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EXECUTIVE SUMMARY

Why the SEUSISS project?

The ability to use information and communications technologies (ICT) fluently and with confidence is an essential skillset in a rapidly-changing world. ICT skills are vital for employment, for education, and increasingly for everyday life. Consequently, there is continuing concern among employers, governments and universities about graduate ICT skills, because graduates are the leaders of change and innovation in many walks of life.

It is not only practical skills, such as word-processing and email, that are important. Attitudes towards ICT and confidence in its use are just as important and perhaps more so, for learning-to-learn and transferability of skills are now seen as vital in enabling graduates to move beyond their current level without prolonged training, and to take up new opportunities without needing direction.

Mobility and virtual mobility are also firmly on the European agenda, raising questions about whether students are able to cope with study conditions in more than one country, and whether graduates are equipped to take up international employment. These require answers about the comparability of ICT skills and standards, addressed in part by schemes such as the European Computer Driving Licence (ECDL).

The SEUSISS Project, based in part upon 10 years of data collection in the University of Edinburgh, was a partnership between seven European universities, all of them traditional and research-oriented. We did not attempt to collect data typical of all higher education institutions in each country, but worked together as a group of similar universities (Åbo, Finland; Bergen, Norway; Edinburgh, UK; Groningen, Netherlands; Pavia, Italy; Poitiers, France; & Salamanca, Spain; all of which are members of the Coimbra Group, which was itself a partner) to make the task of comparison more manageable. Now that we have reliable instruments, we can extend their use to different types of universities. The context within which student ICT skills and attitudes develop are outlined in the diagram on page 7.

How did we collect our data?

Our questionnaires were mostly paper-based, with a small number on-line. We collected the views of 9221 newly-arrived students and 3495 established students approaching graduation, asking them about ICT skills, ownership of PCs, where and how much they used ICT for their studies, and their confidence and attitudes towards ICT in their careers and studies.

To help us interpret these data, we also collected information about the context in which these students studied: that is, the views of their universities about graduate ICT skills, which we obtained from samples of senior staff (i.e. policy/strategy), teaching staff and support staff (i.e. tactics).

Finally, to discover how well student ICT skills and attitudes matched employers’ needs and wishes, we questioned a sample of employers in each country, and researched statements about ICT skills by employer and professional organisations.

We worked in the language of each university and country, without assuming that respondents were proficient in English, so that the surveys would be of value beyond the current study. Our surveys in seven languages are available on-line.

What did we discover?

Students

We found some clear similarities between students at all the universities. They were mostly young adults studying full time, with more females than males, data typical of these universities. Ownership of PCs and ancillary equipment (including Internet access) was high among both new and established students, and they had good ICT skills, as measured by the number of ICT applications that they reported they could use unassisted (we did not attempt to assess their competences ourselves). Almost all students could handle word processors, web browsers, email and chat. New students had less experience than established students with presentation managers (e.g. PowerPoint) and bibliographic databases, suggesting that they do in fact acquire these skills during their courses.

The main sources of help and support for ICT skills development of both new and established students were friends and family, followed by self-tuition. Most students thought that there was rather little integration of ICT skills
development in their courses, irrespective of the number of ICT courses available or the extent to which integration was stated to be the university ICT skills strategy. (Although this is true for core ICT skills it will apply less in the acquisition of specialised skills such as CAD, programming languages, statistics applications.)

ICT was seen as important for their future careers by the great majority of students, those nearing graduation as well as those just leaving school. Near graduates were confident about their ability to cope with ICT in the workplace, and new students about their ability to cope with it in their studies. In fact, use of ICT in university courses was quite high for many students, with 26% reporting daily use and 47% 1-3 times weekly use on average. This was much higher than was reported by most new students to have been the case at school.

Owning a PC was strongly associated with self-assessed skills, confidence and frequency of use of ICT in studies, and the minority of students without PCs appeared to be significantly disadvantaged in these respects. Where on-campus provision of ICT was good, they compensated by using this equipment more, but where it was less adequate they were less frequent users and had to seek other PC sites such as cybercafes.

Overall, females tended to self-assess slightly less highly on ICT skills and usage than males, but not on its importance to their careers, ownership of PCs, or Internet access. They also appeared to be slightly less confident in their assessment of their own ICT skills. These may be manifestations of general male:female differences, as they are seen in other contexts.

Despite a general similarity between students at the seven universities, there were some variations. This was despite the fact that this group of universities are superficially similar, and would expect to be able to exchange students and staff relatively easily. Examples of variations were in average ICT skill level, extent of use of ICT in studies, and where they studied. A more detailed analysis of these variations is given in our full report. There was no evidence of a ‘north-south divide’; that is, there were no systematic differences between students in northern and southern universities in this study.

Universities
Despite the high level of student ICT use and confidence, not all of the universities had defined policies and strategies towards student ICT skills, and it appeared that much of the student ICT skillset was based on self-teaching or assistance from family and friends. This was not because ICT skills were thought unimportant, but not all universities had developed systematic ways to ensure that students acquired them. Some universities relied almost entirely on integration into courses without specific accreditation, whereas others had made more provision for training, two having introduced the European Computer Driving Licence as a graduate qualification.

Most of the academic staff we interviewed felt reasonably well skilled in use of ICT, although there were subject, age, confidence and gender variations. As ICT is now the dominant tool for research and administration this is not surprising. Few staff, however, felt that student ICT skills development was part of their role as academics.

As all these universities move to greater use of ICT for learning they will increasingly rely on students having the necessary abilities in this area.

Employers
Our sample of employers generally appeared to be satisfied with the ICT skills of their graduate recruits, most of them expecting little more than competence with standard office applications, except in specialist areas such as engineering where specific software skills were required (we did not attempt to assess the match between demand and supply in individual specialisms). There is a general balance between expectations and supply. Few employers expressed much enthusiasm for certification of ICT skills, although a small number used the ECDL or its equivalent in their own staff training.

Employers emphasised that they expected graduates to be confident and able to learn. In small organisations self-teaching was the norm, whereas larger ones had more systematic training programmes. Some large organisations were beginning to use eLearning in their staff development programmes and so will require graduate skills in learning on-line in future.
There was no strong sense of employers’ future needs: most seemed to expect ICT in their companies to be ‘more of the same’, or thought that graduate recruits (and hence indirectly, universities) ought to be the ones taking them forward. European professional organisations and employer bodies did not appear to have much public information about the ICT skills needed by graduates for entry to their professions and areas of commerce, and in some countries might in fact be looking to the universities to define these, rather than defining the skills themselves.

**What do these results tell us about current graduate ICT skills?**

Students from the seven universities appear to be well-skilled with respect to employers’ expectations, which do not yet appear to be overly demanding. They are mostly self-reliant rather than dependent on courses, mainly using self-tuition or taking support from friends and family. This is positive for many (especially small) employers who expect graduates to ‘learn as they go’ and provide little formal training. The downside might be that what they have learned is not very systematic or well-founded.

Both genders, and the great majority of students, felt that ICT would be important in their careers. This, plus their high confidence, is a very positive finding, and suggests that employers will find in these graduates, employees who are able to tackle the majority of ICT-related tasks necessary in their careers.

The variations between students at different universities, their ICT skill levels and the extent to which they have been exposed to eLearning tools might pose some problems in moving between countries for studies or for employment. Greater focus on attainment of comparable levels of activity and skills for graduates in all these universities would be helpful.

**Where next?**

ICT skills are rapidly changing: the cutting edge can become mainstream in well under ten years, and higher education needs to review its position periodically. The lack of explicit strategies for graduate ICT skills in the majority of these universities makes it harder for them and their students to assess progress against this change, and to see gaps in provision before they become of concern to employers. It would be valuable for these and similar universities to work together with major graduate employers to map out the kinds of ICT skills that might be needed over the next few years (bearing in mind the pace of technology change in areas like mobile working, multimedia, eLearning) and to decide how best to address the potential gaps.

It is important to recognise that our findings are not directly generalisable beyond the universities of this study, for even within this relatively homogeneous group there were differences and variations. Further studies are needed to determine to what extent these results hold true for other sorts of universities in these seven countries and beyond, especially in the candidate countries of the European Union.

Universities are embarking on greater direct use of ICT in education (that is, eLearning), and will need to understand their students’ views about this important subject too. A sister project, the SOCRATES-MINERVA-funded SPOT+ project, is currently exploring this area [http://www.spotplus.odl.org/](http://www.spotplus.odl.org/).

**Further information & acknowledgements**

The full SEUSISS report can be downloaded: [www.intermedia.uib.no/seusiss/](http://www.intermedia.uib.no/seusiss/)

We should like to thank the Directorate for Education & Culture of the European Commission, SOCRATES-MINERVA Action, for its partial funding of this project (i88103-CP-1-2000-1-UK-MINERVA-ODL SEUSISS). We are indebted to the almost 13,000 students, staff and employers who responded to our surveys and interviews. We hope that they too will find our report useful.
University of Groningen
1. INTRODUCTION

Importance of ICT skills to the knowledge economy
Information and Communication Technology (ICT) skills in the population are currently of great concern to all governments, to industry and commerce and to many, if not most, individuals in society. The reasons for these concerns are not hard to find.

1. For governments, remaining, or becoming, one of the most advanced and developed countries is seen to be closely linked to the ‘knowledge economy’ where intellectual rather than physical resources are key to wealth-generation [1.1, 1.2, 1.3]. ICT is a vital part of the knowledge economy, providing the automation, the creativity tools, the local and global communications and part of the support for mass post-compulsory education. A population that is ICT-skilled and confident is a sine qua non for success in the modern world. All governments look to their education systems to ensure that those who ‘graduate’ from them are competent at relevant skill levels.

2. For industry and commerce, whether huge or small, local or global, they are dependent upon high productivity, communications, knowledge management, which are increasingly becoming ICT-based. As other businesses become ICT-enriched, so business-to-business (B2B) processes become ICT-based, and similarly for customers (B2C). To have a workforce that has little or low ICT skills and confidence is to be severely hindered in the marketplace. The large volume of ICT training materials now available is testimony to the need to enhance employees’ ICT skills. Employers increasingly expect their recruits, at whatever level, to come adequately skilled.

3. For individuals, when they look at almost any aspect of modern life, whether urban or rural, ICT is present in some form or another, and to lack the skills to manage ICT to best personal advantage is to be excluded from development paths and from opportunities for self-improvement. One route to these skills is as part of the education process, and parents and learners expect to be taught in settings where they can acquire the skills they need, whether in the period of compulsory education, at university or college, or in lifelong learning.

These concerns are particularly true for the Europe Union, whose constituent countries vary somewhat in level of technological development, strength of educational systems and balance of urban and rural base for their economies [1.4, 1.5, 1.6].

Ownership & use of ICT are rising hence the need for good quality training
An important measure of the technological development of a country is the level of PC and internet access of its general population as well as the ICT infrastructure of the services provided by government (e.g. education, health) and by business. Recent data for European countries shows rapidly increasing levels of personal ownership of PCs and internet access [1.7, 1.8, 1.9], and this personal investment is likely to be a strong stimulus to individuals to acquire relevant ICT skills, through either formal or informal channels. The emergence of a range of popular magazines offering advice and support to private PC owners is evidence of this demand.

ICT skills are gained from family, friends, educational establishments, special courses, self-tuition
Thus for many individuals the sources of training and support on which they draw for their ICT skills development and maintenance will be complex, and consist, in varying amounts, of:

- formal training courses within formal education (e.g. ICT skills classes)
- informal training within formal education (e.g. as part of subject-specific classes)
- formal training courses outside formal education (e.g. commercial ICT skills courses)
- formal training in the workplace
- informal training in the workplace by colleagues (e.g. mentoring or spontaneous)
- self-tuition by exploration or with manuals, helpfiles etc
- informal tuition from friends, family or colleagues

This is shown for the ‘typical undergraduate student’ below (Figure 1.1) where the informal influences are clustered in the upper part of the diagram and the formal in the lower part. The wider the range of opportunities open to an individual the wider the range of supports s/he is likely to draw upon.
Mobility, employment & ICT skills
So far we have considered a view of ICT skills that assumes individuals are largely living and working within single countries. However, within the European Union in particular, and with respect to its interactions with the rest of the developed world, a further aspect of ICT skills emerges, namely their role in mobility of workers and learners [1.10, 1.11, 1.12]. For individuals to be able to move freely to take up employment or study in other countries they need to be assured that their skills and knowledge are comparable to those required elsewhere, that is they need to know that they are able to meet standards, and possibly to have suitable accreditation as proof that they meet these. In the area of ICT skills, the European Computer Driving Licence (ECDL) provides one such accredited standard [1.13], but there are others being developed within some countries’ education systems, and in specialist areas such as Microsoft (Microsoft Certified Systems Engineer, MCSE) and Sun (Certified Java Programmer) softwares there are global standards for migrant workers to ‘carry’.

Role of schools & universities in developing ICT skills
As a consequence of the pressures to improve the ICT skills of whole populations, within the education systems of all European countries there have been substantial developments to provide PCs and internet access in schools, colleges and universities, and to promote their use directly in the curricula [1.14, 1.15]. Universities have sought effective methods to develop ICT skills and knowledge in their graduates to enable them to be better fitted for employment, both as they begin their careers and also in the longer term. Some have adopted an identifiable ‘accreditation approach’ with specific ICT courses, whereas others have adopted an ‘embedded’ approach where ICT skills development is integrated into the curriculum and accredited as part of the degree award.

Examples of both were present in the universities that formed the partnership of this study. Recent developments from around the world in this area can be found in the proceedings of conferences on information literacy, for example eLit 2002 and 2003 [1.16, 1.17]. Some universities monitor student ICT skills and attitudes as part of the institutional research that underpins their strategy implementation [1.18, 1.19]. One such institutional research programme is that within the University of Edinburgh which has been collecting data on the ICT skills, knowledge and attitudes of newly-arriving students since 1990 [1.20]. These data show a steady rise in PC ownership, in the range of ICT applications that new students feel comfortable in using, and a view of the increasing importance of ICT to them in their studies and careers. Importantly, it has been possible
to explore changes in important relationships, such as the declining differences between male and female students at Edinburgh in ICT use or attitudes.

**Increasing use of ICT in education**

Of course, education as an ‘industry’ has not been untouched in its ‘business processes’ by the expansion of ICT. ICT has altered the management of schools and universities as it has businesses, both in back-office operations and for information collection and dissemination. More importantly, ICT has begun to change education by its direct use in learning and teaching (eLearning), with its advocates holding out the promise of a ‘new paradigm’ for learning and teaching that moves from a teacher-centred to a learner-centred approach [1.21, 1.22]. Clearly, in the expansion of the Internet and the access that it gives to individuals to an enormous range of information, courses and contacts, informal education has taken on an importance far beyond that possible through books, TV & films and face-to-face contacts.

Thus, ICT in education may be explored at two levels: firstly, development of generic ICT skills that are needed for employment and secondly, its use in education, in support of learning (i.e. eLearning), and the skills that are needed for this. It might be argued that this is increasingly a rather tenuous distinction, for in modern business, staff development and training are becoming ever more ICT-based [1.23, 1.24] and thus ‘learning to learn with ICT’ is becoming an employment skill alongside the effective use of common productivity tools.

**Defining ICT skills is complex**

What are ‘ICT skills’? The answer to this question will vary depending upon the type of and grade in employment (manual worker vs. IT support staff), level attained within the education system (primary school vs. university), and personal interests of each individual. In addition, they will inevitably change with time as new activities emerge (e.g. WWW) and old ones become irrelevant (e.g. MS-DOS).

In this report we are concerned with university students and their future employment and so we have defined ICT skills as mainly those skills necessary to cope with study in the modern university curriculum, with an eye towards the introduction of eLearning, and that employers would seek in their new recruits into non-technical posts. This ICT skillset mainly equates to competence with standard office productivity tools such as wordprocessors and spreadsheets; internet tools such as email and web browsers; information search tools such as bibliographic databases, and presentation tools such as PowerPoint. Programming languages, CAD, translation software, statistics analysis, audio and video manipulation etc were considered to be too specialist, although for many graduates these would be the ‘tools of the trade’.

The skills needed for successful employment in the future will change, and universities must stay alert to the messages that come from employers, and from the wider ICT discussions, as to the sorts of skills that will be of value to graduates in the near- to medium-term future and seek ways to develop these through their curricula. To enable universities to do this effectively, employers and their organisations should be explicit about what skills they expect from graduate recruits and in what ways these will change.

**Europe vs. the rest of the world**

Of necessity, this report takes a Europe-centric view of graduate ICT skills, being based in the universities and employment of the seven European countries of the SEUSISS partners. However, in the wider global context, European countries and their industries must compete in the world marketplace, and this competition is increasingly based upon a technological capability and a skilled workforce. This applies to all business and commerce, and not just to those whose business is technology. For European universities to be confident that their graduates are as ICT-skilled as those from North America, Australia or South-East Asia for example, they must be aware of what these graduates are offering employers, the programmes put in place in the education systems of other countries and how they compare with their own. A brief survey shows that governments in all these countries are concerned with ICT skills development [1.25, 1.26, 1.27, 1.28].

**ICT & other generic skills**

As skills for employment and for life, ICT skills do not stand alone – they are one skillset amongst a wider set
that are variously called ‘transferable’, ‘generic’ or ‘transversal’ [1.29, 1.30, 1.31]. For successful employment and social interactions, all of these skills are called into play. Although this study is focussed on ICT skills, its findings should be viewed against the wider context, and the ICT skills development programme within universities seen as one element in the development of the full range of ‘life and employment skills’ that graduates need. Indeed, for many employers, it is clear that ICT skills rank in importance below other skills such as teamwork and communication [1.32], perhaps because graduates are currently less well-equipped with these non-technical skills. However, given the penetration of ICT into such activities as teamwork (Computer Supported Collaborative Work – CSCW, and into communications – email, conferencing, chat) it is becoming an underpinning for these other skillsets too.

Initiatives to promote the use of ICT in higher education
As noted above, all European governments have been actively engaged in varying ways in promotion of use of ICT in higher education, both by providing infrastructure and supporting its integration into the curriculum.

At the level of the European Union, the European Commission has provided both coordination of policy and strategy and substantial funding for collaborative developments through various actions of its SOCRATES Programme [1.33, 1.34] and also through the technology infrastructure development in communications etc to underpin the eEurope plan [1.35]. Much of this activity has been directed towards use of ICT in the educational process rather than at ICT skills development as such, although an inevitable spin-off of any use of ICT is enhancement of underlying skills.

Finland
The Finnish government has well-developed strategies for use of ICT in higher education, within an information society strategy. Infrastructure is very well developed and ownership of PCs and internet access is high. Recently, the Finnish Virtual University has been created to link eLearning opportunities in all Finnish universities and colleges.

France
In France, universities were rather slow in taking up use of ICT and probably lagged behind some other European countries in the 1990s. However, strong action by the government to increase use of ICT in higher education has resulted in substantial change in infrastructure and in the activities of teachers. The Digital Campuses strategy and programme, created in 2000, has been the focus of this systematic development.

Italy
The use of ICT in Italian education has been rather slow to become widespread or embedded due to the loose government management of the higher education system and lack of networks of universities. However, recently, new vigour has been injected through the ‘Guidelines on the Development of the Information Society’ and because of demand from young students. Some individual universities have been ahead of or at the front of the field in use of ICT, and others are following their lead, driven to some degree by competition for students.

Netherlands
The Netherlands has been very active in the field of ICT in education since the 1980s, and has a strong infrastructure and widespread use of ICT in education and society in general. The 1999 Education On-Line memorandum guides these developments. All universities use substantial amount of ICT in their courses, with some making widespread use of virtual learning environments such as Blackboard. The SURF Foundation is the main agent in supporting cooperation and development in ICT in education.

Norway
ICT in education is a high priority for the Norwegian government and it has developed an ‘ICT in Education Action Plan’ for 2000-3. A series of networks support activity in different aspects of this area, for example the ITU is focussed on ICT skills. The distance factor in Norway has stimulated a larger than European average development of distance education, much of which is now being ICT-based. PC ownership and internet access is high in education and generally.

Spain
Relatively low investment in ICT infrastructure for many years has left Spain with a deficit that it is now working
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hard to remove. Spanish universities have made progress in use of ICT although many students still lack facilities. Some universities have begun to experiment with virtual campuses and the open universities give a lead in this. The government has been leading change recently through the introduction of new laws which regulate higher education, and through funding for such projects as Global Village.

UK
The UK has a long history of investment in ICT in education, although many of the early programmes had limited impact. The Teaching & Learning Technologies Programme (TLTP) which ran through the 1990’s produced a lot of content, albeit with rather low transferability, but more importantly, a lot of experience in use of ICT in higher education. The ‘employability skills agenda’ also raised the profile of ICT skills and most universities developed ways to support skills acquisition.

Further details on the development of ICT in education in the seven partner countries are provided in Appendix B and in many European countries in van der Wende & van de Ven, 2003 [1.36].

Why the SEUSISS project?
We have discussed the implications for European universities of the need for graduate ICT skills developments. As the Bologna process shapes the higher education area towards greater comparability of qualifications and educational processes [1.37], there is a matching need for comparability in student skills, including ICT skills, and this comparability must be based for each university upon measurements of the current situation and progress towards common goals.

To enable European universities to support their students and staff, they need:

- to know the ICT skills, knowledge and attitudes possessed by their new and existing students
- to be able to compare their own university’s ICT skills development processes to those of others
- to be aware of what skills their graduates leave with and how these match up to employers’ needs now and in the future
- to be conscious of their own university’s outputs in the context of European and world developments in graduate ICT skills

The SEUSISS Project was designed to provide European universities with some of the information and tools necessary for them to be able to address the issues listed above. It has provided:

- multilingual survey instruments to gather comparable data from students and staff in universities, and from employers
- baseline measures of the ICT skills of students at seven similar European universities
- strategic views from senior managers and academic staff at those universities, and from employers of their graduates
- the background to relate these views to the wider context in each of the seven countries

The SEUSISS project was a 24 month collaborative activity of the Universities of Abo (Finland), Bergen (Norway), Edinburgh (UK – lead site), Groningen (Netherlands), Pavia (Italy), Poitiers (France) and Salamanca (Spain) with the support of the office of the Coimbra Group of Universities (Belgium).

As mentioned above, the University of Edinburgh had been surveying newly-arriving students since 1990 and so the project was able to build on this work to develop a European dataset and toolset that could be continuously updated. During the timescale of the SEUSISS project, two other EC-funded projects have taken advantage of some of these tools in their data-gathering (PICTURE & SPOT-PLUS – [1.38, 1.39]). Longitudinal datasets that record change in ICT skills, knowledge and attitudes of graduates are an important underpinning for the policy and strategy developments of both universities and governments. The remainder of this report contains the data we gathered from the various sources during the project and our conclusions and recommendations.
Acknowledgements
We should like to thank the Directorate for Education & Culture of the European Commission, SOCRATES-MINERVA Action, for its part funding of this project (88103-CP-1-2000-1-UK-MINERVA-ODL SEUSISS).

We are indebted to the 13,000 students, staff and employers who responded to our surveys and interviews.

Some images were provided under licence to the University of Edinburgh by the Scottish Cultural Resources Access Network (SCRAN - http://www.scran.ac.uk).

Åbo Akademi University
2. VIEWS OF NEW STUDENTS

Summary

Newly arriving students in the seven European universities were predominantly young adults, and there were more females amongst them than males, particularly in Arts and Social Sciences.

The majority of new students entering these universities possessed good ICT skills and were confident about using them. PC ownership and internet access were high. They were frequent users of ICT prior to entry into university, in both formal (mainly school) and informal settings. ICT skill acquisition and support came mostly from family and friends and secondarily from formal sources such as school.

New students expected to use ICT regularly in their university studies, and the great majority were confident about this, most of them viewing ICT as important in their careers, no matter what subjects they were intending to study.

However, the students were not homogeneous in their ICT skills and attitudes, varying between universities and by age and gender. Female students were generally less confident than males, and reported fewer skills and lower competence levels. On the other hand their views of the importance of ICT to their careers was similar to those of male students. Older students were less skilled and more worried about use of ICT in university.

Universities varied in the proportion of less skilled, less confident and less well equipped students, and it would be appropriate to direct support towards these groups. There was little evidence of a general or systematic difference between the northern and southern universities in this study.

2.1 Background

Across Europe, students come to university for their first degree or study period either directly from school or college, after a ‘gap-year’ spent on travel or work, or as mature entrants with a period of working or raising a family. Their age ranges from 16 years upwards with no formal ceiling, but in most countries, on average, the majority are still young adults. There is considerable variation between universities in the profile of their main entrants, with the older, more traditional and research-oriented universities still tending to have a less diverse intake than newer, more vocationally-focussed institutions. These experiential factors will influence the knowledge, skills and attitudes of new students, in ICT as in other areas.

ICT skills are socially and economically desirable, and so new students will have experiences in use of ICT drawn from school and other formal settings, from informal settings such as family and friends, and perhaps from working. It is likely that all new students are aware of the increasing use of ICT in universities, and the current interest in eLearning in newspapers and on TV will add to these expectations. The skills that these students possess may be adequate or inadequate for the challenges ahead of them, and it is likely that they will all have some view of their abilities with respect to these challenges, and some views as to the likely demands which will be made of them.

We wanted to answer four general questions about the new entrants to all our universities, namely:

- What is the level of ICT skills that students have when entering university, and where and how did they obtain these? Is their general level of skills likely to be adequate for the demands about to be placed on them in university?
- What are the views of new students on the value of ICT in their studies and in their future employment? Are these in line with the current demands of modern university curricula and of most graduate careers?
- What is the extent of their access to, and expected use of, ICT facilities where they will live during university periods? Are these likely to be adequate for supporting their use of ICT in their studies?
- To what extent are there variations in the skills, attitudes and ICT facilities of new students entering the seven universities? How do these relate to country-specific experiences, age, gender or the main subjects that they intended to study?

An analysis of these data will offer insights for universities with respect to the actions they might take to assist new
entrants to make the most of their university education, and how universities might best take advantage of the ICT skills and facilities that these new students do already possess. Additionally, it will provide a guide to the ease with which students from different universities might move between them for periods of study within Europe, for example under schemes such as EC Erasmus.

The questionnaires were administered as soon as possible after the new students entered university, when they had little or no experience with using ICT in their university studies.

More detailed analyses of the data and the questionnaires in each language can be found at http://www.intermedia.uib.no/seusiss. The questionnaires in English are shown in Appendix D.

2.2 A profile of the new students

Age

The majority of newly-arriving students in these seven universities are young adults (Fig 2.1) and thus arrived at university straight from school, with a rather small proportion being mature entrants.

As the survey had been targeted, as far as possible, at those taking a ‘first degree’ (allowing for the variations across Europe in the meaning of that term), these findings are in line with expectations inside the individual universities about their new students. The traditional, research-oriented universities largely recruit from schools, with a small proportion of mature entrants in comparison to newer and/or more commerce and industry-focused universities. The Edinburgh sample had the fewest of the youngest age group (16-20 years - 59%) and most of the higher age groups (26+ - 16%).

Gender

Our data contain responses from more female than male students (Fig 2.2). This is due to the convergence of several factors. Overall, these seven universities do
recruit more females than males, substantially so in some subjects (e.g. arts, social sciences); the distribution of student numbers across subject areas is not equal, and there are more students taking high-female subjects (arts, social sciences) than high-male subjects (science & engineering), and females tend to be more willing to complete surveys. These factors produced different gender distributions across the seven universities.

Nevertheless, the numbers of female and male students are large enough in all the universities and in all the subject areas taught to enable us to carry out an analysis of correlations between gender and the views, skills and experiences of new students. This is a matter of some concern at the present time for governments and society at large.

**Subject areas of study**

The assignment by us of the newly-arriving students respondents to academic subject areas, in order to investigate differences and similarities between the areas, was problematic for several reasons.

- Firstly, the distribution of academic subjects is not consistent. In different universities, particular subjects may or may not be taught; any given subject may be located in the same or different Faculties or Schools; and Faculties or Schools may be given different names or be divided at different size or academic levels.

- Secondly, students may not be restricted to subjects that fall in the same academic ‘area’, that is they may take inter- or multi-disciplinary degrees. A common example is science subjects combined with business or management subjects.

- Thirdly, newly-arriving students may not have chosen their ultimate subject grouping, and so may not be able to assign themselves.

For the purposes of this study students were asked to state the Faculty or School they were joining and could indicate more than one if appropriate. (They also indicated their main subjects, although this proved to be of rather low additional value as there was no good way to guide their answers and the data largely repeated that of the Faculty/School assignment.) Each Faculty/School option on the questionnaires was assigned by us to one of four ‘cognate domains’: Arts & Humanities (A); Clinical & Para-clinical (CP); Science & Engineering (SE), or Social Sciences (SS). In practice, most students could be assigned to single domains, and where this was not possible, the answer to this question was treated as ‘missing data’. In other universities where inter- and multidisciplinary degrees are more common, assignment would present greater problems.

The assignment also ignored any cultural view of the subject – for example, education was treated as a social science, although in some countries it may be aligned more with arts/humanities; psychology was located as a social science although for some it might be para-clinical or a science.

![Figure 2.3 Distribution of students between 'cognate domains'](image-url)
The distribution of students across the four domains (A, CP, SE and SS) in Fig 2.3 shows that we had representation of all domains, and hence would be able to investigate similarities and differences between them. The distribution of respondents was not identical in the seven universities due to both the ease or difficulty of sampling students in different cognate domains, lack of domains or variations in domain sizes.

Mode of study
Overall, the great majority of students were studying full-time (93%) rather than part-time (7%). However, there were some significant differences from this pattern in Pavia and Bergen where the percentages of part-time students were 17.5% and 12% respectively. Although students who claim to be studying part-time are not necessarily doing so. In similar manner to the lack of multi-disciplinary degree studies and mature students, the relatively low proportion of part-time students is characteristic of the traditional, research-oriented universities in Europe and would be expected to be higher in newer or industry-focussed institutions.

Given that it was not possible in all the partner universities for us to obtain systematic samples of student responses that were fully representative of the new students, our analyses are necessarily ‘broad brush’, and indicative of differences and trends rather than accurate pictures of the status quo (Appendix C). Despite this caveat, there are a substantial number of responses from most of the universities, and evidence of internal consistency that leads us to believe that these data are reliable indicators of student views and experiences with ICT.

2.3 What are the ICT skills of new students?
The newly-arriving students were asked to rate themselves in terms of their own skills with ten well-known standard software applications (word-processor, spreadsheet, database, graphics, web authoring, presentation software, web browsers, e-mail and chat programs, bibliographic database). To achieve maximum standardisation the respondents were given an example of a use of each software to guide them to the level of skill we wished to know about (for example, “create a CV with a word-processor”).

In some software applications, most students considered themselves skilled (word-processing, chat, email and web browsing), whereas in others very few students felt themselves to be skilled (web authoring, databases, presentation manager) (Fig 2.4). In this context, 'skilled' means that students stated that they 'could do this type of task alone'.

There are some significant differences between students
at the seven universities; for example, 95% of Groningen students but only 56% of Salamanca students felt themselves to be skilled in the use of word-processors, and 59% of Pavia students but only 34% of Åbo students felt themselves to be skilled with graphics packages. Some of these differences may relate to the kinds of skills that are socially valued in peer groups in each country and some different emphases in schools.

To reduce complexity in the data and to enable us to see trends and cross-correlations more easily we have computed an overall ‘ICT skills index’ from the individual skills in the ten packages. This can be done ‘restrictively’ by totalling for each student those skills that s/he self-rates as being ‘able to do alone’ or ‘permissively’ by totalling all those students who self-rates as being ‘able to do alone’ plus those who say that they can do this ‘with some help’. The maximum value is 10 (can use all these packages) and the minimum is 0 (can use none). Figure 2.5 shows the mean restrictive and the permissive ICT skills indices for students in each of the seven universities.

On average in these universities, the majority of students judged that they could use at least 6 of the most common software applications, mostly alone and some with a little help, and few students felt that they had difficulty working alone with common tasks on the most commonly used softwares.

Figure 2.6 shows that these variations in average restrictive ICT skills index are the result of some universities having more students with low skills rating (0-3 applications) and fewer with high skills rating (8-10 applications).
applications) in comparison to other universities (e.g. Pavia & Poitiers vs. Groningen & Edinburgh). These are likely to have significant consequences for ICT skills development in these universities.

These indices have to be interpreted with care, for they mask such variations between universities as the different software applications in which students are skilled, but they provide a useful tool for investigating the impact of internal and external factors on student ICT skills.

**Age**

Average ICT skills were age-dependent, with the most skilled students being concentrated in the age range 21-35 (index = 7.6), with a little less skill in the youngest students (7.3) and much less in the oldest (6 or below). These mature entrants may not have been in working situations which encouraged development of a wide range of skills as much as the younger students, or perhaps lack confidence and so self-rate less highly.

**Gender**

The confidence factor is likely to be the explanation for the difference in ICT skill index between males and females, with females assessing themselves at “one skill” less than males (7 vs. 8). As this value is entirely dependent upon self-rating, it is influenced by such factors as general ICT confidence and interest. Most gender studies report differences between male and female students in ICT skills and attitude towards ICT. Female and male students do not like the same aspects of ICT.

In a review of research Kerr [2.1] states that female students use computers less than male students and have lower motivation and self-esteem regarding ICT than male students. These differences could be due to the overall ‘male’ approach to ICT in schools: often ICT is used as a tool for individual study and playing of games, less for co-operation and communication with others. Female students are more interested in communication and co-operation and not so much in individual activities with ICT.

In fact, although statistically significant, the difference between males and females on ICT skills index is small (one skill) and may in reality be less than this if the tendency for females to under-report actual skills [2.2] holds true in this case. It is unlikely to be of practical significance in their work or studies. The gradual diminution of a ‘gender divide’ in ICT has been reported by others [2.3].

**Cognate domain**

As with gender, small average ICT skill differences were found between new entrants intending to study in different academic subject domains (Table 2.1). Students in Science and Engineering scored highest, followed by Social Sciences and then Arts and Clinical/para-clinical.

The correlation of higher skill level with the more obviously ICT-related subjects is not surprising, although in reality medical subjects are now as technical as sciences in many respects. The magnitude of the difference is not likely to be important in academic work. The lack of a large difference is interesting in that, although it is in the same direction as one would predict from the stereotype of arts-oriented individuals being less “technical” than scientists, the mean difference of one (7 to 8 skills) hardly suggests that new entrants to arts faculties and schools

<table>
<thead>
<tr>
<th>Cognate domain</th>
<th>Average permissive ICT skill index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>7.0</td>
</tr>
<tr>
<td>Clinical &amp; Paraclinical</td>
<td>7.0</td>
</tr>
<tr>
<td>Science &amp; Engineering</td>
<td>7.9</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>7.3</td>
</tr>
<tr>
<td>Overall</td>
<td>7.4</td>
</tr>
</tbody>
</table>

Table 2.1 ICT skill indices in different cognate domains

Average number of common software applications that students reported being able to use either alone or with some help (permissive skill index) by subject area of study.
in these universities are non-technical or technophobic, and therefore suggests that in their studies and careers they will be equally open to use of ICT.

2.4 Where did new students acquire ICT skills?
During their time at school many students teach themselves and/or are taught software applications that are seen to be directly relevant to academic studies and to their life in adult society. In most countries school students probably now use programs such as word-processors and web browsers in tasks and assignments, especially in the higher grades. Internet browsers, email and chat-programs will be in common use among students as the Internet is available in many (at least secondary) schools in all countries. This is a direct result of government programmes to promote use of ICT in schools as noted in Chapter 1. In addition, many households are acquiring PCs and internet connections, and where surveys have been done it is clear that ownership is higher in homes with school-age children in all socio-economic groups [2.4]. Thus many opportunities exist for new students to have gained ICT skills.

We asked our respondents to indicate which of a variety of possible sources they had drawn on in their ICT skills development (Table 2.2).

The main source on average was ‘family or friends’ (67%), followed by ‘integrated in school classes’ (42%) and then ‘self-taught’ (31%). All other sources were of much less significance. However, these average values mask some interesting variations between universities. In Åbo and Edinburgh, school and family/friends were equally important, whereas in Groningen and Poitiers, school was of much less importance than family/friends, and only in Salamanca had many students taken special courses outside school (21% vs. less than 10% for rest). Finally, the percentage of students indicating that they had acquired ICT skills at work was small for all except Edinburgh, which also had the highest percentage of mature entrants (21%), and despite the fact that more students at Bergen and Pavia than Edinburgh reported that they study part-time.

Female students report slightly different sources than males, being less self-taught (22% vs. 47%) and slightly more reliant on family/friends (71% vs. 62%) and on school (45% vs. 38%).

It is clear that at present the biggest single influence on new student ICT skills across these seven European universities is family and friends, a finding which agrees with other reports [2.5, 2.6]. Informal learning is increasingly recognised as important at all educational levels. The implications of this reliance on informal sources of help for the degree to which students have, or have not had, systematic and reliable training in the most commonly used software applications is clear. These patterns of seeking help from particular sources may well become strongly embedded, and we see them re-emerge in the data from established students.

2.5 What ICT equipment do new students own?
Increasingly, personal ownership of, and access to, a computer and the internet is viewed as important, if not essential, to study in higher education. Some universities

<table>
<thead>
<tr>
<th></th>
<th>integrated in school classes</th>
<th>special course at school</th>
<th>course outside school</th>
<th>self-taught</th>
<th>family or friends</th>
<th>at work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>58%</td>
<td>9%</td>
<td>6%</td>
<td>17%</td>
<td>57%</td>
<td>11%</td>
</tr>
<tr>
<td>Bergen</td>
<td>47%</td>
<td>7%</td>
<td>3%</td>
<td>30%</td>
<td>74%</td>
<td>7%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>56%</td>
<td>15%</td>
<td>6%</td>
<td>34%</td>
<td>55%</td>
<td>21%</td>
</tr>
<tr>
<td>Groningen</td>
<td>23%</td>
<td>13%</td>
<td>8%</td>
<td>40%</td>
<td>86%</td>
<td>-</td>
</tr>
<tr>
<td>Pavia</td>
<td>35%</td>
<td>5%</td>
<td>5%</td>
<td>31%</td>
<td>66%</td>
<td>-</td>
</tr>
<tr>
<td>Poitiers</td>
<td>23%</td>
<td>28%</td>
<td>5%</td>
<td>20%</td>
<td>74%</td>
<td>3%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>37%</td>
<td>5%</td>
<td>21%</td>
<td>23%</td>
<td>63%</td>
<td>1%</td>
</tr>
<tr>
<td>overall</td>
<td>42%</td>
<td>10%</td>
<td>8%</td>
<td>31%</td>
<td>67%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Percentage of students reporting each of six sources of ICT training and support
in the US now make these mandatory for new students [2.7], and there have been experiments in European HEIs in issuing laptops to groups of students to enable innovations in courses and to monitor the effects of ownership on behaviour [2.8].

Of the new students entering the seven universities in this study, ownership of a PC varied from 54% to 89% (Table 2.3). The factors that might influence these values are: different residence patterns of new students (home vs. university accommodation); perceived availability of university computers; likely value of a PC in studies; advice given before entering university (‘buy first’ vs. ‘wait until you are here’); the relative cost of PCs in each country, and different interpretations of the question between countries (‘own’).

Of those who owned PCs, around 70% had internet connections (highest in Edinburgh and lowest in Åbo), mainly by phone but in some cases via cable connections. These varying uptakes will reflect local phone charges, the availability of cable wiring in homes and in university accommodation (for example, all Edinburgh student halls are data-wired).

The most common accessory was a printer (varying from 75-97% ownership), presumably reflecting the need of students to print hardcopy of assignments for submission (alongside other personal uses). Other accessories were less common and more varied in ownership, with scanners as the most common external device (37%). The age of the students’ PCs can be estimated from the presence of CD and DVD drives which were present in around one third of the machines. PCs with DVD drives are likely to be quite new and high performance. Across the seven universities, Groningen students stood out as having the most equipped PCs, with those at Åbo having the least equipped, and the remaining students owning very similar systems.

### Gender and ownership

There was a small difference between females and males in ownership of PCs (72% vs. 81%), but of those who did own a PC, internet access was very similar as was ownership of a printer and scanner. The printer and scanner are seen as standard for academic work and are often sold along with new computers as ‘bundles’. Females tended to own less highly equipped PCs with respect to other accessories.

The low average ownership of PCs by students at Åbo and Bergen is mostly explained by the very low proportion of females who have PCs at these universities (47% at both, as compared to 71% for males). In all other universities, females are almost the same if not equal to males in ownership. This suggests some relationship between gender and technology in these two countries, Finland and Norway.

Groningen had almost reached saturation for male ownership of PCs, with 95% reporting that they had a PC.

### 2.6 How often do new students use ICT for study and recreation?

As measures of the general level of experience of the new students with using PCs, they were asked about the frequency with which they used ICT at school for studies and anywhere for recreation.

