Transferring Kaleidoscope members' activities research into economic outcomes

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RESEARCH REPORT

"Transferring Kaleidoscope members' activities research into economic outcomes"

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1. Introduction

The importance of research undertaken within academic and research organisations is widely recognized by governments, industries and diverse stakeholders. Indeed, the contribution of higher education in the generation of new ideas and knowledge, and as an economic driver, has probably never been as important.

Nevertheless, universities face a rapidly changing environment shaped by pressure on funding, an emphasis on quality assurance and the increasing impact of globalisation, marketisation and new technology. Such pressure for change has placed a particular emphasis on the need for effective technology and knowledge transfer to create economic benefits.

This report aims at providing

- A Short synthesis of the state of the market, based on currently available reports
- A Snapshot of the current situation of Kaleidoscope members' technology transfer activities
- An Analysis of the situation of Kaleidoscope Academy – Industry interactions

The report reveals the specificity of the Technology Enhanced Learning marketplace and the results of technology and knowledge transfer between Academy and Industry as well as it highlights some TEL industry specific issues.

2. Technology Enhanced Learning

Various names or synonyms have been embraced and used interchangeably in research that uses digital technology to support human learning, including:

- computer-assisted instruction
- computer based learning
- educational technology
- educational computing
- technology enhanced classroom
- information and communication technology (ICT) in education

and more recently:

- e-learning
- m-learning or wireless e-learning
- distributed learning
- virtual learning
- asynchronous learning
- network learning
- technology-enabled learning
- technology enhanced learning (TEL)

Sometimes these terms are used interchangeably. Though some of these terms are of a general nature, most of the names are linked to the means or devices used. While the properties of the devices are important, we suggest avoiding the techno-centric view as implied by notions of e-learning (learning supported by digital electronic tools and media) and m-learning (e-learning using mobile devices and wireless transmission). Moreover, we acknowledge that there are many definitions of technology enhanced learning (TEL) more specifically, that wide differences exist in the use and application of these terms.

According to the Report of the Technology Enhanced Learning Committee, The University of Texas at Austin[1] Technology Enhanced Learning leverages technology to maximize learning within an environment of sound course design that can offer the students options of time, place, and pace and emphasizes different learning styles. Moreover, TEL represents one stage in the natural evolution of educational methods that integrates advances in pedagogy with those of design, interaction, delivery, and assessment technologies. The type and amount of technology incorporated into the

[1] Report of the Technology Enhanced Learning Committee, The University of Texas at Austin, November 2004 http://www.utexas.edu/provost/research/TEL_Report_2004.pdf

instructional environment can and should vary according to the subject, the instructor, and the aim's of the course. Instructional technologies have made it possible to emphasize different learning styles and offer a range of learning options which, combined together, offer much more individualized instruction.

According to the Lisbon Strategy, Technology Enhanced Learning is one of the major goals of the European Community, which should also be reached by access to ICT, networks and resources. European Commission's e-Learning Initiative[2] defines the term as the use of new multimedia technologies and the Internet to improve learning quality by facilitating access to resources and services as well as to remote exchanges and collaboration. The term is also used when technology refers to digital technology[3]

Nevertheless, there is several definition for the "look or feel" of a technology enhanced course; instead, this effort occurs along a very broad spectrum; at one end, it can include a course with only minimal technology enhancement such as a Web site with an electronic syllabus, while at the other end a robust, multimedia rich, interactive, collaborative, fully online or delivered over mobile devices course can be found.

For the purposes of this report, we offer the following definition of technology-enhanced learning: *using digital technology to support human learning*

The term Technology Enhanced Learning Industry in this report, based on above mentioned TEL definition, means: *Educational content producers, learning platform developers, training consultants, training centres, etc. which use digital technology to support human learning.* Moreover it refers to synonymous terms framed in the e-learning sector (e-learning industry, e-learning providers, e-content providers).

2.1. TEL Industry marketplace

TEL Industry combines segments of different industrial sectors such as Education & Training and Information Communication Technology.

2 European Commission, eLearning Initiative, May 2000

3 Research and Practice in Technology Enhanced Learning Vol. 1, No. 1 (2006) 3–29 ONE-TO-ONE TECHNOLOGY-ENHANCED LEARNING: AN OPPORTUNITY FOR GLOBAL RESEARCH COLLABORATION TAK-WAI CHAN et al.

Education & Training markets

The Annual Information Industry Outlook 2008, prepared by Leigh Watson Healy[4] - Chief Analyst of Outsell, forecasts steady and moderate growth for the information industry from 2007 to 2010. According to this report, performance will vary among segments, and successful companies will be agile and adaptive solutions providers. The report summarizes metrics and trends for information industry segments and key customer groups that fuel the $362 billion information industry and its Education & Training (E&T) segment. The report forecasts growth to $448 billion by 2010.

Market Analysis by Mukta Ohri looks at key dynamics of the global E&T market, which grew just over 5% in 2006, to $40 billion[5]. Whereas market report: E-learning - The Future[6] published in 2002, states that the global E&T market is a $2 trillion industry, out of which the US has a share of $740 billion. Approximately 10% of this is "for-profit" business. The growth rate for the different education and training market segments is projected at 10-15%. Indeed, it is a little “fuzzy” to guess just how large a percentage TEL occupies within the training industry.

ICT market place

Businesses of all types focuse on responding faster to changing business needs fostered by strong ICT growth. European Information Technology Observatory 2007 (Lamborghini, 2007[7]) reports growth resulting from the emergence of new business models and new ICT market leaders. Broadcasters and telcos move from pure transportation of voice and bits to VAS and new customer-driven digital content, IT and consumer electronics companies integrate media content in new digital devices. Media providers converge with Internet aggregators and social networks and new “garage start-ups” speed up radical changes in business models, in competition and industry structures.

