT-related skills and knowledge, studies have shown that (under)graduate students' essential computing competences are often overestimated. In order to improve ICT- related education, a project was started at the Association of the Katholieke Universiteit Leuven (Belgium) to develop an information compendium, called the 'Information Companion'. As a part of this project, we examine in this paper the level of perceived computer literacy and the disparities in the perceptions of different cohorts of (under)graduate students of the Association. Perceived computer literacy was measured as a multi-dimensional second-order factor, consisting of 5 primary factors ("security", "information retrieval", "legal issues", "internet risk awareness", and "multimedia storage "). Also, a number of antecedents were measured (including gender, computer experience, type of education, and branch of study). Using a sample of 7896 students we found a significant gender, branch and computer experience effect. In line with the literature, female students have a significant lower computer literacy score than male students. Computer experience has a major positive impact on all our literacy factors as well. The data indicates further that students of the exact sciences have a significantly higher score than students of other branches. Particularly medical students have a lower score on perceived computer literacy.

Keywords - computer literacy - computer knowledge – higher computer education – survey

1 INTRODUCTION

The needs of a student of the millennium generation in a rapidly changing information society confront our educational system with new challenges. During the learning process, students become more and more responsible for the management of their own information processes. After their graduation, the job market expects them to function as mobile knowledge-workers. It is therefore vital that students acquire the right attitudes and skills in order to survive in this information society and to deal with the ceaseless information flood and to manage the information that was gathered.

When conceiving the computing and information management aspect of graduate and university degree programs however, educators should bear in mind the increasing use of ICT by students, both in curricular and extra-curricular activities. Whereas the increased students' ICT usage (and as can be expected an increased computer literacy) can be utilized to submit students to innovative educational projects (involving for instance e-learning or blended learning), valuable and scarce educational resources should be allocated in an efficient and targeted way, avoiding that computer literate students are confronted with skills and knowledge they already possess ([1]). On the other hand, students must be made aware of the digital footsteps their private, academic and professional activities leave. They must be endowed with skills and knowledge to control this digital trace and to manage the information overload they are likely to be confronted with.

Offering students the right level of computer competences and designing appropriate computer-related courses, requires more insight into the actual degree of computer literacy or knowledge of (under)graduate students. Within the literature, computer literacy has been defined in multiple ways, using synonyms such as computer competences, computer knowledge, computer experience,

information literacy and information (or computer) fluency (see for example [1],[4],[18],[19],). Although "computer literacy" sometimes connotes only the ability to use several specific applications (such as word processing, database knowledge or the use of a spreadsheet), the term is frequently used in a broader perspective, including competences to use ICT to satisfy personal needs or to maximize performance of specific (job-related) tasks ([4],[18]).

In this paper we use a broad definition that is in line with most of the concepts that have been used in the literature. In our perspective, computer literacy is to be seen as a collection of skills pertaining to the use of basic information and communication technology in an internet-oriented environment, as well as the knowledge that relates to the legal and ethical issues and risks of ICT usage. In the following the terms “computer literacy” and “computer knowledge” will be used interchangeably.

Within the related educational literature, computer literacy has been measured and assessed using both students’ self-assessments and more objective tests (for instance [1],[4],[12],[21]). Most investigations show that students’ essential computing competences - including issues such as application knowledge, operating systems skills, and web skills - are frequently overestimated, not in the least by computer experienced study.

In order to target and improve the required computer competences of (under)graduate students, the Association of the Katholieke Universiteit Leuven, Belgium (K.U.Leuven and its various associated institutes for higher education), started an educational innovation project in 2007. In the light of this endeavor, a survey was administered to all students of the association, measuring their perceived computer skills and competences. The survey was administered in 2008 and resulted in 7896 responses. The results and its implications will be analyses and discussed in the rest of this paper. We start with a concise presentation of the educational project in the next section.