---

**Table 2.3 Ownership of ICT equipment by new students**

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>phone connection</th>
<th>cable connection</th>
<th>scanner</th>
<th>digital camera</th>
<th>printer</th>
<th>CD writer</th>
<th>DVD drive</th>
<th>Zip drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Åbo</td>
<td>54%</td>
<td>62%</td>
<td>36%</td>
<td>19%</td>
<td>7%</td>
<td>76%</td>
<td>40%</td>
<td>21%</td>
<td>8%</td>
</tr>
<tr>
<td>Bergen</td>
<td>56%</td>
<td>74%</td>
<td>39%</td>
<td>31%</td>
<td>12%</td>
<td>84%</td>
<td>39%</td>
<td>33%</td>
<td>7%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>70%</td>
<td>84%</td>
<td>33%</td>
<td>32%</td>
<td>14%</td>
<td>75%</td>
<td>27%</td>
<td>35%</td>
<td>15%</td>
</tr>
<tr>
<td>Groningen</td>
<td>89%</td>
<td>72%</td>
<td>40%</td>
<td>50%</td>
<td>27%</td>
<td>90%</td>
<td>50%</td>
<td>31%</td>
<td>22%</td>
</tr>
<tr>
<td>Pavia</td>
<td>85%</td>
<td>83%</td>
<td>15%</td>
<td>39%</td>
<td>6%</td>
<td>95%</td>
<td>28%</td>
<td>18%</td>
<td>11%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>67%</td>
<td>76%</td>
<td>11%</td>
<td>47%</td>
<td>4%</td>
<td>96%</td>
<td>30%</td>
<td>33%</td>
<td>8%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>79%</td>
<td>70%</td>
<td>38%</td>
<td>34%</td>
<td>6%</td>
<td>97%</td>
<td>34%</td>
<td>21%</td>
<td>12%</td>
</tr>
<tr>
<td>Overall</td>
<td>74%</td>
<td>77%</td>
<td>31%</td>
<td>37%</td>
<td>13%</td>
<td>87%</td>
<td>35%</td>
<td>28%</td>
<td>14%</td>
</tr>
</tbody>
</table>
There were very wide variations between the students entering different universities in the extent to which students reported using a PC in their school time. At the highest level, 40% of Edinburgh students reported daily use whereas only 5% of Salamanca students reported use at this level. At the opposite end of the frequency scale, 30% of Salamanca students rarely or never used a PC in school whereas only 7% of Edinburgh students reported this use. Students entering other universities fell in between these extremes, reflecting the varying degrees to which ICT is embedded in normal school practice. It would appear that despite the investment made by all governments in ICT for schools, on average 18% of students reported only weekly use of a PC in their last years at school. The reliability of these data is supported by the data from Salamanca showing that uptake by students of special ICT courses outside school was almost three times higher than in any other university, presumably in compensation for a perceived lack in school.

Formalised training in ICT in school does not necessarily lead to higher use, for in Poitiers there was the highest reportage of special ICT courses (20%) yet the frequency of use in classes is quite low (only 15% of students used it daily). Females and males were quite similar in reported use of ICT for studies, implying that school demands imposed equally and females responded to those demands as strongly as males.

By contrast, in their recreational time there were less variations between students from different countries in time spent on the internet, although there were some region-specific differences, with fewer of the northern students reporting use below one hour per week than did southern students. High usage (greater than five hours per week) varied little between universities. In contrast to use of ICT for studies, there were gender differences in recreational use, where females were more represented in the low use groups than males, and less represented in the high use groups (66% of females used ICT 2 hours per week or less as compared to 48% of males, but only 6% used 6 or more hours as compared to 18% of males).

Frequency of use of ICT, PC ownership and ICT skill level

There are strong correlations between reported frequency of use of ICT for studies, PC ownership and self-rated ICT skills, suggesting consistency in the data students were providing (Table 2.5). Students who rarely or never used ICT for studies judged themselves to be much less able (by 2-3 ‘skills’) than those with regular use. There is also a strong association between PC ownership and ICT skill, with those who own a PC reporting skills that they can do alone (restrictive skill index) of 1 - 2.5 higher than

| Table 2.4 Frequency of use of ICT for study by new students at different universities |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                                 | every day 2-3 times per week    | once per week   | monthly | rarely or never |
| Abo                             | 13%    | 31%    | 28%    | 18%    | 11%    |
| Bergen                          | 20%    | 31%    | 23%    | 14%    | 12%    |
| Edinburgh                       | 40%    | 34%    | 14%    | 5%     | 7%     |
| Groningen                       | 32%    | 39%    | 16%    | 9%     | 4%     |
| Pavia                           | 30%    | 37%    | 16%    | 7%     | 9%     |
| Poitiers                        | 15%    | 22%    | 26%    | 19%    | 19%    |
| Salamanca                       | 5%     | 20%    | 20%    | 24%    | 30%    |
| overall                         | 26%    | 32%    | 18%    | 12%    | 12%    |

Percentage of students reporting each frequency of use of ICT for study before entering university

<table>
<thead>
<tr>
<th>PC ownership</th>
<th>Study with ICT 2-3 times per week or more</th>
<th>Study with ICT monthly or less</th>
<th>Restrictive skill index (number of applications alone)</th>
<th>Study with PC at school</th>
<th>Study with PC at home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>74%</td>
<td>20%</td>
<td>5.5</td>
<td>28%</td>
<td>84%</td>
</tr>
<tr>
<td>No</td>
<td>34%</td>
<td>46%</td>
<td>3.8</td>
<td>24%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Values are percentages of students or number of applications that were reported to be used alone
those who do not own a PC, with an average of 2.3 applications difference. We explore this more fully in the next chapter.

What recreational purposes have new students used ICT for?
Students were asked about the use they made of chat, email, downloading files from the internet (e.g. MP3), shopping and banking on-line, general surfing, playing games and gambling. Gambling on-line does not seem to be a habit of more than a tiny fraction of European students!

Broadly, email (65%) and web surfing (51%) were most common, followed by downloading files (30%) and chat (23%). Some region-specific differences were evident: for example, in Åbo, Bergen, Edinburgh and Groningen ( northern universities) banking on-line was very much more common (18-34%) than in Pavia, Poitiers and Salamanca (0.5-5%), as was shopping on-line in Åbo and Edinburgh than in the other locations. This may reflect differences in the e-business options available to young adults in these countries. Other local factors may influence other uses of the internet, most importantly the cost of telephone calls.

Gender and use of the internet
There are clear gender differences in how the new students have used the internet for recreation. Males are much more likely than females to have downloaded files (45% vs. 21%) and to have played games (18% vs. 7%), whereas their use of chat and email are almost identical (24% and 65% respectively). This is in line with previous findings that showed females being more interested in communication than in solo use of the PC [2.9].

2.7 What use of ICT do new students expect to make in their studies?
In general, most new students (72%) thought that they would be using ICT either daily or several times per week in their university studies (Table 2.6). There was some variation between students at different universities: for example, almost half the Edinburgh students predicted daily use, whereas only 10% of Pavia students did so; and in Poitiers almost one third of the students thought that only weekly use would be the norm, a much larger proportion than any of the other universities. These local differences may be partly explained by sample composition, but there are other factors which will lead students to predict ICT usage.

These surveys were completed before students had any or much actual experience of university courses and so students were predicting use based upon whatever information they had gained about ICT and higher education. Their possible sources of information might have been: friends who were ahead of them in their education; brochures, prospectuses, websites and open days at this and other universities; TV and films; parents, relatives and schoolteachers, and extrapolation from the last years of school. These factors will be highly country- and university-dependent.

### Table 2.6 New student expectations of use of ICT in their university studies

<table>
<thead>
<tr>
<th></th>
<th>every day</th>
<th>2-3 times per week</th>
<th>once per week</th>
<th>monthly</th>
<th>rarely or never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Åbo</td>
<td>28%</td>
<td>52%</td>
<td>14%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Bergen</td>
<td>14%</td>
<td>50%</td>
<td>23%</td>
<td>9%</td>
<td>5%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>46%</td>
<td>45%</td>
<td>7%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Groningen</td>
<td>19%</td>
<td>57%</td>
<td>20%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Pavia</td>
<td>10%</td>
<td>50%</td>
<td>25%</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>13%</td>
<td>26%</td>
<td>32%</td>
<td>20%</td>
<td>9%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>14%</td>
<td>41%</td>
<td>24%</td>
<td>15%</td>
<td>5%</td>
</tr>
<tr>
<td>overall</td>
<td>24%</td>
<td>48%</td>
<td>18%</td>
<td>7%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Percentage of students ‘predicting’ each frequency of their future use of ICT at university
2.8 What do new students feel about using ICT in university?

When asked about their confidence towards using ICT in their university studies, most students at all the universities replied that they were either ‘very confident’ or ‘looking forward to the challenge’; on average, one quarter were very confident and just under half were confident (Table 2.7).

This finding is in line with the general level of ICT skills and extent of use. However, there were some important variations between universities which have implications for their student ICT induction and training. At Bergen, 40% of students were a little apprehensive about using ICT and 11% were very apprehensive. At Groningen, Poitiers and Salamanca around one in ten students were very apprehensive about ICT in their studies, a level which could impact directly on what is feasible in the use of ICT by staff, and merits further investigation. If this apprehension was a result of lack of information and an unrealistic prediction of what would be expected it could be relatively easily be allayed, but if it is realistic, in that these students were in fact under-skilled, then corrective action should be taken. A much higher proportion of females than males is present in this very apprehensive group (6% vs. 3% overall), and in the slightly apprehensive group (32% vs. 16%).

Confidence and skill levels

The relationship between self-rated ICT skills with common software applications and degree of confidence with using ICT in studies is very strong. Students who judge themselves able, alone or with some help, to use 7-8 or more applications are confident about their ability to cope with university studies which involve ICT, whereas those who think that they can only use 4-5 applications are worried.

2.9 How do new students view the importance of ICT in their careers?

At all the universities, the great majority of new students viewed ICT as being either ‘very important’ or ‘important’ for their future careers, and almost no students thought that it would be of ‘little or no importance’. There were some variations between universities: for example, at Edinburgh and Pavia most students thought it would be ‘very important’, whereas at the other five universities most students thought that ICT would be ‘important’ in their careers. These differences may be partly accounted for by such factors as differences in composition of the samples with respect to subject areas studied, different perceptions of likely future careers, and interpretation of the question in each language. However, the message overall was very clear: that around 80% of students thought that ICT was going to be a significant feature in their careers, and about 20% thought that it was of less significance. This is a very positive outcome, and suggests that students at these universities are likely to seek ways to improve their ICT skills in preparation for a wide range of employment.

For individual universities, some thought should be given to those students who feel that ICT is not important. This is particularly the case at Åbo, Bergen, Groningen and Poitiers, where between one quarter and one third of students did not rate ICT very highly. Few graduate careers are ICT-free, and these students might need more assistance.

The least skilled consider ICT of less importance

This interpretation is reinforced by exploring the relationship between perceived importance of ICT to career and self-rating on ICT skills, which shows that those
students who feel that ICT will be of less importance to them also self-rate at a (slightly) lower skill level. This could mean that students with lower skills under-rate ICT or that those who feel that it will not matter to them in the future acquire fewer skills. The ICT skill difference between the most and least skilled is around 2 skills, although attitude (and hence approach to gaining new skills or applying existing ones) rather than actual skill may be the critical lesson here.

**Scientists view ICT as more important than other students**

On average at the seven universities, new students entering science faculties and schools thought that ICT would be more important to them in their careers than did those entering social sciences and clinical subjects, and students entering arts subjects thought that it would be least important. This is an unsurprising finding, as ICT is more dominant in many science careers than in those of other graduates, although this is a shrinking gap. A measure of the extent to which new students have a realistic view of ICT in their careers can perhaps be seen in the fact that whilst 86% of scientists viewed ICT as ‘very important or important’, 78% of social scientists and clinical students felt the same, and even amongst arts students, 70% saw ICT as being of high value.

**Both genders have the same view of the importance of ICT**

An important finding was the absence of a significant gender difference in attitude to ICT in future career (Fig 2.8). Slightly more males thought that it would be very important and slightly more females thought that ICT would be important, but given the gender variations across subject domains (more males in science for example), these differences appear unimportant. Thus despite the slightly lower self-rating of females in ICT skills, in frequency of use and in confidence, their overall view of the role of ICT in their careers is the same as that of males.
2.10 Conclusions

At the beginning of this chapter we posed four general questions about the new entrants to all our universities, namely:

- What is the level of ICT skills that students have when entering university, and where and how did they obtain these? Is their general level of skills likely to be adequate for the demands placed on them in university?
- What are the views of new students on the value of ICT in their studies and in their future employment? Are these in line with current demands of most graduate careers?
- What is the extent of their access to, and expected use of, ICT facilities where they will live during university periods? Is this likely to be adequate for using ICT in their studies?
- To what extent are there variations in the skills, attitudes and facilities of new students entering the seven universities, reflecting country-specific experiences, age, gender or the main subjects that they intend to study?

Using the data we have collected from students we have answered the factual portions of these questions. Now we can use our knowledge of the curricula in our universities and our graduates' career paths to interpret the information in terms of how well students are matched to the demands of their studies and careers:

1. Is the general level of skills of new students likely to be adequate for the demands placed on them in university?

In terms of current curricula, the general levels of ICT skills of new students in mainstream softwares such as word-processors, email, web browsers etc is likely to be sufficient so that they do not face major barriers at the start of their academic studies. Not surprisingly, they were rather under-skilled in such tools as presentation managers and bibliographic databases – applications little used in schools, from where most entrants come. The newer systems now coming into use in all universities (virtual learning environments, portals, computer-aided assessment etc), will probably be unfamiliar to almost all students and hence good training in these tools will be needed. However, it is important to note that at all the seven universities there was a group of students (generally, but not exclusively, older) who were less skilled and for whom some form of continuing support and training in basic ICT skills might be needed. Their confidence was also lower and this needs to be recognised as a potential barrier to their development. Two of these universities now offer ECDL, which might well be suitable for these lower skilled groups.

2. Are the views of new students about ICT in line with current demands of most graduate careers?

There was a very positive view of the career-value of ICT in a high proportion of students, and this is a positive finding that encourages us to feel that most students have realistic expectations about their careers. There was some variation across the universities, which might be partly a reflection of the career options and subject mixes; these need to be noted and some form of action taken to inform students early in their studies about the general skills they should be seeking to develop before graduation. It may be that other general skills such as groupwork and communication skills are also in need of some attention alongside ICT. The promotion of generic skills development is a country-specific phenomenon, but with global employment implications.

3. Is the equipment available to new students likely to be adequate to support them in using ICT in their studies?

Ownership of PCs and internet access is rising across Europe and the students entering these universities reflect that pattern, with generally high ownership. Overall, the levels appeared to be well in line with what is needed for modern university studies, assuming that the university also provides equipment on a substantial scale. The level of equipment that students owned alongside the PC was also high, with most having printers and many having other devices useful for file transfer and manipulation.

Where we have reliable data, the majority of these student PCs appear to be desktop rather than laptop machines, probably reflecting the price differential between the two types. There is also a difficulty for most students in carrying laptops as well as books, lack of secure storage and little by way of wireless or
open ports around universities. Thus, although a large number of students are able to work off-campus on their studies, and use eLearning, the need for PC provision on-campus will remain high.

However, within these generally high ownership figures there were some worrying deficits, mostly gender- and age-related, and some attention should be paid to these by the universities involved. The extent to which groups lacking good access are able to participate fully in the development of eLearning is questionable, and this might increasingly disadvantage these groups in the coming years.
3. VIEWS OF ESTABLISHED STUDENTS

Summary
Our established student sample was drawn from those well advanced in their degree programmes or at graduation. In the seven European universities these were predominantly adults in their early-to-mid 20's, and there were more females amongst them than males, particularly in Arts and Social Sciences.

Student self-assessed skills with common software applications were generally good across all the seven universities, with small differences between subjects, scientists self-rating more highly. In less common applications there was more variation between universities and subjects, especially in use of bibliographic databases, presentation managers and databases.

Informal sources of help with ICT (friends and family, self-tuition) dominated over formal sources (courses inside and outside university), and a rather small percentage of students thought that ICT was well-integrated into university curricula, even in universities where provision was good and support strong. Recently some universities have introduced ECDL to support this area.

Many established students used considerable ICT in their studies. In some universities 40-60% used it daily. However this high usage was not uniform and the proportion of students using ICT monthly or less ranged from 3% to 39%. Usage varied with subject area too, with students studying science and engineering the most frequent users and students studying clinical subjects the least frequent users.

The impact of PC ownership is very marked in some aspects of student behaviour. On average, PC owners used ICT in their studies more often, mostly at home but also on campus, and felt more skilled and confident than did non-owners. However, owning a PC did not over-ride the effects of low demands for ICT use in courses within the university.

On average, there were small differences between female and male students, females being less confident about using ICT in their careers, and rating themselves a little lower on ICT skills. In ownership of PCs and views of the importance of ICT there were no gender differences.

3.1 Background
We collected information from students who were well into their degree programmes and were at, or approaching, the time when they were thinking about their careers post-graduation, and were also able to look back at their time in university to comment on their use of ICT and the sources of training and support available to them. This group of students was generally much harder to collect data from than new students, and the number of responses is much lower than for new students. This was primarily due to their distribution in smaller and more numerous classes, often with complex and less-scheduled timetables. In addition, these students had been subjected to many questionnaires and surveys during their time at university and may have become ‘saturated’. Finally, time and exam pressure is more acute the closer students get to graduation and teachers can become more protective of them against activities that were not seen as ‘core’ or essential to the business of studying.

As with the new students, we posed questions about the knowledge, skills and attitudes of the established students that related to their studies and to their futures:

- What ICT equipment and skills do they have and is this likely to be adequate for their studies?
- How do they develop their ICT skills whilst at university?
- What use do they make of ICT in their studies, and how well integrated is this into their degree programmes?
- What experience do they have of eLearning in their courses?
- What are their views of the role of ICT in their future careers, and are these views in line with the likely demands of graduate careers?
- Are there variations in these attributes between students at different universities, in different subject areas and between genders? Are we able to explain these differences in terms of local conditions?
3.2 A profile of the established students

Age
The majority of the established students were in the age-range 21-25 years, which is to be expected given the low recruitment from older age groups and their tendency to full-time study and with completion of first degrees in four to seven years (Fig 3.1).

Gender & subject areas of study of the students
The composition of the samples with respect to gender showed that females predominated, more in some universities than others (Abo’s sample being most female and Groningen’s least – Table 3.1). This reflects the norm in European universities of this type where female student entry has risen steadily over the years, especially in some subject areas. The breakdown of the samples by subject areas are also markedly different, with some subjects having low, or zero, contribution to the data. As mentioned above, at some universities obtaining access to students close to graduation was very difficult, and in some subjects more than others (for example, medical students in their last years spend much time in hospital settings, and scientists in laboratory projects). Thus the samples are less representative of the whole student population than are those for the new students, but nevertheless, the internal and logical consistency of the data suggests that the views of the students in the samples are broadly reliable indicators of the views of the population as a whole.

Table 3.1 Profile of respondents in the seven universities

<table>
<thead>
<tr>
<th>University</th>
<th>Female</th>
<th>Male</th>
<th>Arts</th>
<th>Clinical &amp; Paraclinical</th>
<th>Science &amp; Engineering</th>
<th>Social Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>75%</td>
<td>25%</td>
<td>25%</td>
<td>-</td>
<td>21%</td>
<td>55%</td>
</tr>
<tr>
<td>Bergen</td>
<td>65%</td>
<td>35%</td>
<td>21%</td>
<td>24%</td>
<td>9%</td>
<td>45%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>72%</td>
<td>28%</td>
<td>33%</td>
<td>9%</td>
<td>14%</td>
<td>43%</td>
</tr>
<tr>
<td>Groningen</td>
<td>57%</td>
<td>43%</td>
<td>14%</td>
<td>13%</td>
<td>11%</td>
<td>62%</td>
</tr>
<tr>
<td>Pavia</td>
<td>62%</td>
<td>38%</td>
<td>30%</td>
<td>13%</td>
<td>26%</td>
<td>31%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>62%</td>
<td>38%</td>
<td>29%</td>
<td>-</td>
<td>32%</td>
<td>39%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>67%</td>
<td>33%</td>
<td>17%</td>
<td>11%</td>
<td>14%</td>
<td>58%</td>
</tr>
<tr>
<td>Overall</td>
<td>65%</td>
<td>35%</td>
<td>20%</td>
<td>11%</td>
<td>15%</td>
<td>54%</td>
</tr>
</tbody>
</table>

Percentage of students in each subject area in the seven partner universities
Mode of study
As with new students, the proportion of part-time students in the seven universities in this study was small, well under 10% for all the universities with large numbers of students in their samples, and never exceeding 20%.

3.3 What ICT skills do established students have?
As with new students, the established students were asked to rate themselves in terms of their own skills with ten well-known standard software applications (word-processor, spreadsheet, database, graphics, web authoring, presentation software, web browsers, e-mail and chat-programs, bibliographic database). To achieve maximum standardisation the respondents were given an example of a use of each software to guide them to the level of skill we wished to know about (for example, “create a CV with a word-processor”).

The common applications with which students reported most fluency (i.e. could use alone) were word-processing, email, chat and web browsers, but well over half the students also said they could use on-line bibliographic databases, which is an activity very closely related to academic studies in these universities (Fig 3.2).

There were some substantial differences between the universities in respect of self-reported skills: for example, students and Pavia and Poitiers were least skilled with on-line bibliographies in particular, although their other skills were similar to those of students at the remaining universities. This might reflect the differing availability of these tools to students in different universities. The other applications with large differences between universities were web authoring and presentation managers, both of which are dependent upon the sorts of opportunities and pressures within curricula, and the mix of subjects being taken by our respondents.

From the list of software applications with simple tasks, we again calculated indices of how many softwares students said they could ‘use alone’ (‘restrictive’) and ‘alone plus with help’ (‘permissive’). The variation between universities was not large, in the permissive index it was 7.0–8.1 skills and in the restrictive index it was 4.8 – 6.4 skills. There was a 0.9 skill point difference between females and males (7.2 – 8.1) and 1.6 across cognate subject domains (SE=8.5; SS=7.5; CP=7.2; A=6.9). A major reason for the skill lead of science and engineering students was their reported higher capability with several of the less common packages.

3.4 Where do students at university develop their ICT skills?
For the great majority of students in all seven
universities, friends and family were the single most important source of help in developing ICT skills (68% overall). Their second source books and manuals although with considerable country-specific variation (38% overall, lowest 22%, highest 47%) followed by integration into courses. Some universities run special ICT courses which students may attend. The pattern of this intra-university sources is shown in Fig 3.3, demonstrating the variation in the degree to which students in the middle-to-end of their degree programmes perceived an integration of ICT skills development into their courses, and the extent to which they took special courses. Overall, rather a small percentage of students take specific ICT courses (although uptake does not indicate supply, as some universities, for example Edinburgh, have courses available even though relatively few students used them). Students in Pavia and Salamanca appeared to be least well served with respect to opportunities for ICT skills development inside the university, and it is noteworthy that Salamanca students had the largest uptake of external courses (22% of respondents had taken these). In the case of Pavia, the increasing impact of in-university ECDL courses is rapidly redressing the balance. From the 2003-4 academic year, French universities will be following the ICT training scheme recently initiated at secondary level with the B2i (IT and Internet proficiency certificate for secondary schools) by establishing the C2i (higher education IT and Internet proficiency certificate)

Integration of ICT skills development – gender and subject domain
The greatest integration of ICT skills development into university courses was reported by scientists and engineers, followed by social scientists, and they also said that they used ICT courses inside the university (Table 3.2). This probably reflects their use of specialised softwares and reliance on spreadsheets, databases and statistics applications that can only be reasonably learned by students with focused training. Again for these softwares, informal help is probably less readily available, and scientists reported a high proportion of use of manuals and books to help them (programming languages are

Figure 3.3 Mechanisms for student ICT skills development inside universities

![Graph showing percentage of students integrated and taking special courses]
Males and females reported very similar views of the integration of ICT skills development into their courses, uptake of special ICT courses inside or outside the university, but were very different in their extent of use of books/manuals and friends/family. Whereas 54% of males said they used books to self-teach, only 30% of females did so, and instead relied more on friends and family (72%) than did males (62%). These different patterns have implications for the sorts of skills and knowledge that male and females students might acquire, and the sorts of situations universities need to use to support both genders.

### 3.6 What use do established students make of ICT?
We asked the established students about three aspects of their use of ICT whilst at university: how much time they spent studying using ICT and where; how much time they spent recreationally using ICT and what they did; and their experience during university of a range of uses of ICT for education (i.e. a measure of their ‘exposure to eLearning’).

#### Time spent studying with ICT
The frequency with which students studied using ICT varied substantially from university to university (Fig 3.4). We have grouped usage into three categories: high (daily), medium (1-3 times per week) and low (monthly, rarely/never). At Salamanca, almost 40% of students reported low use as compared to under 5% at Åbo and Edinburgh, and these latter universities, 60% of students made daily use of ICT. These relative levels of use probably relate directly to the demands on students by their courses and teachers, for they correlate with other ICT
experiences in the universities, discussed below.

Frequency of use of ICT for study is related to the subject area of the students (Fig 3.5). Scientists and engineers made most frequent use with arts and social sciences following them quite closely. Students in clinical and paraclinical subjects used least ICT, a finding of concern given the rapidly increasing dependence of these subjects on ICT. However, even in the sciences 10% of students report marginal use of ICT (monthly or less) and this rises to 20% or more in arts and social sciences. As more use is made of ICT for formal eLearning activities, these students may be at risk unless some attention is paid to their needs.
Experience of eLearning tools
We asked students about their experiences with several technology-based tools during their university studies. These were: a course website, on-line discussions, desktop and suite videoconferencing, a virtual learning environment (VLE) and audioconferencing. Experience with any form of audio- or video-conferencing was low for all students, which is unsurprising and these low values suggest that students could distinguish between the tools we had listed.

The extent to which students had experienced websites, on-line discussions and VLEs varied greatly between the seven universities, reflecting marked differences in the extent to which these tools are used widely within them for teaching (Table 3.3). For example: Groningen has adopted Blackboard as a centralised VLE, and about half its courses with web-presence are hosted within this VLE, whereas Edinburgh has three different VLEs (WebCT, IVLE and EeMEC) but these only host around one third of the 1100 courses with web-presence. Thus students at Edinburgh and Groningen had around the same level of course website experience, differing in where they located these. It would also appear that use of websites and VLEs is distinct from use of on-line discussions, for at Poitiers, Edinburgh and Bergen around a quarter of students had such experience, whereas presence of a central VLE at Groningen had not resulted in its use for this purpose, for less than 10% of students had had on-line discussions. Blackboard may not be a good choice of VLE for discussion, and more suited to asynchronous activities. Apart from Bergen, Edinburgh and Groningen, use of the web for learning and teaching appeared to be still quite low, with less than one fifth of students in Åbo, Pavia, Poitiers and Salamanca reporting any experience at all. These data reflect the ‘state of play’ as seen by students well into their degree programmes and may not be good indicators of the institution-wide use of such tools, since for strategic reasons, there may have been concentration of effort in larger, first- and second-year classes (as was the case at Edinburgh for VLEs). In Åbo it would appear that the high level of ICT use is for other purposes than in eLearning.

The 2004 launch of a university-wide eLearning platform in Pavia and the growing availability of teachers’ web sites, especially in some Departments and Faculties, in addition to the ECDL courses, almost certainly means there would be an substantial difference between data gathered here and that from established students for the present new student population when they reach the same stage. In Poitiers, the VLEs (Learning Space & Quickplace) were still very seldom used, explaining the views expressed by students. However, this too is expected to change when the use of these tools is officially introduced into classes from academic year 2003-4.

There were also substantial variations in the exposure of students in different subject domains to these eLearning tools (Table 3.4). In contrast to the extent that students reported use of ICT in their

<table>
<thead>
<tr>
<th>Course</th>
<th>Abo</th>
<th>Bergen</th>
<th>Edinburgh</th>
<th>Groningen</th>
<th>Pavia</th>
<th>Poitiers</th>
<th>Salamanca</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course website</td>
<td>12%</td>
<td>42%</td>
<td>45%</td>
<td>42%</td>
<td>17%</td>
<td>16%</td>
<td>5%</td>
</tr>
<tr>
<td>On-line discussion</td>
<td>16%</td>
<td>27%</td>
<td>27%</td>
<td>9%</td>
<td>12%</td>
<td>26%</td>
<td>17%</td>
</tr>
<tr>
<td>VLE</td>
<td>10%</td>
<td>17%</td>
<td>10%</td>
<td>55%</td>
<td>3%</td>
<td>10%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Table 3.3 Student experiences of eLearning tools by university

Percentage of students at each university that had experienced different eLearning tools during their studies.
Table 3.4  Student experiences of eLearning tools by subject

<table>
<thead>
<tr>
<th></th>
<th>Arts &amp; Humanities</th>
<th>Clinical &amp; Paraclinical</th>
<th>Science &amp; Engineering</th>
<th>Social Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>course website</td>
<td>14%</td>
<td>31%</td>
<td>24%</td>
<td>21%</td>
</tr>
<tr>
<td>on-line discussion</td>
<td>14%</td>
<td>17%</td>
<td>26%</td>
<td>17%</td>
</tr>
<tr>
<td>VLE</td>
<td>8%</td>
<td>22%</td>
<td>16%</td>
<td>18%</td>
</tr>
</tbody>
</table>

Percentage of students in each subject domain that had experienced different eLearning tools during their studies.

Studies, clinical and para-clinical students had more experience of course websites and VLEs than did other students, more even than did scientists and engineers, who were the most active users of ICT. This paradox is probably explained by differences in the use of ICT (standard productivity tools and software vs. web-based materials) and in the management of curricula (medical curricula are often centrally-controlled and may adopt, as in Edinburgh and other medical schools, a single VLE for all courses, whereas other curricula are more open to individual staff and departments to define). Students in clinical subjects also had more experience of videoconferencing, which is coming into use for medical teaching in some universities. The students in arts and humanities appear to be generally least exposed to eLearning.

Location of study using ICT
Students can use ICT for study at a range of locations, inside and outside the university. Overall the pattern was for most study at home, followed by at university, with all other places being much less well-used (Fig 3.6). Thus off-campus study by students using ICT is well-established, even at these seven traditional and largely campus-based universities.

Åbo was the only university where workplace study was significant, greater than at university, and this was almost certainly due to the sampling technique that had to be used there which reached students as they graduated and some had already taken up employment. In Groningen students appeared to be studying with ICT heavily in both university and home, whereas in Salamanca home was much more important than university; in Poitiers and Salamanca cybercafes were of much greater importance than elsewhere. For Pavia, 15% of the students used other locations, probably largely accounted for by

Figure 3.6 Locations where students studied with PCs
the extensive network of university colleges and residential halls which all offer on-line computer facilities. For Poitiers, among the possibilities for “other” we could suggest interactive kiosks that can be found in various public places (eg post offices); multimedia rooms that are also available for free use or at low cost in libraries, information centres etc, and finally friends and family who are equipped with a computer and Internet. (This use of ‘other locations’ turned out to have greatest importance to students who did not own PCs - see below).

Integration of ICT into university studies

In this question we asked student about the general integration of all ICT into their studies, as opposed to the earlier question about ICT skills development. As Figure 3.7 shows, there were substantial differences between the universities, and at some the majority of students felt that integration was poor or non-existent. These differences mirrored the extent of integration of ICT skills development, which suggests that at least there is a consistency in how the universities approach use of ICT in learning and teaching, albeit that this may be to say only that they do little to make any sort of ICT an integral part of their degree programmes. Overall the responses to this question gave a rather disappointing perspective on how students regard the integration of ICT into their courses, and no university was regarded by even 20% of its students as reaching full integration.

Recreation using ICT

Across six of the seven universities, students spent very similar amounts of time on-line for recreation, supporting a view that differences in their reports of study time, experiences of ICT etc are indeed reflections of real experiences and behaviours and not a generalised, country-related phenomenon. The exception to this consensus was Salamanca where a quarter of students spent almost no time on-line even for recreation, in accord with their reports of much lower levels of use of ICT in study.

Table 3.5 Locations where students study with PCs by university

<table>
<thead>
<tr>
<th></th>
<th>Home</th>
<th>University</th>
<th>workplace</th>
<th>cybercafe</th>
<th>other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>65%</td>
<td>26%</td>
<td>46%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>Bergen</td>
<td>55%</td>
<td>50%</td>
<td>6%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>70%</td>
<td>67%</td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Groningen</td>
<td>78%</td>
<td>72%</td>
<td>4%</td>
<td>0%</td>
<td>8%</td>
</tr>
<tr>
<td>Pavia</td>
<td>68%</td>
<td>42%</td>
<td>7%</td>
<td>1%</td>
<td>15%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>55%</td>
<td>65%</td>
<td>4%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>77%</td>
<td>24%</td>
<td>1%</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td>overall</td>
<td>73%</td>
<td>42%</td>
<td>6%</td>
<td>5%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Percentage of students in each university using each location to study with a PC.

Figure 3.7 Student views of degree of integration of ICT into their studies at each university
It may be that this can be explained by a cultural difference in terms of time spent socialising face-to-face and a preference for synchronous communications as opposed to electronically, for when on-line, Salamanca students were the highest users of chat, although they were the lowest users of email. Banking and shopping on-line were only used substantially by students at northern universities, but downloading files, surfing and games showed no consistent patterns. Scientists and engineers had a slightly higher use of all on-line activities (including games and gambling!), the other subject areas being very similar to each other. This again suggests that within Europe all students are very similar in their social use of ICT, and that differences between them in academic activities are a true reflection of real phenomena.

### 3.7 Impacts of ownership of a PC

Ownership of a PC appears to be a significant factor in how much and where students use ICT for study (Table 3.6). This is perhaps an unsurprising finding, but it is an important point for universities to be aware of as they move towards greater use of ICT in learning and teaching. It emphasises the need to consider what might be the best mechanisms to increase levels of PC ownership, for example through loans or special deals.

Considering firstly use of computers at home and at university, it is clear that in all cases those students who owned a PC studied with them at home more than they used the university machines, and that those who did not own PCs relied heavily on university machines. (We must assume that when non-owners were working at home that they were using PCs belonging to others in some way.) Non-owners also made more use of public spaces such as libraries and, particularly in Poitiers and Salamanca, of cybercafes (18% in both). In some universities, students indicated substantial use of ‘other locations’, the nature of which we discussed above.

Male and female non-owners appeared to take similar approaches to not studying with PCs by finding equipped places to study. The only difference between these females and males was that more females appeared to find these ‘other places’ (22% vs 10%) (Table 3.6).

Those students who owned PCs spent more time studying using ICT than non-owners (Fig 3.8). In the highest frequency-of-use group (‘daily’) owners used ICT twice as often as non-owners, and of those who used ICT in their studies monthly or less, the ratio of non-owners to owners was close to 3:1. The impact of ownership was also present in recreational use, where twice as many non-owners than owners reported no use at all of ICT (27% vs. 13%), and for high use, non-owners were half as frequent as PC owners (11% vs. 22%). However, although the extremes were different the modal value for

---

### Table 3.6 Study locations with a PC by gender & PC ownership

<table>
<thead>
<tr>
<th>Uses a computer to study</th>
<th>females</th>
<th>males</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PC ownership</td>
<td></td>
</tr>
<tr>
<td></td>
<td>at home</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>at university</td>
<td>89%</td>
</tr>
<tr>
<td></td>
<td>at workplace</td>
<td>36%</td>
</tr>
<tr>
<td></td>
<td>in public library</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>in cybercafé</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>other locations</td>
<td>3%</td>
</tr>
</tbody>
</table>

Percentage of female and male student PC owners and non-owners using different locations to study with a PC.
recreational use was 1-2hr per week for both, suggesting a ‘self-limiting’ process was operating.

**PC ownership and ICT skill levels**

PC ownership correlated with increased self-reported skills, in particular the number of applications that students said that they could use. This can be seen by comparing the two skills indices we have computed as a measure of the range of ICT applications that students said they could use ‘alone’ (restrictive index) or ‘alone + with some help’ (permissive index) as shown in Table 3.7. PC owners self-rated as more skilled alone or with help than non-owners, and, perhaps most importantly, the differential was greater when we looked at the number of applications they felt able to work with alone.

This effect was not uniform across the universities, for those universities which appeared to have a less well-developed ICT infrastructure (so that students without computers get less practice on-campus) had a greater differential between owners and non-owners.

In some respects this might seem merely to prove a commonsense assumption, namely that the PC owners are better with computers, but it has important implications for all universities as they move towards greater use of ICT in education, and as a consequence the pressures rise on their campus ICT provision for students. If the on-campus resources become less able to cope with student demand, those students who own PCs will become increasingly favoured, in other words, a ‘digital divide’

**Table 3.7 Skill indices of PC owners and non-owners**

<table>
<thead>
<tr>
<th></th>
<th>Restrictive skill index</th>
<th>Permissive skill index</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC owners</td>
<td>5.8</td>
<td>7.7</td>
</tr>
<tr>
<td>PC non-owners</td>
<td>3.9</td>
<td>6.4</td>
</tr>
<tr>
<td>Difference (owners-non-owners)</td>
<td>1.9</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Average number of software applications that student PC owners and non-owners assessed themselves as being able to use alone.
is being re-created in the student body. Thus student dissatisfaction with eLearning could emerge not from a fundamental disagreement with the concept but through unhappiness with its implementation.

**PC ownership and experience of eLearning**

PC ownership had less impact on the extent to which students had experienced eLearning, although there were some differences in that owners of PCs reported more experience of on-line discussions and of VLEs. Whether this was due to their preferential enrolment on such courses (still largely the minority) or their greater participation in them, and hence recognition of them, cannot be resolved. The relatively small impact in this area suggests that student exposure to eLearning is determined more by staff and their adoption of ICT than its elective use by students.

### 3.8 How do established students view the role of ICT in their careers?

**Importance of ICT in career**

The views of students nearing graduation of the importance of ICT in their future careers was largely positive (83% overall, combining ‘very important’ and ‘important’) with only 17% considering that it was ‘of some value’ or less. However, this did vary from university to university (Table 3.8), but not in a manner that related either to their use of ICT or to the apparent level of ICT provision in the university. For example, Groningen had high provision as measured by use of VLEs and high frequency of use in study at university (72%) but only 20% of students viewed ICT as ‘very important’ and 27% saw it as of only ‘some value’, the highest rating on this measure. By contrast, Salamanca had relatively low ICT provision and low use in study, but 48% of its students saw ICT as ‘very important’ in their careers. Pavia had similar findings. Thus relatively poor access to facilities and provision do not lead students to the view that ICT is unimportant to them personally, not high provision and use to views of high importance. Local circumstances may influence these views, and perhaps greater awareness of the ‘true’ place of ICT in education and employment leads to less emphasis being placed on it.

Student views of the importance of ICT to them in their careers was dependent upon the subject area they were studying (Fig 3.9), with scientists and engineers viewing it as more important and arts and particularly clinical subjects students seeing it as less important. As we commented above, this finding in clinical subjects is particularly worrying given the hi-tech direction that modern clinical practice is taking. Again PC owners were more likely to view ICT skills as very important in their future careers (42% vs. 32%). However, it is interesting to note that 79% of students who do not own a PC also view ICT as important or very important in their careers, yet they still do not purchase a PC. The reasons for this are probably largely financial, which underlines the need for increasing good access to PCs for all students, something that they themselves reinforce in surveys [3.1].

<table>
<thead>
<tr>
<th>University</th>
<th>very important</th>
<th>Important</th>
<th>of some value</th>
<th>of little or no importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>32%</td>
<td>43%</td>
<td>22%</td>
<td>3%</td>
</tr>
<tr>
<td>Bergen</td>
<td>35%</td>
<td>43%</td>
<td>22%</td>
<td>0%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>53%</td>
<td>36%</td>
<td>10%</td>
<td>1%</td>
</tr>
<tr>
<td>Groningen</td>
<td>20%</td>
<td>50%</td>
<td>27%</td>
<td>2%</td>
</tr>
<tr>
<td>Pavia</td>
<td>50%</td>
<td>28%</td>
<td>17%</td>
<td>5%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>37%</td>
<td>44%</td>
<td>17%</td>
<td>1%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>48%</td>
<td>43%</td>
<td>8%</td>
<td>1%</td>
</tr>
<tr>
<td>overall</td>
<td>40%</td>
<td>43%</td>
<td>15%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Percentage of students at each university indicating each view of importance.

---

**Table 3.8 Student views of importance of ICT in their careers**
Confidence using ICT in career

Student confidence with use of ICT in their future career varied between the universities, although at all, most of the students were in the two highest confidence bands (Fig 3.10), and the number of students who were very apprehensive was quite small. Åbo and Bergen reported the lowest number of students with high confidence. It is perhaps not surprising that between 20% and 40% of students should report some apprehension given their likely lack of knowledge about what will be expected of them in their careers. However, in Åbo the situation appears more paradoxical for these students reported highest levels of workplace study with ICT. As some of them had just begun work, this might be part of a general anxiety, or based upon a true realisation that their skills were indeed inadequate!