The ICT industry has entered a new strong cycle driven by digital convergence, the Internet Protocol (IP), new HW technologies and web 2.0/3.0. This new cycle reshapes many industry sectors (Figure 1).

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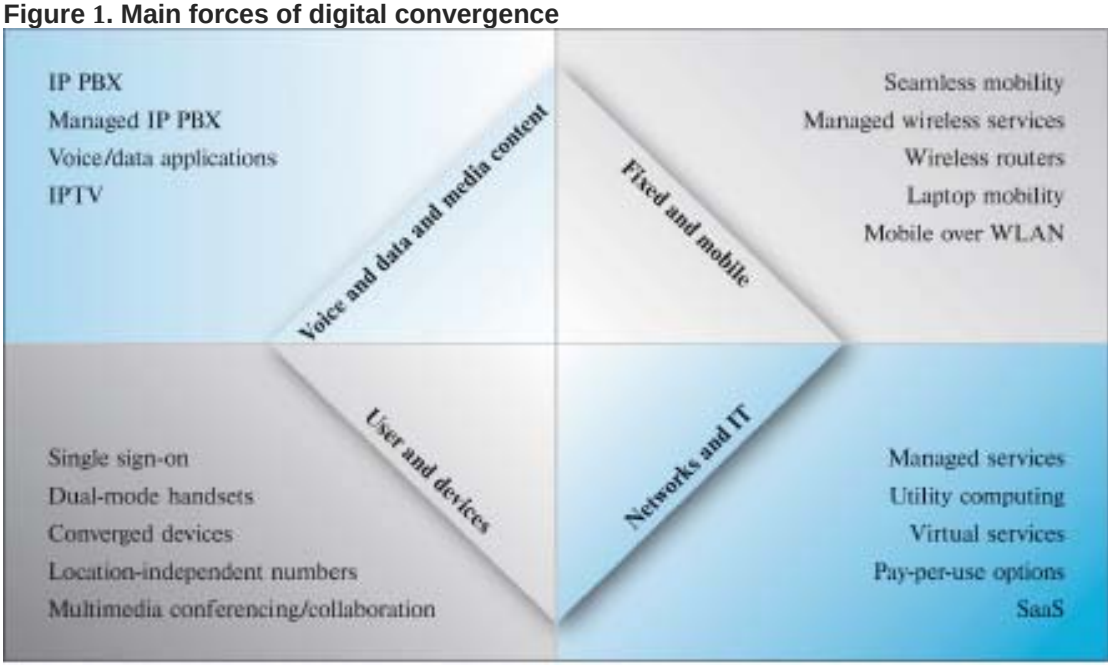
4 www.outsellinc.com

5 “Education & Training Market 2006: Key Trends and Dynamics” Mukta Ohri, Director & Lead Analyst at Outsell Inc.

6 ThinkEquity Partners, Eduventures, Inc., 2002

7 www.eito.org

Figure 1. Main forces of digital convergence

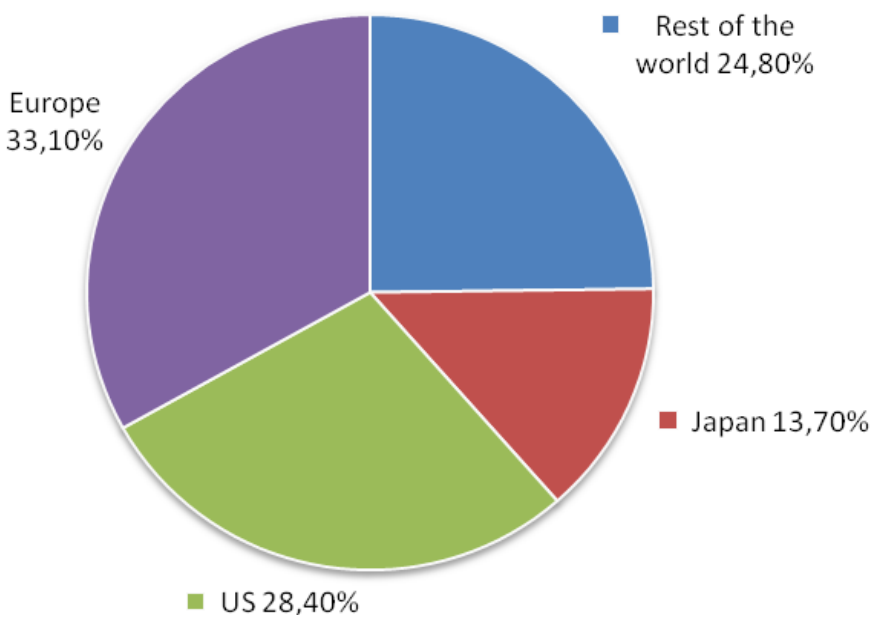


Source: EITO 2007

The growth is twice the EU economy as a whole, and ICT markets in Europe are still showing solid positive growth (Lamborghini, 2007). Gradual improvements in the European economic outlook are now beginning to exert a positive effect on business confidence. Over all, ICT market in Europe in 2007 amounted to 680 billion Euro, compare to 594 billion Euro two years ago[8]. It represents 1/3 of worldwide ICT market (Figure 2.).