2 THE INFORMATION COMPANION PROJECT

In order to improve ICT- related education and create more awareness towards computing possibilities and risks, an innovative project was started at the Association of the Catholic University of Leuven encompassing a multi-disciplinary effort to develop tools for the students to acquire the essential skills to improve their personal information management.

This implies not only a wide range of practical competences, but also more conceptual skills, and more importantly, a consistent attitude, which is necessary in their educational careers and later in their professional life. The strategic goal of the project is to make the students more aware of the need for adequate information skills, and learn that it is their own responsibility to upscale their competences where and when required. In order to achieve this goal, we have developed a web portal, www.informatiewijzer.be, also referred to as 'the Information Companion'. The web portal (written in Dutch at the moment of this writing), is constructed around three methods: an online manual that gives an overview of all required knowledge, a blog where the project members post news items that grasp the student's attention and a self test that enables the students to check their information management skills. The purpose of this website is to give the students a handy tool that will enable them to deal with the numerous aspects of their personal information management.

The project group consists of more than 25 members, representing different divisions, faculties or participating educational institutions. They are either ICT lecturers, educational coordinators or directors of various (under)graduate programmes. The information companion is perceived as a work-in-progress project that will be extended and appropriated in the future. The objective is not only to inform students about this companion, but also to encourage educators and lecturers to integrate (parts of) the content of the web portal in their ICT-related courses.

In order to be able to develop and further enhance the information companion, it was useful to collect different experiences from lecturers and administer a survey that can shed a light on how students ascertain their own competences. Therefore, a survey was developed to measure the perceived computer literacy of different cohorts of students of the association.

3 RESEARCH DESIGN: MEASURING COMPUTER LITERACY & ITS ANTECEDENTS

Perceived computer literacy (and its related constructs) has been appraised in various ways. Whereas computer competences were measured as being able to master a limited number of applications and

programming languages in the 1980's and 1990's, the focus has shifted to measuring the ability to handle a range of various web-related applications as well as more general competences with respect to the management of information ([4],[21]). Bunz et al. for instance include general operating system skills (tasks related to saving, storing and retrieving files), and email and web skills (activities related to the use of email and internet applications), asking respondents how much thought the listed activities would require [4]. In the enquiry of van Braak, word processing skills were measured, next to operating system and web skills [21]. Ballantine and McCourt (et al.) measured computer literacy using several sub-dimensions such as 'knowledge of general computing', spreadsheets, word processing, databases, email/internet and presentation software, both as perceptions and in an objective way([1],[12]). In a survey of Hakkarainen a broader concept is measured, including attitudes towards ICT, networking and the collaborative use of ICT, next to typical 'technical ICT skills' (including skills in text processing, programming, authoring tools and file management) [9].

In this paper, we developed a survey that is based on typical experiences of the members of the project group, and that is in line with the objectives and the contents of the developed 'Information Companion'. As such, the questionnaire did not focus in particular on the ability of students to interact with a number of well-known types of ICT applications (such as word processing, databases or presentation software). Instead, questions were more related to the student's awareness of the possible consequences, risks and legal issues of using the internet as well as (electronic) information in general. Next to this, questions that are related to the storage and retrieval of information were added. In order to facilitate the interpretation of the results, we grouped the questions into 5 primary factors: "security", "legal issues", "internet risk awareness", "information retrieval" and "multimedia information storage". Each factor was measured using multiple formative items (varying between 2 and 4 items per factor).

- *Security*: evaluation of a student's awareness of firewalls, virus scans and the risks of using a laptop as the main storage device
- *Legal Issues*: measuring a student's knowledge concerning the implications of copy rights, author rights, public property and creative commons.
- *Internet Risk Awareness*: evaluation of a student's awareness of the internet trail s/he might leave on the web.
- *Information Retrieval*: measuring skills related to the retrieval and recovery of historical data.
- *Multimedia Information Storage*: questions related to the storage and usage of data on CD's and DVD's.