Confidence was influenced to a small extent by field of study, with most scientists and engineers (34%) and least arts students (17%) reporting high confidence. Arts subjects also had the highest number of very apprehensive students (8.4%). The degree to which scientists and engineers differed from arts students in the extent to which they knew their likely careers and its demands may well be a major factor in this difference. Social science and clinical students were similar and lay between the science and arts students in confidence.

PC ownership correlates with confidence

Confidence with ICT in the future was strongly correlated with ownership of a PC (Fig 3.10), either because those who felt confident bought PCs and those who were worried about ICT in general shied away from this, or, more likely, students who owned PCs could practise often (see above) and so became more confident in their skills.

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>very confident</th>
<th>quite looking forward to it</th>
<th>a little apprehensive</th>
<th>very apprehensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>16%</td>
<td>54%</td>
<td>26%</td>
<td>34%</td>
</tr>
<tr>
<td>Bergen</td>
<td>10%</td>
<td>54%</td>
<td>31%</td>
<td>5%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>27%</td>
<td>42%</td>
<td>29%</td>
<td>3%</td>
</tr>
<tr>
<td>Groningen</td>
<td>24%</td>
<td>51%</td>
<td>20%</td>
<td>5%</td>
</tr>
<tr>
<td>Pavia</td>
<td>26%</td>
<td>50%</td>
<td>20%</td>
<td>3%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>25%</td>
<td>34%</td>
<td>40%</td>
<td>2%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>26%</td>
<td>36%</td>
<td>30%</td>
<td>8%</td>
</tr>
<tr>
<td>overall</td>
<td>24%</td>
<td>43%</td>
<td>28%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Percentage of students at each university indicating each confidence level.
3.9 Conclusions
At the beginning of this chapter we posed some questions that we wished to answer from the data collected from the students at the partner universities. These questions were:

- What ICT equipment and skills do they have and is this adequate for their studies?
- How do they develop their ICT skills whilst at university?
- What use do they make of ICT in their studies, and how well integrated is this into their degree programmes?
- What experience do they have of eLearning in their courses?
- What are their views of the role of ICT in their future careers, and are these views in line with the likely demands of graduate careers?
- Are there variations in these attributes between students at different universities, in different subject areas? Are we able to explain these differences in terms of local conditions?

We have presented an analysis of most of the large volume of data we collected in terms of these questions, but a few items remain to be considered here, namely the adequacy of these students' ICT equipment and skills, and the appropriateness of their views about ICT in their studies and careers.

1. How adequate is the ICT equipment and skills of established students in the light of the demands of their studies?

The majority of students appeared to have sufficient access to ICT equipment (either their own or provided by the university) to enable them to use it daily or at least several times a week. This is a level that is almost certain to be sufficient for most modern university courses, except in the most demanding subjects. There were some variations in this and it was clear that in Salamanca for example, students without PCs were less frequent users of ICT in their studies. Despite these variations, the great majority of students rated themselves as competent in the basic software applications, and many of them considered themselves skilled in the less common applications too, such as bibliographic databases and presentation managers, both tools becoming, if not already, essential to modern degree programmes. For these universities to be
sure that all their students were competent in these applications would probably require more integration of ICT in the curricula, something that many students felt did not happen at present. Female students appeared to have a lower confidence in their abilities.

2. Do these students have an appropriate view of ICT given the demands of their likely careers?
There was a relatively small proportion of students in all universities that did not consider ICT to be important in their careers, and this was as strong a view as in the universities where the level of ICT provision was high as in universities where students had less access to equipment, made less use of ICT and self-rated less highly. This low percentage of students who have a rather negative view of ICT in their careers is a positive finding, and the lack of gender difference in this respect is important given the high and rising proportion of female students in the general university population.
University of Edinburgh
4. A COMPARISON OF NEW & ESTABLISHED STUDENTS

Summary

Although we cannot treat the differences between the new and established student samples as a measure of progression of student views and attitudes within the universities because they were not drawn from single cohorts, the two datasets do give us some insight into the similarities and differences that existed in students within and between universities.

PC ownership was generally high for both new and established students, but where it was lower for new students we saw higher levels of ownership in established students suggesting a pressure to acquire PCs during the course of their studies. This applied to both genders almost equally.

The established students reported higher ICT skills, especially in the use of more academic applications such as spreadsheets, bibliographic databases and presentation managers. This suggests a ‘demand’ from their courses, as would be anticipated in research-oriented universities of this type.

Comparing frequency of use of ICT for studies at school and university, it appeared that students generally used ICT more or much more than at school, suggesting that the university curriculum was making more use of ICT than the school curriculum in most countries.

When new students were asked to predict or estimate the extent to which they would use ICT in their studies at university and this was compared to what actually was used by established students, at most universities students were using more or much more than the prediction. However, in a few cases students on courses were using less than predicted, and hence the new students may find themselves disappointed in ICT use unless the curricula in these universities change soon.

New and established students of both genders turned to friends and family for ICT support and training more than they did to any other source, and both viewed ICT as important or very important in their future careers.

Owning a PC was strongly associated, for both new and established students, with much greater frequency of use of ICT in their studies and higher ICT skills ratings that do not seem to reduce during university career. Although the number of non-owners was relatively small, their educational experiences across several years at the end of school and through university must be markedly different to those of their PC-owning colleagues.

4.1 Background

In this chapter we draw together some of the common threads in our findings about ICT skills, knowledge and attitudes of the new and established students, focussing particularly on those aspects where there is little difference between the two groups and those aspects where there are apparent differences. Before doing so, we need to introduce a caveat about comparing the two datasets, namely that these are not part of a longitudinal study, following the same groups of students through their university careers, but are two simultaneous samples taken from the student population at two stages in the university degree programmes. We therefore have no direct knowledge of the established students as they entered the university several years previously, nor of what the new student group will be like in several years time. We know that some aspects of student behaviour change rapidly (emergence of web skills since the mid 1990’s, growth of PC ownership), whereas others may change more slowly (attitudes for example, or use of PCs in schools).

Although we shall compare and contrast the data from our two groups of students, we cannot draw conclusions about the reasons for any differences with high confidence, and we can only really pay attention to large differences or clear consistencies. Nevertheless, the combined dataset of new and established students is large, it contains information given by 12,716 students, and the distribution of the respondents in both samples across subjects, age and gender within the universities are not grossly dissimilar. They also bear a reasonable relationship to the actual student distributions at most of the universities. In addition, as will be mentioned later, for some of the universities we have two other datasets to draw on that come from related projects (SPOT-PLUS and PICTURE) [4.1, 4.2], and the findings there are generally in line with our own.
Table 4.1  PC ownership amongst new and established students

<table>
<thead>
<tr>
<th></th>
<th>New students</th>
<th>Established students</th>
<th>Difference (Established-New)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Åbo</td>
<td>54%</td>
<td>84%</td>
<td>+30%</td>
</tr>
<tr>
<td>Bergen</td>
<td>56%</td>
<td>77%</td>
<td>+21%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>70%</td>
<td>73%</td>
<td>+4%</td>
</tr>
<tr>
<td>Groningen</td>
<td>89%</td>
<td>85%</td>
<td>-4%</td>
</tr>
<tr>
<td>Pavia</td>
<td>85%</td>
<td>83%</td>
<td>-2%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>67%</td>
<td>63%</td>
<td>-4%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>79%</td>
<td>80%</td>
<td>0%</td>
</tr>
<tr>
<td>Female</td>
<td>72%</td>
<td>79%</td>
<td>+7%</td>
</tr>
<tr>
<td>Male</td>
<td>81%</td>
<td>84%</td>
<td>+3%</td>
</tr>
</tbody>
</table>

Percentage of students in each university that owned a PC, and in all universities by gender, and the differences in ownership between the new and established student groups.

We shall consider the following topics when comparing the new and established students:
- PC ownership and internet access
- ICT skills
- Use of ICT for studies
- Support for ICT skills development
- Views of importance of ICT and confidence in its use
- Relationships between PC ownership and student views and skills

4.2  PC ownership & internet access
Established students are slightly more likely to own a PC than are new students, something more pronounced in female than in male students (Table 4.1). In both groups around three quarters of students or more have a PC, with only Poitiers students falling below this level slightly. The biggest difference between the two groups of students is seen in Åbo and Bergen where 20-30% more established students than new students own PCs, a large increase which is perhaps driven by much greater need for PCs at university than was the case at school (see below).

This high level of ownership, coupled with apparent rises where ownership was lowest, brings the majority of students at each university into the position where they can use ICT in their studies at a level commensurate with the demands of the modern university curriculum, so that they can continue to develop their ICT skills, and where use of eLearning opportunities will be largely unrestricted by access to equipment. For both groups of students, over 70% of PC owners had internet access through phone or cable. As universities begin to provide more web-based learning materials and communications, this internet access will increase in importance.

4.3  ICT skills
Both new and established students reported a similar pattern of self-assessed ICT skills (Table 4.2), with most students stating an ability to use word-processors, email, chat and web browsers. This table shows the percentage of students who said that they could use each application ‘alone’, and excludes those who could do so ‘with some help’. Those software applications that had changes under 10% were omitted (graphics, web authoring, databases and web browsers).

A few skills stand out as being foci for change. The one skill that was generally much higher in established than new students was use of on-line bibliographic databases, something taught and used in universities but of less prominence in most schools. Presentation managers also featured, particularly strongly at Åbo, Groningen and Poitiers, perhaps reflecting curricular experiences of the students in these university courses. Chat appeared to be more a skill for new students than established students. It seems unlikely that there was a skill loss in use of chat (or any other application) area whilst at university,
Table 4.2 Differences between established & new students in ICT skills

<table>
<thead>
<tr>
<th>Software Application</th>
<th>Abo</th>
<th>Bergen</th>
<th>Edinburgh</th>
<th>Groningen</th>
<th>Pavia</th>
<th>Poitiers</th>
<th>Salamanca</th>
</tr>
</thead>
<tbody>
<tr>
<td>presentation manager</td>
<td>18%</td>
<td>11%</td>
<td>4%</td>
<td>17%</td>
<td>11%</td>
<td>21%</td>
<td>8%</td>
</tr>
<tr>
<td>spreadsheet</td>
<td>21%</td>
<td>-6%</td>
<td>-5%</td>
<td>12%</td>
<td>6%</td>
<td>11%</td>
<td>7%</td>
</tr>
<tr>
<td>online bibliographic database</td>
<td>28%</td>
<td>16%</td>
<td>27%</td>
<td>16%</td>
<td>11%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>email program</td>
<td>26%</td>
<td>5%</td>
<td>1%</td>
<td>32%</td>
<td>41%</td>
<td>24%</td>
<td>-6%</td>
</tr>
<tr>
<td>chat program</td>
<td>-25%</td>
<td>-2%</td>
<td>2%</td>
<td>-9%</td>
<td>2%</td>
<td>4%</td>
<td>-12%</td>
</tr>
<tr>
<td>word processor</td>
<td>20%</td>
<td>1%</td>
<td>-5%</td>
<td>35%</td>
<td>2%</td>
<td>34%</td>
<td>-22%</td>
</tr>
</tbody>
</table>

Difference between established and new students in the percentage of students in each university that self-assessed as being able to perform simple tasks unassisted with each software application.

rather that new students had acquired this skill and that established students had never had it and had not gained it. There was probably little curricular pressure for use of chat in these campus universities. Amongst the universities, students at Åbo and Groningen appeared to have made the most skill gains, or more strictly, where established students were most skilled in comparison to new students.

Overall, the restrictive ('can do alone') skill index is slightly higher for established (5.4) than new (5.1) students, and for both genders (female 4.9 vs. 4.6; male 6.5 vs. 6.0). These levels of self-reported skills in common software applications are:

• certainly adequate as underpinnings for ICT-enhanced curricular;
• show some circumstantial evidence that students are acquiring new skills whilst at university;
• are reaching levels that must be adequate for the majority of graduate careers.

Evidence in support of these findings can be found in the surveys carried out as part of the SPOT-PLUS and PICTURE projects.

In SPOT, a subset of the skills and eLearning experiences questions were asked of second-year students at the universities of Åbo, Bergen, Edinburgh & Groningen (plus Aarhus, Budapest, Erlangen, Gdansk, Granada, Krakow, Leuven & Padova). Thus these students were intermediate to our new and established students. SPOT-PLUS sample sizes were smaller than our own in SEUSISS, generally being in the range 100-150 per university. Broadly similar results to those of established students in our study were obtained in SPOT-PLUS from the four SEUSISS partner universities on self-assessment of ICT skills: high skills being reported with word-processors and email, lower but still substantial, skills reported with presentation managers and bibliographic databases. Their experiences with eLearning techniques and methods was also similar to those reported by us in SEUSISS in terms of the relative frequency of exposure to different methods. This suggests a consistency in the students at these universities in their reporting of their own skills and experiences, and give us increased confidence that our observations are reliable.

In the PICTURE project, some of the questions devised in SEUSISS, and used in SPOT-PLUS, were asked of groups of students in quite different educational settings, namely full-time students in an old university in Northern Ireland and distance education students taking courses from a new university in Eire. The on-campus students were quite similar to those in SEUSISS in age, the ODL students much less so, including many more older students. The courses being taken were more restricted and vocational (IT and nursing). Levels of PC and internet ownership appeared to be generally somewhat lower than reported by SEUSISS students, with a larger difference between males and females than we observed in our established students. The higher percentage of older students in the PICTURE population would contribute to this difference as they were less well-equipped than were the younger students. Taken overall, the pattern of self-reported ICT skills was similar to that found by us in SEUSISS, with the great majority of students reporting good skills with email and wordprocessors, and around half reporting good skills.
with bibliographic databases and presentation managers like Powerpoint. In terms of their use of ICT in studies and their exposure to eLearning methods, similar questions to ours were used, and the responses show a slightly lower frequency of use (closer to weekly than daily) and somewhat less exposure on average to eLearning, although these data were very course-dependent. PICTURE respondents confirm our view that informal methods of acquiring ICT skills are widespread, for a significant proportion of the students in their surveys had had no formal ICT training.

The PICTURE project data suggest that for on-campus students there is reasonable similarity between students at the SEUSISS partner universities and other European universities, but that when one considers students taking very different courses the findings are much less ‘portable’. This is very much as expected, and reinforces the need to take a wider range of samples across European higher education to get a more rounded view.

4.4 Use of ICT for studying

The data we collected from new and established students enables us to ask some interesting questions about the changes that might take place between school and university in use of ICT for studies, and also about students’ predictions or ‘guesstimates’ of what use they expect to make of ICT at university and what actual use was being made of it by students during their degree programmes.

ICT use: school vs. university

The period of sampling of student views spanned just over one academic year (mid 2001-late 2002), a time during which we assume no dramatic shifts in use of ICT took place.

Use of ICT varied greatly in the school system, with highest reported use before university by students who enrolled at Edinburgh, Groningen and Pavia (~70% used it daily or 2-3 times per week) and lowest in Poitiers and Salamanca (~30% daily or 2-3 times per week). Even in the high use educational systems, greater than 1 in 10 students reported use at monthly or less, a quite surprising finding given the pressure and funding for ICT incorporation into school curricula in these countries. The percentage of students reporting this low use of ICT was 25% in Åbo and Bergen, and 50% in Salamanca, quite worrying levels.

Some of these students would appear to have experienced a dramatic upward shift in ICT use as they embarked on their university studies (Åbo, Bergen, Edinburgh, Poitiers), whereas for others there appeared to be smaller changes (Groningen, Salamanca, although at opposite ends of the frequency of use spectrum).

### Table 4.3 Differences in percentage of students reporting various levels of use of ICT in university to that in school

<table>
<thead>
<tr>
<th>University</th>
<th>every day</th>
<th>2-3 times per week</th>
<th>once per week</th>
<th>monthly</th>
<th>rarely or never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>+51%</td>
<td>-6%</td>
<td>-20%</td>
<td>-15%</td>
<td>-10%</td>
</tr>
<tr>
<td>Bergen</td>
<td>+17%</td>
<td>-1%</td>
<td>-3%</td>
<td>-6%</td>
<td>-6%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>+23%</td>
<td>-8%</td>
<td>-6%</td>
<td>-3%</td>
<td>-7%</td>
</tr>
<tr>
<td>Groningen</td>
<td>-8%</td>
<td>+1%</td>
<td>+1%</td>
<td>+7%</td>
<td>-1%</td>
</tr>
<tr>
<td>Pavia</td>
<td>+4%</td>
<td>-12%</td>
<td>+3%</td>
<td>+7%</td>
<td>-2%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>+11%</td>
<td>+24%</td>
<td>-7%</td>
<td>-11%</td>
<td>-17%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>+7%</td>
<td>+6%</td>
<td>+3%</td>
<td>-4%</td>
<td>-11%</td>
</tr>
</tbody>
</table>

Differences in percentage of students reporting each frequency of use of ICT (established students at university minus new students at school)
Table 4.4 Differences between new students’ predictions of ICT use at university and that experienced by established students

<table>
<thead>
<tr>
<th>Actual ICT use (established) minus predicted ICT use (new)</th>
<th>every day</th>
<th>2-3 times per week</th>
<th>once per week</th>
<th>monthly</th>
<th>rarely or never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>+36.0%</td>
<td>-26.7%</td>
<td>-6.4%</td>
<td>-2.4%</td>
<td>-0.7%</td>
</tr>
<tr>
<td>Bergen</td>
<td>+22.3%</td>
<td>-19.6%</td>
<td>-3.1%</td>
<td>-0.4%</td>
<td>+0.7%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>+16.5%</td>
<td>-19.5%</td>
<td>+1.2%</td>
<td>+1.4%</td>
<td>+0.3%</td>
</tr>
<tr>
<td>Groningen</td>
<td>+5.2%</td>
<td>-17.7%</td>
<td>-3.1%</td>
<td>+13.4%</td>
<td>+2.2%</td>
</tr>
<tr>
<td>Pavia</td>
<td>+24.0%</td>
<td>-25.1%</td>
<td>-5.4%</td>
<td>+6.9%</td>
<td>-0.5%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>+12.9%</td>
<td>+19.6%</td>
<td>-13.3%</td>
<td>-12.5%</td>
<td>-6.7%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>-2.1%</td>
<td>-14.7%</td>
<td>-0.8%</td>
<td>+4.8%</td>
<td>+12.9%</td>
</tr>
</tbody>
</table>

Difference between established and new students in the percentage of students in each university that experienced (established) and predicted (new) varying frequencies of use of ICT in studies.

Predicted & actual use of ICT in university studies

In five of the universities (Åbo, Bergen, Edinburgh, Pavia and Poitiers) there was substantially more frequent use of ICT by students on courses as compared to the predictions of use by the incoming students (Table 4.4). Of course, the new students probably predicted first year use and we have measured actual use in later years, however, it is interesting to note the magnitude of the differences between the predicted and the actual, especially as one would expect use of ICT in university courses to become even greater during the coming years during as the new students progress through their studies, and thus may be even higher by the time they reach the same stage as the sample of established students were when we surveyed them.

Edinburgh has been collecting, for several years, these ‘predictions’ by new students of their likely use of ICT at university, and has found that expected frequency of use has been rising steadily, in step with changes in schools and society in general, the ‘messages’ transmitted by the university through its websites, in ‘open days’ for intending students, and in publications. They appear to be a reliable source of new student views about the extent of ICT use in university curricula.

At Salamanca, new students who came from school backgrounds with relatively little use of ICT for studies, appeared to be anticipating more use than was actually the case, although planned changes in the university curriculum at may well alter this current pattern significantly, and the new students may have responded to that information. Their expectations however, were quite modest in comparison to those of new students in the other universities.

Groningen appears to be somewhat paradoxical, for the students here had high ownership, high use at school and high self-rated skills, but actually predicted rather low daily use of ICT, and some established students were actually using ICT only monthly. It may be that the use is rather bimodal – some students making a lot of use and others on different degree programmes using rather little. In addition, some students in later years may be mainly focused on projects and thus use less ICT than they would a year earlier or a semester later.

4.5 Sources of support & training in ICT skills

For both new and established students, friends and family were their main source of support and training in ICT skills, and their use of these sources was almost identical, perhaps reflecting strongly embedded behaviours. Established students reported more reliance on ICT courses outside university (especially in Åbo and Bergen) and less use of formal training integrated into university coursework than in school (Table 4.5). The slight tendency for females to favour friends/family over self-teaching with manuals was seen in both groups.
It may be that strong patterns and ways of working develop quite early after the start of use of computers, and that informal methods of obtaining support are dominant for many, if not most, people. The role of informal learning is beginning to be more recognised in ICT skills development as in a wide range of other ‘life skills’ (refs here), and points up a potential problem for all educational institutions that wish to develop systematic and well-founded ICT skills in their students, namely that the formal ICT course may be trying to compete with a well-embedded ‘normal’ source of support. These informal sources may have arisen due to lack of provision of formal ICT courses or as a more personal ‘backup’ or aid to supplement them. They carry with them the advantage of fast, context-sensitive support but may also propagate elements of poor practice or misinformation.

However, having said that one should not take too pessimistic a stance, for there is a very large number of people in universities who are very competent in the use of a wide range of softwares and who have never taken a course of any kind. Self- and peer-tuition works – providing good quality self-help materials for those who wish to take this route, alongside courses and testing for those who do not, might be the best solution for some universities; accredited courses best for others. We return to this idea of ‘self-assessment against standards’ and accreditation in the last chapter of the report.

There was a very clear consistency between the views of all new and established students about the importance of ICT in their future careers, with an average of 35-40% of students in both groups feeling that ICT was going to be ‘very important’, ~45% that it would be ‘important’ and ~2% that it would be ‘of little or no importance’. For some universities there were substantial differences between the views of new and established students as to the degree of importance of ICT in their careers, for example at Bergen (21% to 35%) and Poitiers (20% to 37%), whereas those universities with already high numbers of new students regarding ICT as important (Edinburgh, Pavia and Salamanca) retained these high numbers of established students believing ICT to be important. Interestingly, despite the apparent low use of ICT in studies at school and university in Salamanca, established students retained their views of its importance in their careers, suggesting that external influences were dominant over university actions. Again, Groningen was ‘paradoxical’ in that it had the lowest percentage of both new (15%) and established (20%) students regarding ICT as ‘very important’ for their careers despite high self-rated skills and ownership, that is, this was a consistent view amongst its students, and may reflect a local or national phenomenon. One interpretation of this finding is that the level of integration of ICT into Groningen students’ lives has become so well-developed that they have now reached a ‘balanced view’ of its importance, and that they do not ‘over-rate’ its importance against other skills or activities.

### 4.6 ICT: importance & confidence

<table>
<thead>
<tr>
<th></th>
<th>Integrated in school or university</th>
<th>Special course at school or university</th>
<th>Course outside school or university</th>
<th>Self-taught</th>
<th>Family or friends</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New students</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>45%</td>
<td>11%</td>
<td>9%</td>
<td>22%</td>
<td>71%</td>
</tr>
<tr>
<td>Males</td>
<td>38%</td>
<td>9%</td>
<td>7%</td>
<td>47%</td>
<td>62%</td>
</tr>
<tr>
<td><strong>Established students</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>31%</td>
<td>10%</td>
<td>18%</td>
<td>30%</td>
<td>72%</td>
</tr>
<tr>
<td>Males</td>
<td>30%</td>
<td>9%</td>
<td>14%</td>
<td>54%</td>
<td>62%</td>
</tr>
</tbody>
</table>

Difference between established and new students, by gender, in the percentage of students in each university that reported different sources of training and support for use of ICT.
Science and engineering students viewed ICT as more important than those taking other subjects, a view that was a little stronger in the established students. There was very little difference in views between male and female new and established students, with all regarding ICT as equally important for their careers.

Similarly, confidence in their ICT skills with respect to the forthcoming experiences of either university (new students) or career (established students) varied little between the two groups, both

4.7 PC ownership and student views and behaviours
For both new and established students, PC ownership was associated with higher use of ICT at home for study over use at school or university, although in general established students appeared to spend more time using ICT for study than new students did at school, perhaps reflecting greater pressures on them from their courses (see above). PC non-owners at university appeared also to accommodate this pressure by using other locations more than the new students recently had when at school. Similarly, amongst the new and established students, those who owned PCs studied more frequently with them, and those who did not own PCs made up the majority of the low frequency-of-use group, suggesting that their lack of experience was a continuing process across several years. Although the number of students in the non-owing category was small at all universities, the impact on the study experiences of this group must have been quite significant. Again, we should note here the possible impact of ‘loss of access’ on some students during their academic careers.

Finally, there was a reported ‘skills gap’ of between 1 and

| Table 4.6 Some parameters of ICT access, use and skills of new and established students |
|-----------------------------------------------|------------------|------------------|-----------------|-----------------|
| **Use PC for study** | ** OWN PC?** | **Yes** | **No** | **OWN PC?** | **Yes** | **No** |
| at home | 84% | 20% | Use PC for study | at home | 88% | 15% |
| at school | 28% | 24% | at university | 37% | 63% |
| in cybercafé | 3% | 4% | in cybercafé | 3% | 10% |
| other | 6% | 8% | other | 3% | 19% |
| How often used for studies | | | | | |
| every day | 28% | 11% | How often used for studies | every day | 29% | 16% |
| 2-3 per week | 34% | 33% | 2-3 per week | 31% | 23% |
| 1 per week | 18% | 20% | 1 per week | 19% | 20% |
| monthly | 11% | 20% | monthly | 13% | 21% |
| rarely/never | 10% | 26% | rarely/never | 8% | 21% |
| **skills index difference (owner - non-owner)** | **Abo** | **1.7** | **Abo** | **1.0** |
| **Bergen** | 1.7 | Bergen | 1.7 |
| **Edinburgh** | 1.5 | Edinburgh | 1.2 |
| **Groningen** | 1.2 | Groningen | 1.4 |
| **Pavia** | 2.7 | Pavia | 2.2 |
| **Poitiers** | 1.8 | Poitiers | 1.4 |
| **Salamanca** | 2.0 | Salamanca | 2.4 |

Differences between established and new students, as owners and non-owners of PCs, in locations of use and frequency of use of ICT for studying, and ICT skill index differences.
2 skills (measured on the index of number of ICT applications that could be used alone) between PC owners and non-owners in both new and established students, and this appeared not to be significantly smaller in the more experienced students than in the new recruits, although both groups reported a gain in skills overall.

### 4.8 Conclusions

Reviewing the data we had collected from these new and established students at the seven partner universities it became clear that we could develop from them an ‘ICT Readiness Profile’ that could be used to map where individual students or whole universities stood with respect to others, and to an average or norm. This profile would contain a measure of skills, of ownership, of use in studies, of confidence and of attitude. Tables 4.7 and 4.8 show these profiles for new and established students at each university.

We believe that senior staff in universities could use these profiles to:
- record the changes in new students’ profiles and use this information to plan changes in use or provision of ICT;
- compare the mean values for all students in different years of their degree programmes to explore changes that take place, and try to measure impact of educational changes that have been put into place;
- carry out informal benchmarking of the students at their university to those at others, especially if

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**Table 4.7 Readiness Profiles of new students at each university**

<table>
<thead>
<tr>
<th>university</th>
<th>average ICT skill index</th>
<th>ICT important in career</th>
<th>frequent use of ICT in studies</th>
<th>confidence in using ICT in future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>5.0</td>
<td>69%</td>
<td>80%</td>
<td>61%</td>
</tr>
<tr>
<td>Bergen</td>
<td>4.8</td>
<td>64%</td>
<td>64%</td>
<td>49%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>5.6</td>
<td>90%</td>
<td>91%</td>
<td>77%</td>
</tr>
<tr>
<td>Groningen</td>
<td>5.8</td>
<td>67%</td>
<td>77%</td>
<td>76%</td>
</tr>
<tr>
<td>Pavia</td>
<td>4.2</td>
<td>79%</td>
<td>60%</td>
<td>74%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>4.4</td>
<td>59%</td>
<td>38%</td>
<td>59%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>4.6</td>
<td>88%</td>
<td>55%</td>
<td>64%</td>
</tr>
<tr>
<td>overall</td>
<td>5.1</td>
<td>78%</td>
<td>72%</td>
<td>69%</td>
</tr>
<tr>
<td>females</td>
<td>4.6</td>
<td>77%</td>
<td>69%</td>
<td>62%</td>
</tr>
<tr>
<td>males</td>
<td>6.0</td>
<td>79%</td>
<td>77%</td>
<td>81%</td>
</tr>
</tbody>
</table>

**Table 4.8 Readiness Profiles of established students at each university**

<table>
<thead>
<tr>
<th>university</th>
<th>average ICT skill index</th>
<th>ICT important in career</th>
<th>frequent use of ICT in studies</th>
<th>confidence in using ICT in future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>5.0</td>
<td>69%</td>
<td>89%</td>
<td>70%</td>
</tr>
<tr>
<td>Bergen</td>
<td>4.8</td>
<td>64%</td>
<td>67%</td>
<td>64%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>6.1</td>
<td>89%</td>
<td>89%</td>
<td>69%</td>
</tr>
<tr>
<td>Groningen</td>
<td>6.4</td>
<td>70%</td>
<td>65%</td>
<td>75%</td>
</tr>
<tr>
<td>Pavia</td>
<td>5.2</td>
<td>78%</td>
<td>59%</td>
<td>76%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>5.3</td>
<td>81%</td>
<td>71%</td>
<td>59%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>4.8</td>
<td>91%</td>
<td>38%</td>
<td>62%</td>
</tr>
<tr>
<td>overall</td>
<td>5.4</td>
<td>83%</td>
<td>57%</td>
<td>67%</td>
</tr>
<tr>
<td>females</td>
<td>4.9</td>
<td>82%</td>
<td>52%</td>
<td>60%</td>
</tr>
<tr>
<td>males</td>
<td>6.5</td>
<td>86%</td>
<td>64%</td>
<td>79%</td>
</tr>
</tbody>
</table>

ICT skill index: the average number of software applications that students self-assessed as being able to use alone for simple tasks.

ICT importance in career: percentage of students who rated ICT as either ‘very important’ or ‘important’ in their career.

Frequent use of ICT in studies: percentage of students who stated that they used ICT for studying either ‘daily’ or ‘2-3 times per week’, either at school (new) or university (established).

Confidence in using ICT in future: percentage of students who stated that they were either ‘very confident’ or ‘quite looking forward to’ using ICT in university (new) or career (established).
substantial exchanges or co-operations are planned;
• to demonstrate to employers and governments the
current state-of-play in their university with respect to
graduate ICT skills, knowledge and attitudes;
• to investigate policies and strategies designed to cope
with the groups of students who fall into the lower
portions of the profile.

In addition, we feel that at the opposite end of the ICT
skills process, an ‘ICT Readiness Profile-plus’ could be
devised that might act as a measure of progress of
students and graduates into new areas of ICT use. For
example, it might include such items as:
• more advanced uses of common softwares eg moving
data between applications, creating PDF files, creating
multipart documents and interactivity; digital literacy
skills such as search strategies and quality
assessment of returns;
• creation and maintenance of personal bibliographic
databases;
• creation of multimedia projects and presentations;
• ability to operate email from mobile equipment;
• experience with eLearning tools and study on-line
skills;
• use of Outlook or similar personal/group information
management tools.

We shall continue to work in this area to further develop
and test these profiles.
University of Groningen
5. VIEWS OF THE UNIVERSITIES

Summary
During the SEUSISS Project, we interviewed staff at various organisational levels in the partner universities. We wanted to map their policies, strategies and implementation efforts with respect to staff and student ICT skills in general and the use of ICT in teaching and learning in particular. To achieve this we interviewed university leaders, senior service managers, and technical and academic staff to determine their use of ICT in teaching and learning, research, and administration. In addition we asked about access to training and support in the use of ICT. Finally, we asked interviewees their opinions about the ICT skills of students entering university and the expectations of graduate employers.

There is a general belief that ICT will be used more frequently by staff and students in the future, but there is also concern about focussing purely on technology, in isolation from its pedagogical uses.

5.1 Background
In order to map the surveyed universities’ policies, strategies and implementation efforts in respect of staff and student ICT skills in general and the use of ICT in teaching and learning in particular, we carried out interviews with university leaders and senior service managers. To gain an understanding of the use of ICT in teaching and learning, research, and administration, we also conducted interviews with academic staff themselves. In addition, both management and academic staff were asked about access to training and support in the use of ICT. Finally, we asked them their opinions about the ICT skills of students entering their university and the expectations of graduate employers.

Academic staff are, to a certain extent, comfortable about their own ICT skills. However, issues of confidence, age, gender, and subject area apply to staff as much as they do to students, and they need to be taken into account when considering interactions with students and staff in their own departments, and with technical support staff. Most organised staff training in ICT is related to the office applications most frequently used by staff and students. Self-training and support by friends and family are the most common ways of acquiring skills. Opinions differ about certification of ICT skills for students or staff via the ECDL or its equivalent.

Most universities now understand that the sound pedagogical use of ICT is as important as mastering the tools and applications themselves. Trends in the use of ICT in education include: the use of ICT for presentation and demonstrations in the classroom (a continuation of the traditional overhead, but with added multimedia contents and animations); using it as a tool in problem solving (examples include statistics software, simulation software and specialized search engines); and the employment of large Learning Management Systems (LMS). The last in particular is seen as the future means of publishing information and making course material available on the Web, as well as facilitating communication; it is also part of strategies to offer distance-learning programmes.

The interview pro formas in English are in Appendix E. A number of themes emerged from these interviews under the following headings:

- University and Faculty policies on ICT skills;
- University and Faculty policies on ICT skills for students;
- Academic staff skills in ICT;
- In-service training in ICT;
- ICT in education;
- Opinions about future developments in ICT.

5.2 University and Faculty Policies on ICT Skills
Few of the universities have a written, explicit central policy or strategy towards ICT skills for staff or students, except for Groningen and Bergen. There is, however, a general recognition that, as a senior leader stated, “Staff and students need to be able to function in a modern
society and this means possessing the ability to take advantage of ICT tools for both work and learning." Another added, "ICT should not be considered as an aim, but as a tool for the transformation and transmission of information in more interactive learning environment." However, for most it is unclear: "What sort of policy should a university have for ICT skills for students? Should it be integrated with curriculum or stand-alone generic courses? Which works best from the student perspective and from the employer perspective?"

Those universities without explicit policies also have good facilities and promote innovation; in other words, their actions point to an implicit policy of some kind. It is, furthermore, the faculties that have the final say in how best to develop staff and student skills, although sometimes there are central provisions on which they may draw. In particular, the responsibility for the curriculum lies with the faculties, and so it is natural that the responsibility for developing students’ ICT skills lies with them as well.

The University of Groningen is one of those with a central ICT policy, having decided in 2000 to introduce the Blackboard learning management system. A central group took care of the technical implementation and management of the Blackboard system and started the training of specialist teachers, some of whom would become coordinators for Blackboard in their faculty. Extra funds and technical and pedagogical support was provided to those faculties that decided to use it.

The University of Bergen Senate created in 2002 an ICT strategy committee with a mandate to develop a draft ICT strategy for the university for 2003-06. The committee’s December 2002 report, ‘Standardising and Cooperation’ (www.uib.no/it/dok/strategi/IKT-strategides.htm), deals with nine different themes. Its overall objectives are that Bergen should have ICT services oriented towards cost efficiency, user friendliness and stable joint services in order to provide staff and students with the tools they need in their research and study. The importance of heightening ICT competencies among staff is mentioned. Also emphasized is that the university needs meeting places for the sharing of experience in order to ensure that, for example, new projects can choose the right tool for the right task. When it comes to particular subjects and specialized software, each researcher has an obligation to manage his or her own ICT tools; it is an important management responsibility to ensure that users have sufficient skills to use various systems in the best way. Further, it could be necessary to require both staff and students to take mandatory courses to ensure a minimum of ICT skills. For example, the psychology faculty aims to have all staff and students take the ECDL and then intends to reduce support for all skills covered by the ECDL. Few of the staff we interviewed in Bergen knew about the university strategy, but interviewees believed that national university reform in Norway (Kvalitets reformen) would have an impact on ICT strategies.

Poitiers University initiated its ICT training plan for non-academic staff in 2002 and began academic staff training towards the end of the year. All faculties are equipping themselves with new PCs and have at least one computer room. These rooms are mainly free-access, but prior booking is required. In some faculties, some computer rooms are reserved for specific groups of students. Teacher offices are progressively being equipped with PCs.

Initiatives in ICT and computer literacy at the University of Pavia are driven by Italian and EU policy on the one hand and by stiff competition with universities in nearby Milan on the other. Pavia has thus been relatively quick in implementing several ICT projects, with funding coming from the Lombardy region, Italian state and EU sources. These started with the 1984 PAIDEIA project, which resulted in computer rooms being set up in each faculty and the engagement of technical staff to offer ICT support and training to students.

Recent Italian university reforms (1999-2001), designed to align Italian university education with that of other European countries, have seen the implementation and improvement of numerous ICT-based services aimed at modernising universities and improving services to students. Previously, ICT initiatives of various kinds (online registration for exams, bulletin boards, course websites, and the development of some ICT facilities) were handled by faculties or departments individually, but now more and more university-wide implementation of central ICT policy is taking place. This includes: the
introduction of ECDL courses for all students; the engagement of graduate technical staff specializing in eLearning; and the future implementation of an eLearning platform and central support unit for eLearning services.

Edinburgh has been collecting data on student ICT skills for 10 years as part of its ICT Literacy programme. Staff and students have free access to all self-teaching documentation about the use of common software, and can attend free training courses. In 1998 the central Media & Learning Technology Service was set up to provide support for e-learning across the university. It now provides (and maintains jointly with the Computing Service) VLEs, on-line discussion forums and on-line assessment systems, as well as building websites with interactive materials for classes. Training is offered for new students and staff members in the first term as part of the ‘Freshers programme’. At present, Edinburgh is revising its strategy for eLearning to build on the work done so far in ICT literacy.

The University of Salamanca considers ICT policy of great importance, but ICT has not yet been fully integrated into its teaching. This is in part because of an inadequate environment and insufficient teacher training related to a lack of proper infrastructure. As part of the university’s strategy, a virtual learning environment, EUDORED (http://www3.usal.es/eudored/), has been introduced, enabling teachers to make available the documents relating to their subjects. To date, only 65 teachers have taken part in the project, but it is expected that the majority will be using EURORED in the near future.

In 2001 Åbo received funding from Finland’s Virtuella Universitet (www.virtuaaliyliopisto.fi) and began systematic work on the development of net-based teaching. The management of Åbo Akademi then developed a strategy and organization roadmap for ‘virtualization’. Several areas within the Akademi have already been using course homepages in teaching for some years, and some have mailing lists and e-learning systems to support interactivity.

5.3 University and Faculty Policies on ICT Skills for Students

Every university leader felt that students should use digital technology as part of the learning process, as a tool for knowledge management, as a tool for finding resources on the Internet, as a library service system and as a help aid or learning tool in various subject areas. Students also have to be able to present written assignments using word processing tools. One senior staff member from Bergen stressed that “ICT skills are a fundamental prerequisite to, and need to be part of, their university education”. Students should have electronic access to all relevant information about study programmes and individual courses.

There are two different models of ICT training in operation in the seven universities, sometimes at the level of the university and sometimes only in specific faculties. These models are:

- Self-study by students on their own initiative; and
- Generic or specific ICT skills courses, including ECDL

At Groningen, the general opinion is that students should acquire skills in the use of the main productivity tools (word processing, spreadsheet, and presentation) and be able to use specialist software for their intended profession. The faculties have responsibility for this, and also have to evaluate students’ skills. All faculties organise software courses; in most, the relevant software is housed on an intranet and is an integral part of the curriculum. Many students already know how to use standard productivity software when they enter university; in first year a compensatory programme is usually offered for those who lack these skills. The university computer centre offers a wide range of courses each year at low cost. There are also plans to provide the European Computer Driving Licence in some faculties, as the need for international ICT certificates will gradually grow. Until now the impression has been that most employers are not interested in such certificates; ICT is an integral part of the university education of employees, and this appears to be satisfactory to most employers.

At Salamanca there are two opposing opinions with respect to student ICT skills. While some consider students to be well prepared for the use of ICT at university, others think that this belief is not well founded. Consequently, the university offers courses in word-processing, graphics programs, web browsers, e-mail, etc. to its students, in the form of extracurricular activities for which they receive a university certificate.
At Pavia there had until recently been no formal expectation in terms of ICT skills of new undergraduates, either at university or faculty level. From 2002-03, students will undergo four of the seven modules and tests of the full ECDL (start level). Students from some faculties learn ICT skills in their degree courses and regularly use basic and advanced software packages. Students from other faculties could in theory go through their entire university career without using a computer until they need to write their thesis. This is, however, increasingly unlikely. Lessons on software packages are given in some faculties and departments, while in others students are expected to learn (on their own or from computer room technicians) at least what is necessary to write their thesis. Lessons on basic software packages are increasingly held as part of the growing ECDL package.