8 European Information Technology Observatory: EITO 2005

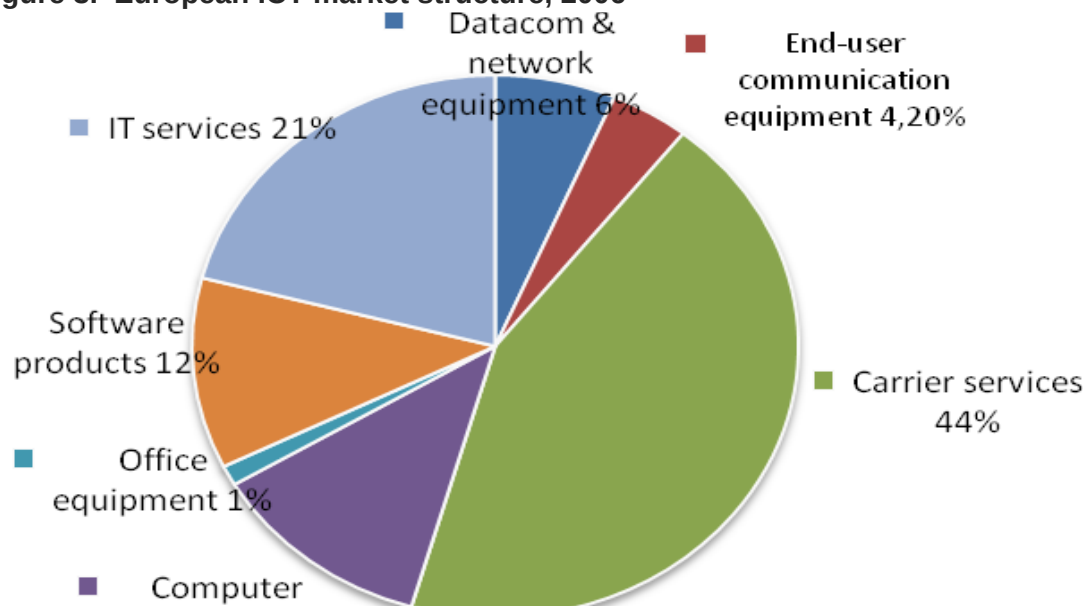
Figure 2. Worldwide ICT market by region 2007



Source: EITO 2007 *Market value 2007: 2,115 billion Euro*

According to EITO 2007 report, European ICT Industry is increasing investments in skilled human resources and R&D projects and tends to gain productivity through more IT investment, especially by SMEs. Moreover, there is a strong tendency favouring high-tech/high-risk entrepreneurship and intra-European partnerships, Mergers & Acquisitions and concentration efforts. The European ICT market structure is presented in Figure 3.

Figure 3. European ICT market structure, 2006



Source: EITO 2007 in co-operation with IDC *Market value 2006: 680 billion Euro*

With increasing number of Web users in Europe, the use of the Internet within the companies is still widely spreading. In addition, many Internet users are switching to the fast DSL technology, which does not require dialling over the local telephone network. Data services are experiencing a boom across Europe. Nevertheless, the Internet landscape is different when considering vertical sectors of European markets. Education stands out for its Internet complexity, web-enabled solutions and high levels of PCs per employee and per student.

E-Learning market

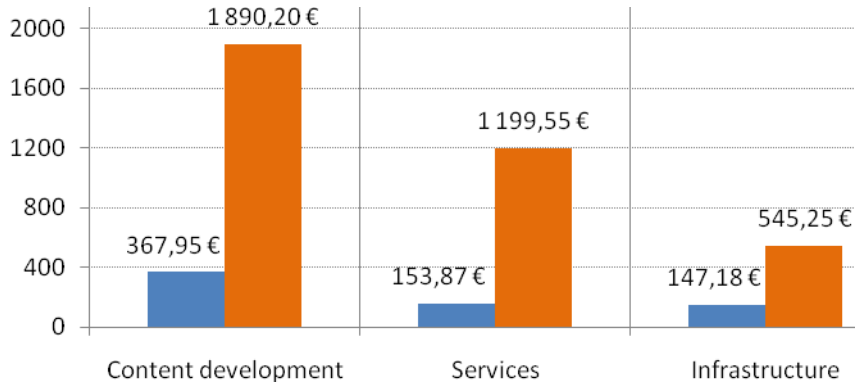
The size and evolution of the e-Learning market is unclear due to many factors. The rate of substitution from traditional training to e-Learning is unknown. While it is expected to be high, its variability, added to the uncertain size of the training market, thwarts efforts to accurately size the e-Learning market. Moreover, there's only a limited amount of information that can be accessed to, and market research reports tend to be very expensive. According to the International Data Corp.[9], U.S. companies spent $14.5 billion training employees on the Web and through computer based trainings in 2004. This is an increase of more than 400 percent from the $350 million spent in 1998. This growth is projected to continue in the next five years as more and more companies see the clear and inherent benefits of using technology-based training.

9 http://www.idc.com/

In the April 2004 report “Corporate Training Market 2005: Forecast & Analysis,” by Simba Information (2004[10]), e-Learning was forecast to grow by 8% in 2005, training outsourcing by 20%, and market for training seminars by 15%. In the latest version of the “Corporate Training Market 2005: Forecast & Analysis” (2004[11]), global corporate training sales of U.S. based firms was forecast to grow by 8% to $10.72 billion in 2005. According to this report, the growth was fuelled by a 30% e-learning increase, including virtual classrooms, Web meetings and conferences.

The growing economic importance of content development and services compare to infrastructure in e-Learning industry has been shown by EITO 2003 report (Figure 4.)