We also calculated one secondary-order factor, using all 15 items. In the appendix, the survey items are listed. (Note that the original items were presented in Dutch.)

In the related literature, a number of determinants of students' computer literacy or competences have been identified and investigated, including computer experience and access to personal computers (both at home and at school), computer anxiety and age (see for example [4],[11],[21]). The studies report different and sometimes contrary findings. Van Braak (2004), studying perceived computer literacy among 137 freshman students, found that computer confidence, computer experience, intensity of computer use and home access are four significant determinants [21]. Link et al. reported that in their sample of first year medical students, age, computer use and previous exposure to computers are significant determinants [11]. In Bunz et al. computer anxiety was tested as a determinant, but it did not have a significant impact on their fluency measures [4].

Another determinant that received a considerable amount of attention in ICT-related literature is gender. In general, there seems to be no consensus on the gender-effect on (educational) IT usage and attitudes [4],[13]. While some studies report existing gender differences regarding measures such as computer self-efficacy, computer experience or computer-related attitudes, others report a declining gender gap [7],[16]. In Bunz et al. [4] gender had a significant impact on perceived computer-email-web fluency, but not on an actual computer fluency test.

In our investigation, we also added gender as a possible significant determinant of perceived computer literacy. Because of the potential effect of computer experience, we asked respondents to indicate their level of computer usage and the extent of their interactions with the internet. In particular, we asked them whether they use computers frequently, to what degree they post messages on the

internet, to what extent they are an active member of social networks (like Facebook, LinkedIn, etc) and to what degree they deploy several online identities (see the Appendix).

In the literature, survey results often concern a limited number of respondents within a specific educational setting, targeting a homogenous cohort of students (for instance medical or business students of freshmen applicants). Because of the scope of our survey, aimed at various types of students in multiple faculties and educational programmes, we were able to investigate the impact of the study subject and the type of education (professional bachelor, academic bachelor or master) on computer literacy.

A professional bachelor is a three-year programme, not leading to an academic master. Contrary to an academic bachelor, it is known to be focused on more specialized and professional skills. Next to bachelors and masters, we used the category 'others' to represent students that are enrolled in various additional masters or specialization programmes. Some of those students already possess job experience.

Due to the vast number of study subjects, and corresponding to the classification used in the Association, we grouped them into 3 main study branches: exact sciences, medical sciences, and humanities. The branch humanities comprises several faculties and programmes, such as business economics, psychology, philosophy, linguistics and law. The branch exact sciences includes subjects related to engineering, mathematics and IT.

The survey was administered online in June 2008. It was targeted towards enrolled students of every institution (and every grade) of the Association K.U.Leuven. No less than 7896 students completed the survey. In the following section we will first give a more detailed overview of the sample (section 4.1.). Next, we present the descriptive statistics of the degree of computer literacy in (section 4.2.). Finally, in section 4.3. we investigate and analyse the impact of gender, computer experience, educational type and study branch on perceived computer literacy.

4 DATA ANALYSES AND RESULTS

4.1. Sample Composition

In Table 1 the sample size is presented according to gender, type of education and study branch. Globally, 54,4 % of the sample are female respondents. 55,7 % stem from the humanities (being the biggest study branch in the Association), and 44,6% are studying an academic bachelor's degree. The distribution of Table 1 reflects the structure of the Leuven Association. The huge sample size guarantees a reliable analysis, and enables testing differences between different types of students.