At Edinburgh, students are taught how to use subject-specific software but generally are expected to acquire skills with standard productivity tools themselves. Many arrive with adequate skills, and those who do not usually teach themselves using study documentation or by attending free courses. There appears to be little problem with skills like word processing, email and the Web, but others are more problematic (for example, use of spreadsheets and presentation managers). The emergence of personal development portfolios for students in the UK is seen as important, and may become mandatory for universities over the next five years. These contain ICT skills alongside ‘people skills’. Edinburgh University now needs to decide how best to let students know what level they have achieved in all of their ICT skills, and how to help them acquire skills they want but might otherwise miss out on (e.g., spreadsheets are not used in many humanities courses).

Internet access is seen as more and more important in Bergen, which has led to the university negotiating favourable broadband agreements with one of the leading broadband ISPs in Norway. Wireless connection to the university is also available for free to students who have the right equipment and are within range of the transmitters.

Technical Support Staff at Bergen:

Students want to use the new communication technology but sometimes the teachers do not allow it or do not like it. For example, the students want to submit their assignments through e-mail, but the teacher wants to have them printed the old way.

Disability Office at Edinburgh:
Legislation in the UK says that people should be treated equitably and the University of Edinburgh has a commitment to equal access. ICT can be an enabler or a barrier for disadvantaged students but if they are depending on ICT it needs to work properly which raises technical and cost issues.

Faculty Computing Officer at Edinburgh:
The most problems we have are with 18-year-old school leavers who don’t want to admit they have difficulty; I think the reason has been a lack of a PC to practice on.

Technical Support Staff at Edinburgh with 7 labs & 1000 machines:
More women come to our training tutorials than men; men expect to be able to make technology work, but for women it’s okay to be puzzled. We have the impression that mature students are less confident, but we don’t see postgraduates; we are less aware of having questions from them.

Women contact the Help Desk at the last minute, while men bring complex technological questions. Where there is a demand for things that we as a service don’t do at the moment, e.g. help to build a web page, we will plan to introduce it the following term. We need to provide a service that reflects demand, but the kind of support the student looks for is often a result of group peer pressure, e.g. feeling they need to use a complicated graphics package, and you have an image that women are more competitive about this. Sometimes there is an “academic push”, for example from Medicine with VLEs and websites; in particular, there is a demand for statistics support, which we find a challenge to meet.

By and large, students are resistant to learning materials, as they would rather have a person to help. A typical student would look for support first in the labs and then go the rounds looking for help. There are several points
in the library where they could ask for help, so we may be a last resort.

We have seen an explosion in the use of email and the Internet; in general, the students ‘know it all’, since there has been a growth in access at home and school, and they learn from fellow students. Students are learning ‘on the fly’ and by themselves, i.e. self-teaching rather than through courses. They expect the support staff to be experts on everything.

Technical Support Staff at Salamanca:
Most students use the time available for free practice on university computers to surf the Internet; some technicians see this as “recreation”. In some classrooms they have even tried suspending access to the network to restrict computer use to the programs or packages used in class by the professor. The result has been that the classrooms remain practically empty.

Others argue that you cannot distinguish between public use and private use of university computers. Technicians themselves have trained themselves by working and studying day after day so that they know how to use a computer beyond its specific formal function. They believe that students will begin to lose their fear of computers by using them informally, and will acquire new knowledge. In this way, they will be discovering their potential.

5.4 ICT Skills of Academic Staff
The ubiquity of PCs in offices has left most academic staff comfortable with the most common ICT tools and applications. For example, Poitiers reports that even though not all academics use ICT in their teaching, most use ICT to prepare their lectures. They use the Internet to research a topic, word processors to write papers and in some cases presentation software to make presentations. Word processors, e-mail, presentation software, spreadsheets and Internet browsers, along with more profession- and subject-specific software (e.g. statistics software, compilers, simulators and special research databases) now seem to be an integral part of the daily activities of academic staff. Not all academic staff are experts in every type of software (e.g. not all can set up an e-mail account), but in general they know the basic functions (e.g. how to send an attachment, change the font in a document, etc.). The survey shows that academic staff members, as well as having computers at work, often have computers with Internet connections at home. This was true for all academic staff members interviewed at Åbo Akademi. A comprehensive survey at the University of Bergen in 2002 showed that there are only a few staff members who do not use ICT tools in their daily activities (1.6%).

Across all the universities in our study, many staff members were self-trained in ICT use or had learned from colleagues; their universities had not yet trained them to use ICT tools, even though training is generally available (see next section). Some were unaware of university ICT courses and the help available. When asked, most academic staff declared that training would be appreciated, especially if it was aimed at their actual needs. Unfortunately, there is little evidence that most academic staff attend training courses.

One senior staff member identified two aspects of the skills required by academic staff: basic technical skills in the use of ICT tools and applications; and the use of ICT in knowledge management. As ICT is a key tool for management and sharing of knowledge among academics, it is part of the backbone of our competence. He also argued that academics have to be critical users of information, using ICT both to access and, equally importantly, to filter information. The role of the university in society includes knowledge sharing and knowledge filtering, and ICT is certainly valuable in these tasks.

A survey from Groningen shows that a small group of teachers use web authoring software or graphics applications frequently. The rise in course websites in all the universities studied shows that some staff also know how to use this kind of software. Åbo Akademi has taken this into account, and now provides a course (TieVie) for teachers who wish to start virtual courses. (www.abo.fi/virtuellauniversitetet/personalutbildning/tieviekurs_2002_2003.htm)

Concern was expressed at Edinburgh that skill limitations among academic staff may inhibit change. The lack of sufficient pro-active support is also a concern; one frequent user of ICT said that the main obstacle in making better use of it was finding time to keep up with the latest innovations. A staff member at Åbo expressed similar
worries, and one at Bergen said he was concerned that
too much time was spent dealing with ICT instead of with
his own subject.
SEUSISS researchers at Salamanca identified a
generation gap – younger teachers as a rule are better
prepared to use ICT than their older colleagues. Almost
all interviewees agreed that nowadays a university teacher
should be well prepared in ICT use. Further, the area of
study is also decisive in determining the ICT skills of
teachers: for example, in the humanities teachers and
students would be less well trained in ICT use than those
of the natural and technical sciences.

While members of staff at Pavia were all competent in
the use of the general and specialized software essential
to tasks in their academic field, skill and confidence in
the use of ICT in teaching was less uniform, being
influenced on the one hand by how much encouragement
and support staff members get from their faculty or
department, and on the other by their own experience.
Differences in use of ICT in teaching appeared to depend
on faculty but not on sex or age. Most teachers make
consistent use of Internet and presentation software. One
particularly important observation was the extent to which
teachers do or would like to rely on ICT for the production
of images to complement teaching materials. Many
teachers in the sciences use images extensively in
teaching. Obstacles to their wider distribution as part of
e-learning materials include copyright and download
times.

Those who use ICT are highly self-motivated and self-
trained (both factors of course being related), and often
belong to a discipline that lends itself nicely to ICT (e.g.
Genetics at Edinburgh extensively uses ICT for
calculations, reporting and presenting results, interactive
tutorials, etc.). Furthermore, it seems that the level of a
staff member’s ICT skills is related to their use of ICT in
research, administration, and preparation for lectures, less
to its use in lectures themselves (other than slides and
projectors). Staff ICT skills are related to personal office
applications and to some extent web authoring and
 graphics software, not to using ICT in a directly
educational way. More and more academic staff are using
ICT, which in itself will improve their ICT skills, but some
are being left behind, and programmes are needed to
address this. The most frequent users are self-trained
and are helping their colleagues in various ways
(arranging courses, providing ad-hoc help, etc).
Increasing the pool of skilled staff who can informally help
others may be the most effective way of increasing skills
across the board, as it uses the ‘local expert’ approach
that has been shown to be effective in other settings.

Academic staff from Åbo:
People are starting to realize the importance of ICT
competency and the fact that there are other things to
search for on the Internet that you’ll find with the
same automatic search engine. The library has access
to several thousand e-magazines and virtual libraries as
groups of reference databases.

There are endless opportunities: scientific documents on
the Internet in various formats; less copying of paper;
dissemination of messages is much easier; one gets new
information faster; the technical part of dealing with and
analyzing data is faster. It’s easier on virtual courses to
get in contact with shy students.

The obstacles are more economic than technical or
pedagogical. Since I also take care of administrative
tasks, I have too little time to keep up-to-date. There
should be full time pedagogic specialists in libraries.

We should not let the means become more important
than the ends. For example, it sometimes takes too much
time to do a PowerPoint presentation, so in that case it is
better to use overheads. There is also a risk that students
will expect to find all necessary information on the Internet.
Students are losing their grip on reading long texts,
otherwise known as books.

5.5 Training in ICT
Most organized training is related to the office applications
most frequently used by staff and students. At Groningen
the University Computer Centre provides training in the
standard software used by staff, including office
applications, compilers, etc. More specialized training is
provided by the faculty, or, when a completely new
package is implemented, by the company selling the
software or the staff member who took the initiative to
buy it.

The system at Åbo Akademi seems to work well. Courses
in the most common software are available at all times, and the supply of courses is constantly monitored by the Computing Centre and the Centre for Continuing Education. Courses mainly cover the most common software (in the spring of 2003, for example, they include Advanced Word, Beginners FrontPage, and Beginners PowerPoint; each course has 9-12 lectures). Planning staff are also considering running courses in more scientific software, such as LaTeX and MatLab.

Bergen has courses in Windows, office applications and the Web for both students and staff, along with special courses for new academic staff that try to integrate ICT and teaching. The university pedagogy course offered by the Programme for Learning Research is one example. All new academic staff must take this course, which includes units on ICT skills and on ICT in teaching and learning, unless they can document similar education.

Poitiers has no university policy on ICT training at the moment; at staff level there are experimental programmes but no institutional ones. A new structure was created this year with the objective of developing ICT in teacher training. The official scheme will start in the next academic year, but some teachers have already received training related to specific needs or projects.

Staff ICT training at Salamanca is voluntary, so there is little incentive to attend for teachers who already use ICT, but there is significant demand for the courses on offer among others. The university offers courses for students on word-processing, graphics programs, web browsers, e-mail, etc., in the form of extracurricular activities for which they receive a certificate.

There are no ICT courses for academic staff at Pavia, although administrative staff are trained in the use of professional software packages. Academic staff are expected to possess or acquire the necessary ICT skills, although these are not a deciding factor in employment. Most teachers are using ICT in teaching on their own initiative and with some encouragement and support from their departments, but not yet the kind of consistent support that would be required for advanced use. Those who do make advanced use of ICT and computers in teaching are in fields where the technical know-how to produce teaching products and systems stems from their own discipline. A survey of 30 academic staff at Pavia showed that they learn ICT and computer applications on their own from manuals, as well as learning from friends and colleagues. Some teachers mentioned that they would appreciate courses on applications that they know are important but cannot learn on their own.

At Edinburgh, one interviewee pointed out, there is no structured matching of staff training to staff needs: members of staff decide for themselves which training courses to attend. Many people won’t “potter about” with training that has no specific use, so will not be aware of the possibilities. In general, academic staff – at Edinburgh and elsewhere – do not take training courses, which are usually not compulsory, so keeping their skills up-to-date over long careers is a challenge.

**Typical statements from four academic staff members:**

**Lecturer One:**
I have good skills in ICT. I am adventurous, confident, a fixer, and will help others. Unusually for a woman I like to play games on my computer. I am hands-on and want to try everything. I use my computer everyday; when travelling it's useful. For young students from overseas where English is not their mother tongue, it’s more convenient, as they can spell-check. This new generation sees ICT as supporting them; however, it increases my workload if I put students on (for example) TeamWave. We are encouraged to put teaching material for students online, but I think it’s not necessary if they come to class. Presentation skills are important for selling ideas, image, networking skills. The Internet is very important: checking from the Web, then going to the library; search engines get results more efficiently than a library search. I use image software at home for digital photos, and would like to take a course to use Photoshop, but don't have time.

**Lecturer Two:**
I have poor skills in ICT, although on reflection I sometimes tell colleagues what to do in this area. The problem is that I work in a department where there are some very confident male members of staff and would never speak to the clued-up male. I am not confident to talk about ICT and am particularly wary of talking about it to men. I know that the university is keen on VLEs and that I should be more involved, but I'm not ecstatic about this, and am focussing on my research and teaching. I use IT as a
way of communicating with people overseas and working with colleagues, for my own networking, and with family abroad. I think the students know how to do bibliographic searches, but I have to check that the books are there for them to use, and use the inter-library loan for this. If I engage with ICT then I would turn to the (female) computing officer for know-how and possibly one female colleague for educational and academic support. I personally would employ somebody to do tasks involving IT, e.g. to do a mail merge, because I don’t have the skills but would know what was required. I could plan it. I think that students are clued up to ICT and I would be too if I was 10 years younger.

Lecturer Three:
I am no longer in the forefront of ICT use, but find email particularly useful. I’m a ‘blackboard teacher’ and would need to have a motive to use ICT. Other lecturers have notes in PowerPoint form, and I would consider doing the same, but I don’t like the passivity it creates; I have my own teaching style which is ‘active’, and find writing on a board more dynamic. If I was building a website I would ask the Media and Learning Technology Service to help, but to do something educational would ask the computing officer or the person who jointly runs my course.

Lecturer 4:
I use ICT in my preparation more than directly in my teaching in front of the students. When we use ICT it is because we want to get new ideas of how we can use ICT in teaching. I use ICT with projector in brainstorming sessions because I think that is better than the blackboard. And presentation software. I have bad handwriting so I have to use ICT!

5.6 Certification of ICT Skills
While there is no real opposition to the European Computer Driving Licence, most interviewees doubted its practical value. Opinions differed about the value of an ICT certificate for staff. One interviewee said that she would appreciate staff ICT certification, because it would be useful when securing her next position at the end of a short-term contract; her university staff development programme doesn’t give out certificates.

Bergen became a certified test centre for the ECDL (Datakortet in Norwegian) in 2001. As such, all of its employees have the opportunity to take the ECDL, and some faculties allow students to take part, or even make it mandatory. Some faculties have even hinted that they will require that all staff (and possibly students) gain this certificate or document similar skills in order to continue receiving help from ICT support personnel. Certification of this kind will help staff and students take personal responsibility for their own installations, backup, security, virus protection, etc., and to do networking related tasks. This will both empower users and allow IT personnel to focus their resources on critical issues.

Poitiers plans to implement the European Computing Driving License for students shortly. Pavia’s policy is to equip most undergraduates with a recognised basic level of ICT competence, and all are now required to follow ECDL courses; ECDL courses for new undergraduates started at the beginning of March 2002. Edinburgh’s Computing Service has looked at ECDL, but at present there is little support from academic staff for its introduction – nor do employers appear to want it, as far as can be discerned from their feedback to the university Careers Service or faculties.

In the UK higher education there is currently an interest in the development of student portfolios that can be used by students to record their skills and achievements for later use when seeking employment (see for example www.nottingham.ac.uk/padshe and www.internet-pars.ac.uk). Some Schools in the University of Edinburgh are piloting portfolios and these can be found at URL. For students to be able to build such records they need ‘competence descriptors’ at the right levels, and perhaps also self-tests that they can use if the skills they wish to document are not developed directly as part of their degree programmes. Such personal portfolios might be a substitute for generic tests like ECDL in accreditation of skills for graduates, and of course, can easily be updated to keep pace with changing technologies.

Some interviewees feared that the ECDL would increase costs for both universities and students. One was concerned that there is no pedagogical aspect to the ECDL, and that there should be an educational ICT certificate. Another asked, “Is it really relevant to academic work or targeted at employers?” Finally, a
lecturer from Åbo joked that, rather than the ECDL, students should have "a certificate that they have walked in the woods, smelled the flowers, talked with their pals, laughed and cried together".

5.7 ICT in Education
Most universities understand that sound pedagogical use of ICT is important, rather than simply mastery of ICT tools and applications. At the government level this is also understood, and policies recognise that the educational use of ICT should be based on sound pedagogical principles.

The use of ICT in education can be classified in various ways:
- Using ICT for presentations and demonstrations in the classroom;
- Using ICT as a tool in problem-solving; and
- The use of large Learning Management Systems (LMSs).

Using ICT for presentations is a continuation of the traditional overhead, but with added multimedia content and animations. ICT as a task-solving tool includes statistics software, simulation software and specialized search engines. The employment of LMSs and course portals is seen as a means of publishing information and making course material available on the Web, as well as facilitating communication, but is also part of strategies to offer distance learning programmes.

Even though we can find these ingredients in our participating universities, there are similarities and differences. All universities have websites with links to units and research centres. Some course portals provide only basic information, while others are updated frequently and incorporate tools for facilitating interactivity and communication between teacher and student, and among students (e.g. a discussion forum).

LMSs have been deployed to various extents both between and within universities. At Bergen, different faculties and departments use different LMSs; some are more learning software than management system. For example, some departments in the Faculty of Arts use KARK, an in-house learning and collaboration facility developed over many years, while the Faculty of Psychology uses LUVIT, an off-the-shelf product. The university is currently developing and testing a new student portal containing information that was previously spread among the different faculties and departments. Every student will have a personalised page within the portal (similar to the famous "My Netscape" page) containing information about all of his or her courses (curriculum, timetables, news etc.). In contrast, Groningen has run a pilot programme in which all participating faculties used the same LMS, Blackboard. A central group took care of the technical implementation and management of the LMS and the training of specialist teachers, some of whom became co-ordinators for the LMS in their faculty. A small group of teachers from all faculties tried the LMS in their courses, and training was offered to all teachers in the different faculties. All faculties have now appointed co-ordinators for this particular LMS. Local adaptation seems to be the key here, since it would be unpopular to force a new system on a unit that had invested years of development in a system of their own with which they were very satisfied.

Åbo uses two platforms, the more common one being Blackboard; its Centre of Continuing Education also uses Lotus Learning Space. One unit is also making increasing use of a multimedia server. Poitiers plans to widen the use of tools such as “Learning Space” and “Quick Place” and to offer technical and pedagogical training on these to teaching staff and students. It also plans to offer access to live and pre-recorded broadcasts of such events as conferences and round-tables.

Edinburgh University is developing a student portal to link all of its e-learning systems to its central university databases. It currently has four LMSs/VLEs in operation, two for specific faculties and two for the whole university. Hundreds of courses now using these, some presenting only basic course information and others having very advanced e-learning materials. Gradually, awareness is emerging about how to blend traditional learning and teaching with new methods, and research is providing insights into the best ways to achieve a successful blend. The University of Pavia has faced similar challenges of finding the right blend of old and new. University policy is to maintain the traditional classroom format in keeping with the ancient traditions of the university, and it is felt that replacing high quality face-to-face lessons with a
virtual environment would conflict with this image. It is generally felt that e-learning cannot be implemented without at least some face-to-face contact with teachers or tutors. But although the use of the Web for e-learning at Pavia has so far been limited, it is set to expand rapidly. The infrastructure, including an e-learning platform, is in place for course materials to go online in 2004. This is intended as a complement to, rather than a substitute for, face-to-face lessons. Teachers already often refer students to existing websites as part of their course reference materials. More advanced ICT applications such as video-conferencing, telelabs, forums and bulletin boards are to be used in specific projects.

5.8 The Future of ICT in Education

Looking to the future in Groningen:
We are working towards new ICT skills for staff in the field of ICT-mediated communications with students, online learning materials and computer-aided assessment with the help of Blackboard. During the implementation of the new Bachelors/Masters structure in education in the coming five years, we will look into open and distance learning and virtual mobility for students and staff. There have been some experiments with staff working at home and e-learning, but if students live near the university they want face-to-face interaction with students and teachers. Even if all materials and assignments are in a Blackboard course, students want lectures and working groups for social contact and the motivation to keep studying. E-learning often results in students dropping out; we know that from the results of open universities both in the Netherlands and abroad. Communication in e-learning platforms will only partly compensate for face-to-face teaching and learning.

When asking academic staff about possible future changes in their use of ICT, most found it difficult to envisage what could happen. One said that all he knew for sure was that he was going to use it even more, but that with ICT one could never know what comes next. On the practical level he hoped that there would be more wireless equipment and smaller devices that could replace large projectors and all the cables and sockets they need. Staff at all levels at Poitiers foresaw a change in teaching behaviour within the next decade, with the emergence of a new generation of teachers who will have received ICT training from secondary school onwards. Pavia staff envisaged that development would come from within; the fact that all courses will eventually go online also means that staff will inevitably get experience in the use of e-learning technology, even if this is not yet operational.

One Salamanca interviewee expected that in the near future students would have guaranteed access to ICT by means of their personal computers and the university’s Internet connection, allowing the student-teacher relationship to become more effective and rapid. Students will be more active in their participation, and in turn teachers will have a personalised approach. The tendency is towards an increasing number of teaching hours involving ICT.

Even a university such as Pavia, which has decided to maintain traditional face-to-face teaching, is planning an increase in the use of video-conferencing; not in the near future for teaching on the campus itself, but it will be used in several distance learning projects linking the outlying sections of the university from next year. There is a trend for building distance facilities for both staff and students: open and distance learning facilities like video-conferencing, on-line discussion forums, and virtual mobility for students and staff. There is also awareness that e-learning cannot fully replace face-to-face learning, and that the support and company available in a real environment are an important and positive aspect of traditional ways of teaching.

Edinburgh also expects to maintain a predominance of on-campus education for undergraduate and postgraduate students, although there will be greater use of distance education for professional development and some types of postgraduate degrees such as MBAs. Greater use of mobile devices is clearly on the horizon; the university’s new student portal will have direct output to student mobile phones and PDAs. More use will be made of existing software and hardware, and these will get easier to use and support. Almost all courses will have some form of on-line component, and students will become more skilled in using these for learning. Staff may find it hard to keep up for some time. Some developments, such as on-line exams and attendance rules, will require changes in university rules and
regulations, and these will take time and effort.

While there was a general belief among those we interviewed that ICT would be used more frequently in future by staff and students, there was also a concern about focussing on technology in isolation. A typical view from Groningen was that there is a growing need for ICT knowledge beyond mere skill in using software; we need ‘ICT literacy’, which is more than the skills measured by a digital driving licence. Students should be able to understand the basic concepts of ICT so that they are able to use new applications on their own or with only a little help, and to find new uses for ICT in solving problems. In all sectors of academic work the use of ICT is growing, from information seeking and producing to international co-operation with the help of the Internet and special software (e.g. a team operating on a patient with specialists in the US and the Netherlands connected via the Internet). Knowledge of ICT as both a tool of the trade and a means for communication and co-operation should be the goal.
University of Pavia
6. VIEWS OF THE EMPLOYERS

6.1 Background

An important component of the SEUSISS Project was to interview employers of university graduates to find out:
- the match or mismatch between the ICT skills of graduate recruits and organizational needs; and
- the future needs of companies with respect to ICT skills, which are of great interest to universities in helping to devise new training strategies for students.

Our aim was to interview a range of employers across the participating countries, using a pro forma to set the main areas for discussion while at the same time being sensitive to other questions and themes that might arise. The pro forma used in all cases is shown in Appendix E. Researchers at each location approached between twenty and thirty employers for interview, but success rates ranged from over fifty percent to as low as one in ten. Some workplace cultures – and perhaps national cultures – seem to be more receptive to participating in studies of this kind than others, and some employers appeared to be a little ‘suspicious’ of our motives. Both Bergen and Groningen conducted ten employer interviews; Åbo, Poitiers and Edinburgh did between 4 and 6; and Pavia and Salamanca were each able to convince only a few employers to take part, despite efforts as strong as those made in other locations. In the end we gathered a total of forty interviews and these are discussed here in overview.

The sizes of organizations sampled ranged from small local companies with 20-25 employees to global organizations with over a quarter of a million employees worldwide. They were drawn from the banking, IT services, retailing, manufacturing, education and government sectors, among others.

6.2 General Findings

What use do organizations that employ graduates make of ICT?

Organizations of all sizes use the standard office tools (Word, Excel, PowerPoint), e-mail and web browsers, although a few reported using non-Microsoft office software, and some have limitations on employee use of the Internet (for example, a company firewall). Medium
and larger organizations also rely on ICT for back-end operations, which are usually run from corporate databases using management tools such as SAP and Oracle. Larger companies increasingly use the Internet for business-to-business marketing and customer sales; smaller companies have budgetary and support constraints on how much business they can do through the company website.

Although most of the technical aspects of these ICT-based operations are managed and supported by specialist staff (in-house in the larger companies, external contractors for many smaller to medium companies), general staff in most organizations also use ICT routinely. Most graduates will find themselves working for companies whose use of ICT is already high and increasing.

A large Norwegian company with an international orientation:
The company uses ICT in consultancy, outsourcing, project integration, application maintenance, human resources, and financial solutions. To this it is adding: a greater presence in Internet-related business, to turn itself into an integral supplier of networks; the development of its own products for the economic and financial management of small and medium companies; information services; the management of strategic macro-projects; and engineering solutions.

A medium sized Finnish insurance company with a local orientation:
The company programs its own insurance systems. General office software consists of Microsoft Office, Microsoft Exchange, Web browsers and networking software. (Within ten years they plan to have abandoned all Microsoft software.) They make no use of video conferencing now, but it will be of great importance in the future. The company uses databases, data warehousing and knowledge management systems. Its website allows the normal customer transactions (in Finland today bills are normally paid and accounts managed over the Internet, even by ordinary people).

A small Spanish company employing a high percentage of graduates:
The company mainly uses ICT in its management unit, but also to “give better attention to our clients”. The role of the Internet in gathering information becomes more important every day. The company has a rapid turnover in technology, based on the exigencies of the market and client demands.

What is the match or mismatch at present between graduate intake ICT skills and organizational needs?
Almost all interviewees reported no major mismatch between their expectations and graduates’ abilities. Some, however, saw a difference between graduates’ views of their own ICT skills and their actual abilities when they came to use them: “There is a gap between new recruits’ knowledge and actual skills. They often experience difficulties when they have to put into practice their knowledge.” Mostly this related to presentation skills using programs such as PowerPoint, and to their understanding of databases, knowledge management and interactions between programs. Graduates did not always understand the underlying workings, structure and logic of ICT, as opposed to being able to use it.

Employers agreed that graduates quickly learn the skills they lack when recruited. Their university training also gives them the ability to find information quickly. One employer said that “universities are there to educate and not to train – I want people who can think and learn”. Another observed that “compared with non-university-graduated staff, the advantage is [graduates’] ability to find the necessary information and the way they have been trained to think.”

Two small specialist companies based in the UK:
Graduates have the IT skills needed, and show a marked difference over non-graduates; they are more accomplished, more comfortable writing macros for Excel, and so on. They also require a lot less in-house training, if any.

Another interviewee saw some mismatch between graduate IT skills and employer needs, but believes that universities exist ‘to educate, not train’. The company puts much effort into recruitment and communicating with potential staff before taking them on.

A large Norwegian business in the financial/banking
sector:
We need students with an holistic understanding of how things work, knowledge about structure and pedagogical insight. Most students today have good knowledge, good insight and understanding in relation to office and Internet applications, which is all good.

A small Finnish consultancy:
Graduates have good ICT skills and learn fast, although there is a lack of “knowledge management” thinking.

With respect to ICT, do employers expect graduates to arrive ‘ready for employment’ or do they expect to train them? Graduates are expected to arrive ‘ready for employment’ when it comes to standard office programs, and generally seem well equipped for this. “We don’t even talk about that, neither do we mention it in the recruiting ads. We take it for granted that people, when they come here, are able to work with the normal software; that is, Microsoft Office, e-mail, and the web. We don’t even ask them about it. We consider it self-evident.”

Large employers are prepared to train when necessary, since other qualities are more important to them when they recruit. They often have on-line materials for this purpose (i.e., e-training) as well as face-to-face courses. Smaller employers find providing such low-level training more difficult, as they lack dedicated training divisions, and so will either contract out their training or rely on informal peer support networks.

Employers expect to have to train graduates in the use of specialist software within the company, although some expressed a wish for universities to cover more specialist software and ICT skills in certain areas. The latter are often so task-specific, however, that they do not come into the ambit of university objectives or experience, at least where traditional degrees and diplomas in the humanities and social sciences are concerned.

A small consultancy in the UK:
Graduate recruits are not expected to be ready for employment: ‘that takes a few months,’ depending on their capabilities and whether they have learnt to think rather than been ‘trained’. It is taken for granted that they can use office productivity software, or can pick it up immediately; all of them will have been using computers for a number of years.

A multimedia publisher based near a northern Italian city:
The skills required of new graduate job candidates varied according to the profile of the job they were applying for. New graduate employees tend to arrive with the ICT skills expected by the company. Although it is assumed that new-graduates have basic ICT skills, and so receive no training in them from the company, it is probable that skills are passed on in an informal way between colleagues.

A corporate banking business with most of its employees based in Paris:
Twelve hundred of the company’s employees are IT specialists. Before the events of 11 September 2001 there were three waves of recruitment each year, but the subsequent recession meant that in 2002 there was only one hiring campaign. Forty to fifty percent of programming work, such as the production of Web graphics and code, is carried out under contract with outside companies. Some of these outside IT staff eventually end up being hired on a permanent basis by the company.

A telecom maintenance company with branches in southern Spain:
The company prefers graduates to arrive ready for employment with respect to ICT. This saves it money, and is one of the most important considerations at time of hiring. Graduates with technical and scientific backgrounds are well prepared in the use of ICT. Administrators also make good use of ICT, at least at the level of office applications: e-mail, databases, etc.

A leading UK food retailer:
Graduates generally have the basic IT skills required; it’s considered more important to match the interpersonal and leadership skills of students and provide the IT training as necessary. Graduates are trained on the use of the company’s own system, but are expected to have basic
Internet and word processing skills.

What in-house training do employers provide for ICT skills updating etc?
This varies a great deal, and is mostly a reflection of the size of the company: from small organizations (for example, an IT and management consultancy, or a property management firm) where staff members are expected to update their ICT skills on their own; to large organizations (such as banks and global retailers) where staff continuously take part in in-house training and updating programmes.

This medium sized Spanish firm exports goods to fifty countries:
The company sometimes uses external training in general ICT tools and provides internal training in a few cases. In such cases it organizes short intensive courses. E-training plays no role. Graduate-level employees are to a large extent expected to update their ICT skills on their own.

Over a quarter of this small Spanish company are graduates:
Every year the company organizes an advanced training course on office tools for its administrative personnel. Its technicians periodically undertake external advanced training courses. The company expects employees to maintain their ICT skills through such courses and the everyday use of computers.

This leading UK food retailer employs graduates for store management, corporate purchasing and strategic research:
The company IT department runs many IT workshops from basic to advanced skills. Employees also have access to computer-based training via the company intranet. Computer-based training is covered at the basic induction to the company, but recruits generally have to make best use of it themselves. Graduates are expected to be proactive in determining any training needs they have, including IT skills.

How have ICT-based methods of training (e-training) impacted on this provision?
In general, e-training has not been of great importance in many organizations, and traditional methods of training have remained dominant. There are exceptions, however, particularly in large national and international companies, which use substantial amounts of e-training in such areas as ICT skills and legal compliance issues. Once a large company moves in this direction and adopts e-training as company policy it is implemented widely.

Many companies spoke of making more use of e-training in the future, so there are signs that its relatively modest level of impact will change. The bigger the company, the clearer these signs of change tended to be.

A small specialist software company based in the UK:
E-training has had a limited impact, although staff use the Internet for research. Prompted by our line of questioning, our interviewee wondered why software engineering is not susceptible to e-training. Perhaps, he speculated, it’s ‘like living in a plumber’s house’; people who write software won’t use software in this way.

A large furniture construction firm with a branch based in France that distributes to over forty countries:
There is no e-learning at the moment, but the company is examining the possibility. There is not really an urgent need, as its in-house training is well-defined and individualized, and fully corresponds to employee needs and expectations. However, the company expects to set up one or two PC stations for training use in the year to come. These machines would be freely available for self-training, but employees will have to organize their workload to book a machine. Management will then assess the use of this e-learning facility to decide whether the in-house ICT training regime will change in the future.

A health products multinational with a branch in Italy:
Employees have access to e-learning courses – for example, on software packages important to their job.
The e-learning courses developed by the company for outside contractors are made available to its own employees. The company relies to a large extent on temporary external consultants to provide course content, and on undergraduates or masters students working temporarily within the company for routine content production tasks.

A large Scandinavian power supplier:
The company provides no training in the use of standard applications – only for specialized software. It contracts out its office training. E-training is used only in the executive/manager training programme. The company cooperates with a distance education firm to provide this over the Internet.

Do employers provide training in getting the most out of e-training, or do employees ‘work this out for themselves’?
For those companies that do not use e-training this has yet to become an issue. For those that do, only a few provide training to get the most from e-training; most assume that staff can use the materials provided to them. Some of the barriers to the use of e-training are a result of staff reluctance to use it. At present, much e-training is quite low-level, and not as sophisticated as university-based e-learning is becoming. Most focuses upon less-complex skills and is aimed at solo learners rather than groups.

A large multinational concerned with satellite production and based in Europe:
There is an in-house lab for self-trained language study, but employees do not at this stage have access to full instructional units from their individual workstations. They have access to databases, however, and more interactive material will no doubt be implemented in the near future.

A French corporate finance group with most employees based in Paris:
There is insufficient use of e-learning within the company, much less in fact than [in others] which have a long tradition of on-line training. For example, staff members were offered individual computers at a special low price last year, with the company subsidizing each purchase at the rate of almost seven thousand euro. Many employees took advantage of this offer, but less than ten percent of buyers chose the accompanying online training option.

To what extent do employers expect graduate-level employees to acquire their own ICT skills updating?
Training in most large organizations focuses on soft skills (teamwork, management), and many assume that, other than for specialist software, graduates will either acquire ICT skills or request training on their own initiative. Some, however, have systems of regular ICT skills review in place. Small companies are even more likely to rely on their employees’ own efforts to train themselves in basic ICT skills.

A group of companies in the Netherlands:
Four of the organizations have their staff undergo in-service training in ICT each year. The other six let their staff train as needed, or allow for self-study. Organizations pointed out that academically skilled members of staff like to explore new things themselves. They go to conferences or read articles, and apply to do further study as they see fit for carrying out a particular project or task.

A group of Norwegian companies:
As for whether training is voluntary or mandatory, there was again a difference between the smaller and larger companies. The largest company said that it was mandatory for all employees to go through an ICT competence program, while the smallest said that it was up to each individual, and that an e-learning system would mean too much overhead and work for it to be implemented.

A computer services company in Spain with international markets:
The company considers its employees to have superior knowledge of ICT. It looks for qualified personnel, but dedicates four percent of its budget to training activities.

Do employers think that accreditation or certification of general ICT skills is important, particularly pan-European schemes such as the European Computer Driv-
Only a minority of companies considered the ECDL necessary for their graduate recruits. Two main reasons were given for this:

- Graduates today generally have the requisite knowledge of and skills to use standard office tools, e-mail and the Internet. There appears to be little or no gap to fill with formal certification.
- University graduates learn quickly, so lack of particular ICT knowledge is only a temporary problem. Other qualities are more important to employers than graduate recruits' basic ICT skill set.

Not all agreed, however, and a few were using the ECDL or its equivalent in their own training, and expected staff to develop their skills using it. As mentioned in Chapter 5, Personal Development Portfolios (PDPs) might eventually bridge this gap in the UK.

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**A power supplier in Norway:**
Every form of documented formal competence is good; but I don’t know if the ECDL is the right thing. It depends heavily upon who takes it. For example, it is not a quality measure if one of the engineers had one, but for the office personnel I think perhaps it would be good.

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**A local, medium sized business in Finland:**
The European Computer Driving Licence courses are provided as basic material in this training. They have mandatory and voluntary courses within the ECDL programme. The company gives its employees three days of company time and expects them to use three days of their own time. Two thirds of its employees have completed the driver’s license course.

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**A small local UK firm:**
The European Computer Driving Licence is a ‘great idea’ as it provides a good focus and transferable skills between jobs. Being independent of brands, it would last longer than any particular software, allowing people to adapt to what is happening next.

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**A company that promotes internet shopping in Europe:**
A European Computer Driving Licence may be useful in the future, but is not something that this company would consider essential.

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**A view from Norway:**
One company has made the European Computer Driving Licence mandatory for its staff, and approved of any formal demonstration of competence. Three other companies provide their staff with the opportunity to take the ‘Datakortet’ (the Norwegian version of the ECDL), but said it was not mandatory and is not seen as the most important demonstration of ICT skill. The remaining six did not see generic certification as a good tool at all, but wanted, perhaps, to see some certification for more expert knowledge.

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What do employers expect to happen in terms of use of ICT in their organizations over the next five years, and the next ten years?

Most remarks about the expected changes within the next five to ten years were in the area of information management and communications. The importance of ICT-mediated communication within companies is growing rapidly with the widespread development of intranets, along with the need to know how to find information effectively on the Internet. In many companies the demand for and importance of web publishing skills and database content management is also growing.

The bigger the company, the more likely it is to have specialist staff for web publishing, whereas graduate recruits are more likely to take care of database handling and maintenance. In smaller companies graduates have to be able to take on a wider range of activities.

New patterns of ICT use, such as the wider adoption of handheld computers and mobile phones, will make understanding the bigger picture of ICT and the integration of various aspects more important, as well as an understanding of the technical possibilities. The latter applies predominantly to the more ICT-focussed companies at this stage, but will apply to most organizations over the next few years.

The prospect of increasing numbers of employees working from home and on the move is also on the horizon...
for major companies.

Size is unlikely to be the sole, or even the key, factor in whether a company uses ICT. The type of business-to-business (B2B) and -customers (B2C) that a company has may be a very strong determinant of the degree to which it uses a range of ICT tools. For example, the one-person company situated in a remote region doing business globally will turn readily to the internet and link this with back-office productivity tools, whereas the very large local government organisation dealing with mainly traditional local businesses and clients may be slow to convert its paper-based and face-to-face practices. However, there is some evidence that companies in general are slower to take up e-business than had been anticipated [6.1].

A UK view:
A large company suggested that use of ICT will increase dramatically over the next five to ten years, with greater use of the intranet, B2B, radio-wave technology and satellite navigation. The company will provide training for any new skills needed. However, a small specialist company looking ahead five to ten years said the use of ICT will be more important, but knowledge of its inner workings will become less important. Abstract skills will become more important than technical skills; skill sets will concentrate on business.

An insurance company in Finland:
Over the next five to ten years the importance of the company intranet will grow. IT tools are becoming simpler to use. Graduates need the ability to update their skills and to be aware of what’s happening in IT, as well as to know how to use the most common new programs.

A general Norwegian view:
When looking ahead at changes in the use of ICT by the company over the next 5-10 years, the more general visions for the long-term were: more networking, both as ‘culture’ and in terms of software and hardware; a greater emphasis on security (documents, viruses, encryption); and more use of the Internet and company intranet.

A Spanish computer services company:
In coming years, e-training will be fundamental in the processes of change in and transformation of the company. The linking of the company’s strategic processes with supporting processes of change in ICT will make e-training a key factor in the development of its employees and its business. A key element of the viability and effectiveness of e-training over conventional training is that in the latter the student must meet the objectives of the course, but in general these are insufficient to guarantee results under future conditions.

In the Netherlands:
Most (companies) found it almost impossible to foresee developments in ICT more than a few years ahead; they prefer universities to do the exploring and forecasting of ICT developments.

What changes in graduate ICT skills do employers think will be needed to keep pace with those changes?
All interviewees stated that graduates are able to learn and to adapt to new conditions quickly, and expect that they will continue to do so. The acquisition of new skills by graduates appears not to be a major cause for concern. However, as this is predicated on universities continuing to encourage ICT skills development in their students, there is always the potential for a future mismatch between the skills that universities instil in its students and those required by employers.

A general Dutch view:
Without exception all organizations expressed faith in universities to train students in the necessary skills that will be important in the near future.

Four organizations thought that graduates need more skill in specific tasks that are becoming necessary to carry out a job (e.g., programming in JAVA or using Oracle databases). Two employers stressed that students should learn not only how to handle programs and procedures but also the major concepts of ICT. Such concepts have their place in the broader context of a particular scientific field, ranging from social science (communication, presentation and ethics) to physics (data transfer and data
compiling); it is not desirable to disconnect ICT from its theoretical background. Contextual knowledge of ICT will enhance learning when staff members have to change from old applications to new ones. University students should learn how to co-operate when carrying out ICT-related tasks, and how to communicate solutions to others less skilled in ICT.

A Spanish computer services company:

In e-training, interest, motivation and a capacity for self-discipline are required, which better equips students to cope with the unknown.

A Finnish view:

When it comes to the technical knowledge of university graduates, one company would like to see more practical competency. Computing theory is the same today as in the 1980s, but graduates need to be more cunning when it comes to finding technical solutions in their everyday work.

Another interviewee said that graduate recruits need the courage to learn new programs and methods of using equipment. Physicists should master Visual Basic; 3D and CAD programs also have to be mastered, as their employees are handicapped without these. Databases will be a challenge.

It was also reported that graduates need the ability to update their skills and to be aware of what’s happening in IT, as well as to know how to use the most common new programs.