Figure 3. e-Learning spending per market segment in Europe, 2002 and 2006 (estimated)



Source: EITO 2003 report; Total market value in Euro: 669 millions (2002) and 3635 million (2006)

E-Learning market forecasts

With an already strong foothold in companies, e-learning is developping in K-12 and higher education teaching environments. According to "e-Learning: A Global Strategic Business Report", the 2007 U.S. e-learning market was already $17.5 billion and San Jose, CA-based market researchers Global Industry Analysts project the global e-learning market to overpass $52.6 billion by 2010[12].

The report also states that while Europe and Japan lag on e-learning adoption compared to the United States (U.S. enterprise e-learning adoption accounts for 60 percent of the market, while Europe's accounts for 15 percent), overall use of e-learning in Asia is expected to reach a compound annual growth rate of 25 percent to 30 percent

[10] http://www.marketresearch.com/product/print/default.asp?g=1&productid=1078909
[11] http://www.marketresearch.com/product/print/default.asp?g=1&productid=1078909
[12] David Kopf (2007), “e-Learning Market to hit $52,6B by 2010”, T.H.E Journal http://thejournal.com/articles/21046

by 2010[13]. According to this report, a 15 to 30 percent growth rate is to be expected worldwide. The key driver for e-learning use is an increasing number of solutions and services. However, the report warns that a lack of interoperability standards could stifle e-learning growth.

According to new research by Epic[14], the UK e-learning market is growing at 18% a year. Though the study shows steady growth and improving productivity it states poor profitability in the industry. Indeed, researchers examined 157 companies providing e-learning products and services in the UK., and analysed the financial performance of 34 major e-learning suppliers. Improved productivity (top line revenue per employee increased by 24%) and year-on-year growth of 18% result in static or declining general training revenues and poor profitability – some players prepared to bear heavy losses in order to build market share. The study showed an emerging, fragmented industry, with consolidation fuelling rapid growth at the top of the market, sometimes at the expense of profitability.

The above is the most current data, and e-learning *does appear* to be the key growth driver for training industry. The transformation of the educational environment as fuelled by the computer revolution is still in a formative and rapidly developing stage. Many reviews highlight what has changed over the past ten years even as they reveal just how difficult it is to predict long-term trends in this area.

TEL market trends

With the cost of implementing e-learning tools drastically decreasing, more governments, businesses, and educational institutions have added online courses and other forms of distance learning to their organizations. Based on research from the Gartner Group, the University of Pennsylvania, and other prestigious think tanks, the following outlines vital trends that will influence the growth of TEL over the next ten years.

Overall trends

Application Service Providers offer quicker start options. Governments, companies, and learning institutions can lease or purchase turnkey TEL systems. As e-learning processes are more standardized, clients benefit from shared research and

[13] David Kopf (2007), op.cit.
[14] John Helmer, *TrainingZONE 05-Apr-07,* http://www.trainingzone.co.uk/cgi-bin/item.cgi?id=166868&d=680&h=608&f=626&dateformat=%25e-%25h-%25y

development expenses, lower costs, and fast deployment. Even organizations on low budgets can implement open source e-learning platforms like Moodle on third party servers in a matter of hours.

Companies integrate TEL into their infrastructure. As more organizations implement department or company-wide intranets to increase communication and productivity, savy managers use the same tools to release e-learning programs into the wild. Professional development directors can easily integrate learning modules into staff communications, while human resources directors can add similar tools to web-based benefits and payroll systems. Not only does this emphasis on learning encourage workers to participate in more training, but the modular nature of TEL content also allows employees to learn at their desks in smaller chunks.

E-Learning cuts the cost of high quality content. Ivy League institutions like the University of Pennsylvania once traded on their exclusivity to justify the high cost of enrolment. Today, even the Wharton School of Business understands the value of purposing classroom content for distance learners around the country. By developing classrooms without walls, TEL programs can reduce the costs of participation without negatively affecting the compensation for well known lecturers, researchers, and presenters.

Learning support for Small Businesses around the world. Workers in niche industries once had to travel to specialized learning centres to discover the best practices in their field. Today, TEL connects students in rural communities to urban experts, and vice versa. We are only starting to see the effects that quality education is having on business and industry in developing countries. Likewise, small businesses can access the same quality of high-level information and insight that was once only available to Fortune 500 companies with large human resources budgets.

Gamers bring interactive skills to TEL. Human beings enjoy learning through experience. Many e-learning providers have discovered that they can use video game technology to develop fun, engaging, effective simulations. Industrial employers can train workers to handle sophisticated tasks without risking injury or production quality. Other types of teams can grow skills and learn best practices by participating in simulated quiz shows or treasure hunts. Fun TEL programs help boost staff morale while reducing the time it takes for team members to integrate new skills and ideas.

Governments deploy TEL at all levels. In addition to the obvious business uses for e-learning, governments around the world have discovered that TEL programs can dramatically improve the quality of life for citizens while reducing the financial burden on taxpayers. Local schools in underserved rural areas or dangerous urban neighbourhoods can rely on TEL to offset the lack of skilled teachers in their districts. State university systems can keep talented students from crossing borders by importing highly specialized programs from other schools. Governments in developing countries have invested heavily in e-learning programs to build eager, talented, work forces.

Partners and collaborators use TEL to get everyone on the same page sooner. As conglomerates unbundle themselves into smaller, more tightly focused companies, the connections between these operating units determine the success or failure of projects and products. Strong TEL systems allow team members from collaborating companies to understand and share objectives. As a result, outsourced call centres and repair facilities can serve customers transparently, while parts manufacturers can respond to end user demand with dramatic turnaround time.

Wireless technology helps TEL "cut the cord" initiatives. Today's wireless technology allows educators and development specialists to reach even further into rural areas, farms, deserts, and rainforests. With radio, mobile, satellite, and Wi-Fi signals beaming two-way information from distant places, people can participate in an almost endless array of learning opportunities.