	All		**Female**		**Male**	
Antecedents	**No.**	**%**	**No.**	**%**	**No.**	**%**
Type of Education						
Professional Bachelor	2573	33,6%	1514	19,2%	1059	13,4%
Academic Bachelor	3521	44,6%	1829	23,2%	1692	21,4%
Master	1492	18,9%	771	9,8%	721	9,1%
Other	308	3,9%	183	2,3%	125	1,6%
Total	**7894**	**100%**	4297	54,4%	3597	45,6%
Study Branch						
Medical Sciences	1602	20,3%	1068	13,5%	534	6,8%
Exact Sciences	1888	23,9%	385	0,5%	1503	19,1%
Humanities	4396	55,7%	2837	36,0%	1559	19,8%
Total	**7886**	**100%**	4290	54.4%	3596	45,6%

Table 1: Sample Composition

In Table 2, the degree of computer experience is presented. It was measured as a general construct, formed by 4 items measuring internet experience, and computer usage. Internet experience contains items asking students to what degree they post items on the internet frequently, to what degree they are engaged in 'social computing' (using Facebook, LinkedIn, etc.) and whether they have multiple online identities. Computer usage rates to what extent a student uses his/her computer.

Scale: 1 (very low) to 6 (very intensive)	*Internet Experience*	*Computer Usage*	*Computer Experience*
Total Sample	3,33	3,19	3,30
Female Students	3,13[1]	3,05[1]	3,11[1]
Male Students	3.57[1]	3.36[1]	3.52[1]
Professional Bachelor	3,33	3,23	3,30
Academic Bachelor	3,32	3,02	3,25
Master	3,37	3,45	3,39
Medical Sciences	3,14[2]	2,72[2]	3,03[2]
Exact Sciences	3,47[2]	3,48[2]	3,47[2]
Humanities	3,34[2]	3,24[2]	3,32[2]

1: significant gender differences for all three usage variables (using Anova)
2: significant differences between 3 study branches (using Anova and Bonferonni post hoc tests)

Table 2: Degree of Computer and Internet Experience

4.2. Descriptive Statistics of Computer Literacy

In Table 3 the means of the different scales of computer literacy are displayed. In Figure 1 the distribution of computer literacy is shown. In general, we observe that students are positive about their knowledge, yet the scores indicate no extreme self-appraisal. The means vary between 3,45 and 4,07 on a 6-point scale. On 4 of the 5 subscales, more than 40% of the respondents assess their literacy as being at least "rather good" (> 4). In particular, students seem to lack legal knowledge; while their "information retrieval' skills receive the highest mean rate (4,6).

Scale: 1 to 6 ; N=7896	*Mean*	*S.D.*	*No. >4*	*No. <3*
General Computer Literacy (2nd order factor)	3,94	0,60	3300 (42%)	333 (4%)
Internet Risk Awareness	4,01	0,82	3372 (43%)	618 (8%)
Security	4,07	0,94	3692 (47%)	728 (9%)
Multimedia Storage	3,95	1,05	3565 (45%)	1131 (14%)
Information Retrieval	4,60	0,90	5356 (68%)	244 (3%)
Legal Knowledge	3,45	0,79	1432 (18%)	1860 (24%)

Table 3: Degree of Computer Literacy

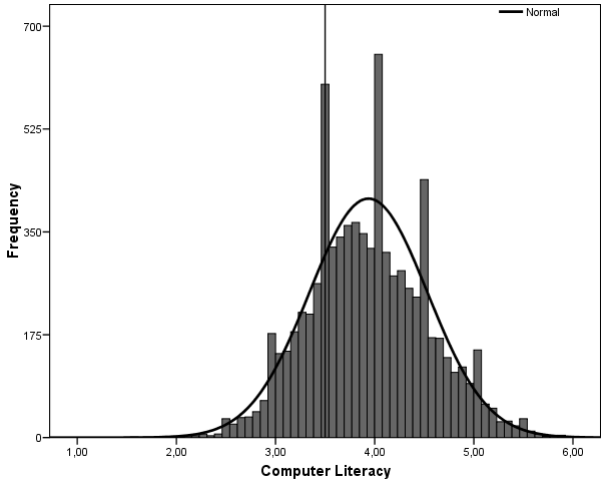

Figure 1: Distribution of Computer Literacy

4.3. Antecedents of Computer Literacy

A one-way Anova between-groups analysis of variance was conducted to explore the impact of gender, study branch and type of education (academic bachelor, professional bachelor, master and 'others') on computer literacy (seen as one second-order factor, but also considering the 5 primary factors). In a final subsection (D), the relative importance of these factors will be analysed with multiple regression.