6.3 Views from Professional and Commercial Associations

To supplement our interviews with employers we conducted further research into opinions about graduate ICT skills using reports and position statements gathered from the websites of professional and employer organizations. In general, one might expect these groups and organisations to present a ‘meta-view’ or summary of their members’ views of the importance of graduate skills, including ICT, for those joining their profession or area of commerce. This meta-view could range from one of ‘no opinion’ to one of ‘prescription of standards’ depending both upon the degree of control or regulation of the profession by the association, and also its stance on the appropriateness of such detailed statements. Moreover, if such associations felt that universities were failing to supply graduate recruits with the right sorts or levels of skills, these concerns might also be present in their publicly available materials. Clearly, seeking such evidence only through the websites of these associations neglects all those that have no web-presence, although this lack in itself, is a statement of position with respect to ICT in the first decade of the 21st century! Those promoting themselves through use of ICT are clearly stating their view of its importance at least for publicity.

Although specific points about graduate ICT training were uncommon, those we found supported the general impressions that emerged from interviews.

United Kingdom

A recent report describes how the large UK hardware chain B&Q has found that “switching to e-learning has brought big improvements in performance. Stores using e-learning are achieving better results with higher levels of customer staff satisfaction.” However, it also sounded a note of caution: “When Icus, an international e-learning consultancy, polled 275 human-resources executives and asked them whether investment in e-learning had been a success in their companies, 45% said ‘no’.”

The British Medical Association points to the need among doctors for a range of ICT skills: in databases, computer graphics, spreadsheets, Internet searches, presentation software, and Web editing. It believes that “steps should be taken … to demonstrate the potential of IT to GPs – many of whom feel computer equipment is merely an expensive ‘toy’ for enthusiasts”.

The UK Law Society encourages the increased use of ICT in the legal profession, noting that “The employment tribunal system lags dramatically behind other Courts in the use of information and communication technologies (ICTs). Fax is the newest technology used in communicating with tribunals.”

The General Teaching Council for England believes that “further development opportunities to integrate ICT into professional [teaching] practice must be made available as a priority”, and sees a “critical role for teachers in partnership with the research community to offer the
expertise and build the capacity for classroom innovation and investigation of a digitally enabled education”. The Council sees “an urgent need for continuing investment at the ‘front-end’ of digitally enabled learning, ie, in teaching and teachers’ confidence and professional skills”.

ICT is clearly an area of direct relevance to the engineering profession, although neither the UK Institution of Structural Engineers’ An Institution for 2010 nor the Institution of Civil Engineers’ Skills for the Built Environment: Team Effort says anything specifically about ICT skills training.

Scandinavia
Norwegian professional organizations such as the law association, the dental association, the psychologists’ association and the social scientists’ labour union had little to say on their websites about training in the use of ICT, although the Norwegian medical association expressed some concern about continuing education in the area for medical practitioners. We also found no statements on the use of ICT on the sites of professional organizations in Finland (for example, the Association of Finnish Lawyers, Finnish Medical Association, Union of Professional Engineers, Finnish Union of University Professors, Trade Union of Education in Finland, Finnish Union of University Researchers and Teachers, and the Finnish Association of Graduate Engineers).

France
In general, professionals tend to think that the French educational system does not fully prepare students for the labour market. According to the MEDEF, the French Employers’ Federation, the transition between education and work is a source of difficulties for new employees. The initial orientation period upon employment can last up to a week depending on the size of the company. More and more companies are investing in in-house ICT training areas. Personnel can follow group training sessions, tailored sessions and even use such areas for self-training. This appears to be more time- and cost-effective for both employers and employees.

According to a report published in December 2000 by the French Chamber of Commerce and Industry (ACFCI), employers recognize that the lack of specific training in technical professions could be at the origin of a candidate shortage. The national education curriculum does not seem to be following technical evolution and does not fully correspond to companies’ needs. The MEDEF has indicated that business representatives are willing to participate in improving the curriculum so that technical and vocational teaching correspond to the actual needs of the market.

The French metal industry federation, UIMM, has already set up an educational guidance process open to both school-age students and adults. This programme is set to help students to discover the industrial world and the metal industry profession. In order to train new recruits and staff, other corporate groups have also created their own training centres: for example, the Centre de Formation de la Profession Bancaire for banking, and THALES Université for corporate and professional development for Thales employees.

Netherlands
Together with representatives of Dutch companies, the government of the Netherlands developed a national plan for innovation in service organizations and industries. The plan, ‘Competition with ICT competencies’, aims at bringing organizations and industry up to date over the period 2001-2005. Each year progress is evaluated and reported. The Netherlands has very good ICT infrastructure and knowledge centres, but ICT knowledge has not been implemented widely except in finance and ICT companies. Dutch companies and government are implementing four types of activities:

- Breakthrough projects in which practical research and theoretical research join forces to apply new technologies and applications;
- Knowledge networks in which companies and knowledge institutes work together to solve practical problems;
- Software development and training of ICT managers who can communicate and lead the implementation of ICT projects in companies; and
- National ICT meetings where those involved show their projects and explain progress to a broad audience.
Our surveys indicate that the Internet, e-commerce and e-business are the areas of ICT most interesting to Dutch companies (60%). Others are: network technology & ICT infrastructure (49%); Telecommunication & broadband, software & applications, and wireless systems & Bluetooth (33-34%); CRM/ERP, and computer systems & technical components (24-26%); security (21%); ICT services & training, and document, workflow & content management (17-18%); and Linux & Java solutions (12%).

Italy
Connections between industry and the universities in Italy are growing rapidly, but none of the sites of Italy’s professional bodies that we studied gave direct guidelines on ICT training.

Italy has many medical professional bodies, all of which appear to act independently. National policy on ICT in the medical profession permeates from government level through the ministry of research (MIUR), drawing on EU policy, and through regional government, who determine the funding of local projects. Areas of interest throughout the field include the use of online databases to centrally store and access data, e.g. in the case of multi-centre studies, and the use of diagnostic instruments connected to remote interfaces (telematics).

Engineering is also characterized by a diversity of professional associations representing different interest groups. However, there is far more active involvement of students in industry-initiated study experiences. But as in other professional areas, while there is concern about and development of ICT in engineering, finding single sources of concretely-worded objectives or national professional policy has not been possible.

Spain
The websites of Spanish professional organizations and associations show a lack of interest in ICT. Apart from those from education and social welfare fields (such as law, medical assistance), there were not many references to the opportunities that ICT can bring to practice in their field. At the most, they offer their members introductory courses in basic applications and website building. In some cases, such as the Press Association, ICT activities and the promotion of ICT use is only just beginning. Portal Point 2003 is an example of an international fair held in Barcelona providing information about recent issues on ICT and e-Commerce.

6.4 Issues and Challenges
Graduate ICT skills for the future
The major challenge for both employers and universities is to predict the ICT skill sets that graduates will need over the next ten years. Despite the high rate of change in technology in recent years, there appears to be a strong sense of ‘comfort’ with the current situation among employers and universities with respect to graduates, which could be summed up in the phrase “Microsoft Office, email and web browsers are enough, and graduates are okay with that”. The future appeared to most employers interviewed to be ‘more of the same’ with minor adjustments.

In reality this cannot be sufficient. Change affects all companies, including those we interviewed, and companies expect universities to keep ahead of these changes in their student training – ahead, even, of the companies themselves. As one employer said, ‘We expect graduates to come to us and tell us how to do things – to change us.’ This places a high level of expectation on graduates and on the universities that teach them.

We know that current university entrants are arriving with better skills and more confidence than they did five years ago, and are in some respects in advance of graduates leaving now. Given this, a major question for universities must be how to provide a modern education that enables students to develop their nascent skills and knowledge of ICT, which may already be in advance of that of many staff in the university, and may be beyond what universities can provide the physical resources or specific training to satisfy.

A clear example here is the trend towards mobile working and communications. How will universities support their students to become confident users of ICT ‘on the move’, given most universities’ fixed and rather traditional way of working? Other examples are improving familiarity with knowledge-management systems, which are already
many and varied in character, and giving student access to desktop video-conferencing, which is currently beyond the resources of most universities.

Employers place great value on ‘soft skills’, and often recruit non-specialist and specialist graduates alike on the basis of these attributes; for example, customer-focused companies choose graduates on the basis of their people and teamwork skills. In the working world of the future, ICT will be at the heart of these transversal (transferable) skills: for example, electronic teamwork using collaborative working tools, communications via online conferencing, and presentation skills in relation to digital productions. How will universities ensure that they can prepare students to use and understand the value of these tools?

**ICT skills and e-learning skills**

One area that was relatively low-priority at present for most employers interviewed, but which is likely to increase significantly in importance, is that of e-learning in personal and professional development. Major companies are investing strongly now, and demand for materials outstrips supply in some countries. Many universities are experimenting with e-learning for their CPE (Continuing Personal Education) and CPD (Continuing Professional Development) groups, as well as within main degree programmes.

The skills needed to learn efficiently in e-learning are not identical to those needed in traditional learning, and universities will have to ensure that students have ‘learning to e-learn’ skills within their curricula, whatever subjects they study. Given the nature of education (as opposed to training), universities are well placed to do this. As more graduates leave universities proficient in e-learning, they can use their skills to help develop high quality e-learning rather than e-training in their workplaces. This is particularly true of those subjects where process is more important than content.

Universities should also play a role in raising awareness among students of their own personal level of ICT skill, if only to improve students’ confidence when approaching a difficult job market. Employers take for granted that students will arrive with certain skills (the use of standard office productivity tools, for example) because their experience of past graduate recruits has shown them that this is indeed the case. There is evidence that many students have been given better skills, including ICT skills, by their studies than they may realise, and should be made aware of this [6.2].

Case studies of a sample of the interviews we conducted with employers are presented in Appendix A.
University of Poitiers
7. CONCLUSIONS

If European universities are to support their students in the development of appropriate ICT skills, they need to:

- know the ICT skills, knowledge and attitudes possessed by their new and existing students
- be able to compare their own university’s ICT skills development processes to those of others
- be aware of what skills their graduates leave with and how these match up to employers’ needs now and in the future
- be conscious of their own university’s outputs in the context of European and world developments in graduate ICT skills
- ensure that their staff are aware of university objectives and initiatives regarding student ICT skills, so that they can align their activities to promote these

The SEUSISS Project was designed to provide European universities with some of the information and tools necessary for them to be able to address the issues listed above. It has provided:

- multilingual survey instruments to gather comparable data from students and staff in universities, and from employers
- baseline measures of the ICT skills of students at seven similar European universities
- strategic views from senior managers and academic staff at those universities, and from employers of their graduates
- the background to relate these views to the wider context in each of the seven countries

We have developed and tested our surveys with several thousand students in the partner universities, and consider that these are useful tools that could now be used more widely to provide data from students at different types of higher education institutions and in other countries to extend the baseline information about student ICT skills in Europe. Their partial use in two other projects give us additional evidence of this wider applicability.

Using these tools we feel confident in drawing the following broad conclusions from our study:

**Students**

We found some clear similarities between students at all the universities. They were mostly young adults, studying full time, with more females than males, data typical of these universities. Ownership of PCs and ancillary equipment (including internet access) was high amongst both new and established students, and they had good ICT skills, as measured by the number of ICT applications that they reported they could use unassisted (we did not attempt to assess their competences ourselves). Almost all students could handle wordprocessors, web browsers, email and chat. New students had less experience than established students with presentation managers (e.g., PowerPoint) and bibliographic databases, suggesting that they do acquire these skills during their courses.

The main sources of help and support for ICT skills development of both new and established students were friends and family, followed by self-tuition. Most students thought that there was rather little integration of ICT skills development in their courses, irrespective of the number of ICT courses available or the extent to which integration was stated to be the university ICT skills strategy.

ICT was seen as important for future career by the great majority of students, those nearing graduation as well as those just leaving school. Near graduates were confident about their ability to cope with this, and new students about their ability to cope with ICT in their studies. In fact, use of ICT in university courses was quite high for many students, with 26% reporting daily use and 47% 1-3 times weekly use on average. This was a much higher use than was reported by most new students to be the case in their schools.

Owning a PC was strongly associated with self-assessed skills, confidence and frequency of use of ICT in studies, and the minority of students without PCs appeared to be significantly disadvantaged in these respects. Where on-campus provision of ICT was good, they compensated by using this equipment more, but where it was less adequate they were less frequent users and had to seek other PC sites such as cybercafes.

Overall, females tended to self-assess slightly less highly on ICT skills, and on usage, than males but not on ICT’s importance to their careers, and also not on ownership of PCs and internet access. They also appeared to be slightly less confident. Some of these are probably generic male-female differences, as they are seen in other
Despite this general similarity between students at the seven universities, there were some variations too. This was despite the fact that this group of universities are superficially similar, and would expect to be able to exchange students and staff relatively easily. Examples of such variations were: average ICT skill level, extent of use of ICT in studies and where they studied. A more detailed analysis of these variations is given in our full report. There were no systematic differences between students in northern and southern universities; that is there was no evidence of a 'north-south divide'.

Universities

Despite the high level of student ICT use and confidence, not all the partner universities had defined their policies and strategies towards student ICT skills, and it appeared that much of the student ICT skillset was based on self-teaching or assistance from family and friends. This was not because the universities thought that ICT skills were unimportant but that some had not developed systematic ways to ensure that students acquired these skills. Some universities relied almost entirely on integration into courses without specific accreditation, whereas others had more training provision, two having introduced the European Computer Driving Licence as a graduate qualification.

Most academic staff we interviewed felt reasonably well skilled in use of ICT, although there are subject, age and gender variations. As ICT is now the dominant tool for research and administration this is not surprising, however, few staff really felt that student ICT skills development was part of their role as academics.

As universities move to greater use of ICT for learning they will increasingly rely on student abilities in this area.

Employers

Our sample of employers generally appeared to be satisfied with the ICT skills of their graduate recruits, most of them not really expecting much more than competence with standard office applications, except in specialist areas such as engineering, where specific software skills were required (we did not attempt to assess the match between demand and supply in individual specialisms). Most of our employers did not express much enthusiasm for certification of ICT skills, for example through ECDL, although a small number used this or its equivalent in their own staff training.

Employers emphasised that they expected graduates to be confident and to be able to learn. In small organisations self-teaching was the norm, whereas larger ones had more systematic training programmes. Some, again the large organisations, were beginning to use eLearning in their staff development programmes, so graduate skills in learning on-line will be required in future.

There was no strong sense of employers' future needs; most seemed to feel that there would be ‘more of the same’, and some thought that their graduate recruits ought to be the ones taking them forward. European professional organisations and employer bodies did not appear to have much public information about the ICT skills needed by graduates for entry to their professions and areas of commerce, and in some countries might in fact be looking to the universities to define these, rather than defining the skills themselves.

Issues & challenges

A series of important challenges still exist for European universities and their students with respect to ICT skills development and maintenance. Clearly it is not feasible here to offer prescriptive solutions, for each university in Europe, working within its own local social, educational and financial context, must decide what is its most appropriate way forward. However, we are able to offer some comments based upon our own experiences within the SEUSISS project.

The challenges include:

• defining the appropriate set of skills for the near to medium term future
• defining the skills needed to underpin the growth in eLearning
• coping with ‘age & generation’ differences
• tackling the remaining gender-related issues
• supporting the minority of students of who are uncomfortable with ICT
• supporting students who do not own or have good access to a PC and the internet outside
CONCLUSIONS

the university

• agreeing the division of labour between schools and universities as the loci for skills development, and supporting lifelong learners for whom school-based training is irrelevant
• ‘working with the grain’ of strong preferences by most individuals for informal over formal training in ICT skills
• deciding between external and internal accreditation of ICT skills, including setting appropriate standards for graduates

Defining the appropriate set of skills for the near to medium term future
Defining the skills needed to underpin the growth in use of eLearning

These two topics are closely related, and require that the university continually ‘scans the horizon’ of ICT skills to determine what skills will be needed by its graduates in the next few years, and seeks ways to equip them with these skills. Some of this will need to be done in conjunction with employers, with professional organisations that accredit qualifications, and organisation that represent different areas of commerce and industry. Our observations in several countries suggest that there is a lack of public pronouncements of the types and levels of ICT skills that they would wish graduates (and other recruits) to possess.

Amongst the future skills that will be needed we can include:
• digital literacy – the ability to find, retrieve, assess and manage digital information;
• mobile studying & working – reflecting the greater fluidity in work and study places permitted (and perhaps enforced) by use of ICT;
• digital security – as information and communications become increasingly digital and hence take place via servers and networks, so an understanding of security processes becomes an essential ingredient in the skillset of the student and employee;
• learning-to-learn through eLearning – the rapid increase in use of eLearning in universities and business requires that students are given support in how to take advantage of these new techniques, and to be able to critique their application rather than fearing or uncritically accepting them;
• integration of applications – the skilled user of ICT is able to choose the applications best suited to their current needs and use them creatively in combination, rather than individually. This is particularly true where manipulation of images, data and text are concerned.

Coping with ‘age & generation’ differences
Tackling the remaining gender-related issues
Supporting the minority of students of who are uncomfortable with ICT

Differences in the ICT skills and attitudes of subgroups within the student population must be identified before suitable methods for training and support can be implemented, and hence surveying a sample of all students with instruments such as developed in this project is the first step. As subgroups such as these may be uncomfortable at being ‘singled out’ for attention, non-intrusive support may be needed such as ‘drop-in clinics’, use of student as well as staff ‘ICT assistants’, printed documentation as well as on-line etc. Collaboration with the local student association or representatives may enable the university to make contact with typical members of subgroups in a way that is least threatening to them. Monitoring the effectiveness of support provided is essential. The provision of on-demand support has the advantage that all students can take advantage of it in those areas of ICT use that they themselves judge might be useful.

Supporting access to a PC and the internet inside and outside the university

Our data show quite clearly that those who own or have good access to PCs and the internet outside the university use them frequently, and hence have the opportunity to practise and expand their ICT skills at will. Some universities have arranged loans and special purchase prices for PCs for students, which might be extended to regional and national levels. Alongside this will be the need for good provision inside the university as it is clear
that students who use ICT frequently do so everywhere that they study and live. Increased ownership may not reduce the pressure for on-campus provision; indeed the opposite might occur. As the internet becomes central to study with ICT the cost of access gains in importance, and regional or central actions to minimise charges will be essential.

‘Working with the grain’ of strong preferences by most individuals for informal over formal training in ICT skills

The substantial amount of informal training and support given to students by friends and family is an enormous reservoir of unpaid effort that no university could hope to provide itself. The question for the university is how to harness this effort to make it work for and alongside provision by the university so that positive results are obtained. As in the situation of supporting specific subgroups of the student population, key tasks are clarity of goals, explicit definition of desirable standards and levels, and provision of good quality self-training materials (paper and on-line). Much support is probably peer support in university classes, so universities can help this by ensuring that there is suitable baseline training available for all, to make sure that those who become more skilled pass on robust, high quality help. Use of student assistants alongside technical support staff may make help appear less formal in university computer labs.

Deciding between external and internal, formal and informal, accreditation of ICT skills, including setting appropriate standards for graduates

There are distinct divisions of opinion between universities about the need for formal accreditation of ICT skills, and the value of externally-defined qualifications such as European Computer Driving Licence (ECDL). The choice of route will be influenced by the demand from students and employers, the choice of competitor universities and colleges, the ability to provide a tailored versus an ‘off-the-shelf’ solution, the availability of external qualifications that are appropriate to the ICT skills level that a university considers its graduates should attain. Our interviews with employers did not suggest a strong demand by them for formally accredited ICT skills, but this does not preclude the desire for them by some groups of employers, and hence each university will have to judge the relative merits of each approach in consultation with its own ‘pool’ of the employers of its graduates. Clarity about the ICT skills and competences of graduates is generally desirable however this is provided. Whatever solution is adopted, it will be necessary to review the relevance of both the type and level of ICT skills at intervals of no more than a few years, as they can change quite rapidly. As graduates will draw on these skills for some years, the accreditation or descriptions must have a ‘forward look’ within them and not be confined to the skills of the recent past.

As basic ICT skills become more ‘taken for granted’, a situation that has probably been achieved in some universities in our studies, it might be opportune to examine the option of formal or informal accreditation of ICT skills directly related to the professions that graduates will enter. Some universities have begun to explore this type of training (Groningen for the social sciences, Edinburgh for medicine), and some professional associations have begun to outline the sorts of skills that practitioners will need.

Employers value a positive attitude to the use of ICT and the ability to use it productively in workplace settings. These attributes are harder to accredit than practical competences.

In the discussion so far we have concentrated on students and their ICT skills and attitudes; however, a parallel concern must be that of the ICT skills and attitudes of academic (teaching) staff and the role of these staff in support of students.

We can divide some of the issues with respect to the role of academic and support staff in ICT skills development into three areas:

Clarity of university policy and strategy
Availability of information about, and supporting materials for, student ICT skills development

The lack of explicit policy and strategies for student ICT skills development can create difficulties for teaching and support staff in leaving them uncertain as to their roles. Consensus within the university on standards expected of graduates, either by formal accreditation or other
means, will enable staff to support these developments more easily, and also measure their own skills against these criteria. If there is good availability of materials, documentary or on-line, about ICT skills development, staff can make students aware of these at appropriate points in their courses.

Training for use of ICT in teaching and research

Formal vs. informal training and the role of peer support

Academic and other staff, like students, need access to training and support for development and maintenance of their ICT skills. In universities where teaching is closely related to research in the materials and tools that are used, the university gains from training in both areas. Staff, again like students, appear to prefer informal or personalised training and support and uptake of training courses is low in most universities. Provision of local or peer support to academic staff is one option that could be explored.

Integration of ICT skills development into the curriculum

Attitudinal development of students

Identification of students with difficulties in use of ICT

Academic staff in particular can play a central role in student ICT skills development, whether or not the university has a central, generic skills certification programme. This is because the design of curricula can include systematic and integrated ICT skills development or can use ICT in a haphazard and unplanned way. It is clear that practising skills in context is important to their full development, even where generic courses exist, and as students spend most of their time at universities working on their studies, this is the ideal place to support them. A central or local management view about the sorts of ICT skills students should be acquiring, and provision of support for teaching staff would be of great value, especially in those subjects where ways of integrating ICT are less self-evident than in others.

To a large degree, this is dependent upon the attitudes of teaching staff towards explicit ICT (and other) skills development for their students, which underlines the importance of staff in inculcating positive attitudes to technology in their students. These come from implicit as well as explicit messages – thus staff who are under-skilled send negative messages by their inability to do things that to students seem simple or desirable. This is particularly important in the emerging use of eLearning, where pedagogical as well as technical issues arise.

Finally, teaching staff have an important role to play with respect to that minority of students who are anxious about or uncomfortable with using ICT. Their ‘detection’ of such students and the actions that they can take to point them towards help and to give them direct support, will become more important as study at university and beyond increases its dependence upon ICT. The university itself must be aware of these groups and ensure that sufficient help with basic ICT skills is available to them, even as the mainstream becomes more sophisticated.

We hope that the information collected during the SEUSISS project and the conclusions it has enabled us to draw about ICT knowledge, skills and attitudes of students in the partner universities are of value to the European higher education community and to policy makers in their local and national governments.
Salamanca University
APPENDIX A: EMPLOYER INTERVIEW CASE STUDIES

This appendix contains detailed accounts of the employer interviews conducted by the SEUSISS partners, as discussed in the Employers section of the main report. All interviews are shown for Åbo, Edinburgh, Pavia, Poitiers and Salamanca; in the case of Bergen and Groningen, two sample interviews are shown for each along with an overview of all ten interviews conducted at each location.

Companies have been kept anonymous for the purposes of this report. The pro-forma questionnaire was accompanied by a statement that interviews would be confidential to the project team: “No statements or data given will be reported in a form that attributes or can be traced back to the organization, [and] no information given by any individual within an organization will be available to their employer.”

In some cases, such as larger companies in smaller countries, strict anonymity is difficult to maintain; nevertheless, the attempt has been made. Keeping companies anonymous also makes it more straightforward for readers to see general trends across all of the interviews.

Responses have not been given for each company under the heading of each and every question in the pro-forma questionnaire, as over the space of forty summaries this would become unwieldy. Instead, answers are summarized under the headings of Uses of ICT, IT Skills and E-Training, and The Future. Background information about each company is also provided where appropriate and available.

ÅBO
Åbo Company 1: IT & Management Consultancy
Company 1 is in the IT and management consulting sector. It has 40-50 employees, a quarter of whom are consultants; the rest are programmers. Some staff are foreigners. The company had a turnover of more than two and a half million euro in 2001, with almost twice that amount estimated for 2002. It has some customers abroad, but these are managed in Finland.

Use of ICT
Three quarters of the staff work in programming. General office software is also used, apart from video-conferencing. The Web is particularly important for searching for articles and manuals; university graduates are very good at this. The company uses Lotus Notes for databases, workflow management and data warehousing.

IT Skills and e-Training
This company takes it for granted that new recruits will be able to work with the normal software: Microsoft Office, e-mail, and the Web. It doesn’t even ask about it in interview nor mention it in recruiting advertisements. It does not consider the European Computer Driving Licence important for its own needs.

The company provides no training in general office programs, but teaches its technical staff the programming and technical aspects. Graduate-level employees are expected to update their own ICT skills. The company makes no use of e-training for its staff, though it is involved in it; the Finnish Virtual University is a customer.

The company finds that graduates who come to do technical work are too theoretical. Also, graduates commonly do not stay for long in that kind of work. Compared with non-graduate staff, the graduates’ advantage is their ability to find necessary information, and the way they have been trained to think.

The Future
The biggest challenge for this company at present is coping with the technical requirements of handheld computers (Palm, etc.). As the software and tools improve its consultants must keep up-to-date. When it comes to the technical knowledge of university graduates, it would like to see more practical competency. Computing theory is the same today as in the 1980s, but graduates need to be more cunning when it comes to finding technical solutions in their everyday work.

Åbo Company 2: Parish Church
Company 2 is a Lutheran parish church with 500 employees.

Use of ICT
The church uses ICT for its book-keeping, member registers, and a database of sermon material with, for example, words of psalms and bible texts to make leaflets
for sermons. It uses Corel Office software, and Netscape for e-mail and Web browsing. It makes no use of video-conferencing, nor has it any plans to do so. It has a few Microsoft Access licenses, and performs data transfers to and from the official databases of Finnish citizens. It makes use of specialist companies to fulfill some of its back-office needs.

**IT Skills and e-Training**

The church sees no problems with graduate ICT skills; all it requires is the ability to use e-mail and a word processor. Any other requirements are met by employer-provided training. The importance of this is growing, and they train as much as time and space (computer class) allows – between two and five months a year. No use is made of e-training so far, but this is coming. The European Computer Driving Licence is not considered important.

A group decides yearly what training is required. The system is based on employees taking the initiative and enrolling in IT courses, but the IT staff also recommend courses for some.

**The Future**

The future will involve more working remotely. Because salaries are poor, the church has difficulties in hiring people, which means that some employees have to deal with the matters of other churches as well as their own. Similarly, the use of mobile equipment is becoming more important. Graduates have to be ready to use their own machines at home, although not necessarily connected to the network at work.

Web updating is becoming more common, but with a method that everyone can use (for example, Web pages that automatically update when saving text files). Their expectations of graduate ICT skills are actually becoming smaller, because programs are getting easier to use.

**Åbo Company 3: Acoustics Consultancy**

Company 3 is an acoustics consultancy with five employees. It recruits physics graduates, has an annual turnover of €300 000, and has plans to work internationally.

**Use of ICT**

As well as specialist acoustic editing programs, the company uses the usual office software – Microsoft Office, e-mail, and browsers – as well as graphics and multimedia software (Corel Draw, Adobe Photoshop, Director) and Visual BASIC. It has no plans for video conferencing, but does intend to use Net Meeting. Knowledge management is carried out via an intranet, while an Internet presence is maintained for business-to-client transactions.

**IT Skills and e-Training**

Graduates have good ICT skills and learn fast, although there is a lack of “knowledge management” thinking. It usually takes six to twelve months to train new recruits in the use of the company’s ICT systems. This is done through courses and self-study with books; no use is made of e-training. At present 10-20% of training is course-based; this should increase to 50%. Graduate-level employees are expected to update their general ICT skills on their own. The company does not require recruits to have a European Computer Driving Licence, but thinks “it might be good”.

**The Future**

Interaction between different equipment is increasing. Also, travel is decreasing; instead, the company is beginning to transfer more data to handheld computers. Because it needs to know how well its acoustic noise-reduction solutions are working, it hopes to implement a central controlling unit to transfer data to portable handheld computers; it is waiting for fast Internet connections to enable this.

Graduate recruits need the courage to learn new programs and methods of using equipment. Physicists should master Visual Basic; 3D and CAD programs also have to be mastered, as their employees are handicapped without these. Databases will be a challenge.

**Åbo Company 4: Insurance**

Company 4 is an insurance company with over four hundred employees and an annual turnover of almost half a billion euro. It has no international orientation.
Use of ICT
The company programs its own insurance systems. General office software consists of Microsoft Office, Microsoft Exchange, Web browsers and networking software. (Within ten years they plan to have abandoned all Microsoft software.) They make no use of video conferencing now, but it will be of great importance in the future. The company uses databases, data warehousing and knowledge management systems. Its website allows the normal customer transactions (in Finland today bills are normally paid and accounts managed over the Internet, even by ordinary people).

IT Skills and e-Training
The company is just becoming familiar with e-training. It will probably be of importance in the future for individual courses in IT, and also for courses on insurance sales for free-lance agents.

The company expects graduates to arrive ready for employment with respect to ICT, and sees no problems in this regard. The quality of the graduates has recently improved, meaning that there is no need for an IT driving license.

The company provides a lot of good-quality in-house training for ICT skills updating. The European Computer Driving Licence courses are provided as basic material in this training. They have mandatory and voluntary courses within the ECDL programme. The company gives its employees three days of company time and expects them to use three days of their own time. Two thirds of its employees have completed the driver’s license course.

The Future
Over the next five to ten years the importance of the company intranet will grow. IT tools are becoming simpler to use. Graduates need the ability to update their skills and to be aware of what’s happening in IT, as well as to know how to use the most common new programs.

Åbo: Further Findings
Internationally, the development of the information society in Finland is of a high standard. In a survey conducted in 55 countries in 1997, Finland ranked second after the United States when measured according to social, communicative and information technology parameters.

The Finnish National Strategy for Education, Training and Research in the Information Society, completed in early 1995 by an expert committee set up by the Ministry of Education, drew up guidelines for information and communication policy for education, training and research into the 21st century. The strategy contained proposals on raising the level of education and research by applying information technology, thus promoting national competitiveness and employment. A follow-up investigation evaluated the results of the strategy from 1995–1999, and introduced an action plan to achieve the objectives listed in the strategy.

At the end of 1999, the Government fixed the guidelines for higher education up to the year 2004. One focus is the implementation of the information strategy for research and education. The aim is to secure knowledge and skills for all by developing initial and in-service teacher training, establishing a virtual university, expanding and diversifying content production, and strengthening the necessary infrastructure in education and research.

The strategy for 2000–2004 includes the founding of the Finnish virtual university. The FVU provides university students, teachers, researchers and other staff with a virtual campus through a common portal and net services, including:

- Information about on-line education;
- New opportunities to study through the Internet;
- Training and courses for staff;
- Tutoring, guidance and support;
- Digital learning materials and access to the most modern learning environments;
- Research services;
- Various tools supporting study and research;
- Carefully selected connections with the world’s virtual campuses;
- Business opportunities for companies wishing to take part in constructing the virtual campus.

The FVU is, above all, a new method of networking between universities; it is not a new university in itself. Services will be flexible and individualized. The current services provided by universities will be complemented
with components utilizing information and communication technologies and by developing completely new net-based services. Eventually new working methods, such as multi-mode study as well as the sharing of expert knowledge, will become an accepted part of university life.


€ Other Finnish Ministry of Education Links: http://www.minedu.fi/julkaisut/information/englishU/2/2.html

€ The Finnish Virtual University: http://www.virtuaaliyliopisto.fi/


BERGEN

Overview of All Bergen Interviews

All ten employers expected graduate recruits to arrive with basic ICT skills in word processing, the Internet, e-mail and other office software. Employers do not expect graduates to know how to use software specific to the profession or used or developed for a particular purpose (for example, accounting, GIS, or financial software). One company, however – a consulting firm – said the opposite: they hire only those who can show skills in software other than the basic applications.

All employers except one (the small consultancy firm) mentioned that a more complete, holistic understanding of ICT was the most important requirement among new graduate employees; employees should know how things work in a wider context. The small consultancy firm said that generic understanding was a matter of course; it was experts they wanted. They want universities to give students the option to become expert in a particular ICT skill.

The larger the company, the more in-house training in ICT skills it had. Small companies said that in-house training was given on an individual basis, while the larger ones provided various sources of training (courses, CD-ROMs and LMS for self study). Employees generally were not left to their own devices; if a company needed competence in a certain area it would ensure that the employee was given the necessary training.

As for whether training is voluntary or mandatory, there was again a difference between the smaller and larger companies. The largest company said that it was mandatory for all employees to go through an ICT competence program, while the smallest said that it was up to each individual, and that an e-learning system would mean too much overhead and work for it to be implemented.

One company has made the European Computer Driving Licence mandatory for its staff, and approved of any formal demonstration of competence. Three other companies provide their staff with the opportunity to take the ‘Datakortet’ (the Norwegian version of the ECDL), but said it was not mandatory and is not seen as the most important demonstration of ICT skill. The remaining six did not see generic certification as a good tool at all, but wanted, perhaps, to see some certification for more expert knowledge.

When looking ahead at changes in the use of ICT by the company over the next 5-10 years, the more general visions for the long-term were:

€ More networking, both as ‘culture’ and in terms of software and hardware;
€ A greater emphasis on security (documents, viruses, encryption); and
€ More use of the Internet and company intranet.

Bergen Company 1: Power Suppliers

Company 1 is a power supplier also involved in broadband services. It has approximately one thousand employees and an annual turnover in excess of €300 million. Its business is oriented towards Norway and Scandinavia.

The company uses ICT for general office purposes,
specialist purposes, back-office services, business-to-business and business-to-client transactions, and staff training. It expects graduates to have experience with standard application packages (office, e-mail, and browsers), but not to be ready to use specialized software. It finds that new young staff members in general know better than older staff how to use Internet-related technology, and have no problem with using the company intranet.

The company provides no training in the use of standard applications – only for specialized software. It contracts out its office training. E-training is used only in the executive/manager training programme. The company cooperates with a distance education firm to provide this over the Internet. It also offers a stipend to people who want to get a ’Datakortet’ (ECDL) license; all expenses are covered, but the employee has to do it in their spare time. Our interviewee observed that, “Every form of documented formal competence is good! But I don’t know if the ECDL is the right thing. It depends heavily upon who takes it. For example, it is not a quality measure if one of the engineers gets one, but for office personnel it would perhaps be good.”

The company plans to make more use of its intranet and the Internet. Its intranet will, after its redesign, contain all of its human resource management and personnel administration information, such as how to apply for leave of absence, etc.

Bergen Company 2: Financial/Banking
Company 2, part of the financial/banking sector, has an international orientation, several thousand employees, and an investment portfolio valued at €1 billion.

The company uses ICT for general office purposes, specialist purposes, back-office services, business-to-business and business-to-client transactions, and staff training. It sees a high degree of match between graduate intake ICT skills and organizational needs. “We need students with an holistic understanding of how things work, knowledge about structure and pedagogical insight. Most students today have good knowledge, good insight and understanding in relation to office and Internet applications, which is all good.”

Graduates are given further training in the use of office applications and other specialized software. They are not expected to be ready at the time of employment with respect to the latter.

Forty employees, selected from internal applicants, are being educated through an e-learning system run by the Norwegian School of Management BI – a 10 credit course equivalent to one semester at university. The company also runs a mandatory ’Datakortet’ programme for all employees; staff bonuses are withheld from those who do not complete the course. Thus, it does not expect employees to update their ICT skills on their own.

The company has an e-training ‘Competence Portal’ with the role of marketing all of its training programs within the organization. Fifteen people are employed for this purpose.

Over the next 5-10 years it envisages major development and improvement of its intranet, Internet portals, and Internet services to the costumer.

EDINBURGH
Edinburgh Company 1: Tableware
Company 1 is a manufacturer and retailer of tableware with a history going back to the 17th century. It has several hundred employees, a third of whom are based at its factory outside Edinburgh; over a hundred concession sites where floor space is provided within existing retail outlets; and over a hundred factory outlets across the UK. The company imports products from throughout Europe and then decorates them itself either by hand or machine. The latter process uses computer-aided design packages, with designs made in-house. The company sells 100 000 items annually over the Internet, with 1 million a year projected. Its organizational divisions are: Warehousing and Distribution; Manufacture; IT; Quality Design; Marketing; Sales Force (Trade Sales & Personalized Sales); and Customer Services.

IT Skills and e-Training
The company employs graduates in marketing, science, engineering and accountancy, and computing specialists in their IT department. New general recruits are not usually ready for employment; they need proficiency in spreadsheets, word processing, databases, presentation and data analysis. In general they lack presentation skills,
for example in PowerPoint or importing JPEG files into Word. Consequently, three months of training is required for graduate recruits, and six months for 16-year-olds.

The company has a centre for training people in their own time but few people use it. Two PCs are used (infrequently) as an introduction to open learning, but without supervision. Our interviewee believed that open learning requires motivation and that many employees pass on this responsibility to managers rather than seeing it as investing in their own future. Acquiring IT skills is a way of reaching career goals, but is only effective if you can identify specific needs; there is a lot of bad IT training around. Certification is good because it gives a baseline understanding.

The company has a training package on its intranet; trainees are offered a choice of videos, computer-based training or books. Power users have a culture of knowledge-sharing.

The Future
Company computer systems have been Lotus-based, which is cheap but not suitable for office management. They are migrating to Microsoft, but find it poorly executed and unreliable, so are gravitating towards Linux.

Edinburgh Company 2: Insurance
Company 2 is an insurance company going through a period of change because of retirements on its Board of Management. It has a health care subdivision, a bank, and a stand-alone investments company, which is removed from the assurance division and its associated branding and image in the City. Its personnel department is being restructured, and sales and marketing are being brought together.

The company has 30,000 customers in the UK. Beyond the UK it has partnerships in Asia and Europe and a major presence in Canada, which is run along similar lines to its UK parent.

Distribution to the customer is largely achieved through independent advisors, who bring in eighty percent of business, while the other twenty percent comes from the company’s own direct sales force. Greater efficiency is being driven by the government’s introduction of a maximum charge of one percent on stakeholder pensions. The company made one billion stock market sales in this financial year. It estimates a quadrupling of sales in five years.

Use of ICT
The company has an intranet system, which is now ‘archaic’. Alongside the mainframe they have PCs running Windows and MS Office. E-mail has been difficult to implement because of the age of their internal systems. It takes time to make decisions about changes to the system, as security and the control of information are important considerations. Data integrity is an issue in the back-end database; it is a challenge to keep addresses and other customer information up-to-date.

Other technology is used for automated workflow. Online application forms are used to recruit new staff, and passed on to recruiters. Diaries are managed online across the organization using the company intranet. Mail distribution is a slow process: all mail is digitally scanned, the aim being a paperless environment. Electronic document management means that in the longer term the issue of staff working from home needs to be addressed.

The bank has the facility to access information online (externally). The intranet is used for updating and accessing customer information, such as maternity and marriage status. The intention is to become web-based so that information can be accessed remotely, which will give opportunities for flexibility, but this has not yet been achieved.

IT Skills and e-Training
The company currently recruits thirty people a year and invests over £13 million in training and development. Managing personal development takes up ten percent of salary costs. Training programmes use IT extensively.

Its intranet hosts an open access development centre with learning materials – a competency framework to help manage personal development. There are nine key competencies. The material has a customer focus, and includes a variety of videos and training courses to suit different learning styles. Training forms part of employees’ annual review. Each staff member has objectives for the
year and a development plan of due diligence (for example, Fire, Health & Safety, and Fraud), which they can do online via e-training; if they fail, they do a ‘regulation round-up’ regulated by the FSA. Those managing the process must also demonstrate their level of competence.

The company aims to employ sixty graduates a year. It has five graduate recruitment schemes: Information Systems; Accountancy; Actuarial; Human Resources Management; and Investment. All but Information Systems have no assessment in terms of technology, but rather in terms of customer focus, preference for action, capacity for teamwork, decision making and judgment, communication skills and ability to influence others, openness to ideas, strategic thinking, people development, and leadership. There are also formal exams (for accountants, for example).

Graduate recruits are expected to know how to use technology unless it is specific to the company. They are expected to have skills in word processing and the use of browsers, to know how a letter is formatted, and to have used presentation software at university. Generally they have the experience expected of them. Training tools are available.

**Edinburgh Company 3: Software Development**

Company 3, a software company founded in the early 1990s, employs 18 staff at its office in Edinburgh. Its main market is Edinburgh and the central belt of Scotland; the other is London. The company’s niche is catering to organizations that cannot find packages to suit their needs, and so need a unique solution; the current client base is the public sector. The company produces bespoke application software, which its clients then own. Initially they wrote low-level code; they now do less of that and more packaging of existing material. Over time they expect to write less software and move towards strategic consultancy. Although they are working in a relatively diminishing area, the overall market is expanding and so they continue to grow.