Corporate Training Trends

Corporate training trends are highlighted by Bersin & Association survey 2007 for authoring tools carried in the US:

- Blended Learning – organisations now recognize that some training can be delivered online while other programs need a combination of modalities.
- On-demand – the migration form “training” to on-demand information access. Training and related information (e.g. formal, informal, experts) can be searched and accessed in smaller chunks
- Rapid tools – the need to get training information out quicker remains a priority for many corporate applications.

- Shared services- organisations are setting up centrally managed training technology groups that: procure products or services and provide consulting services to business units.

- Talent management – being recognized as a priority in (particularly established) industries. Systems for managing talent and training are starting to converge.

- Technology adoption – LMS is maturing in large enterprises, less so in SME.

- Shifting of Spending – expenditures on salaries being shifted to technology and outsourcing.

Demand for hosted training platforms is growing. A number of start-ups are addressing the hosted market with LMS, content development / management systems, games, mobile technology.

Mobile content development and delivery is gaining traction. More and more informal content is created and delivered for instant access. 35% of corporate training applications are candidates for mobile delivery (e.g. product trainings, sales, field services). 18% are already using mobile delivery

Gaming has potential but growth is slow. Gaming platforms (virtual worlds) and tools are the most interesting for corporate and government markets with potential applications (e.g. in Management and Leadership trainings, rapid response applications). IBM invests $20 M in collaborative virtual world technology. Forterra Systems provides 3D game engine and environment called OLIVE for collaborative virtual training environments. ProtonMedia targeted training market providing content development services.

Business Intelligence Tools are evolving. The **query** and reporting interface consists in off-the-shelf business intelligence tools which make it easy to create reports, drill into information, and create dashboards. Most companies already have licenses for these tools – typically Cognos, Business Objects, Actuate, or others.

Open source content management tools use is still high but future use is unclear according to o*verview of e-Learning Industry by Chris Howard*

3. Academy-Industry interaction

The relationship between industry and science is definitely important and yields benefits for both partners. There are clear benefits to Academy and Industry for collaboration. The importance of these relationships is likely to grow in the future. The US experience demonstrates that universities have a vital role to play in driving growth in a modern economy. However, there are significant differences in objectives:

- Industry - Research applied to new products/processes or services or solving problems for ultimate commercial benefit.
- Academia - More fundamental or speculative character - theories, models, understanding of scientific/ engineering principles. It tends to be carried out for:
    - Generating and disseminating new knowledge - without necessarily having an application in mind.
    - Training staff
    - Updating teaching programmes

Moreover main expectations from Academy are:

- "Production" of a pool of well-educated professionals. With people come the ideas, skills and knowledge from which many companies derive their competitive edge
- Research - generation of new knowledge
- Technology and knowledge transfer - successful exploitation of new knowledge in order to generate revenue and additional funding for research

The following benefits for industry have been mentioned: commissioning basic research to universities and public research institutions, and concentrating firm efforts on R&D closer to business; improving research speed; accessing various knowledge, especially in high-tech areas. The benefits for the university are: the possibility to expand sources for researches funding; the identification of new research topics relevant to society; the identification of new disciplines to meet social needs; the ability to contribute directly to society; better assessment to R&D results due to external evaluation.

Thus collaborative goals are different and the objective for any collaboration will be to use the diversity for mutual benefits. The table below outline main mutual benefits from a partnership.

For Industry	For Academia
Long-term thinking	Market awareness
New ideas and experiences	Updating staff and teaching programmes
Outsourcing	Application to solve real business problems
Complementing skills	Learning new skills
Multi-disciplinary approach	Learning business Processes - new approaches
Risk reduction of R&D investments	Track record with Industry
Physical resources	Physical resources
Finding the right staff	Job opportunities

3.1. Forms of knowledge and technology transfer

Knowledge transfer and technology transfer follow different ways to generate economic benefits:

- hiring skilled people, collaborative research contracts, informal contacts, conferences and publications (scientific and non-scientific) for knowledge transfer
- potential business channels such as know-how, invention disclosures, patent applications, patent grants for technology transfer.

However, knowledge as well as technology transfer share common channels e.g. licensing and Start-up/spin-off/spin-out creation. In this model, academic research or technologies are formally transferred to the market. The relative importance of these different ways from transfers to economic benefits is largely analyzed by Lambert Review of Business-University Collaboration[15].

3.1.1. Knowledge transfer

Knowledge transfer is the term used for the transfer of knowledge between academy and industry in either direction.

15 Lambert Review of Business-University Collaboration - Summary of Consultation Responses and Emerging Issues July 2003

Personal Interactions

The importance of personal interactions in transferring knowledge between the two sectors is of utmost importance. A number of researches noted that knowledge transfer is increasingly a non-linear process involving many players – including not just members of the university and business community but also involving students, business angels, venture capitalists, trade organisations and other networks. These connections are important in enabling knowledge transfer and many universities are increasingly involved in organising conferences and seminar events to bring these groups together.

Staff placements

Though the movement of staff between industry and academia is an effective way to promote knowledge transfer, it is not a popular form of collaboration among "traditional" Academy-Industry interactions.

Collaborative and contract research

Collaborative and contract research is reported to be an extensive and an important form of collaboration. However, conflicts of interest in relation to externally sponsored research and bureaucracy has been identified – such as the assignment of any subsequent IP rights that might arise from the research.

Consultancy and training services

Academic consultancy work is reported to lead to larger collaborative or contract research agreements with business. There has been an increase in the amount of consultancy work undertaken by universities on behalf of business.