A. Gender Differences

In Table 4, we compare the mean scores of computer literacy and its subscales by gender. The results show a clear pattern in both the global scale and the subscales: male students report a significant higher degree of perceived computer literacy. The differences are the biggest in the more technically-oriented subscales "multimedia storage" and "security". The difference is the slightest (but still significant) in "information retrieval".

However, we should stress that these gender differences reflect self-assessments. As has been shown in the literature [4], and confirmed by the ICT lecturers participating in the information companion project, gender differences might decline when talking an actual computer literacy test, or when looking at exam results. Moreover, as is explained in section E, we also found an interaction effect, showing that the gender differences on the subscales internet risk awareness and legal knowledge, diminishes between students with higher computer experience.

	Mean Male	***Mean Female***	***Mean Differences (Male - Female)***	***Sig.***
General Computer Literacy	4,22	3,70	0,52	,000
Legal Knowledge	3,67	3,26	0,41	,000
Security	4,35	3,83	0,52	,000
Internet Risk Awareness	4,23	3,83	0,40	,000
Information Retrieval	4,74	4,48	0,26	,000
Multimedia Storage	4,47	3,51	0,96	,000

Table 4: Results of Anova Analysis applied to Gender

B. Differences in Study Branch

The Anova test applied to detect significant differences between the four study branches, depicts a strongly significant 'between groups' difference. In Table 5, we present post-hoc comparisons using the Bonferonni test. The results clearly point to the following patterns:

- Students in Exact Sciences have a considerably higher score on perceived computer literacy, in each subscale, particularly when compared to medical students and students of the humanities. The differences are most prevalent in the factors 'multimedia storage' and 'security'. The difference is the least in the factor 'information retrieval'. Though the sample has a greater ratio of boys versus girls for Exact Sciences, the branch difference is not attributable to this: it is present irrespective of gender (see also Table 8).
- In all factors but one, 'information retrieval', students from the humanities score significantly better than medical students.

The fact that students from the exact sciences exhibit a higher degree of computer literacy is not astonishing. We can assume that these students are more 'technically (and ICT)-oriented' than other students. This also accounts for the big differences in 'multimedia storage' and 'security', two more technical scales that relate to firewalls, virus scans and CD or DVD storage.

Remarkable are the clearly lower scores of medical students. Although a lot of research effort has been devoted to ICT competences of medical students, underlining the importance of ICT in medical sciences ([6],[11], [17]), our results reveal significant lower scores compared to other other students' cohorts. Again, as with gender, this finding should be interpreted cautiously, as we are dealing with students' perceptions. Medical students might either have less computer knowledge or they may be

more realistic (or even pessimistic) about their level of computer competences. To date, we have no indicators pointing to either explanation.

	Study Branch (i)	*Study Branch (j)*	*Mean Differences (i-j)*	*Sig.*
General Computer Literacy	Exact Sciences	Medical Sciences	0,46	,000
		Humanities	0,34	,000
	Humanities	Medical Sciences	0,13	,000
Internet Risk Awareness	Exact Sciences	Medical Sciences	0,36	,000
		Humanities	0,18	,000
	Humanities	Medical Sciences	0,17	,000
Security	Exact Sciences	Medical Sciences	0,47	,000
		Humanities	0,39	,000
	Humanities	Medical Sciences	0,09	,004
Multimedia Storage	Exact Sciences	Medical Sciences	0,75	,000
		Humanities	0,65	,000
	Humanities	Medical Sciences	0,10	,007
Information Retrieval	Exact Sciences	Medical Sciences	0,26	,000
		Humanities	0,23	,000
Legal Knowledge	Exact Sciences	Medical Sciences	0,41	,000
		Humanities	0,23	,000
	Humanities	Medical Sciences	0,18	,000

Table 5: Bonferroni test results applied to 'Study Branch'

C. Differences in Educational Type

An Anova test, including general computer literacy and the five constituting factors, reveals that no significant differences exist between the educational types that we considered: professional bachelors, academic bachelors, masters and 'others'.