**Use of ICT**

Projects are carried out by teams following the software lifecycle: systems analysis, design, training and documentation. All employees have a first degree; for all but two (the office manager and website manager) this is a professional requirement. All staff members are computer literate, with at least one PC on their desk; four or five have two PCs each for different purposes.

**IT Skills and e-Training**

Graduate recruits are not expected to be ready for employment: ‘that takes a few months,’ depending on their capabilities and whether they have learnt to think rather than been ‘trained’. It is taken for granted that they can use office productivity software, or can pick it up immediately; all of them will have been using computers for a number of years.

Our interviewee saw some mismatch between graduate IT skills and employer needs, but believes that universities exist ‘to educate, not train’. The company puts much effort into recruitment and communicating with potential staff before taking them on.

The hardest thing to teach graduate recruits is software testing. Academic programming assignments are by their nature never applied to real situations, so their bugs are not discovered. Commercial software development is sixty percent ‘getting it to work’, forty percent debugging. From the training point of view, this is the most important aspect.

Staff development needs are assessed on a quarterly basis. A minimum of twenty days a year is devoted to staff training, the majority provided in-house in blocked units. Group training sessions are timed to coincide with the middle or end of projects; these are joint projects with team-based interaction, so there is scope for fun and experimentation. The company provides self-paced training materials. Most employees are studying for certificates – MSCE, for example, or Sun certification – and might use a CISCO training package; management does not have time to develop tailor-made manuals.

E-training has had a limited impact, although staff use the Internet for research. Prompted by our line of questioning, our interviewee wondered why software engineering is not susceptible to e-training. Perhaps, he speculated, it’s ‘like living in a plumber’s house’; people who write software won’t use software in this way.
Staff members do update their skills on their own, but the company does not expect this. Many software houses would expect people to do their own personal development, but this company prefers to do its training during working hours.

The European Computer Driving Licence is a ‘great idea’ as it provides a good focus and transferable skills between jobs. Being independent of brands, it would last longer than any particular software, allowing people to adapt to what is happening next.

The Future
Looking ahead five to ten years, the use of ICT will be more important, but knowledge of its inner workings will become less important. Abstract skills will become more important than technical skills; skill sets will concentrate on business. Their recruitment model – unless they shift their market – will change in profile from technical computer science graduates towards a business focus – possibly in five years, certainly in ten. They will probably need to train such people in software tools; software development will become more like other businesses in that regard.

Edinburgh Company 4: Food Retailer
Company 4 is one of the UK’s leading food retailers. Its core value is its customer focus, so graduate employees are selected because of their people and team-work skills. The company was an early promoter of Internet shopping, and has a turnover in excess of £20 billion per annum. It employs graduates for store management, corporate purchasing and strategic research.

Use of ICT
The company requires both specialist and general IT skills: for example, e-mail, Word, PowerPoint and Excel as general tools; and B2B, e-commerce, intranet, Web and online recruitment as more specialist tools.

IT Skills and e-Training
Graduates generally have the basic IT skills required; it’s considered more important to match the interpersonal and leadership skills of students and provide the IT training as necessary. Graduates are trained on the use of the company’s own system, but are expected to have basic Internet and word processing skills.

The company IT department runs many IT workshops from basic to advanced skills. Employees also have access to computer-based training via the company intranet. Computer-based training is covered at the basic induction to the company, but recruits generally have to make best use of it themselves. Graduates are expected to be proactive in determining any training needs they have, including IT skills.

A European Computer Driving Licence may be useful in the future, but is not something that this company would consider essential.

The Future
Use of ICT will increase dramatically over the next five to ten years, with greater use of the intranet, B2B, radio-wave technology and satellite navigation. The company will provide training for any new skills needed.

Edinburgh Company 5: Brewery
Company 5 is one of the biggest breweries in the UK, facing a declining market under strong competition from wine and breezers and changing drinking habits. Its parent company has three sections: International Beer, which is focused on Europe and has a small head-count; Retail, the sizeable pubs and clubs outlet; and UK Beer, with seven or eight companies. Company 5 is one of the latter, and manufactures to order, including regional brands and supermarket brands. The company brews on all its sites; its markets expect beers to be brewed locally.

Use of ICT
E-mail is standard throughout the company. Some sites use Lotus Smart Suite, while others use Word, so they need to move between the two. Fire-walled Web access is available for certain staff. The company has its own intranet system.

IT Skills and e-Training
The company employs almost two thousand people, and turnover is low. It has had a graduate recruitment programme for the last five years, recruiting 8-10 per year from throughout the UK. Master Brewers have PhD-qualified laboratory assistants.
The company assumes a certain level of competence in Word and Excel – it would provide external training if required, but that would be unusual, and has not been requested yet. It makes no use of computer-based training in these areas, instead using in-house trainers. The employee is responsible for identifying his or her IT training needs, although top-up training is offered by the company automatically in some areas (for example, database processing).

The company was at the time of interview about to upgrade its internal systems, and planned to use computer-based training in this process: five modules, which would take 18 hours, followed by a test. The company created this training material itself as part of customizing its system. Those who used it would then provide informal support for others.

The Future
The company foresees big technological changes to handle reduced stock levels, short-interval planning, 400 suppliers and 25 product lines. The level of complexity has gone up: bottle shapes, for example, are different for continental markets, which creates difficulties in racking lines. Health and safety, staff training, reducing downtime, stock tracking: all will involve increased use of IT.

Edinburgh Company 6: Property Management
Company 6 is an Edinburgh-based property management firm involved in various aspects of real estate sales, rentals and management. It has approximately twenty staff, three of whom (property managers and senior assistants in accounts) are graduates. A degree is not usually a requirement for new recruits, but is looked on favourably.

Use of ICT
The company makes a lot of use of ICT; everyone has a PC in the office. Field staff don’t carry laptops, but the office has two laptops and data projectors for presentations.

The office has a local-area network with some Internet access. Most employees use MS Office, some also using specialist programs for PAYE tax. Almost all use e-mail, while the Web is mostly for research. The company has a website, maintained internally with some design and development farmed out.

IT Skills and e-Training
Company use of e-training has been limited so far to some of the government-provided training packages on CD-ROM. One member of staff is also doing a locally run Masters degree that is partly Internet-based and partly lecture-based – his work for this is predominantly online. The company gives him some time off for these studies.

Graduates have the IT skills needed, and show a marked difference over non-graduates; they are more accomplished, more comfortable writing macros for Excel, and so on. They also require a lot less in-house training, if any. Employees are expected to update their IT skills on their own time – it’s seen as part of life. They are also expected to update their skills in their specific areas, such as accounting, but there are no specialized industry software packages yet that the company would expect them to be familiar with.

The ECDL is seen as useful, letting prospective employers know that recruits have those skills. Having a series of benchmarks would be excellent – being able to measure the extent of IT skills in new recruits is helpful. Ten years ago only computer science graduates had these skills; now everyone does.

The Future
The company website will grow, and clients will be able to do more online: complete applications for properties; book online for holiday rentals. In the day-to-day functioning of the office, less and less will be done on paper, and more on computers; the company plans to change to a fileserver rather than networked stand-alone PCs.

GRONINGEN
Overview of Groningen Interviews
The ten organizations interviewed were:

€ The department of land and buildings in a local city hall;
€ An information centre for learning and behavioural problems;
€ A hospital radiology department;
A healthcare organization for the elderly;
Air traffic control at a local airport;
The research department of a telecommunications corporation;
The training section of a computer services management firm;
A company training employees in language skills;
The educational support department at a secondary school for vocational training; and
A training centre for truck drivers.

Six of these are local or regional in focus, and four are national; there were no international firms in these interviews. All are based in the north of the Netherlands. Four of these organizations employ fewer than 20 academic staff, four employ between 20 and 100, and two employ more than 100. The organizations employ students from the social sciences, medicine, law, physics, mathematics, information technology, economics, foreign languages and business management.

Use of ICT

All organizations use ICT on a daily basis as part of the working routine of their staff. All organizations use the Microsoft Office package (Word, PowerPoint and Excel) and Internet software (browsers and e-mail clients). Eight use software for an internal network/intranet. Five use various programming languages. Special software specific to the profession is used in all organizations: specialist programs for word processing and presentation in three; databases in nine; graphics programs, AutoCAD and SCEN (in radiology) in three; planning programs in five; and statistical packages in five organizations. We may conclude that these organizations are frequent users of ICT.

IT Skills and e-Training

All organizations were satisfied with the match between university training and the skills required for the job. All made clear that they allow new recruits time to get used to specific professional software. There were no deficiencies in skills in standard packages like Microsoft Office. If a new program is installed, most (7) allow for in-service training of their staff; sometimes this is undertaken by the external developers of the software. Organizations that did not provide in-service training claimed that members of their staff were qualified enough to master new programs themselves when necessary.

Almost all organizations (9) expected staff to learn the use of standard and specific software on the job. All had a high opinion of the ICT skills of graduate recruits, who are seen as flexible and knowledgeable about ICT. Our impression was that employers like young employees to be the forerunners of innovation in ICT within their organization.

Four of the organizations have their staff undergo in-service training in ICT each year. The other six let their staff train as needed, or allow for self-study. Organizations pointed out that academically skilled members of staff like to explore new things themselves. They go to conferences or read articles, and apply to do further study as they see fit for carrying out a particular project or task.

Only three employers were convinced of the value of the ECDL for their organization. Most (7) were satisfied with the ICT skills of their new staff and had little use for international exams in this area. Some (4) feared that international standards would hamper the flexibility of graduates and their up-to-date conceptual knowledge of ICT.

The Future

All organizations agreed that ICT use would become more and more important to carry out their tasks. In most (8) ICT was already the backbone of job routines. Four organizations thought that graduates need more skill in specific tasks that are becoming necessary to carry out a job (e.g., programming in JAVA or using Oracle databases). Without exception all organizations expressed faith in universities to train students in the necessary skills that will be important in the near future. Most found it almost impossible to foresee developments in ICT more than a few years ahead; they prefer universities to do the exploring and forecasting of ICT developments.

Two employers stressed that students should learn not only how to handle programs and procedures but also the major concepts of ICT. Such concepts have their place in the broader context of a particular scientific field, ranging from social science (communication, presentation and ethics) to physics (data transfer and data compiling);
it is not desirable to disconnect ICT from its theoretical background. Contextual knowledge of ICT will enhance learning when staff members have to change from old applications to new ones. University students should learn how to co-operate when carrying out ICT-related tasks, and how to communicate solutions to others less skilled in ICT.

**Groningen Company 1: Information Centre for Learning and Behavioural Disorders**

Company 1 is a nationally oriented private organization that acts as a clearinghouse for information about behavioural and learning disorders. It has approximately twenty staff members with university education (mostly in social science or education) and several executives (secretaries, administrative personnel, etc.). It provides courses and up-to-date information for institutions, schools, community groups and parents. One of its main tasks is publishing magazines and booklets for its clients.

**Use of ICT**

The organization’s desktop publishing (DTP) specialist manages its central databases. Staff members use different databases according to their specialization, and the Microsoft Office package for publishing. All published documents are designed according to a house style; some publishing is done on the Internet.

Until now the organization has had different database systems for its different departments, but has now contracted software developers to build and install a new system to connect and restructure these, which will be developed over a number of years as government funding allows. The intention is to build a knowledge resource system with a Web platform and central management of information exchange and publishing routines.

**IT Skills and e-Training**

Graduate recruits are well equipped to handle the Office package and organizational databases. There are ample opportunities to work with specific applications and older staff members are willing to teach how to use these. This often takes only a few days. As for the new system currently in development, staff will be trained in its use by the company DTP specialist and the software developers. This training will be in-house; the company makes no use of e-training.

Our interviewee saw no problems with the matching of graduate ICT skills to the needs of his organization. Graduates learn new computer programs quickly and have been the first to suggest improvements and adopt new systems. Consequently, he saw no need for a European Computer Driving Licence for most employees; more important is conceptual knowledge of the Internet and ICT. ICT skills can be taught on the job. Licenses for ICT specialists, however, would be welcome.

**The Future**

More interrelated software for finding and publishing information and for communication within and outside the organization is to be expected. In the future a national information network for behavioural disorders learning problems will develop, with branch offices in the main cities of the Netherlands. The database and Web platform being built by the organization indicates the direction of these future developments. To deal with them, future graduate recruits will have to know more about Web authoring and database content management than before. One concern is how to get an experienced DTP specialist in the future; specialists are hard to find and salary costs are high.

**Groningen Company 2: Telecommunications Corporation Research Department**

Company 2 is a private organization that provides telecommunication services and telephone networks in the Netherlands. It owns substantial infrastructure for wireless telephone connections, and delivers ADSL to connect home computers to the Internet. Its research department has 350 staff members with a university education (most of them in technical sciences like electronics, telecommunication, and informatics, and some in business management) and 30 executives (secretaries, administrative personnel, etc.). Staff members conduct research on new communication tools like I-mode and other more advanced tools. Their main tasks are improving new concepts, field-testing, and data gathering and analysis. They program in languages like C++, Java, and Delphi, and use Oracle and other databases.
Use of ICT

The company has many specialists, from hardware to computer programming to data analysis. Staff members use different databases according to their specialization, as well as the Microsoft Office package for creating reports and publishing results in technical handbooks. All published documents are designed according to a house style. Most publishing is done through the internal network of the company.

The organization has one database system for all of its departments, so the exchange of information is straightforward. There are different levels of access to information within this system; as a rule an employee only has access to information that is strictly necessary for his or her job.

IT Skills and e-Training

Most graduate recruits are well equipped to handle the Office package and others used in the organization. Graduates from technical studies are familiar with the required software. Recruits generally know what to expect from their jobs in terms of ICT use. Most of the time they are highly qualified and do not need much technical guidance.

Training is mostly in-house. Most of the work in the department is applied research; new recruits have to learn to communicate about their work, share ideas, and work according to a plan and fixed timetable. In a technical sense the match between graduates’ university training and their job is excellent, but graduate recruits need guidance in social competencies, the division of complex tasks and co-operation.

Training is seen as an investment in the future of the company. The company has its own training department for employees in service departments (e.g., call centres or departments with service mechanics). These departments use tools developed by the research department and must be briefed and trained regularly. No external training facilities are considered necessary, however, for the research department; if employees want to study a new computer language they may go to a conference or buy a book — they are considered clever enough to learn on their own.

The manager interviewed considered it important that universities stick to theory-driven research. Telecommunication companies need students with a broad theoretical background in communication theory and physics.

He saw no need for an international driving licence; technical university studies provide enough students with good ICT skills. The company requires graduates with good analytical skills and the ability to conceptualize solutions to problems, skills that are more general in nature and not restricted to ICT. The danger of certification is that ICT becomes isolated from its theoretical background. ICT is an aspect of different fields of theory, from social science to physics; it should not be isolated in university studies.

The Future

The company sees wireless communication and the Internet as its future. It is looking for combinations of both, and at faster connections for audio and video information. The use of the Internet and telephones at home, especially, will change dramatically in the next five or ten years: all Dutch households will be connected to the Internet. People will use integrated telephone and Internet connections at home and, especially among young people, will make use of portable telephone and Internet tools such as I-mode. These integrated tools will be more and more a part of everyone’s work and home life. The company’s task will be to develop tools that ensure connections of high quality.

PAVIA

Pavia Company 1: Health Products Multinational

Company 1, headquartered in the US, is a developer and producer of animal and human health products. In addition to pharmaceutical products, it offers a medical manual and online information services to doctors, pharmacists and patients on medical research and products available for treatment. Its services thus include education and information.

The company has almost 80 000 employees in 100 branches worldwide, six of which are located in Italy. Its Pavia branch has over four hundred employees, who are involved in the production and packaging of pharmaceutical agents. Approximately one hundred employees have degrees (90% of them from the
University of Pavia), mostly in Pharmacy, Pharmacological and Toxicological Chemistry and Engineering.

The company offers careers in a wide range of sectors including accounting and finance, clinical development and research, engineering, information technology and services, human resources, legal, marketing and pharmacy. All of these rely on ICT; new graduate employees thus inevitably have to acquire some specific ICT skills. Such task-specific software applications as those used for quality control, inventories, e-commerce and data warehousing are unlikely to be familiar even to newly graduated engineers.

Use of ICT
The main software applications used by the company are: JD Edwards Laboratory Information Management System for laboratory quality control; DATA3 for planning and inventory; CAD 2002; PeopleSoft; Microsoft Outlook for e-mail; Internet Explorer for intranet/Internet; Streaming Video Technology for video-conferencing; Oracle and an internally developed Material Handling Control System for database and knowledge management; and Interactive Education and Smart Force for e-training. It had no business-to-business or business-to-customer systems at the time of contact, but planned to set up EZBuy (an e-commerce platform) for B2B use.

The company uses ICT to handle a wide variety of tasks involved in production, administration and R&D. Company strategy gives high priority to being at the forefront in the use of ICT to improve production and development. It has partnerships with several other companies to develop ICT applications for training and aspects of production and commercial processes.

IT Skills and e-Training
Graduates employed by the company are generally already in possession of the IT skills necessary for the job. This corresponds with company preference for job candidates who have basic IT skills in office and Internet applications.

Training in ICT of new graduate employees is achieved in a variety of ways: collective in-house courses; on- and off-line company courses; and help when needed from colleagues. E-training courses are produced by outside suppliers in collaboration with the company. The company supplies training/guidelines on getting the most out of e-training resources. Those who undertake e-training on an individual basis have access to a help desk where a tutor answers queries. Because the e-training system had only recently been installed, our respondent was unable to comment on its impact on the ICT competencies of personnel, but felt that e-training would take on an ever more important role in the company. Our respondent did not think that ECDL certification of ICT skills was useful for this company.

The Future
The company will be installing and operating an e-commerce system to permit clients to order products online. Graduate employees will be expected to keep up with changes in ICT by following internal and external courses.

Pavia Company 2: Multimedia Publisher
Company 2, located on the periphery of Milan, is a leading multinational producer of e-learning content and applications. Since the early 1990s it has made several strategic partnerships and acquired other companies in pursuit of its goal of launching an e-learning portal. It now offers courses in several European languages on the Web and CD-ROM to other companies, institutions and individuals. Contents include business skills, languages for general and specific purposes, and IT skills and software courses. The company also operates a call/centr centre offering telephone operator (toll free numbers, market surveys, credit recall) and database services and consultancy.

The company has branches around Europe: 250 of its 300 employees are based at its Italian headquarters. Thirty percent of employees at this branch have a degree, mostly in Computer Science or the Humanities. Graduates are involved in business administration, in the technical aspects of platform and application development and in the production of course content.

Use of ICT
ICT is intrinsic to most aspects of the functioning of this company. Tasks range from routine office work to highly sophisticated Web data-gathering and management techniques offered as a service to other companies.
Computers are indispensable in the authoring and production of course content materials and in distributed them online or on CD-ROM.

The company uses the usual office software; has Web and e-mail access for all employees, and provides individual tutoring via e-mail; has its own Intranet and Web site; performs data acquisition and warehousing via the Web; uses a wide range of graphics and Web/CD authoring tools, and application development software; and has its own proprietary e-learning platform with e-sales functionality, along with a call centre with help desk.

**IT Skills and e-Training**

The skills required of new graduate job candidates varied according to the profile of the job they were applying for. New graduate employees tend to arrive with the ICT skills expected by the company. Although it is assumed that new-graduates have basic ICT skills, and so receive no training in them from the company, it is probable that skills are passed on in an informal way between colleagues.

Employees have access to e-learning courses – for example, on software packages important to their job. The e-learning courses developed by the company for outside contractors are made available to its own employees. The company relies to a large extent on temporary external consultants to provide course content, and on undergraduates or masters students working temporarily within the company for routine content production tasks.

Personnel are provided with guidance and training in getting the most out of the e-training courses available to them. The company expects that e-training will become more important in the training of personnel over the next few years. Our respondent thought that accreditation/certification of ICT skills would be useful.

**Poitiers**

**Poitiers Company 1: Banking Centre**

Company 1 is the coordination centre for a series of banks operating along cooperative lines on a regional basis. Among other services, it offers its members assistance in the field of training and international relations. An intranet and e-learning programmes have been available for over five years. Our contact had been involved in e-training since the beginning.

Staff members working in the intranet/e-learning department are not necessarily ICT specialists. Some have degrees in the humanities but have acquired the necessary skills for formulating program specifications. Some of those programs (notably those using ‘speaking agent technology’) are produced by outside firms in close cooperation with the centre.

The centre has designed and launched an inter-bank intranet to provide its members with information about available training sessions and facilities. The system is now several years old, and other functions have been added. New online resources for trainers have been made available through the intranet. At a later stage the centre initiated its own educational platform, which was intended to be a full online system of courses. The venture did not prove successful; it was probably too early, and high-ranking executives were not fully convinced of its worth.

Currently, the centre offers a database of pedagogical resources containing 300 archives in HTML and PDF form to its member banks, which are widely used by trainers and trainees. These are also made available free of charge to an inter-bank training institute common to all banks in France, be they cooperative, private or state-owned. Trainers like the design of those resources and their ease of access, which makes it possible to tailor material according to specific needs as they arise.

**Poitiers Company 2: Corporate Finance**

Company 2 is the market-listed international arm of a mostly cooperative banking group, involved in corporate financing, banking and insurance. Customers include major French and international firms. The company has over seven and a half thousand employees, mostly in Paris. Our contact was the director of internal communication for the group, who had also spent lengthy periods in fieldwork and human resources at corporate headquarters.

New recruits, who usually have 3-4 years of university training, are expected to have an operational knowledge of the most common office software, such as Word, Excel, PowerPoint, and e-mail. Traditional clerical jobs are on
the way out, and existing secretaries are being moved to such tasks as the production of PowerPoint presentations and desktop publishing.

Twelve hundred of the company’s employees are IT specialists. Before the events of 11 September 2001 there were three waves of recruitment each year, but the subsequent recession meant that in 2002 there was only one hiring campaign. Forty to fifty percent of programming work, such as the production of Web graphics and code, is carried out under contract with outside companies. Some of these outside IT staff eventually end up being hired on a permanent basis by the company.

Hiring of IT professionals is based on academic background; they are usually engineers with five years of post-secondary study at Grandes Ecoles or universities. A degree in computer science is not a prerequisite. Once hired, new IT staff members spend five or six months in training at a branch that specializes in the company’s particular approach to an interactive information policy. They then spend two years getting additional training in the bank.

The in-house emphasis is on being able to use traditional programming languages like Cobol while also being comfortable with dynamic Internet programming. The aim of the company is to transform its static intranet and Internet presence into a dynamic system with a fast-moving internal workflow.

At the maintenance level, the company is looking for versatile multi-function specialists: whenever something fails internally, the in-house maintenance specialists might only know one side of the problem and may have to resort to outside help, which creates delays in fixing problems. They are looking for IT maintenance experts with a broader range of competence, and may try to achieve this through in-house training. In short, the emphasis is on advanced, flexible IT staff who can develop dynamic HTML pages quickly (3-4 months) using software like Vignette, and have expertise in developing heavy security sites.

There is insufficient use of e-learning within the company. For example, staff members were offered individual computers at a special low price last year, with the company subsidising each purchase at the rate of almost seven thousand euro. Many employees took advantage of this offer, but less than ten percent of buyers chose the accompanying online training option.

Poitiers Company 3: Furniture Construction

Company 3 is a furniture construction firm with a thousand employees, distributors in over forty countries, and four international branches in Europe and the USA.

The company employs all types of students, from general and specialized backgrounds. For positions within the company structure, employees tend to come from highly specialized schools, such as commerce and management. These employees are recruited at a national level. Employees in technical positions are drawn from engineering or technical schools after or near graduation. These employees have often studied at regional universities. Employees are offered long-term contracts; they are expected to stay and evolve within the company.

The company has some 400 PC workstations, used for everything from administrative to highly specialized tasks. New employees have a good level of experience with computing tools. Even though in-house training sessions are organized, a minimum level of ICT skill is absolutely required.

In general, there is a big gap between new recruits’ knowledge and actual skills. They often experience difficulties when they have to put their knowledge into practice. The company organizes a three-week induction period during which each new recruit goes from department to department so that he or she understands what goes on in at all levels the company, and so has a better understanding of his or her own job.

Every year an ICT skills diagnosis is led by a specialized company, and employees are asked to state whether they would like to get any specific training. Each training session is individualized and carried out by an external trainer.

There is no e-learning at the moment, but the company is examining the possibility. There is not really an urgent need, as its in-house training is well-defined and
individualized, and fully corresponds to employee needs and expectations. However, the company expects to set up one or two PC stations for training use in the year to come. These machines would be freely available for self-training, but employees will have to organize their workload to book a machine. Management will then assess the use of this e-learning facility to decide whether the in-house ICT training regime will change in the future.

**Poitiers Company 4: Satellite Production**

Company 4 is a multinational company involved in the design and production of telecommunications and observations satellites. It employs eight thousand people at approximately a dozen locations, with 2000 (70 percent of them engineers) at the location where this inquiry was conducted. We spoke with an engineer involved in its Internet-based e-learning programmes.

Secretarial staff members are required to have knowledge and experience of mainstream office software, and receive e-training through the company intranet for new tools when they are introduced to the company.

Aerospace and telecom engineers are recruited from the prestigious Grandes Ecoles and are expected to have the basic IT skills: Word, Outlook, software for financial reporting, and use of the Internet. Project managers must know how to use specialized software for project management.

Specialized IT personnel are recruited by the industrial operations division and are usually graduates of the computer engineering Grandes Ecoles. Their task is oriented towards development and security. They are among other things responsible for securing the in-house intranet and for the classified defence-related sub-network. Many IT tasks are outsourced to other firms, such as network maintenance and support, development of applications and configuring of software.

Since each operational unit within the company has gained a greater degree of autonomy, it has set up its own simple (PC-based) videoconferencing facility connected to the company’s dedicated broadband lines. There are 13 connected sites.

E-learning is on the move in the French arm of this multinational, especially for the study of languages and the discovery of new office applications. Clerical staff members do most of their training in the use of such software online.

There is an in-house lab for self-trained language study, but employees do not at this stage have access to full instructional units from their individual workstations. They have access to databases, however, and more interactive material will no doubt be implemented in the near future.

The company also has its own Academy, and its parent group a Corporate Business Academy, both catering to the training needs of executives. Training is geared to their time constraints and resulting short attention spans. So far it has been offered on a face-to-face basis, but is evolving towards some form of e-learning.

**Poitiers Company 5: Support Services for Business**

Company 5 is a provider of services and assistance to enterprises both large and small, in an area with a long entrepreneurial tradition once based on heavy industries (mines, metal, textiles) and now largely the base of large distribution chains. The services provided include legal advice, help with company creation, company transmission, financing, and the integration of IT-based systems and services within companies. Its computer lab provides assistance and demonstrators to companies that are exploring IT developments suited to their needs. The company has about 250 employees, and is closely linked to the French Employers' Federation, MEDEF. Our contact was an executive officer and specialist in corporate training.

Due to its tertiary vocation, the firm hires office personnel at the “assistant(e)" level, with a degree obtained after two years of post-secondary training (for example, a Lycée BTS or university DUT). A working knowledge of office software (Word, Excel, PowerPoint, file management systems) is a must. The firm finds employees’ prior training satisfactory and improving at the level of operational skills, but finds that employees lack an overall vision with regard to the general organization, which results in difficulties in networking, sharing information and exchanging files. To compensate for those deficiencies, the company has its own Resource Centre where a specially appointed counsellor helps each staff
member identify his or her own skills and needs and build a personalized training itinerary to be carried out in-house.

Specialized IT staff members – engineers, site and database developers – are hired from the Grandes Ecoles and universities. Training is found to be satisfactory. There is little or no outsourcing of IT tasks by this company.

The company is a key support as well as a resource and development unit in a number of e-learning ventures. One of the most recent, a partnership with the Ministry of Education, involved designing and producing a specialized one-year training programme for young people who have completed their secondary school studies and wish to be qualified in “bricolage” (do-it-yourself) retailing. Some students follow traditional courses while others opt for the e-learning/training mode. The company helped the ministry compile the required skills reference list and provides the e-learning material using a traditional platform. The project works on the widely accepted French and German principle of “alternance” (study periods sandwiched between field work).

Another e-learning project in which the firm is involved at the design and implementation stage is an international research centre on retailing, which will exist largely online and will, among other things, offer advanced diplomas in partnership with universities.

Poitiers: Further Findings

In general, the French educational system does not fully prepare students for the labour market. According to the MEDEF, the French Employers’ Federation, the transition between education and work is a source of difficulties for new employees. The initial orientation period upon employment can last up to a week depending on the size of the company.

More and more companies are investing in in-house ICT training areas. Personnel can follow group training sessions, tailored sessions and even use such areas for self-training. This appears to be more time- and cost-effective for both employers and employees.

According to a report published in December 2000 by the French Chamber of Commerce and Industry (ACFCI), employers recognize that the lack of specific training in technical professions could be at the origin of a candidate shortage. The national education curriculum does not seem to be following technical evolution and does not fully correspond to companies’ needs. The MEDEF has indicated that business representatives are willing to participate in improving the curriculum so that technical and vocational teaching correspond to the actual needs of the market.

The French metal industry federation, UIMM, has already set up an educational guidance process open to both school-age students and adults. This programme is set to help students to discover the industrial world and the metal industry profession. In order to train new recruits and staff, other corporate groups have also created their own training centres: for example, the Centre de Formation de la Profession Bancaire for banking, and THALES Université for corporate and professional development for Thales employees.

SALAMANCA

Salamanca Company 1: Frame Makers

Company 1 makes artistic mouldings for picture frames. It exports to more than 50 countries and employs over 300 people.

The company uses MS Office, specialized IBM mainframe software, and mainframe and PC software of its own for administrative tasks. It uses CAD tools for moulding design, specialized remote-administration tools and software development tools, and has its own intranet.

Since the company uses mostly its own tools, it does not need high-level ICT skills in graduates, except in a few cases. Because its demands are modest it expects most graduates to arrive ready for employment.

The company sometimes uses external training in general
ICT tools and provides internal training in a few cases. In such cases it organizes short intensive courses. E-training plays no role. Graduate-level employees are to a large extent expected to update their ICT skills on their own.

Our interviewee made no comment on future use of ICT in this company (“I can’t answer this”), or on the European Computer Driving Licence.

**Salamanca Company 2: Telecom Maintenance**

Company 2 is a small company that offers maintenance services to telephone operators and other companies across Spain. It has branches in Andalucia, Extremadura, and Castilla and Leon, with headquarters in Seville. It has 184 employees, of whom 45 have university degrees, although only some technical and directorial positions require a degree.

The company mainly uses ICT in its management unit, but also to “give better attention to our clients”. The role of the Internet in gathering information becomes more important every day. The company has a rapid turnover in technology, based on the exigencies of the market and client demands.

The company prefers graduates to arrive ready for employment with respect to ICT. This saves it money, and is one of the most important considerations at time of hiring. Graduates with technical and scientific backgrounds are well prepared in the use of ICT. Administrators also make good use of ICT, at least at the level of office applications: e-mail, databases, etc.

Every year the company organizes an advanced training course on office tools for its administrative personnel. Its technicians periodically undertake external advanced training courses. The company expects employees to maintain their ICT skills through such courses and the everyday use of computers. The company would look favourably on candidates with a European Computer Driving Licence; it would facilitate the hiring of foreign personnel as well as Spanish graduates.

In coming years the company expects ICT to change its way of work completely, and believes that the engineers and technicians who work for it are well prepared for these changes.

**Salamanca Company 3: Computer Services**

Company 3 was formed in the early 1970s to offer computer services to the banking industry. Since then it has constantly evolved to adapt to changes in the market, and has grown to its current size of 10 branches across Spain. In recent years its growth has been driven by its 1997-2000 Strategic Plan, one the main results being a process of internationalization of the company in Latin America and Europe. It was involved in the creation at the beginning of 2000 of a European alliance in the IT services sector, which will jointly develop new solutions and establish permanent procedures for the transfer of knowledge, technology and professionals.

The company uses ICT in consultancy, outsourcing, project integration, application maintenance, human resources, and financial solutions. To this it is adding: a greater presence in Internet-related business, to turn itself into an integral supplier of networks; the development of its own products for the economic and financial management of small and medium companies; information services; the management of strategic macro-projects; and engineering solutions.

The company considers its employees to have superior knowledge of ICT. It looks for qualified personnel, but dedicates four percent of its budget to training activities.

The emergence of ICT and new models of information learning can favour the development of competition and new strategies and processes of change. But for this to produce advantageous results, the use of ‘e-training’ must meet the following conditions:

€ A high degree of qualification in individual teaching staff
€ Motivation, capacity and self-awareness in students that allows the development of plans for personal activities
€ A good match between the educational surroundings and the student’s work habits.
€ A good level of technological support and availability of computer systems.

All of these, along with an innovative vision of teaching,
make e-training of high value for the development of enterprise strategies. The Internet is enabling a revolution in the introduction of ICT in multiple sectors, where information, rather than data, is at the heart of the resources used. Internet technologies introduce radical innovations in:

- Standards of presentation (multimedia)
- Open systems of navigation
- Multiple means of access
- Person-to-person communication

Internet technologies offer almost all of the tools necessary to construct information spaces of a diverse nature to meet the demands of modern education. Among these resources are: video-conferencing; e-mail; voice over IP; chat; forums; interactive navigation; hypertext; and continuous evaluation. All make possible the design of solutions adapted to a particular problem. Personalization, flexibility and integration, the three requirements now in demand, can be solved simultaneously and in different degrees.

Companies are integrating ICT into the contents of their work through internal information systems or intranets. This integration is especially high in the teaching of the operational systems of a company. On the other hand, integration is much lower when it involves conceptual or general information.

The company’s enterprise models see the human factor as the key to competitiveness, giving an increasing value to the acquisition, management and effective operation of knowledge. To this phenomenon is added the need to integrate new models, techniques and systems until now nonexistent. The company must invest more and more in obtaining better results through better performance by its people based on new and more extensive knowledge. It appears that conventional training methods are not sufficient to meet the demands of the future, and for this reason the company is beginning to explore other models.

In coming years, e-training will be fundamental in the processes of change in and transformation of the company. The linking of the company’s strategic processes with supporting processes of change in ICT will make e-training a key factor in the development of its employees and its business. A key element of the viability and effectiveness of e-training over conventional training is that in the latter the student must meet the objectives of the course, but in general these are insufficient to guarantee results under future conditions. In e-training, interest, motivation and a capacity for self-discipline are required, which better equips students to cope with the unknown.

Our interviewee believed that European Computer Driving Licence would be positive for its personnel. He did not see any difference between the company’s foreign employees and its local ones.
APPENDIX B - ICT DEVELOPMENTS IN PARTNER COUNTRIES

Finland

The National strategy for education, training and research in the information society
http://www.minedu.fi/julkaisut/information/englishU/2/2.html

The National strategy for education, training and research in the information society completed in early 1995 drew up outlines for the information and communication policy for education, training and research into the 21st century. The strategy contained the opinions and proposals of the Expert Committee set up by the Ministry of Education on how the level of education and research can be raised by applying information technology, thus promoting national competitiveness and employment, and how to promote the availability and use of information and to assess the needs and identify the means for giving citizens basic skills in using information and communication technologies.

The new strategy consists of three parts. The first part evaluates the results of the strategy period 1995–1999, and envisages the potential situation in 2004. The second part focuses on the present day and its imperatives through visions of the next millennium, while the third part introduces the action programme designed to achieve the objectives listed in the strategy.

Internationally, Finnish information society development is of a high standard. In a survey conducted in 55 countries in 1997, Finland ranked second after the United States, measured by social, communicative and information technology parameters. International comparison, however, is difficult, since there are significant cultural differences and wide variations in educational priorities. The speed of technological development and the introduction of new technology also vary from country to country.

http://www.minedu.fi/minedu/education/priorities.html

Open and distance learning
The increasing amount of open and distance learning will have brought about new kinds of electronic teaching material and a market for domestic and foreign educational network services. Tutoring and counselling services including technical and pedagogical support and covering the whole of Finland will have been created to address the needs of even more extensive open and distance learning. Ever more flexible ways of studying will thus be possible. Teacher education will be focused in particular on the development of virtual studies. The evaluation of learning and the development of tutoring methods will have been crucial issues in development. All citizens will have access to information networks, their own e-mail address and an opportunity to contribute towards the contents of networks.

Production and distribution of teaching material
Information and communication technologies will have developed very fast. Hardware will have become cheaper and smaller in size. Moving image, graphics, sound and text material will be transferred between schools, homes, working places and other environments for the needs of students and researchers. A multimedia user terminal will increasingly often be a personal portable tool. Besides information retrieval, students will also actively produce and transmit digital material. Portable multimedia user terminals, digital radio and television and broadband technology will have provided more equal learning opportunities for all age groups.

Higher education policy
At the end of 1999, the Government fixed the guidelines for higher education up to the year 2004. Education and research are crucial to Finland’s strategy for the future, which aims at the well-being of its citizens, cultural diversity, sustainable development and prosperity.

The watchwords in education policy over the next few years will be high quality, educational equality and the principle of lifelong learning. Finland is to be developed into a humane knowledge-based society through education and research. The Government is committed to maintain the high level of public funding to the education and research system. Special attention will be paid to developing teaching and learning at all levels of education through teacher education and guidance services.
In order to meet the needs of the regions the higher education institutions must pay special attention to developing their regional responsiveness through intensified cooperation with local business and industries and by facilitating transfer of expertise to working life. The higher education system will be developed as a whole comprising the two sectors in which universities and polytechnics complement each other. The system of higher education degrees will be developed to correspond to the needs of working life and also in view of the international development of degree structures.

In summary, development of education and research in the early years of the 21st century will focus on:

- basic educational security: no tuition fees at any level of education, regionally and linguistically covering school and higher education network, students' financial aid schemes
- principle of lifelong learning: pre-school education for all, large provision of education at all levels, better financial opportunities for liberal education and professional upgrading, raising the level of education among the middle-aged population, development of vocational competence-based qualifications, targeting educational services for third-age students
- implementing the information strategy for research and education: securing knowledge and skills in the knowledge-based society for all, developing initial and in-service teacher training, virtual school and virtual university project, expansion and diversification of content production and strengthening the necessary infrastructure in education and research
- internationalization: intensified international cooperation at all levels of education; approx. every third higher education student is expected to take part of his of her degree abroad
- improving mathematics and science skills: supporting the development of knowledge-based society, sustainable development, business and citizens' mathematical and scientific knowledge and know-how
- continuing the policy of rewarding centres of excellence and further developing researcher training: quality through evaluation and competition, further development of graduate school system
- strengthening the status of evaluation as an integral part of a steering and development policy emphasizing the importance of quality: monitoring the overall performance of schools and higher education institutions, rewarding good performance in education and adult education

The Finnish virtual university

The Ministry of Education’s Information Society strategy for 2000 – 2004 includes the founding of the Finnish virtual university. Based on the trial best practices will be established and taken into broader use, stage by stage, so that the university will be fully functional by the end of the strategy period.

The Finnish virtual university (FVU) provides university students, teachers, researchers and other staff with a virtual campus through a common portal and net services, including:

- information about on-line education;
- new opportunities to study through the net;
- training and courses for staff;
- tutoring, guidance and support;
- digital learning materials and access to the most modern learning environments;
- research services;
- various tools supporting study and research;
- carefully selected connections with the world’s virtual campuses;
- business opportunities for companies wishing to take part in constructing the virtual campus;

The virtual university is, above all, a new method of networking between universities.
It is not a new university in itself. The services through the net will be flexible and individualised. The current services
provided by universities will be complemented with components utilising information and communication technologies
and by developing completely new net-based services. Eventually new working methods, multi-mode study as well as
the sharing of expert knowledge will become an accepted part of university life.

The portal
The virtual university portal will provide online services. The interface can be customised and personalised to suit the
user's needs. The portal will provide access to all that is necessary for online education: course information, enrollment,
counselling, advisory, and information services, as well as discussions forums, learning management systems, support
services and evaluation tools for teachers and producers of online courses. The basic portal has been launched in the
autumn of 2001. The complete system will be operational by the end of 2004. The portal will be implemented as an ESR
project. CSC Ltd is a collaborating company in the project.
http://www.ala.org/acrl/ilcomstan.html

Information Literacy Competency Standards for Higher Education
These standards were reviewed by the ACRL Standards Committee and approved by the Board of Directors of the
Association of College and Research Libraries (ACRL) on January 18, 2000, at the Midwinter Meeting of the American
Library Association in San Antonio, Texas.