Joint ventures

Involvement in these partnerships generally offers greater value than more ad hoc arrangements. Large multinational companies tend to move from relationships with many universities towards more strategic and long-term relationships with fewer institutions. Most of the universities involved in these strategic partnerships felt that they were efficient because they provided stable, longer-term funding. Moreover such partnerships enabled researchers to work on challenging problems often alongside industry researchers, with access to industry's latest technology and equipment.

3.1.2. Technology transfer and Intellectual property

Technology transfer is the formal commercialisation of intellectual property (IP) developed in university research, through selling or licensing to industry or creating new start-ups/spin-offs/spin-outs.

University control of technology transfer is still relatively new in Europe – most universities did not start commercialisation activities until the mid-1990s. There is widespread agreement that uncertainty about IP ownership is one of the main obstacles to effective technology transfer and research collaboration. This particularly applies when industry contributes to the funding of a university research project.

Trademarks

Trademarks are signs, symbols, letters or words that represent a company or product and serve to differentiate it from competitors. They may also consist of three-dimensional shapes, such as product packaging, or sound, flavour and colour. Registered trademarks are protected, giving the owner the exclusive right to use them. This protection is obtained by registering at a national or regional industrial property office[16].

Product Design

A product can be any industrial or handicraft item as packaging, graphic symbols and typographic typefaces. It also includes products composed of multiple components, which may be disassembled and reassembled. Product design is the outward appearance of a product or part of it, resulting from the lines, contours, colours, shape, texture, materials and/or its ornamentation.[17] However, computer programs are excluded.

Copyright

This protection concerns the way that ideas are expressed and not the ideas themselves. it protects artistic and literary creations from copy or use without the author's permission. Copyright includes books, music, paintings, films and computer programs too. In most countries, copyright protection is automatic. As soon as the work of art is created, it is protected and there is no need to register copyright. All the states

16 http://www.epo.org/focus/patent-system/protecting-other-ideas/trademarks.html

17 http://oami.europa.eu/en/design/faq/faq01.htm

of the European Patent Office have also contracting parties to the Berne Convention for the Protection of Literary and Artistic Works[18], which was signed in 1886 and provides a framework for international protection.[19]

Patent

More and more public research institutions and universities have started patenting their inventions, enhancing technology diffusion and the transfer of knowledge from universities to the public. The patenting trend within public research institutions (which has been popular in U.S. universities since the late 1980s) has taken hold in Europe over the past decade

Discoveries, scientific theories and mathematical methods, computer programs, plant and animal species, and illegal or immoral inventions are excluded from patent protection. Patenting is frequently disclaimed by mutual agreement and the software is classified and commercialized as technical know-how. In addition, informal copyright protection is available for computer programs that allow their commercialization.

Computer-Implemented Inventions

The number of new inventions seeking patent status in the field of computer-based inventions has been rising steadily. In fact, patent applications for computer-based inventions have the highest growth rate among all patent categories presented to the European Patent Office (EPO) over the past few years.[20]

To be patentable, computer based inventions must fulfil the same basic patentability requirements as inventions in all other fields. These are set out in the European Patent Convention (EPC). Accordingly, computer-based inventions can be patented if:

- They have technical character and solve a technical problem.
- They are new.
- They involve an inventive technical contribution to the prior art.

Therefore the patenting process for computer-based invention at the EPO is very restrictive as it puts emphasis on new technical solutions. The most striking

18 http://www.wipo.int/treaties/en/ip/berne/

19 http://www.epo.org/focus/patent-system/protecting-other-ideas/copyright.html

20 http://www.epo.org/focus/issues/computer-implemented-inventions.html

consequence of this definition is that computer programs which do not solve a technical problem are not patentable in Europe.

According to Art. 52(2)(c) and (3) EPC., a program for a computer is not patentable if it does not have the potential to cause a "further technical effect" which must go beyond the inherent technical interactions between hardware and software.

On the other hand, a computer-based invention (even in the form of a computer program) that can provide this further technical effect can be patentable, subject to the other patentability requirements, such as novelty and inventive step. In this case, it would be recognised as providing a technical solution to a technical problem. Thus, in real-life, inventions that use computer programs to provide a business process - not a technical process - are not patentable.

Licensing

Licensing has become an important channel to diffuse inventions and ease follow-on innovation. Indeed, licences are likely to be bought by the firms which are most likely to promote them. In an open innovative system (where a broad range of public and private sources is used by the firms as technological source inputs), licensing has become a key mechanism for exchanging patented inventions.

Licensing is an important way of patent exploitation. Various types of licensing are practiced, including unilateral licensing, cross-licensing and patent pools. All of these involve an agreement by the owner of a patent (licensor) to allow another party (licensee) to make, sell and use the patented invention on an exclusive or non-exclusive basis, without transferring ownership of the patent. Usually, a licensor receives financial rewards in exchange for the licence, typically in the form of royalty payments. Licensing is therefore one suitable mechanism for transferring technology between licensors who want to leverage their technological assets and licensees who want to complement their internal technological capabilities.

Licensing is widely used as a means of commercialising inventions. In a recent survey of European firms, licensing was the most commonly quoted patent to generate income (88% of respondents), followed by an alliance or partnership (61%), joint venture (56%) and sale (38%). However, licensing is not seen as the most promising strategy to generate income as many firms assign to licensing a low probability of success to commercialise an invention.