One exception was the factor 'internet risk awareness', evaluating a student's alertness to the internet trail s/he might leave on the web. Table 6 shows the results of a Bonferroni test and depicts that master students and particularly 'other student' have a significantly higher score than bachelor students. This finding is not surprising as these students are expected to be more experienced and mature, and some of them may already have job experiences. We therefore presume that this group of students is more concerned with their (future) jobs or careers and the possible risks of 'leaving a trail' on the internet.

	Eduational Type (i)	*Educational Type (j)*	*Mean Differences (i-j)*	*Sig.*
Internet Risk Awareness	Master	Prof. Bachelor	0,16	,000
		Acad. Bachelor	0,12	,000
	Others	Prof. Bachelor	0,33	,000
		Acad. Bachelor	0,28	,001

Table 6: Bonferroni test results applied to 'Educational Type'

D. The Impact of Computer Experience

The literature on computer literacy (and related topics) has put forward computer experience (or usage) as an important antecedent of computer competences (see section 3).

In our investigation, computer experience is a continuous variable (measured with 4 items). We applied a Kendall's tau correlation coefficient analysis between usage and the computer literacy factors. We prefer Kendall's tau correlation coefficients over Pearson and Spearman correlations because they are more 'conservative' and they posses more desirable properties [1].

Using one second-order 'experience' factor and two subscales or primary factors, our findings confirm the importance of experience on literacy. In Table 7 it is shown that all correlation coefficients are positive and significant. Applying the more frequently used Pearson correlation analysis confirms this finding (and results in even higher coefficients). Therefore, we assert that the more a student interacts with the internet - using several identities, posting items on the internet, or using social internet networks (such as Facebook) -, the higher his/her degree of perceived computer literacy will be. Since experience is primarily related to interactions with the internet, it is plausible to find that it is most correlated with 'internet risk awareness'. 'Information retrieval' – related to finding and recovering files on a computer – is the least associated with computer experience.

	Computer Literacy	***Legal Knowledge***	***Security***	***Internet Risk Awareness***	***Information Retrieval***	***Multimedia Storage***
internet_exp.	0,253**	0,146**	0,132**	0,293**	0,089**	0,197**
computer_usage	0,191**	0,120**	0,114**	0,150**	0,072**	0,183**
computer exp.	0,279**	0,164**	0,148**	0,300**	0,099**	0,227**

** Correlation is significant at the 0.01 level (2-tailed)

Table 7: Kendall's tau non-parametric Correlations Coefficients

E. Relative Importance of Gender, Computer Experience, Educational Type and Study Branch

In the previous subsections we explored the impact of several antecedents on computer literacy. Our data clearly suggests that particularly gender, computer experience, and to a lesser extent, study branch have a significant effect on all of the subscales of computer literacy.

However, in section 4.1, Table 2, we revealed significant gender and study branch effects on computer experience as well. I.e. male students have a higher degree of computer experience than their female colleagues and students from the exact sciences have the highest level of experience, followed by students of the humanities. Medical students clearly have the lowest computer experience level.

Matching these findings with the results of section 4.3. may point to a mediation effect of computer experience. More specifically, the literacy impact of gender and study branch might be due to the fact that male students and students from the exact sciences are more intensive computer users, which would explain their higher level of computer literacy. If a full mediation effect is the case, no direct effects of gender and study branch on computer literacy will exist, when computer experience is taken into account (see Baron et al. for mediation effects).