Additional information on ICT in Finnish education
Internationally, the development of the information society in Finland is of a high standard. In a survey conducted in 55
countries in 1997, Finland ranked second after the United States when measured according to social, communicative
and information technology parameters.
by an expert committee set up by the Ministry of Education, drew up guidelines for information and communication
policy for education, training and research into the 21st century. The strategy contained proposals on raising the level
of education and research by applying information technology, thus promoting national competitiveness and employment.
A follow-up investigation evaluated the results of the strategy from 1995–1999, and introduced an action plan to achieve
the objectives listed in the strategy.
At the end of 1999, the Government fixed the guidelines for higher education up to the year 2004. One focus is the
implementation of the information strategy for research and education. The aim is to secure knowledge and skills for all
by developing initial and in-service teacher training, establishing a virtual university, expanding and diversifying content
production, and strengthening the necessary infrastructure in education and research.
The strategy for 2000–2004 includes the founding of the Finnish virtual university. The FVU provides university students,
teachers, researchers and other staff with a virtual campus through a common portal and net services, including:
- Information about on-line education;
- New opportunities to study through the Internet;
- Training and courses for staff;
- Tutoring, guidance and support;
- Digital learning materials and access to the most modern learning environments;
- Research services;
- Various tools supporting study and research;
- Carefully selected connections with the world's virtual campuses;
- Business opportunities for companies wishing to take part in constructing the virtual campus.

The FVU is, above all, a new method of networking between universities; it is not a new university in itself. Services will
be flexible and individualized. The current services provided by universities will be complemented with components
utilizing information and communication technologies and by developing completely new net-based services. Eventually
new working methods, such as multi-mode study as well as the sharing of expert knowledge, will become an accepted
part of university life.


The Finnish Virtual University: [http://www.virtuaaliyliopisto.fi/](http://www.virtuaaliyliopisto.fi/)


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**Netherlands**

In the Netherlands, as in other countries, an active policy is pursued to stimulate the use of ICT in education. ICT is considered to be of critical importance for modernizing education, that is: adapting and shaping education to the needs of modern society. This ICT policy has been set out in the memorandum Education on Line in 1999 for a period of four years.

Since the 1980’s the government has invested in ICT in higher education. At first, stress was laid upon infrastructure and the application of ICT in research at the universities. SURF was developed in the mid-1980s, with its primary goal as the promotion of co-operation in the field of ICT between the Dutch institutions for higher education and research. One of its first initiatives was the development of the national SURF network. Apart from initiating innovation and diffusion projects in the field of infrastructure, the SURF activities can be categorised in three areas: scientific information dissemination, organisation and management, and ICT in education (Educatie<F>). SURF Services grants licences for a wide range of ICT products, such as software and hardware, to institutions for higher education and research at very favourable terms. SURFnet operates and innovates the national research network that connects over 200 organisations.

The activities of government-sponsored SURF are based on the Long-term Plan for the period 1999-2002. Educatie<F>, SURF’s latest programme, aims at innovating in higher education using ICT. Educatie<F> stimulates and organises co-operation in four areas: education innovation projects, development of expertise, research programmes and the EduSite. From 1999 to 2002 SURF Educatie<F> has published an annual call for tender. Partnerships of institutions can submit proposals for the innovation of education. Many activities are organised for the dissemination and exchange of knowledge.(see [http://www.surf.nl/educatief/](http://www.surf.nl/educatief/)).

In the late 1990s the Dutch government and the universities agreed upon a policy called Quality in Studying. This policy started from the problem of too many students dropping out or switching studies in the first years of their university training. ICT in education is regarded as one way to remedy this problem. ICT can be used to inform new students of the contents of a study, provide communication with relevant advisers and teachers, to structure courses and evaluate of study progress. Between 1996 and 1998 20% of the government-funded projects for Quality in Studying in universities were about the educational use of ICT. Most of the time these projects were on a small scale, varying in aim from in-service training of university teachers to development of educational software. Besides these initiatives the government funded extra ICT facilities and ICT projects for teacher training at universities.

In 1999 SURF started an educational programme consisting of:
- a fund for co-financing projects by universities that co-operate in development and implementation of ICT-programmes for education. The programmes should concern a fair part of the curriculum of the co-operating faculties.
- a training programme about the use of ICT and especially learning environments for university teachers.
- exchange of experiences between teachers and specialists in the field through an appropriate platform.
- a virtual centre of expertise for information, support and diffusion of good practice examples.
Research in the late 1990s among students and teachers of different universities in the Netherlands showed that standard software (like text processing programs and online bibliographic databases) and Internet facilities (like e-mail, browsers and chat) are widely used. Most university teachers have a computer and Internet connection at home and most students have these as well. Specific software for a profession is used in university especially when this software is also applied in practice. Examples are CD disks with judicial information in law studies that are also used in law firms and simulation software in technical or medical studies as well as the professions. In arts studies less use was made of software for the profession than in other studies at the universities.

The main problems with integration of ICT in education are:
- lack of time of teachers
- didactic and technical skill of teachers to integrate ICT
- lack of rewards for innovation by teachers,
- lack of content support
- lack of adequate computer work stations for education and testing.
- Government policy is to leave the responsibility for innovation in university education to the universities and to fulfil necessary conditions for innovation in education. Most universities have policy plans to invest in:
  - ICT facilities (e.g. electronic learning environments like Blackboard)
  - training of teachers
  - small scale teaching experiments
  - web platforms for information and communication.

The government is co-financing national projects through SURF. The government will take part in Giga port (very fast Internet connections) and in financing special projects like the open university with many digital applications and experiments for a virtual university. For 2000-2002 a total of 10 million euro was spend on the SURF projects and the universities received many millions extra to boost ICT use. The national educational inspectorate and the universities' self assessment committees will evaluate the results of these efforts.

Norway

The use of Information and communication technologies (ICT) in education is an area of major interest for the Norwegian government. The Ministry of Education and Research (UFD) has stated "ICT in education is a central area of priority for UFD. This should comprise the whole educational system: primary school, high school, higher education and adult education … The purpose of ICT in education is to contribute to a system of education that develops ICT and uses it as a subject and a tool, in the way it is being organised, applied and used pedagogically." ICT is a key tool in achieving:
- general access to relevant and new knowledge
- equal opportunities in acquiring expertise in and access to ICT, irrespective of gender, address and social situation
- flexible and user-friendly learning opportunities
- new forms of cooperation, work, learning and assessment, nationally and internationally, to provide individuals who have learning difficulties with the opportunity to improve their quality of life, learning and participation in communal and working life

The main goal for UFD work with ICT in education is linked to the use of ICT in the development of new forms of learning and evaluation/assessment, new forms of organizing the educational system, new collaboration methods, and new student and teacher roles. Further, the development of subject content/learning materials that comply better with the individual's needs as well as the needs of the society is a central issue. In order to change and improve the learning situation in educational institutions, there is a need for local as well as national effort and initiative. An action plan called "ICT in Education Plan 2000-2003" [http://www.dep.no/ufd/html/ikt] was developed containing challenges, goals, and means for how yo address the issue. Every year more specific plans are developed which identify the focus areas for the next year. The annual plan for 2001 describes the areas of priority for 2002 that are:
- New content and new learning forms
• Teacher competence development
• Research and development
• Infrastructure

New Content and New Learning Forms
In the spring of 2001, UFD launched a systematic action aimed at the development of free digital learning materials for students at the high school level. Three applications divided 20 million Norwegian kroner for the development of digital social science learning materials.

ICT and education research and development
ITU (IT in education) is the national research- and competence network for ICT in education funded by the ministry of research and education. The network aims at changing the educational system in order to make pupils, students, and teachers personal users of ICT and in this way make them also co-designers of ICT in a pedagogical perspective. For ITU the educational sector includes primary, middle and high schools, colleges and teachers schools. Thus, the research projects funded by ITU are not related to universities or continuing education. In the spring of 2002, however, ITU will announce new research funds, Digital Learning Arenas, which focuses on higher and continuing education.

The Norwegian Research Council, NFR gives priority to basic ICT research but does not currently include ICT and learning in their portfolio. In 2001, NFR contracted research representatives from the four Norwegian Universities to draft a research programme for ICT and learning. If accepted, the programme will begin in 2003.

National Statistics on use of the Internet
Forty-eight percent of the Norwegian population use the Internet every week, and 52 percent have access to the net from home. One in four uses her/his home PC every day, and this use is growing especially among older men where 71 percent have access to a PC at home. In the age group 16-24 years, 32 percent use the Internet for educational purposes. http://www.dep.no/ufd/html/ikt/
http://www.ssb.no/vis/07/02/30/medie/sa42/art-2001-03-26-01.html
http://www.ssb.no

Italy
Technology in teaching and learning is a long-standing concern of the Italian educational system, with provision for access to computers in schools and universities being one of the first steps in a process that has snowballed. Nevertheless, the scope and uniformity of concern and action were limited to pockets of individuals and institutions possessing the skills and clout necessary to initiate new projects and win ministerial funding.

Recent years have seen a revolution in all sectors of the Italian education system, in part the consequence of political upheaval that provided fertile ground for the unprecedented changes brought about by series of educational reforms (1997 onwards). Increased government support and funding for initiatives involving ICT in teaching and learning has resulted in much greater uniformity in the purpose and size of projects.

The rapidity of change presently taking place in Italy is due on the one hand to Italy’s membership of the EU, which has promoted concerted attempts to align the Italian educational system with other European systems; and on the other to the internal policy of decentralization and the reduction in central government funding available to schools and universities. This has been a high octane fuel in university competition for students which sees institutions striving to offer better services and skills more in line with market demands; also in terms of mobility and international recognition.

Among the reforms outlined in the Martinotti report (1997), the following reflect the main concerns of the government vis-a-vis the place of Italy in the wider European context and with what were perceived to be the main defects of the University system at the time. These points have been copied directly from the document “Italian University Reforms” at http://www.leeds.ac.uk/sis/publications/bulletin/2000/art1.htm, where a useful comment is also available.

• “a new relationship between students and universities replacing the old passive, quasi fiscal relationship of
iscrizione (registration) with a more formal (contrattuale) relationship seeing universities as communities in which students are active, adult participants and universities provide courses to clearly defined and transparent standards;

- greater diversity of university provision: the report accepts that direct competition among universities is not possible for a variety of social (including familial) reasons, but it does suggest that greater diversification could be achieved to allow students to make better choices of university course based on future occupational objectives, rather than just choosing the local university;
- greater diversity in the modes of study to include part-time study and lifelong learning and to eliminate the problem of students taking longer than the prescribed period to complete their courses (fuori corso);
- greater flexibility in the curriculum to facilitate the rapid approval of new course structures and content and provide more varied modes of delivery including the use of new technologies;
- mobility of human resources: the report is scathing in its denunciation of the rigidity of the current system and calls for much greater flexibility and mobility;
- adaption of a credit accumulation and transfer system to apply not only to the university sector but also to other forms of higher education and training, including work-based learning;
- greater support for ‘bottom up’ initiatives to replace ‘top down’ planning and control;
- a system of external evaluation both of institutions and individuals within the system;
- greater transparency in the management of the system to ensure that it is meeting the government’s overall objectives.

The change in tempo in the last few years has seen ICT and computers receiving front row treatment in schools and universities, along with foreign languages, particularly English and career orientation.

Applications of ICT to teaching and learning in Universities in Italy

As far as the universities are concerned, the Conferenza Dei Rettori Universitari Italiani (CRUI) (the equivalent of the British Vice-Chancellors Committee) discusses and translates government policy into action points at the university level in conjunction with other national bodies like the MIUR (Ministero dell’Istruzione, dell’ Università e della Ricerca; formerly MURST (Ministero delle Università e della Ricerca Scientifica e Tecnologica), national trade union and industrial bodies, the Chamber of Commerce and with European Government.

The CRUI participates in the CAMPUS (Corsi Avvanzati Mirati alla Preparazione per Sbocchi Lavorativi) project (see http://www.campusone.it) and its successors in Italy (CAMPUSONE, CAMPUSLINE, APOLLO, CREDITS and others). CAMPUS projects unify the universities involved in the pursuit of objectives which necessarily involve ICT either as enabling technology or as the content in the provision of high level-skills to students. Among the many actions on the CAMPUSONE agenda are restructuring the syllabus in some technical faculties on the basis of enterprise indications; maximizing contact between enterprise and future graduates; and the accreditation of computer skills (the ECDL). A good summary of the action plan of CAMPUSONE is available at: http://www.campusone.it/data/allegati/table/86/organigramma.gif.

The transparent managerial model on which the organization bases itself reflects a profound philosophical change in the University System in Italy.

Over the last few years the University of Pavia has seen such progress as the formation of a high-profile student career orientation centre (Centro Orientamento, COR); a spate of new course and degree offerings including, amongst many others, 3 year University Diplomas in the area of E-Government and Administration and E-Commerce. These follow on from the restructuring of the degree system to allow for three-year university diplomas followed by a further year or two to obtain a full degree or a masters qualification, (instead of the previous four-five year degree courses). A constant flow of new post-graduate masters qualifications has appeared to satisfy the demand on the one hand for more career-oriented education and on the other for a structural piece to fill the gap between undergraduate degree and doctorate. A qualification at this level did not even exist ten years ago.

The adoption of e-learning platforms, portals and networks is underway in Italian Universities. These include the inter-university portal CINECA, produced by a consortium of universities, new technology providers including satellite providers and the national TV channel RAI, and the more recent NetCampus, a Socrates project coordinated by Europace: http://www.europace.org/PaceSetter/2002_02.html, which focuses on identifying and overcoming the technical and
psychological obstacles encountered in networked instruction. The University of Pavia is involved in the development of a virtual branch of the Engineering Faculty in a college in another town. This will combine ICT applications such as web, videoconferencing; learning platforms with the community support aspects of traditional education.

In another direction, new graduate candidates for teaching posts are required to have a two year post-graduate teaching qualification which includes modules on ICT applications in teaching and learning.

In the last few years, people who were foreign to the ICT process have had sufficient experience of the significance of ICT through the use of e-mail, internet and other information systems, to bring about departmental information systems. It was noted in the teaching staff report, however, that many teachers at the time of interview (all conducted before October 2002) were unaware of University of Pavia initiatives in the teaching/learning applications of ICT, although some provide students with ICT resources off their own or single departmental initiative. One area in which improvement is possible at the University of Pavia is that of gaining and supporting teacher participation in a routine day-to-day way in the application of ICT to teaching.

The present document is inadequate to give any but the vaguest outline of events in the development of ICT use in higher education in Italy. Nevertheless, the general scenario is one of very active university participation in the application of ICT as reported at the 2002 E-Learning conference in Bologna (http://elearning.ctu.unimi.it/elearnconference/it/home/default.html); and of incredibly rapid movement in the direction of advanced applications of ICT in all the relationships between universities, students and the economy of Italy and Europe.

Biblioteca Documentazione Pedagogica: Multimedialità nelle scuole http://www.bdp.it/risorse/gold/gold.htm

CAMPUSONE
http://www.campusone.it/

Centro Orientamento (COR), Università Degli Studi di Pavia
http://cor.unipv.it/index.html

E-Learning 11-12-13 novembre 2002 Università degli Studi di Milano
http://elearning.ctu.unimi.it/elearnconference/it/home/default.html

Europace
http://www.europace.org/portal/index.html

Italian University Reforms

MIUR (Ministero dell’Istruzione delle Università e della Ricerca)
http://www.istruzione.lombardia.it

MURST (Ministero delle Università e Ricerca Scientifica e Tecnologica)
http://www.murst.it

NetCampus
http://www.europace.org/PaceSetter/2002_02.html

SILSIS-MI (Scuola Interuniversitaria Lombarda di Specializzazione per l’Insegnamento Secondario Sezione di Milano)
http://192.84.139.245/

The European Space For Higher Education Bologna June 18-19, 1999
APPENDIX B

The Reform Of University Courses: Giving Universities Curricular Autonomy

Kindest thanks to Adriano Marson of the Provveditorato agli Studi di Pavia for information on the role of the local School Superintendancy; and to Elena Caldirola of the University of Pavia for pointers to recent activity in ICT in Italian Universities.

SPAIN

Current Debates Concerning The ICT Impact In The Spanish University

The ICT presents us with a new teaching paradigm, which raises a debate concerning the present day teacher and university student roles. That is, should the university teaching govern learning processes. The aim is to guide students to produce their own knowledge, based on the information they have access to. This way, students assume an active role because they should research, filter and transform information into knowledge, under the teachers’ guidance. On the other hand, the teacher should respect the individual rhythm of the student in question.

In Spain, similarly to other countries, in the last few years the debate has been centered on the computer use in the learning & teaching process. Thus, there has been noted a concern in the methodological field. In particular, how to teach and learn using the ICT as an additional didactic means. It is known that its availability does not suppose an end to the traditional learning, while it can even reinforce it.

In short, the debate concerns the predisposition and commitment of the two main protagonists of the teaching & learning process: the teacher and the student.

The ICT in the University Education. Current Debate.
At present, the debate concerning the ICT implementation and use in the Spanish higher education deal with:

• government educational policies
• students’ access to the ICT
• teachers and students’ training in the ICT
• how the students and teachers use the ICT
• to what extent are the universities provided with the ICT and how are they distributed?
• the impact of ICT-produced changes on the University

The issues above-mentioned indicate the leading problems as follows:

• the University teachers are lacking in the ICT training,
• the students are not stimulated appropriately, 
• the teachers resist the ICT use, 
• the lack of adequate infrastructure for ICT use, such as equipment, classrooms, etc., 
• the subject programs and the necessities of the job-market do not coincide, 
• the infrastructure for ICT use cannot keep pace with the constant changes brought along by the ICT.

With regard to this topic, there are three fundamental keys in order to incorporate appropriately the ICT into the higher education system:

The infrastructure: the need for bigger finances for the computer classrooms.
The Teacher’s Role: greater teachers’ commitment to the ICT activities; greater interest for the guidance of students (in
the research and transformation of information into knowledge)

The Student’s Role: to make the most of ICT use with the aim of achieving a critical and constructive approach.

The ICT in relation to Presence-Based vs. E-Learning

In Spain, there is an increasing tendency towards both models of University learning: presence and e-based. The majority of Spanish Universities have a virtual campus offering various services to the teachers and students. These complement the presence-based learning and provide access to information on courses, notes, evaluation grades, bibliography, etc. In the University of Salamanca go to:

http://www.usal.es/eudored/

The element which additionally promotes the interest for the introduction of the ICT into the academic system relates to:

a) the increase in the “catchment area” among the Universities in the search for new students. The ICT allows to amplify significantly the radius of influence.
b) the need for greater information interchange both within and outside the Universities.

The short-term expectations are as follows:

- The Universities with a capacity to articulate the teaching and research interdisciplinary networks (to substitute the concept of the University teacher who is self-sufficient).
- The Universities with a capacity to articulate the teaching and research institutional networks (to substitute the concept of the University that is self-sufficient). The tendency is towards the transnational University.
- The Universities with a capacity to articulate connections with the job-market (the ties between the University and private enterprises).

Lastly, the items above-mentioned include a large-scale debate on a national level. The objective is to institutionalize the debate by means of decrees, laws regulating the higher educational system and Universities. For example, in the last 6 months in Spain, a New Law on Universities and a New Law on Higher Education came into force.

E-learning

Distance learning by means of ICT is basically used in the professional training for adults. That is, the job training and life-long learning at the three learning levels: primary, secondary and university education. In Spain, this is considered to be a right and not an obligation. The Ministry of Education, Culture and Sports, through the National Information and Educative Communication Center, has been implementing educational projects with the ICT use, such as, “Aula Mentor” (Mentor Classroom) and “Aldea Global” (Global Village).

See: <http://www.cnice.mecd.es/programa>

In terms of the higher education, two Spanish universities are specialized in e-learning: UNED <http://www.uned.es>, y UOC <http://www.uoc.es>.

United Kingdom

There have been two major strands of concern with computer use in teaching & learning in higher education in the UK. First has been the drive to use computers in the teaching & learning process, and second has come concern relating to the IT skills possessed by undergraduates when they enter higher education, and at graduation. These concerns are genuinely and necessarily linked, but have sometimes also been confused over the years. Further, there is an important distinction between the aim of cultivating IT skills among students with a view to their deploying these skills in their learning, and the idea that the possession of these skills is an important component of the “value added” to the graduate. This latter concern has been expressed, through various initiatives, both in terms of the enhancement of the learning experience for the student, and also in terms of the economic importance of a skilled graduate workforce.
Initiatives in the use of computers in teaching and learning must be set in the context of, and also seen partly as responses to, a number of wider developments in the climate surrounding higher education in the UK. Important among these have been:

- increases in the proportion of young people participating in higher education
- greater heterogeneity of student populations through improved access to provision
- concerns to enhance and demonstrate quality of provision
- development of mechanisms to ensure accountability in research productivity
- pressures to increase relevance of undergraduate experience to the world of work
- pressures to increase graduate employability
- an increasingly constrained resource base
- a greater emphasis on active learning

It has frequently been suggested that increased computer and information technology use in support of teaching and learning can bring gains in effectiveness which can help to offset increased pressure of numbers in higher education, and through enhancing access and flexibility can improve the quality of the learning experience. These were strong themes in the Report of the National Committee of Inquiry into Higher Education, published in July 1997 (www.leeds.ac.uk/educol/ncihe/).

Computers in Teaching & Learning
Central government initiatives like the Computers in Teaching Initiative (established in 1984 and later incorporated into the Learning & Teaching Support Network – www.ltsn.ac.uk), the Teaching & Learning Technology Programme (www.ncteam.ac.uk/projects/tlt/index.htm - set up in 1992) and (in Scotland) the Learning Technology Dissemination Initiative, the TALISMAN Project and C&IT Programme (www.scotcit.ac.uk) have given impetus to the pedagogical applications of information and communication technologies. Other programmes, like the Fund for the Development of Teaching & Learning (FDTL – www.ncteam.ac.uk/projects/fdtl/index.htm), have provided additional resources to develop IT-related projects.

The UK HE infrastructure is well-developed and provides high speed connections between all universities and colleges, videoconferencing facilities, central access to databases and digital library services. The majority of these services are managed through the Joint Information Services Committee (JISC – www.jisc.ac.uk).

IT Skills
Alongside these initiatives in the use of information and communication technologies in teaching and learning have been stimuli to develop the notion of “key skills” (or “core” or “transferable” skills). This emphasis stems from two key political developments. First, widening access has brought new groups of students into higher education who are requiring more study skills support to benefit from their educational opportunity. Further, there is an increasing desire to listen to what employers are saying about the skills and capabilities they would ideally like to see in the graduate products of higher education. In addition, initiatives driven to some extent by the commercial sector are arising to meet their particular needs.

Lifelong Learning
Additionally, the discourse of “lifelong learning” is seen to depend on the use of networked communication to provide access to learning opportunities at any time, and from any location. Continuing professional development is seen as a necessary part of maintaining a skilled professional community, and to allow flexibility in the workforce and changes in career direction. There is also a concern that learning opportunities should be seen as an enhancement to the quality of life of all sectors of the population. Again, access to networked learning is predicated on a sound base of IT skills.
The Wider Learning Community

The developments in higher education are, of course, taking place within the wider learning community of the UK. What requires to be in place to support developments in the higher education sector will therefore continually be changing as a result of initiatives and developments elsewhere.

France

For the last five years, the French Ministry of Education has been proactively developing the use of ICT in schools and higher education. The use of computers and information networks can help students to have a more active and creative approach, but also encourage exchange of ideas between teachers. The French State devotes a large amount of resources to this key area with a twofold objective:

Provide pupils and students with the expertise necessary to use and understand new communication tools

Ensure a broader range of learning methods in line with the reforms that have been initiated in schools and higher education by using the wide variety of multimedia tools

Governmental actions:

It has become obvious and necessary to integrate ICT tools into education. The aim is to encourage pupils to work on multimedia tools. Programmes have to be adapted accordingly and distance learning using information and communications technology, developed.

In order to achieve this objective, several actions have been proposed:

- Training for teachers and supervisory staff
- Teacher training

An emergency plan for teacher training establishments has been set up. Teaching and technical staff posts are being allocated for training in information and communications technology. Ongoing staff training will be developed, supported by multimedia tools.

National conferences for teacher trainers are also being held.

Training supervisory staff

Particular efforts are being made to train supervisory staff, especially the Ministry of Education's inspectors who are each being given a laptop computer and access to various digital resources.

Training staff in higher education

Many initiatives are currently under development to train teachers and research/training technicians in order to encourage the use of ICT in higher education:

- Equipping teaching establishments and bringing them on-line
- Schools and universities are being equipped with computers, linked to Internet and provided with e-mail addresses. Telecommunications companies, have been invited to offer favourable rates for providing schools with access to the Internet.
- A "resources person", in charge of information and communications technology, will be appointed by each establishment or school group.
- Assistant teachers are helping to ensure that ICT is properly used in schools.
- University chancellors will draw up a plan for student access to information technology.
- Changes in programme contents and teaching methods
- The use of ICT in new programmes

Since September 2000, ICT have been gradually introduced into new high school teaching programmes.
Changes in teaching methods
1,700 establishments and experimental schools, which are listed in a database, serve as models to help ensure that the use of ICT becomes more widespread in teaching.
New measures which broaden the range of knowledge-acquisition methods available to pupils rely heavily on the use of ICT. These include various courses and projects carried out with other establishments for middle schools, supervised personal projects for high schools, and professional interdisciplinary projects for technical colleges.
In order to give new impetus to ICT in Education, the minister has asked every region (academy) to identify primary, lower and upper secondary schools to highlight their work and to allow them to be a support to other schools and to teacher training.
A database gathering the descriptions of all projects of these schools is being built, with the following objectives:
Propose models of integration of computers and ICT in education
Analyse projects of schools of various levels and follow their evolution,
Facilitate exchanges between the different schools.
The creation of an IT and Internet proficiency certificate (B2I)

This certificate, brought in for the 2000-2001 academic year, is designed to validate the standard reached by pupils in their use of multimedia tools and the Internet. The B2I certificate is made up of:
level 1 which mainly involves primary education,
level 2 which involves middle school pupils and pupils in seconde (fifth form).

It will be compulsory for all middle schools by 2002 and for all primary schools by 2003.
www.education.gouv.fr/bo/2000/42/encart.htm

Developing an active partnership with local authorities and industry
A system will be set up to facilitate the financing of establishments' expenditure on information and communications technology tools. Agreements will be signed at national level with manufacturers, software suppliers and training organisations to encourage them to offer attractive rates for teaching establishments

ICT in Education : Data (1997-2002)
Improvements in IT facilities available to school pupils
In high-schools: an increase from 1 PC for 12 pupils to 1 PC for 6 pupils;
In middle schools: an increase from 1 PC for 26 pupils to 1 PC for 14 pupils;
In primary schools: an increase from 1 PC for 100 pupils to 1 PC for 23 pupils.

Network connectivity
An increase from 32% to 100% for high-schools
An increase from 11% to 91% for middle schools
An increase from 0.6% to 50% for primary schools

School web sites
More than half of all middle and high schools have their own web site.

Upgrading to high-speed networks
The development of the national education network means that educational authorities can now cope with the need for higher data-transfer rates. Other means of accessing the Internet, including via satellite, are currently being studied.

S3IT
Information systems and telecommunications strategic plan, drawn up by the Ministry of Education in spring 2000. It is designed to optimise the ways in which equipment and human resources are used. A number of national projects designed to improve the working environments of staff and pupils are currently underway. These include virtual office experiments and setting up intranet/internet services for schools.
A successful regional operation, “one trained teacher, one PC”
During the academic year 2000-2001, an interesting operation was initiated by the local authorities of the Vienne region. For each teacher trained to use ICT (mainly software such as Word, Excel, PowerPoint and Hot Potatoes), a PC would be allocated. Fortyfive colleges (private & public) and 1178 teachers were involved in the operation. At the end of the training sessions, teachers were asked to produce a multimedia pedagogical resource to be put on line. Each allocated PC remains the property of the college but the trained teacher is free to use it in class or even at home.
http://www.ac-poitiers.fr/1prof-1micro/rapport.doc
This appendix summarises the approaches that we have taken to collect information during the SEUSISS project from new and established students, from staff and from employers. It describes the successful approaches, the methodological challenges that we faced, and concludes with a brief examination of the validity and reliability of our data.

**Key tasks and instruments**

**Students:** To collect information at the seven partner universities from their newly-arrived students and from those well-established in their degree programmes, ideally in the year of graduation.

The information we needed was the students' ICT skills, their knowledge about ICT applications and their attitudes towards ICT in their studies and in their future careers. We designed a different questionnaire for each group with some questions in common and translated them into each partner language. The survey forms were reproduced from master copies that had been designed to be used with the ReadSoft Forms 5 software (http://www.readsoft.com/). After completion, the surveys were sent to Edinburgh where they were scanned using a Canon DR5020 scanner and Forms 5 software and the extracted data transferred to SPSS (www.spss.com) for analysis.

The English versions of the two questionnaires are available in Appendix D, and in all the languages (English, French, Italian, Spanish, Finnish, Swedish, Dutch and Norwegian) can be found at http://www.intermedia.uib.no/seusiss/

**Employers:** To discover the match between student ICT skills and attitudes and employer needs by sampling the views of employers in each country and carrying out desk research for statements about ICT skills by employer and professional organisations.

The interview proforma that we designed was translated into each partner language and used to guide semi-structured interviews carried out by local members of the project team. The interview notes were then translated into English, common themes identified and small case examples extracted.

The English version of the proforma is available in Appendix E, and in all the languages (English, French, Italian, Spanish, Finnish, Swedish, Dutch and Norwegian) can be found at http://www.intermedia.uib.no/seusiss/

**Ethics**

Throughout the process we strived to maintain good ethical practice by assuring respondents that we would treat all data in confidence, ensuring that all information would be made anonymous before publication and that it would not be attributable to individuals. This was routinely indicated in letters or email correspondence to employers and staff, and at the interviews.

We were given approval to survey the Edinburgh students by the Student Survey Panel at the University of Edinburgh http://www.aaps.ed.ac.uk/committees/OtherCommittees/stud surv.htm

This committee ensures that good ethical guidelines are followed when surveying students and that the student questionnaires in terms of content, wording and mode of operation are appropriate and that the timescales are realistic. We agreed to give a copy of this SEUSISS Report to the committee. The agreement of this committee was taken to indicate that all partners could be confident that the surveys were well-designed and appropriate even though they themselves did not have similar committees in their universities.

Permission was usually also sought from Heads of School or Department. Sensitivity to student exams and minimal intrusion on teaching time was considered important.
Student data gathering

Methods of issuing questionnaires to students and collecting them back include:

- through presentation/orientation/compulsory classes at the start of the year
- within the registration/matriculation process
- via the internet (WWW and email) - on-line surveys
- in microlabs or libraries
- via tutors in small group sessions
- via lecturers at large class sessions
- in graduation offices
- by mail to and from home address
- by mail to and from work or study 'placement' address

Where we used on-line surveys of students we obtained rather poor response rates. However, a major advantage of also having survey on the Internet is that they can be used to reach those students who at that moment are abroad or otherwise distant from the university. In some universities we had no access to mail addresses of new students or near graduates/graduates, others did not allow 'bulk email' to students. This precluded some methods of distributing surveys.

To ensure that we were not excluding present and future students on language ability we decided to translate the questionnaires into each national language. This may have resulted in a small divergence of meaning from country to country as there are not always direct equivalent expressions for each phrase. We accepted this (known) variation as preferable to (unknown) problems due to misunderstanding by students when reading surveys in English.

Questionnaires were issued to samples of students using probability sampling methods. Probability samples are selected when the sample design explicitly gives each element in the population a known (calculable) non-zero probability of inclusion in the sample. We have used all of the three sampling techniques below, depending upon the situation in each university:

- **Whole population**: was used when the survey could be issued to all students or where all had to pass through some central process
- **Proportional stratified sampling**: was used with the variable or stratification factor that determined the composition of the strata being the university centre of study, Faculty, School or Department
- **Random route sampling**: was generally used in order to complement the proportionate stratified sampling because the sampling frame did not allow us to select elements of the population using other techniques (i.e. simple random sampling and systematic sampling). This technique allowed us to carry out the final stage of sample selection.

As can be seen in the summaries below, each university had to devise ways of reaching representative samples of students that were compatible with their attendance patterns. For most universities, contacting new students was much easier than contacting established students and this is reflected in lower sample sizes and response rates for the latter than for the former.

A further difficulty which emerged as the definition of the sampling frames was begun was that somewhat different terminologies existed in the partner universities, as did completely different ways of defining students as to degree or level of study they were undertaking. For some it was possible to identify first degree students as distinct from masters or doctoral students as they entered the university or during their degree programme, but for others these distinctions had little or no meaning and the exit level was not defined until the student decided to exit. The possibility for students to take degrees full-time or part-time means that we have found it difficult to define exactly the student populations in terms of level. In reality, we have managed to largely obtain comparable samples by careful selection of the classes to be sampled or the entry routes taken. A full compliance to the Bologna process will greatly improve this situation!

Finally, each university had unique ways to divide up the academic subjects in which they offer degrees. The number and composition of the Faculties or Schools was distinct in each partner university and so to make it possible to analyse student data along subject lines, we have agreed a method of combining data from Faculties or Schools so that they produce four 'cognate domains' (Arts, Clinical & Para-clinical, Science & Engineering, Social Sciences) that are reasonably consistent in which subjects are present in each. Fortunately there were rather few interdisciplinary degrees that spanned more
than one cognate domain but the trend to more such degree combinations will make such analyses more difficult in the future.

**Profiling students as they enter their courses**

**Abo**
The only effective way of reaching new students and getting a reasonable response rate answering was to be present at the presentation lectures at the beginning of the term. Working with tutors proved far too complicated and took too much time. It is also a very uncertain method since people without any motivation were involved and a response rate of 22% only was obtained from 100 tutors teaching 900 students. Placing the questionnaire on the Internet gave an almost zero result even though the students could either print it, complete and send it free by internal mail, or send as an attachment by e-mail.

**Bergen**
All new students entering the university for the first time usually take an introductory philosophy course which is mandatory for everybody wanting to take a degree at Norwegian Universities. It is recommended that all new students start with this course. These lectures were targeted in the fall of 2001 in order to hand out questionnaires. By contacting the Department of Philosophy, the lecturers involved were reached and local project partners were given the time needed to hand out and collect the questionnaires. Close to 100% of the attending students filled out the questionnaires. There is, however, one problem with this strategy and that is that while the exam is mandatory, the lectures are not and therefore some students probably choose not to attend. Despite this reservation, the sample is probably representative of the new student intake.

**Pavia**
Contact with new students was achieved via a questionnaire distributed through the Ufficio Matricole (the Enrolments Office). This office is open only for a short period in September of each year, so that this method had to be integrated with other approaches. Given that attendance is theoretically rather than actually compulsory in most Italian universities, new students are best contacted in preliminary organisational meetings at the beginning of the semester (most subjects, as a result of recent reforms, being on a semester basis rather than a yearly basis one). This involved contacting course leaders who were prepared to allow presentation of the questionnaire in these meetings, typically attended by groups of 200-300 students. Students were assured that their answers would be anonymous and were thanked for their collaboration. Checks were put in place against students filling in the questionnaire twice.

**Poitiers**
One thousand questionnaires were distributed to teachers in the various faculties (Language / Science / Engineering School / Teacher training school). Those teachers who distributed the questionnaires in lecture theatres got only a very small proportion back, whereas those who distributed the questionnaires to smaller groups had a higher impact and gained better feedback from students.

**Salamanca**
The main subjects which new students had chosen for their study area were randomly selected. Authorization was requested from the heads of departments to give out the questionnaires in the classrooms during or after class, making sure that students did not fill in the questionnaire twice.

**Edinburgh**
The method used successfully for collecting data from new students for the past 10 years was employed. Questionnaires were included in the mailing sent out to new students in August and returned over 'Freshers week' at the beginning of October. Two postgraduate students were hired to encourage the students to fill in any uncompleted questionnaires as they collected them back from the undergraduates as they passed by in a queue. At this stage students are quite willing to complete surveys as they have not yet been 'over-sampled' and they see this as part of their registration process. Permission and support was obtained from the University Registry and also ethical clearance from the Student Survey Committee.

**Groningen**
New students were approached from October 2001 by sending a letter to the heads of the faculties explaining the aim of the SEUSISS project and explaining that faculty members were needed who were willing to co-operate.
Secondly, the secretaries of the faculty heads were asked for the names of the university teachers who taught new students in the first semester of the year, and these teachers were sent an email explaining about the project and announcing a telephone call.

Staff members were asked to let the questionnaires be filled in by the students before or after a lecture. Staff members received a questionnaire in advance. Most staff members (about 65%) complied and in some faculties almost all teachers co-operated. A research assistant conducted the survey in the classes and in this way from each faculty a large sample of students filled in the questionnaire.

### Profiling established students close to the end of their courses

#### Abo
Graduates leave the university throughout the year and not on a fixed day. The near graduate questionnaire was sent out in co-operation with "Employment Forum", a unit within the university that helps graduates to find jobs. Twice a year this unit sends a questionnaire to all graduates just after graduation and they included the questionnaire in those envelopes. "Employment Forum" staff have different experiences of graduates, who probably consider Abo university at that time as their Alma Mater. They usually get an answering percentage of 70%-80%.

#### Bergen
Due to the degree structure in Norway, collecting information from established students near to graduation is difficult. Currently there is no such thing as a graduating class or even last courses for the near graduates. Thus, it was decided to identify established students near to graduation as those that have studied at a higher education institute for 3-4 years (60-80 credits) and also the students newly accepted for a master (hovedfag) program. There was also some success in collecting data from disciplines where there are colloquia (small working groups usually led by a senior student) in lower degree courses.

#### Pavia
The established students near graduation, who enrolled under the previous academic structure, graduated when they finished their exams and their theses, with no fixed time limit. It was only possible to contact a handful at a time, a matter made worse by the fact that during this period students might not contact the University in any way for long periods. Instead, questionnaires were distributed through the computer room technicians, as many students go to the computer rooms to write their theses. Another point of contact was through members of the department who periodically see these students during their thesis period. Completed questionnaires only arrived slowly and in small numbers.

#### Poitiers
Five hundred questionnaires were distributed to teachers in the various faculties (Language / Science / Engineering School / Teacher training school). Those teachers who distributed the questionnaires in lecture theatres only got a very small proportion back: those who distributed the questionnaires to smaller groups had a higher impact and better feedback from students.

#### Salamanca
The postgraduate population was very difficult to find, because they were in small groups, and could choose subjects to study in different faculties and different branches of knowledge. In addition, the postgraduate programmes consist of seminars, conferences, workshops, etc, and as student presence in the classes is not compulsory, courses are never full. In fact less than 50 percent of these students attend classes, thus getting a good sample required visits to many classrooms and establishment of many contacts with professors.

#### Edinburgh
The questionnaire was given clearance by the Student Survey (Ethics) Committee. Members of staff from departments in these faculties who were known to be final year course organisers were invited to participate and asked if they knew of a way that their students could be approached with the chance of a good rate of return. A reasonable rate of return came from classes where the lecturer gave up a few minutes at the start of the class to allow the students to complete and return the questionnaire. In some instances the researcher was
allowed to enter the class for this purpose. A less effective method was to ask the departmental secretary or the Faculty Librarian to invite the students to complete the questionnaire. One group of students participating in a vocational placement was contacted by letter and asked to complete a questionnaire that was enclosed and which they returned in a reply paid envelope.

Difficulties in collecting data from the established students near graduation arose because it was not possible to meet them in one place at one time as with new students, and because a spread of students across all the faculties was needed, the process had to be repeated many times.

**Groningen**

Established students nearing graduation were approached in September or October 2001. After this period students are out of university teaching classes finishing their practicals, examinations and dissertations, and so become very difficult to reach except individually. The method for contacting them was the same as for new students at Groningen.

The interview notes were analysed in each university for major themes and these analyses shared between the partners.

**Bergen**

Technical personnel

Students in part-time positions supervise some of the largest data labs, and are a valuable source of information since they are in direct contact with the users (as opposed to the service personnel and the system administrators who are often located in their offices and in servers rooms). Interviews were carried out with these student supervisors and in addition with technical personnel in permanent positions.

University Leadership

Norwegian University leadership is divided into a University Director (head of administration) and a Rector (elected academic head). Staff in both offices were interviewed separately.

Academic personnel

The strategy for interviewing academic staff was to identify both staff that were frequent users of ICT and staff that were not, belonging to the seven different faculties. Finding enthusiasts was not difficult (all faculties were represented on a reference group for ICT and learning in 2000) and these staff were used to identify their colleagues in their faculty who were not so enthusiastic about ICT.

**Pavia**

Senior staff

Interviews were conducted with senior members of the Engineering Faculty involved in teaching ICT courses in their own Faculty and in implementing University and Faculty level projects that involve ICT infrastructure for learning, computer literacy and ICT for pedagogical uses. Staff were also interviewed in the University's Computing Centre where they were in charge of computer technicians and implemented two university-wide ICT applications, namely electronic student ID cards and an inter-university library service. They were contacted by e-mail and willingly consented to face-to-face interviews.

Academic staff

Staff views were collected by questionnaires and interviews. Questionnaires were sent to staff selected randomly from the university staff lists and also to those known to the team; 27 were returned. Interviews were
carried out with a sample of the staff who returned the questionnaires.