Spin-off firms / Spin-outs / Start-ups

'Spin-offs' are enterprises created by the organisation or its employees to enable the commercial exploitation of knowledge arising from academic research. These enterprises are owned at least partially by an employee(s). Other 'start-up' companies may be formed by staff or students without the direct application of intellectual property. ‘Spinouts’ are enterprises created by or with a university to enable the commercial exploitation of this university’s IP. Other reports use ‘spin-ins’ with slightly different meanings. The lack of consistency complicates the use of metrics in this area.

3.2. Possible transfers between Academy and TEL industry

Industry-science interaction is deeply linked to Human factor. However, its characterisation and measure are complex. Trust, motivation and the career of qualified personnel have been shown to play a key role in such interaction. Institutional and career rigidities represent a major problem in European public research institutions and hamper a smooth transition from one sector to another as well as the start of spin-off ventures from academia.

Most of the technology developed in TEL sector is based on computer-based innovations, which are difficult to patent. This makes patent based licensing unlikely to be used as a means of transfer. Subsequently, personnel participations – such as collaborative research, staff placements, start-ups/spin-outs, consulting and training services – represent major means of transfer between Academy and Industry in TEL sector.

3.3. Best practices in TEL Academy-Industry interactions

There is a number of publications on successful Academy-Industry interaction. “Technology transfer stories 2006: 25 Innovations that changed the world” published by AUTM portrays 14 cases of academic research transfer in Medical field. None of them is related to TEL. Nevertheless, there are best practices in TEL related industry:

US : e-Learning Creations, Inc. [21] *(Founded in 2002: Lawrence, Kansas)*.

e-Learning Creations was formed to commercialize technologies developed within the Centre for Research on Learning (CRL) for special education market. E-Learning

[21] http://www.technologytransfer.ku.edu/about/startup.shtml

Creations' initial strategy includes a partnership with a major special education publisher to produce a 10 course on-line series to certify special education teachers. The backbone of this product was developed by the CRL team and was part of the highly successful On-Line Academy and the e-Learning Design Laboratory. The product has been further enhanced to meet the recently-established standards of the Council for Exceptional Children.

The company also intends to market the licensed content to provide continuing education opportunities for teachers seeking re-certification for special education. As the company grows, the founders expect to expand into other markets where the technology can be easily replicated.

Ireland: WBT Systems Ltd (UNIVERSITY COLLEGE DUBLIN)[22]

WBT Systems Ltd, a spin-off from the Computer Science Department, provides e-Learning solutions to rapidly create, deploy and manage learning. The company's TopClass™ e-learning suite is a web-based training platform with over a million users worldwide including multinational organisations such as Dow Chemical, Nokia, Credit Suisse, and Liberty Group.

WBT Systems have announced that Holcim Group - a multi-billion dollar construction industry supplier headquartered in Switzerland - selected TopClass™ to provide a comprehensive web-based solution in order to train the group's 44,000 employees in 70 different countries. CIO Magazine, a leading publication for Chief Information Officers, announced that the Dow Chemical Company won their prestigious Enterprise Value Award for their in-house e-Learning system which is a global implementation of WBT Systems' TopClass™ e-learning suite

France (Rhone-Alpes region): Cartable Electronique[23] (SYSCOM laboratory, University of Savoie)

Cartable Electronique™, a spin-off from the University of Savoie, provides a collaborative space to educational institutions (schools and universities). This tool targets administration, pupil/students and parents. Nowadays, it works with 6 technical partners, 8 content providers and provides services to 6 universities, 25 high schools and 7 primary schools. Cartable Electronique™ concern over 15 000 users (12.000

22 http://www.irishscientist.ie/2002/contents.asp?contentxml=02p215.xml&contentxsl=is02pages.xsl

23 www.ern.fr

students). A new version was issued in January 2006, providing collaborative space (groups, schedules, contacts, journal, forum etc.) and personal work space including a large storage capacity.

The Cartable Electronique™ project was started in 1999 by the University of Savoie and the Conseil Général of Savoie as “l’Espace Numérique de Travail de l’Education” dedicated to researchers and engineers of the SYSCOM laboratory. The trademark Cartable Electronique™ was registered the same year.

4. Kaleidoscope members’ interactions with industry

This section of the report analyses the results of the Kaleidoscope Network Academy – Industry Interactions survey

4.1. Executive summary of survey

This chapter presents the results of the Kaleidoscope NOE Academy-Industry Interaction survey. The report is based on data for the period 2004-2007 provided by NOE Kaleidoscope research units leaders. The survey aimed at :

- Identifying trends in interaction between Academy and Industry (often referred to as third leg activity
- Developing the relevance and reliability of selected indicators

The survey covers 25 European Research units and includes questions covering aspects of organisations policies related to knowledge/technology transfer, organisation, activities and outputs related to working with companies of all sizes and sectors and other organisations, including the public sector.

The NOE Kaleidoscope survey has been overseen by a steering group to monitor and validate the various stages of the research process. The questionnaires were sent on November 8, 2007, and data was collected electronically (by means of an HTML questionnaire, and through phone interviews) with a deadline for submission on November 13, 2007. The survey response rate was 32%.

The respondents’ data has been checked and validated to ensure that the data is reliable. Results are presented in tables and graphs throughout this report.

4.2. Results of the survey

There are qualitative and quantitative questions. Some of them are difficult to measure with simple numerical metrics. There were designed to identify third-stream activities. There is a degree of subjectivity in some self-evaluation.

A: Overview

Questions in this section include overall information about the context in research units. Data, therefore, is subjective and in some instances qualitative.