In order to test for such a mediation effect, we applied multiple linear regression, using gender, computer experience, study branch and type of education as predictors of the computer literacy measures. Because of the categorical nature of the study branch and educational type data, we created several dummies. Finally, due to possible correlations between dependent variables, we added Variation of Inflation (VIF) indicators to diagnose the presence of multicollinearity In Table 8, the results are presented.

The VIF indicators, varying between 1.01 and 1.20, are far below the recommended cutoff value (5) ([14]), thus excluding the possibility of distorted effects.

A first conclusion is that a direct gender effect exists. This effect is globally as strong as the computer experience effect (both Beta coefficients equal 0,33 on the general literacy factor). When taking these two effects into account, the direct impact of study branch is rather limited (with Beta's varying between 0,04 and 0,11), even though it remains clear that students from the exact sciences have a significantly higher score on computer literacy (as compared to the other branches). The limited effect of educational type on internet risk awareness (see Table 6) is confirmed in Table 8.

	Computer Literacy	*Legal Knowledge*	*Security*	*Internet Risk Awareness*	*Information Retrieval*	*Multimedia Storage*
R-Square	31 %	11%	11%	20%	4%	27%
Gender : - Male (Basis:Female)	0,33***	0,20***	0,21***	0,16***	0,10***	0,36***
Computer Experience	0,33***	0,20***	0,16***	0,37***	0,10***	0,23***
Study Branch:						
- **Exact Sciences**	0,10***	0,04**	0,09***	n.s.	0,06***	0,11***
- **Medical Sciences**	-0,04***	-0,06***	n.s.	-0,04**	n.s.	n.s.
Reference: Humanities						
Educational Type:						
- **Master**	n.s.	n.s.	n.s.	0,04	n.s.	n.s.
- **Others**	n.s.	n.s.	n.s.	0,04	n.s.	n.s.
Reference: prof. & ac. Bach.						

n.s.: "not significant" ; ** p <=0,01 ; *** p <= 0,001

Table 8: Regression Analyses: Beta Coefficients

F. Interaction Effects between Gender, Computer Experience, Educational Type and Study Branch

We examined all combinations of 2-way interaction terms between gender, educational type, study branch and computer experience to detect moderation effects on computer literacy and its subscales. In particular, we used two-way Anova (for the categorical variables) and regression. In total, 2 significant interaction effects could be identified.

- There is a significant interaction effect between gender and study branch on the subscales 'legal knowledge' and on 'internet risk awareness' (not on computer literacy as a global scale). The main conclusion is that for both subscales, the differences between the humanities and exact sciences diminishes within the group of female students. Within the group of male students, there is even no longer a significant difference between the humanities and exact sciences. (The medical students still have significant lower scores within the gender groups).
- There is a significant interaction effect between gender and computer experience on computer literacy (global scale) and legal knowledge. In fact, gender differences on these 2 scales significantly decrease with female students that have more computer experience.

5 CONCLUSIONS

Although students in higher education are increasingly required to work with electronic information and informational processes, studies have shown that (under)graduate students' essential computing skills and knowledge are frequently overestimated. In order to improve ICT- related education and create more awareness towards computing capabilities and risks, a project was started at the Association of the Katholieke Universiteit of Leuven (Belgium) to develop an information compendium, called the 'Information Companion'. The companion is comprised of a manual, a self-test and a blog, explaining and testing several ICT –related competences that are often not taught explicitly in a higher educational curriculum.

As a part of this project, we explored in this paper the level of perceived computer literacy and the disparities in the perceptions of different cohorts of (under)graduate students of the Association. Perceived computer literacy was measured as a multi-dimensional second-order factor, consisting of 5 primary factors ("security", "information retrieval", "legal issues", "internet risk awareness", and "multimedia storage ").

A strong feature of our research was the large sample size composed of different cohorts which allowed us to make reliable measurements. In the literature we often find more limited samples directed towards one particular study programme or faculty, with sometimes a focus on application-based knowledge. We did not, however, involve application-based skills in our inquiry on computer literacy, focussing instead on risk management, security, internet risk awareness and information management.