Technical staff
Technical staff were very willing to collaborate and were extremely helpful. Some were interviewed singly, and others as a group. They were contacted by email and interviewed either in their own computer rooms, or in the offices of the Centro di Calcolo (the University's Computing Centre).

Poitiers
Academic staff
Members of academic staff of both genders who teach in various faculties (Engineering, Science & Technology, Modern Languages, Teacher Training) were interviewed. After a first approach by phone, explaining the goals of the SEUSISS project, these staff responded positively and answered the questionnaire by email.

Senior Staff:
Senior staff were interviewed by phone and by email. They were responsible for coordinating New Technologies for Education, ICT training for Academic Staff and setting up ICT strategy missions.

Technical staff
Interviews were carried out by phone with the teacher responsible for a free access computer room and the technical support staff who worked there.

Edinburgh
Academic staff
Personal contacts across Faculties were approached by email and asked to participate in an interview or to nominate a suitable person. A spread was sought across Faculties of males and females, full-time and part-time staff, younger and older staff, new and well-established staff, and ICT enthusiasts as well as those with few ICT skills. Staff were also identified who had experience of working outside the UK.

Senior staff
The two Vice-Principal responsible for ICT strategy and for learning and teaching were interviewed as well as members of the Disability Office and the Careers Service.

Technical staff
There were interviews with members of the technical support staff in both the central services microlabs and in academic departments.

Groningen
Two university policy makers in ICT were interviewed plus university teachers who taught in the first year of university education and who showed interest in the use of Blackboard, the VLE at Groningen. In 2001 this group of teachers had had training in the use of Blackboard, but were not necessarily users of the digital learning environment. They were drawn from all Faculties. The member of the office in charge of the introduction of Blackboard university-wide, and a manager in charge of ICT-projects in the university both provided their views.

Employers' expectations and needs of graduate recruits
Employers were selected to represent the range that take graduates from the seven partner universities amongst others, and to cover a size range from small company to global organisation. Interviews with employers were carried out in three different ways:

- face-to-face interviews
- telephone interviews
- email interviews

We have used face-to-face interviews wherever possible but in some cases only a telephone or an e-mail interview has been possible. All employers have full anonymity.

Bergen
In interviewing employers it was necessary to be flexible according to the employer organisation's needs. A career day at the university in early 2002 was attended to identify potential employers to interview, and to these were added some multinational corporations. The Bergen partners approached 18 employers and carried out ten interviews. Four of their interviews were conducted face-to-face, one was via email and five were by telephone.

Edinburgh
The Edinburgh team found it difficult and time-consuming to arrange interviews. Employers were generally busy, saw it as a low priority, and in small companies were not used to handling these kinds of enquiries; considerable following-through was needed. In larger organizations it was sometimes difficult to locate a specific person who could speak about the broad recruitment and training issues within their organization. The team attempted to obtain interviews with general practitioner clinics, schools,
lawyers, the police, and various companies and government organizations. An organization called Graduates for Growth, a partnership between commerce and the higher education sector, was of valuable assistance in recommending companies to approach. A letter was sent to a range of employers requesting an interview. This was followed by a telephone call or email exchange. A range of small/medium/large & global companies was approached but there was a better response from large companies because they could more easily identify a person who had responsibility for training & personal development in graduate recruits. The University Careers Office gave help to identify the large employers of graduates. Mainly face-to-face interviews were conducted, although email was used in one instance. Several employers gave information informally by telephone but refused the standard interview. Two local companies which act as employment and training agencies for graduates were contacted for an interview as it was felt that these would have a good overview of what skills employers were seeking in new graduate recruits, but neither wished to participate.

**Groningen**

SEUSISS partners in Groningen built up a list of employer contacts in two ways. Teachers who were interviewed about their use of ICT in education were asked about organizations where their students received practical training or went to work after graduation. This resulted in a list of 24 different organizations and companies; ten of these were approached, and six agreed to participate. Four company representatives attending a Groningen-run course aimed at companies that want to use e-learning in staff training were also approached and agreed to take part. Interviews were conducted with the directors of small organizations or heads of departments of larger organizations. They took about 30 minutes; seven were conducted face-to-face and three by telephone, depending on the time that employers wanted to spend.

**Pavia**

Arranging employer interviews proved particularly difficult in Pavia. The Research Officer established contact with members of the human resources departments of sixteen companies (mostly large enterprises based in Milan and Pavia) present at a university careers open day. These included financial and IT consultants, an automobile manufacturer, a brewery, and a microprocessor firm. Contact people were sent an e-mail detailing the aims of the project and requesting an interview or, alternatively, a questionnaire followed by a telephone interview. The e-mail was followed by a phone call a day or so later. Ten of the companies were contacted at least once by e-mail and at least twice subsequently by phone. Many simply did not reply to e-mails, and the person originally contacted was usually not available to arrange an appointment. Of those who said they would fill in the questionnaire and send it back only two actually did. In these cases, the questionnaire was returned within a week; the project officer was personally acquainted with the contact person in one case.

The Pavia team also approached three other companies in person to explain the aims of the project and request interviews. The personnel in two of these (both of them banks) said that training was not carried out in the branch itself but at headquarters in Milan, and that they would forward a questionnaire to those responsible; these were not returned, despite subsequent queries at the branches. The local Chamber of Commerce was also contacted but was unresponsive to the aims of the project, and failed to give any information, although a list of local enterprises was available for a very high fee. The consistent lack of success with these approaches underlined the importance in the Italian context of personal contacts within a company. Filling in a questionnaire may otherwise be seen as a waste of time or even a breach of company secrecy.

**Poitiers**

The team in Poitiers experienced considerable difficulties in getting employers to agree to be interviewed. Most had little time to spare for this type of study, and would ask to be sent the questionnaire via e-mail; however, no answers were received. The only positive feedback received was from companies the team knew well and did business with. Telephone Interviews were carried out using the interview proforma.

**Desk research of employers’ views**

To supplement our employer interviews we sought a ‘meta-view’ in each country from a range of organisations and associations that represent the professions and commerce. We did this by searching the websites of
these organisations for information such as references to the skills that those working in the profession or area required, comments on ICT skills shortages or guidance to educational institutions about the necessary content or shape of curricula. Clearly, this is a selective approach as it relies on the presence of websites (although these are increasingly commonly used by all organisation as important means of information dissemination) and also on comment in them about ICT skills. However, we considered that absence of such comment might imply a lack of strong interest in the subject, and presence of such comment would be useful insight.

### Validity and reliability of the data

From the outset, within the SEUSISS project our aim was to obtain as high quality data as possible from our various information sources bearing in mind the limitations placed upon us by time, accessibility of those voluntary sources, and the range of survey methods we could reasonably

---

**Table C.1 Distribution of students between gender and cognate domain in new and established students and in the population in each partner university in academic year 2001-2**

<table>
<thead>
<tr>
<th>New student sample</th>
<th>female</th>
<th>male</th>
<th>A</th>
<th>CP</th>
<th>SE</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>65%</td>
<td>35%</td>
<td>26%</td>
<td>0%</td>
<td>22%</td>
<td>53%</td>
</tr>
<tr>
<td>Bergen</td>
<td>64%</td>
<td>36%</td>
<td>25%</td>
<td>7%</td>
<td>20%</td>
<td>49%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>60%</td>
<td>40%</td>
<td>24%</td>
<td>6%</td>
<td>28%</td>
<td>42%</td>
</tr>
<tr>
<td>Groningen</td>
<td>65%</td>
<td>35%</td>
<td>11%</td>
<td>7%</td>
<td>12%</td>
<td>70%</td>
</tr>
<tr>
<td>Pavia</td>
<td>63%</td>
<td>37%</td>
<td>28%</td>
<td>18%</td>
<td>23%</td>
<td>31%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>71%</td>
<td>29%</td>
<td>73%</td>
<td>0%</td>
<td>27%</td>
<td>0%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>72%</td>
<td>28%</td>
<td>8%</td>
<td>23%</td>
<td>14%</td>
<td>55%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established student sample</th>
<th>female</th>
<th>male</th>
<th>A</th>
<th>CP</th>
<th>SE</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>75%</td>
<td>25%</td>
<td>25%</td>
<td>0</td>
<td>21%</td>
<td>55%</td>
</tr>
<tr>
<td>Bergen</td>
<td>65%</td>
<td>35%</td>
<td>21%</td>
<td>24%</td>
<td>9%</td>
<td>45%</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>72%</td>
<td>28%</td>
<td>33%</td>
<td>9%</td>
<td>14%</td>
<td>43%</td>
</tr>
<tr>
<td>Groningen</td>
<td>57%</td>
<td>43%</td>
<td>14%</td>
<td>13%</td>
<td>11%</td>
<td>62%</td>
</tr>
<tr>
<td>Pavia</td>
<td>62%</td>
<td>38%</td>
<td>30%</td>
<td>13%</td>
<td>26%</td>
<td>31%</td>
</tr>
<tr>
<td>Poitiers</td>
<td>62%</td>
<td>38%</td>
<td>29%</td>
<td>0</td>
<td>32%</td>
<td>39%</td>
</tr>
<tr>
<td>Salamanca</td>
<td>67%</td>
<td>33%</td>
<td>17%</td>
<td>11%</td>
<td>14%</td>
<td>58%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual student population</th>
<th>female</th>
<th>male</th>
<th>A</th>
<th>CP</th>
<th>SE</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abo</td>
<td>23%</td>
<td>0%</td>
<td>29%</td>
<td>49%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bergen</td>
<td>29%</td>
<td>8%</td>
<td>15%</td>
<td>48%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edinburgh</td>
<td>24%</td>
<td>10%</td>
<td>32%</td>
<td>33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groningen</td>
<td>23%</td>
<td>11%</td>
<td>16%</td>
<td>49%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pavia</td>
<td>21%</td>
<td>13%</td>
<td>32%</td>
<td>33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poitiers</td>
<td>19%</td>
<td>9%</td>
<td>40%</td>
<td>33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salamanca</td>
<td>17%</td>
<td>6%</td>
<td>24%</td>
<td>54%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A=Arts & Humanities; CP=Clinical & Paraclinical; SE=Science & Engineering; SS=Social Sciences
apply. From these data 'vantage points' we would then be able to 'triangulate' [C.1] to a view of the current state of student ICT skills and attitudes in the old research-intensive universities of Europe, give an informed opinion on the factors that influence these and be able to comment upon the 'fit' of these skills and attitudes to the needs of employers of such graduates.

With respect to the teaching staff of the universities and the employers, these were to be surveyed to give us an insight into the context within which student ICT skills were developed and used. Although we needed to obtain data from a range of sources, these were not intended to be 'representative' of all teaching staff or all employers, but to be sufficient to give us a rounded view from which we might draw conclusions with some confidence.

For the students we could afford to be more ambitious, and indeed we wished to generate a dataset for new and established students that could provide a reference point for subsequent studies in our own and other universities. Each partner aimed to gather data from students across the range of faculties, either as new students or in the last year of study or in classes taken by students near graduation.

Overall, given the constraints on the surveying of students, the majority of the samples were reasonable matches to the actual composition of the whole student population (Table C.1). It was not possible to obtain data about individual years or cohorts so the whole population data have been used as reference. In addition, we have no data for the gender balance at some universities and hence have omitted these numbers from the table below, although the similarity of gender mixture in the samples of new and established students at each university suggests that these are close to the actual values. Weisberg et al. and Cohen et al. [C.2, C.3] provide more detailed discussions of the design of qualitative and quantitative surveys and the problems inherent in obtaining valid and reliable samples.

**Leuven seminar on graduate ICT skills**

As part of the validation process for the research findings, a one-day seminar was held in the Catholic University of Leuven in April 2002 to which colleagues interested in ICT skills, and those involved with the management of higher education institutions, were invited to attend to share their views. At the seminar the interim findings were reported through oral presentations and in a discussion document. A short report of the seminar proceedings and the issues and suggestions raised are presented in Appendix F. The latter were incorporated into the subsequent research phase and into this final report.
APPENDIX D - QUESTIONNAIRES FOR NEW & ESTABLISHED STUDENTS

The two questionnaires that were issued to new and established students at Edinburgh (ie the English versions of the SEUSISS questionnaires) are shown in the following pages. The originals are full A4 size but are reduced to aid reproduction in this report. Each survey had text associated with it, issued to students as an information sheet, and is shown below.

The questionnaire issued to new students is shown on pages 127-129, and that for established students on pages 130-131.

_________________________________________________________

STUDENT INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) SURVEY

As part of a project funded by the European Commission, we are collecting information about the Information & Communications Technology (ICT) skills of students and academic staff in 7 European universities (Abo, Bergen, Edinburgh, Groningen, Pavia, Poitiers & Salamanca), and also the views of employers about the sorts of ICT skills they would wish new recruits to possess.

The aim of the project is to support student ICT skills training for improved employability and lifelong learning.

You can find out more about our project at http://www.flp.ed.ac.uk/seusiss

Please help us with our research by completing this questionnaire. All information collected will be used in the strictest confidence and only for the purposes of this project.
STUDENT INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) SURVEY

As part of a project funded by the European Commission, we are collecting information about the Information & Communications Technology (ICT) skills of students and academic staff in 7 European universities (Abo, Bergen, Edinburgh, Groningen, Pavia, Poitiers & Salamanca), and also the views of employers about the sorts of ICT skills they would wish new recruits to possess.

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You can find out more about our project at http://www.flp.ed.ac.uk/seusiss

Please help us with our research by completing this questionnaire. All information collected will be used in the strictest confidence and only for the purposes of this project.

Please mark boxes with a cross: X

Q1 Please indicate your ability to use the following computer programs to carry out the tasks of the types given as examples (mark one option per program)

<table>
<thead>
<tr>
<th>Program Type</th>
<th>Task Example</th>
<th>Do this type of task alone</th>
<th>Would need some help to do this type of task</th>
<th>Have never done this type of task</th>
</tr>
</thead>
<tbody>
<tr>
<td>word-processor</td>
<td>eg to create a well formatted CV</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>spreadsheet</td>
<td>eg to design a new sheet &amp; enter simple numerical data</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>email program</td>
<td>eg to send an attached document or image</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>database</td>
<td>eg to create a new database of your own with simple text entries</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>graphics program</td>
<td>eg to manipulate an image such as colour to B&amp;W</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>web authoring program</td>
<td>eg to create a personal homepage</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>presentation manager</td>
<td>eg to create a short talk with slides</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>web browser</td>
<td>eg to look for weather or download music files</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>chat program</td>
<td>eg to talk to someone in another town or country</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>on-line bibliographic databases</td>
<td>eg to search for a specific publication</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

Q2 Where did you learn your current ICT skills and knowledge of computer programs (please mark all appropriate)?

<table>
<thead>
<tr>
<th>Source</th>
<th>yes</th>
<th>no</th>
</tr>
</thead>
<tbody>
<tr>
<td>It was integrated into my school or college classes</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>special courses for ICT skills provided by the school or college</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>ICT courses outside the school or college</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>self-taught with manuals or handbooks</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>taught by friends or family</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>at work</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

Q3 Do you own a personal computer (PC)? yes □ no □ (if your answer to this question is No, please go to Q9)

Q4 If you do own one or more PCs, what type is it/are they (please mark all appropriate)?

<table>
<thead>
<tr>
<th>Type</th>
<th>Mac</th>
<th>Windows</th>
<th>Unix/Linux</th>
<th>Other type</th>
<th>Desktop</th>
<th>Laptop</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

(please specify other type)........................................................................................................
Q5 Are you able to connect your PC to the internet through (please mark all appropriate)?
- a phone line
- a cable network point
- Yes
- No
- Don't know

Q6 Which of the following do you have in, or attached to, your PC (please mark all appropriate)?
- scanner
- digital camera
- printer
- CD writer
- DVD drive
- Zip drive

Q7 In your last year of school or college term time, at which locations did you most often study using a PC?
- at home
- at school/college
- at workplace
- public library
- cybercafe
- other

Q8 How often, on average in your last year of school or college term time, did you use a computer in your studies (please mark one option)?
- every day
- 2-3 times per week
- once per week
- monthly
- very rarely or never

Q9 How many hours a week do you spend at home or elsewhere on the Internet for private or recreational purposes?
- 0 hours
- 1-2 hours
- 3-4 hours
- 5-6 hours
- 6-9 hours
- 10 or more hours

Q10 If your answer to Q9 is more than 0 hr, which of the following do you use recreationally?
- Chat
- email
- Download files (eg music)
- Order products on-line
- Banking or similar business on-line
- Surf websites
- Play games
- Gamble on-line

Q11 How important do you think ICT will be in your future career (please mark one option)?
- very important
- important
- of some value
- little or no importance

Q12 How often do you think you will use ICT in your university studies (please mark one option)?
- every day
- 2-3 times per week
- once per week
- monthly
- rarely or never

Q13 How confident are you about using ICT in your university studies (please mark one option)?
- very confident
- quite looking forward to the challenge
- a little apprehensive
- very apprehensive
Now, please tell us about yourself so that we can better target improvements in ICT skills training

Q14 Your age

☐ 16-20  ☐ 21-25  ☐ 26-30  ☐ 31-35  ☐ 36-40  ☐ 41-50  ☐ over 50

Q15 Your gender  Female  ☐  Male  ☐

Q16 Enrolling in Faculty of....

☐ Arts  ☐ Divinity  ☐ Education  ☐ Law  ☐ Medicine  ☐ Music  ☐ Science &Engineering  ☐ Social Sciences  ☐ Veterinary Medicine

Q17 Mode of study  ☐ Part-time study  ☐ Full-time study

Q18 Qualification expected on graduation

☐ 1st level degree (eg BSc, MBChB, BCom, BD, MA)  ☐ 2nd level Masters degree (eg MSc, MBA)  ☐ 3rd level doctoral degree (eg PhD, EdD)  ☐ non-graduating student at Edinburgh

Q19 Subject of study (eg Maths, English, Law)

Thank you very much for completing this questionnaire. It will be collected from you at matriculation.

Edinburgh University contact:

Dr Jeff Haywood  
Higher & Community Education  
Faculty of Education  
Paterson’s Land  
Holyrood Road  
Edinburgh EH8 8AQ

email: jeff.haywood@ed.ac.uk
+ STUDENT INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) SURVEY +

Q 1 Please indicate your ability to use the following computer programs to carry out the tasks of the types given as examples (mark one option per program)

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Do this type of task alone</th>
<th>Would need some help to do this type of task</th>
<th>Have never done this type of task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word-processor eg to create a well formatted CV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spreadsheet eg to make new sheet containing simple numerical data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email program eg to send an attached document or image</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Database eg to create a new database of your own with simple text entries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphics program eg to manipulate an image such as colour to B&amp;W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Web authoring program eg to create a personal homepage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation manager eg to create a short talk with slides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Web browser eg to look for weather or download music files</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chat program eg to talk to someone in another town or country</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online bibliographic databases eg to search for a specific publication</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q 2 Please indicate how often, if ever, you have used or been involved in the following (mark one option per program)

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Several times</th>
<th>Once</th>
<th>Never</th>
<th>Never heard of this</th>
</tr>
</thead>
<tbody>
<tr>
<td>A course with a website which had interactive features such as assessment, online tasks or learning materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-line discussion forum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desktop videoconferencing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Videoconferencing in a special room (suite)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virtual learning environment such as WebCT or Blackboard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audioconferencing via telephone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q 3 Are there other ICT applications and techniques which are not listed above which you feel you would like to have had access to at university? Please describe here:

Q 4 Where did you mostly learn your current ICT skills and knowledge of computer programs (please mark all appropriate)?

<table>
<thead>
<tr>
<th>Source Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>It was integrated into my university academic courses</td>
</tr>
<tr>
<td>Special courses for ICT skills provided by the University</td>
</tr>
<tr>
<td>ICT courses outside the University</td>
</tr>
<tr>
<td>Self-taught with manuals or handbooks</td>
</tr>
<tr>
<td>Taught by friends or family</td>
</tr>
</tbody>
</table>

Q 5 Do you own a personal computer (PC)?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(if your answer to this question is No, please go to Q9)

Q 6 If you do own one or more PCs, what type is it/are they (please mark all appropriate)?

<table>
<thead>
<tr>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mac</td>
</tr>
<tr>
<td>Windows</td>
</tr>
<tr>
<td>Unix/Linux</td>
</tr>
<tr>
<td>Other type</td>
</tr>
<tr>
<td>Desktop</td>
</tr>
<tr>
<td>Laptop</td>
</tr>
</tbody>
</table>

(please specify other type)

Q 7 Are you able to connect your PC to the internet through a phone line, a cable network point, Yes, No, Don't know?

<table>
<thead>
<tr>
<th>Connection Type</th>
<th>Yes</th>
<th>No</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>A phone line</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A cable network point</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q 8 Which of the following do you have in, or attached to, your PC (please mark all appropriate)?

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Scanner</th>
<th>Digital camera</th>
<th>Printer</th>
<th>CD writer</th>
<th>DVD drive</th>
<th>Zip drive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page 1
Q9 At which locations do you most often study using a PC?

- at home
- at university
- at workplace
- public library
- cybercafe
- other

Q10 How often, on average in university term time, do you use a computer in your studies (please mark one option)?

- every day
- 2-3 times per week
- once per week
- monthly
- very rarely or never

Q11 How many hours a week do you spend at home or elsewhere on the Internet for private or recreational purposes?

- 0 hours
- 1-2 hours
- 3-4 hours
- 5-6 hours
- 6-9 hours
- 10 or more hours

Q12 If your answer to Q11 is more than 0 hr, which of the following do you use recreationally?

- Chat
- Email
- Download files (eg music)
- Order products on-line
-Banking or similar business on-line
-Surf websites
-Play games
-Gamble on-line

Q13 How important do you think ICT will be in your future career (please mark one option)?

- very important
- important
- of some value
- little or no importance

Q14 How confident are you about using ICT in your future career (please mark one option)?

- very confident
- quite looking forward to the challenge
- a little apprehensive
- very apprehensive

Q15 How well do you feel that use of ICT was integrated into your university courses (please mark one option)?

- well integrated
- partially integrated
- little integration
- no integration

Now, please tell us about yourself so that we can better target improvements in ICT skills training

Q16 Your age

- 16-20
- 21-25
- 26-30
- 31-35
- 36-40
- 41-50
- over 50

Q17 Your gender

- Female
- Male

Q18 Enrolled in the Faculty of....

- Arts
- Divinity
- Education
- Law
- Science & Engineering
- Social Sciences
- Veterinary Medicine
- Medicine
- Music

Q19 Mode of study

- Part-time study
- Full-time study

Q20 Qualification expected on graduation

- 1st level degree (eg BSc, MBChB, BCom, BA, MA)
- 2nd level Masters degree (eg MSc, MBA)
- 3rd level doctoral degree (eg PhD, EdD)
- non-graduating student at Edinburgh

Q21 Subject of study

Thank you very much for completing this questionnaire.

Please return directly to your course organiser, or mail it in the reply-paid envelope

Dr Jeff Haywood, Higher & Community Education
Faculty of Education, Holyrood Road, Edinburgh EH8 8AQ
email: jeff.haywood@ed.ac.uk

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APPENDIX E - INTERVIEW PROFORMAS

Senior Staff Interview Proforma

Target = all senior academic or service managers in your university responsible for policy & strategy & delivery (implementation) of ICT training and e-learning for students and academic staff – this may include the Rector if appropriate, and if the university is very devolved, some Deans or Heads of Schools too.

See as many members of the organisation as necessary to obtain complete coverage of the ICT skills area. Record interviews on tape or mini-disk if possible.

1. What is the University/Faculty/School policy towards graduate ICT skills?

2. What do you expect entrants to possess and what skills do you expect students to acquire during their studies?

3. What stance do you take with respect to ICT skills for employability – both in research careers and in commercial careers?

4. What does the University/Faculty/School do with respect to this area?
   Specific courses?
   Embedded in academic courses?
   Combination?
   Self-training by students as needed from resources

5. Does it work? Do you assess the extent to which it does work or otherwise?

6. Do you provide any certification of ICT skills for students? If so, is this a national or international award or internal?

7. What do you see as the norm for graduate ICT skills in 5 years, in 10 years time?

8. What is the University/Faculty/School stance towards ICT skills for academic staff? Are they a requirement for appointment or for promotion?

9. How do academic staff acquire new ICT skills? Are there courses specifically for them?

10. What relationship does academic staff ICT skills training have to pedagogical training? How is training for e-learning being tackled?

11. Are these training opportunities compulsory or voluntary? What is the uptake of them?

12. What do you see as the norm for academic staff ICT skills in 5 years, in 10 years time?

13. To what extent will new staff ICT skills be needed, eg ICT-mediated communications, on-line learning materials design, computer-aided assessment design etc?

14. What about support for staff skills for open and distance learning, virtual mobility for students and staff?

15. To what extent does your university’s ICT skills policy and strategy take account of national and/or international directives, pressures, guidelines? To what extent are European influences felt?
Academic Staff Interview Proforma

1. How do you rate your own ICT skills in comparison to colleagues?

2. To what extent does your subject area lend itself to the use of ICT?

3. Which software applications can you / do you use (cf students –)

4. And for what purposes teaching/research/admin breakdown – approx breakdown of overall use as %T, %R, %A)

5. What access do you have to ICT facilities?

6. Do you have a PC for your own use at work?  What type/age is it?  Is it networked?  How much time do you spend on-line in a typical week?

7. Do you have a PC at home?  What type/age is it?  Is it connected to the internet?

8. How much time do you spend on this home PC in a typical week?  Doing what?

9. How much time do you spend on-line from home in a typical week?  Doing what?

10. Where do you get ‘training’ for use of ICT, and particularly for use of ICT in teaching?

11. How much use do you make of ICT in your teaching?  Give examples with scale/intensity/duration

12. What do you do in this area?  Is it pioneering or not much different to what colleagues are doing?

13. Will this change over the next few years?  Is this going to be more of the same or different uses?

14. What are the opportunities & possibilities?  What are the obstacles & barriers? (both technical and educational)

15. What support do you get for using ICT in teaching?

16. Are you aware of any university policy or strategy for developing further use of ICT in teaching and learning?

17. Faculty expectations of student skills

18. What ICT skills do you ‘expect’ students to arrive with & what skills do you hope that they leave with?  (This is in relation to courses & degree programmes you are involved with)

19. How do these match up to reality?

20. Are you aware of any university policy or strategy for developing student ICT skills?

21. Your view of employer needs now and in the future.  Is there a need for certification of ICT skills for students, perhaps with European standards?

22. Do you have students on your courses who come from outside your country?  If so, where do they come from and do you notice any differences with respect to ICT skills & attitudes to ‘home’ students?
Technical Staff Interview Proforma

Target:
Technical staff of maintenance of computer classrooms of the University. These classrooms, are a support to teaching, they are used primarily by the professors to give their classes, for free practice of students, and can be rented to public or private institutions for pedagogical use.

Note.
All the interviews are strictly confidential to the project team. No statement or date given by any individual within an organization will be available to their employer.

1) Could you please summarize to us briefly, what is your work?

2) Could you comment on what your training is to carry out your present job?

3) Which is your personal relationship with students?

4) What do you think about the computer skills students have?
   a) New students: What training do they have when leaving secondary education?
   b) Near graduates: How do the evolution in the computer skills show itself as students progress in their studies?

5) In relation to the previous answer: What is your opinion about computer skills of near graduates and the demand of the work market?
   a) If your valuation is negative: Could you give as some proposal to improve this situation?

6) According to your daily experience, how do the students use the free practice time with the computers?

7) Do they require any software, hardware or special application?

8) Which are the most frequent inquiries made by the students?

9) Could you tell me how student use internet? Do they use it as a didactic resource or as a pastime (leisure)?

10) How is the time distribution of the computer classrooms dealt with between teaching, free practice and renting to other institutions? How has it progressed? What is your opinion about what will happen in the future with this distribution?

11) Are the users of computer classrooms always the same group?

12) Do you think the demand in computer use is met by the University?
   a) If your answer is negative: Have you thought about alternatives to satisfy it?

13) In your opinion: Is there any link between the proliferation of cibercafes in the town and the demand of access to computers?

14) What do you think about the service offered by the computer classrooms? Does it work?
   a) If your answer is negative: Could you tell me the changes you could recommend?
   b) If your answer is affirmative: How would you improve the service?

15) How do you hope that this service will evolve in the future?
A seminar on graduate ICT skills was held in the Katholieke Universiteit Leuven, Leuven, Belgium on 18th April 2002. A document (the “Leuven Discussion Document”) was produced at this stage in the project to give the project partners an opportunity to consult with colleagues who were informed in the ICT skills field, about the ‘match’ between the findings and their experiences. The seminar was also designed to explore the directions that might be taken in the later stages of the project with respect to areas not covered to date and issues that might be addressed. The seminar proceedings were to become part of the final project report (this document).

The seminar time and places were chosen to make it an integral part of the Coimbra Group 2001 General Assembly, and Assembly participants from around Europe were also invited to attend alongside delegates from university senior management staff, student representatives, informed agencies and colleagues working on similar projects.

The SEUSISS project: background – purpose – methodology
Jeff Haywood (Edinburgh) welcomed the participants and introduced the project partners. He explained the background, purpose and methodology of the SEUSISS project. The variety of different nomenclatures in universities to describe the different levels of education on offer and degree structures were discussed, as these are important factors when talking about the data and their meaning.

Before the findings were presented, the audience was asked to consider the following questions about their expectations:

- What differences (regarding students ICT skills) between northern and southern European universities do you expect to find?
- Do you think there will be differences between male and female students’ ICT skills?
- What kind of student ICT skills are employers expecting?

Participants were given some time to think about these questions and were then asked to share their views with the person nearest to them.

Findings I and discussion – “views from students”
New student entrants:
Egbert Harskamp (Groningen) presented the data we had gathered, starting with three research questions
- What ICT skills with handling standard software do student have when they enter university?
- Do students usually have high self-confidence about their ICT skills for university study, a high opinion of the importance of ICT and are they experienced in ICT use?
- Do students have ICT facilities at home so that they can study off-campus and are they using ICT frequently?

Referring to graphs he drew out the following information:
- that there were more female students attending courses.
- that there was no strong evidence for a “North/South divide” between universities. It seems that students are more skilled in Groningen and Edinburgh but for the rest of the countries the figures were similar.
- that there were rather few and small gender differences

A participant pointed out that it was interesting to see how the students’ expectations of using computers at University were much higher than the effective use that was actually made of them once at University. Male students were more confident about using ICT at university than female students. However, it is noted that in general women tend to underestimate their skills.

Regarding the use of ICT at home, a question arose about the concept of “home” as some of the differences between Universities might be explained by whether students are living with their parents or on their own. This could be partly a problem of language translation of the word ‘home’, but it may also reflect a pattern of living away from the family home to study, which is a more common pattern in some countries than others. Therefore this may not be a straightforward question to ask between countries and care is needed in interpreting the data.

Francois Marchessou (Poitiers) told the seminar that in
France there are Grands Ecoles which tend to attract the most able students and that universities such as Poitiers are in a ‘second class’. Mention was also made of the French Minitel System which may have put France behind the use of email.

Established (near graduate) students:
Hamish Macleod (Edinburgh) explained that the information from the established group of students was more difficult to get. He wondered whether students arriving at university feel that know what skills they have, and are therefore more resistant to a university’s influence. He asked what ‘integration of ICT into studies’ means and whether ownership has an influence on studying?

Looking at the data, the following issues emerged:

• that men over-rated their skills while women tended to under-rate them. However, both men and women had an equivalent idea of the importance of ICT. Women were more likely to use communication tools like email than men.

• the use of ICT had been developed in some subject areas more than in others. Students with a background in science and engineering showed higher levels of confidence.

The project partners were asked about the involvement of student organizations when collecting the data and Edinburgh said that it counted on the support of the student unions. There was also a question about the number of responses that were received through the Internet. In Åbo only two answers were received via the Internet and Groningen had not had much success with that method either. It was suggested that incentives could be offered to respond to web-based questionnaires. However, the use of on-line surveys risks biasing the sample in favour of those who like to use ICT.

Another question that was raised was whether the project had developed a system to find out if students are using ICT in an integrated fashion, and to measure how often students are on line or how many applications they are running at the same time. Jeff Haywood explained that they tried to do something of this kind in Edinburgh but the amount of data to be analysed was huge and they learned that students had several or many applications running at the same time, some devoted to social and others to educational purposes. One participant commented on a study at her university that suggested that students used time on computers in the same way that staff do. The researchers had looked at ‘chunks of time’ and found that both staff and students had several tasks running at once.

Findings II & discussion: “views from Universities”
Barbara Wasson (Bergen) talked about the information that had been collected from staff in the partner universities, both senior and junior, technical and teaching.

She addressed the following question to the audience:

• What sort of policy should a university have for ICT skills for students?

From the project group only the University of Groningen had a clear and written policy on the matter, the rest of partner universities had a policy in a more or less implicit way.

The participants explained that there has been a project in the UK looking at UK universities and their policies regarding the use of ICT, and that although it was clear that this is a priority for most (perhaps all) of them, it was difficult for some of these universities to find a way in which to put this belief into practice.

The representative from European Universities Association explained that this is the question he has been asked to work on in EUA. Unfortunately, he had been working in this field for a very short period of time and could not give a general overview of what had been done.

Another intervention pointed out that the implementation of an ICT policy in universities will very much depend on creating a favourable overall climate that will be able to involve all actors: it is in fact a ‘whole university’ approach. This opinion was also complemented by another
participant who suggested that the involvement of the university rectors was essential.

Rune Baggetun (Bergen) continued the presentation by addressing the following questions:

• Should ICT skills development be integrated with the curriculum or stand alone as generic courses?
• Is it desirable to have pedagogical ICT training, that is training to learn with ICT?
• How can universities best address these issues?

The most effective way to provide academic staff with the required ICT skills is by “one to one training” on demand, but it is also the most expensive staff training. Moreover, because use of ICT is not an aim in itself, some people don’t feel the need for a training course because they don’t use particular applications. It is clear that technology has changed the way of working not only for academic staff but also for personnel working in administration.

A major problem is to persuade university staff to attend training. The most important development would be the creation of a ‘learning environment’ which does not force anyone to use it or attend a training course but so that they are aware of the importance of it.

The option of providing training and assessment for the European Computer Driving Licence (ECDL) was not viewed by all the participants as appropriate, for some of them thought it more important to train staff and students in a more integrated way.

One participant was interested to know which was the ‘way to go’, because ICT skills were being given a high priority but most universities were still looking for direction. Another suggested that devolvement to Faculties required a climate favourable to uptake – setting priorities, with support and resources, an infrastructure – and that this should be a total university process, the creation of an atmosphere. One thought that if 3-5% don’t know the ‘nuts and bolts’ it may be because of class differences. There are also budgetary issues for universities cannot assume students will use ICT if they do not have the more recent versions of software or access to a networked PC at university and these have to be funded. There was a feeling that this area should be ‘owned by Rectors’ or lack of support will dampen the energies of enthusiasts.

A link was also identified with schools where ICT skills were developed and a worry was voiced that the need to demonstrate ICT skills might put pressure on staff.

The Project Partners said that they would hope to raise some of these issues in the final report, for example about training for careers, emerging technologies, the digital divide.

**Finding III & discussion: “views from employers”**

Pekka Tenhonen (Abo) presented the data for this section. He explained that at this stage in the project, 13 employers in 5 countries had been interviewed either face-to-face, by email or by telephone.

François Marchessou (Poitiers) asked the audience what kind of support do employers get from universities in ICT skills development? Some comments were:

• There are joint cooperation agreements between chambers of commerce and universities.
• There is also support for SMEs in staff training.

Another question raised was the kind of employers that have been interviewed so far. The project partners explained that they are still in the process of interviewing the employers as it is their aim to get 70 respondents. They pointed out that they have had much more difficulty in getting SME’s and small organizations to cooperate and that there are still more interviews of public employers to do. The European Commission for example couldn’t provide any valuable information (this institution uses an agency to employ its staff) and outsourcing to recruitment agencies and temporary staff agencies is an area to look at for the final report. They were also encouraged to follow through on the hunch that large companies are wondering whether they ought to be using eLearning for staff development and perhaps feel guilty that they have not started using this as a training tool.
Plenary: “What should the graduate ICT skills of the future be?”

The seminar finishes with some slides and comments on the questions “What should the graduate ICT skills of the future be?” and “How will universities ensure that they can enable students to develop the ICT skills that they will need in the future?”. Jeff Haywood chaired the discussion.

The conversation raised many interesting points, which include:

Universities should invest more in technologies. The University of Bergen invests 5% of its total budget in new technologies to support ICT. In the Netherlands there is a ‘technical underinvestment’. In France proportionally more is invested in the Grands Ecoles by the government, than in other universities.

Another problem that was raised was that sometimes those responsible for the maintenance of ICT have a very low level of specialization.

There was reflection as to whether ‘ICT on the move’ (M-working) may be in conflict with the traditional ways in which universities operate.

It was pointed out that some universities don’t provide enough research and courses on knowledge management. The majority of companies will be using eLearning in 5 years and in some American universities the students have to take a distance course when they are enrolled.

The group also said that it would be helpful if a definition of eLearning could be given in the final report. eLearning is also about instruction and depends on the views of the different faculties and professionals as well.

Another topic that was addressed was the possibility of delivering a certificate in ICT skills. Some participants preferred to integrate this into the curriculum vitae rather than having a special and separate certificate, and perhaps as part of a portfolio of skills.

The training of academic staff was also an issue of common concern. Most staff appeared to be in favour of working on their own and having a permanent help-desk to support them, rather than being formally trained.

Further discussion centred on gender and the seminar was told to beware of learning styles where ‘one size fits all’ and possibly to keep training in mind that is more geared to the female population, although this balance may change in the future. Rather than seeing ICT as a technical thing (T), the female emphasis would be on the ‘C’ which involves doing things together with others.

Finally, the seminar touched on the theme of formal versus informal learning. It was suggested that as a first step in integrating ICT into the curriculum, having a good homepage with links would make a course accessible at a time and place when it was needed. Discussion focused on supporting students who might need responses 24 hours a day. Support could be via other students or by identifying someone in a department who might act as a buddy/mentor giving semi-structured informal support on a just in time basis. Support could also be aimed at staff. All of this would cost money to provide and would need to address the question of how best to learn the fundamental underlying concepts.
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APPENDIX G
APPENDIX H - The SEUSISS Project Partners

University of Edinburgh, UK, Co-ordinator

Jeff Haywood
jeff.haywood@ed.ac.uk
Denise Haywood
denise.haywood@ed.ac.uk
Hamish Macleod
h.a.macleod@ed.ac.uk
University of Edinburgh, Higher & Community Education, Edinburgh EH8 8AQ, UK +44 (0)131 651 6545
http://www.scrollia.ed.ac.uk

Åbo Akademia University, Finland, Partner

Pekka Tenhonen
pekka.tenhonen@abo.fi
Katarina Drugg
katarina.drugg@abo.fi
Åbo Akademi, Domkyrkorgt 3, FIN-20500 Abu (Turku), Finland. +358-(0)2-215 31
http://abo.fi/english.sht

University of Bergen, Norway, Partner

Barbara Wasson
barbara.wasson@ifi.uib.no
Rune Baggetun
runeb@ifi.uib.no
University of Bergen, Postboks 7800, 5020 Bergen, Norway +47 55 58 00 00
http://www.uib.no/

Rijksuniverseit Groningen, Netherlands, Partner

Egbert Harskamp
e.g.harskamp@ppsw.rug.nl
Groningen Institute of Education Research, PO Box 1286, 9701 BG Groningen, Netherlands +31 50 36 36 691
http://www.rug.nl/cis/english/index.htm

University of Pavia, Italy, Partner

Anthony Baldry
baldry@gemini.unipv.it
University of Pavia, Dip LLSM, Strada Nuova 106/c, 27100 Pavia, Italy +39 0382 504462
http://www.unipv.it/
University of Poitiers, France, Partner

Francois Marchessou  Cecile Rodriguez
francois.marchessou@univ-poitiers.fr  cecile-rodriguez@univ-poitiers.fr
University of Poitiers, Office AudioVisuel, 95 av du Recteur Pineau, 86022 Poitiers Cedex, France, +33 (0)5 49 45 3228

University of Salamanca, Spain, Partner

Gorka Fernandez & Javier Teira
agenda@usal.es  solis16@usal.es,  pxx98xxi@usal.es,  carrasco@usal.es
University of Salamanca, Servicio de Relaciones Internacionales, Universidad de Salamanca, Patio de escuelas, 237008-Salamanca, Spain  +34 923 294426  http://usal.es

Coimbra Group of Universities, Belgium, Partner

Noelia Cantero
cguniv@coimbra-group.be
Coimbra Group, 119 rue de Stassart, B-1050 Brussels, Belgium  +33 2513 83 32
http://www.alys.be/coimbra-group/

SCROLLA, University of Edinburgh, UK, Support

Rory Ewins
rory.ewins@ed.ac.uk
SCROLLA, University of Edinburgh, Paterson’s Land, Holyrood Road, Edinburgh  EH8 8AQ, UK  +44 (0)131 651 6545
http://www.scroll.ae.uk