When we looked into the 5 primary factors that we used to determine Computer Literacy, the following conclusions emerged:

Gender difference: male correspondents have significantly higher perceived computer literacy. We have argued that this seems more related to technical prowess than to more functional perceived differences in general information management. In particular, gender differences are the highest when considering technical topics such as multimedia storage and security. The more ICT is ripped off from technical issues, the more these gender differences can be expected to diminish. Next, interaction analyses indicate that gender differences decline with an increase in computer experience. Finally, we note that, as we focused on students' self-reports, the revealed gender differences might reflect differences in gender self-awareness, rather than differences in actual competences.

Differences in Study Branch: unsurprisingly, students of exact sciences have a higher perceived computer literacy. This relationship can be interpreted in two ways. On the one hand, it is plausible that students of exact sciences are more confronted with technical and ICT topics; on the other hand, it is also possible that technically-oriented students more likely choose an exact sciences' programme, thus reversing the relationship. Another, more remarkable finding is that humanities students generally perform better than those of medical sciences. Both findings deserve special attention in follow-on studies.

Differences in Educational Type: the differentiating results for bachelor and master students confirm the initial expectations that led to the project funding. It clearly shows that there is room in higher education to work on internet risk awareness, in particular at the bachelor's level. For the K.U.Leuven association, our recommendations will be that basic skills of information management belong to a students' essential competences. We will provide them with self-evaluation and remediation tools; learning how to take responsibility for information however is something that needs actively be addressed in the study curricula of bachelor degrees. Working on a virtual personal and professional identity and web-presence is something that can be supported in more advanced studies.

Impact of Computer Experience: the more a student interacts with the internet - using several identities, posting items on the internet, or using social internet networks (such as Facebook) -, the higher the degree of perceived computer literacy will be, but, strange and counter-intuitive as it may seem, this does not relate to (file-oriented) information retrieval skills. This means that a presupposition of University Curriculum designers, that basic computer skills education isn't needed now that everyone used the internet, is not valid. Our recommendation would be to keep it the responsibility of the learner to address this, but to provide self-assessment and remediation tools.

Relative importance of factors: comparing the strength of the 3 effects simultaneously, it is clear that the gender effects are equally strong as the impact of computer (and internet) experience. The effect of study branch is less but remains significant.

In future research, these effects will be further scrutinized using extended and finer-grained computer literacy measures and also adding objective indicators to the research design. Likewise, the success and consequences of the information companion will be evaluated , in order to improve its scope, contents and usability over time.

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Appendix

The items below are translated from Dutch.
Some items were reverse coded.
Likert Scale:

1. Totally Disagree
2. Disagree
3. Rather disagree
4. Rather agree
5. Agree
6. Totally Agree

Computer Experience

- I spend most of the day behind my computer. *(computer usage)*
- I post frequently items on the internet. *(internet usage)*
- I have several online identities. *(internet usage)*
- I am an active member of a social network (e.g. Facebook, MySpace, Last.fm, LinkedIn, Twitter, etc.). *(internet usage)*

Computer Literacy Items

Legal Knowledge

- I know what Creative Commons is.
- If I post something on YouTube, I lose my author rights.
- If I post something on the internet, it becomes public property.
- I know how to deal rightly with documents that have a copy right sign.

Security

- I am familiar with a virus scan.
- I am familiar with firewalls.
- If my laptop is stolen (or my desktop), I lose important files.

Internet Risk Awareness

- My surf behavior on the internet can be traced.
- If my (potential) employer 'googles' me, he can find me.
- I use an anonymous alias to post items on the internet.

Information Retrieval

- It is easy for me to find a work item (file) on my computer that I created years ago.
- If a file is deleted on my PC, it is possible to recover the contents.

Multimedia Storage

- I know what a coded is
- I know the difference between CD-R en CD-RW
- I can clearly hear the difference between mp3 and CD quality