A.1 Areas of Research Unit (RU) contribution to the economic development

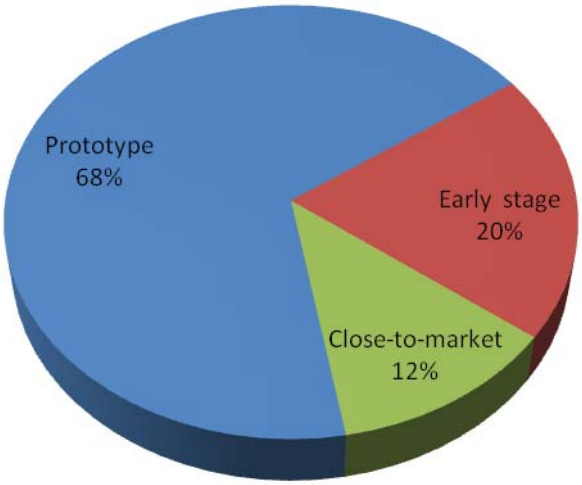
A.2 Research topics of the RU

Topic	Responses
Collaborative learning	84%
Mobile technologies for learning	40%
Computer - supported scripting of interaction in collaborative learning environments	40%
Learning & Technology at Work	40%
Technologies on roles and practices in Higher Education	36%
Supporting Teachers and Students Self Regulation	36%
Production of Educational Formats	36%
Interactions Analysis Supporting Participants in Technology Based Learning Activities	32%
Technology Enhanced Learning in Mathematics	32%
Interaction between learners' representations in multimedia Interactions Analysis	28%
Conditions for productive networked learning environments	28%
Participatory Design Narrative and Learning Environments	28%
Semantic web technologies	24%
Philosophy of Technology Enhanced Learning	24%
Design Patters for recording & analyzing use in learning systems	12%
Building Visual Interactive Blocks for tangible Math	8%

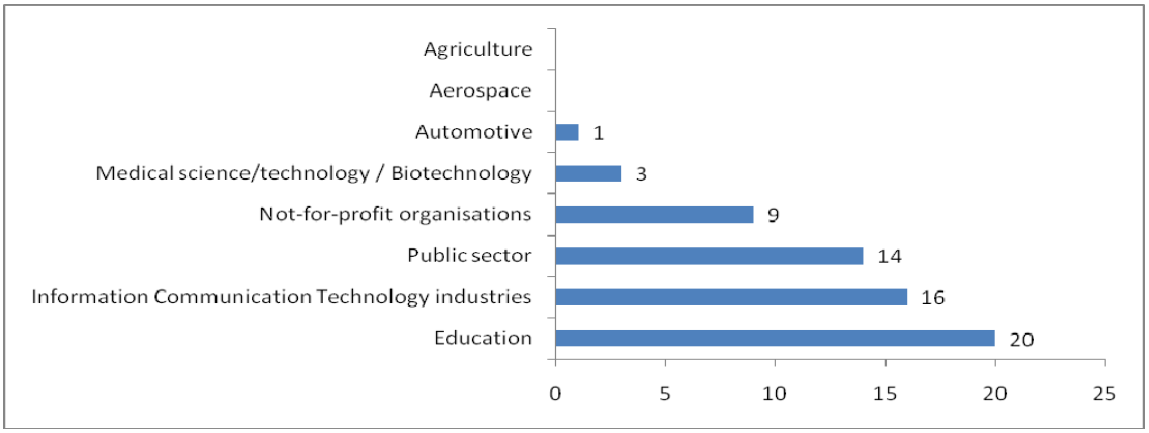
The following topics have also been added

Topic
Use of Learning objects
Designing interactive learning environments based on control technology
Technology for visual learning
Intergenerational learning
Communication and Collaboration Infrastructure
Visual learning
Technology and artistic expression
Ethnography of technology uses
Learning GRID
Artificial Intelligence
Inquiry Learning
Users' Group
Governance for Integration
VDS
Gateway

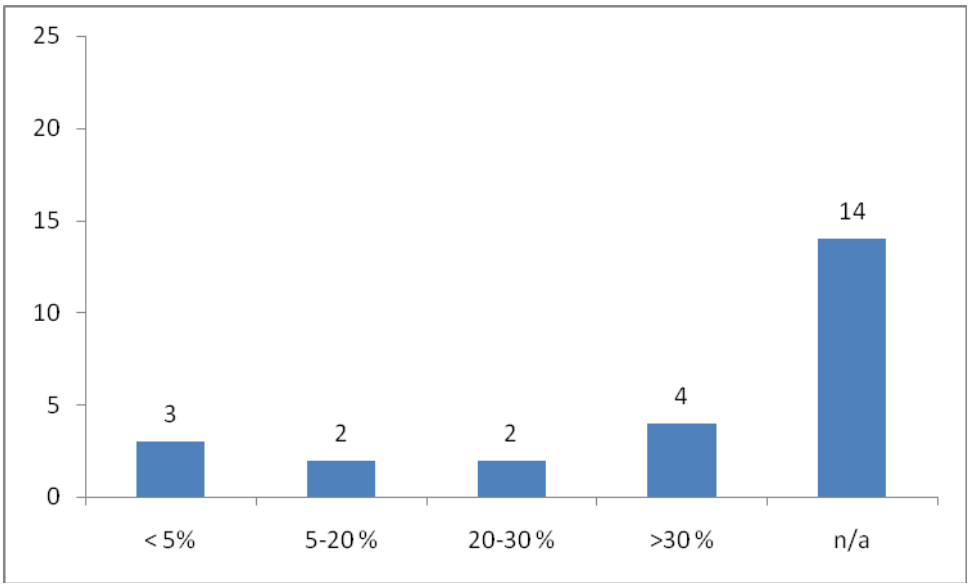
A.3 State of research outcomes when the survey was conducted



A.4 Industry sectors or clusters with whom RUs work closely

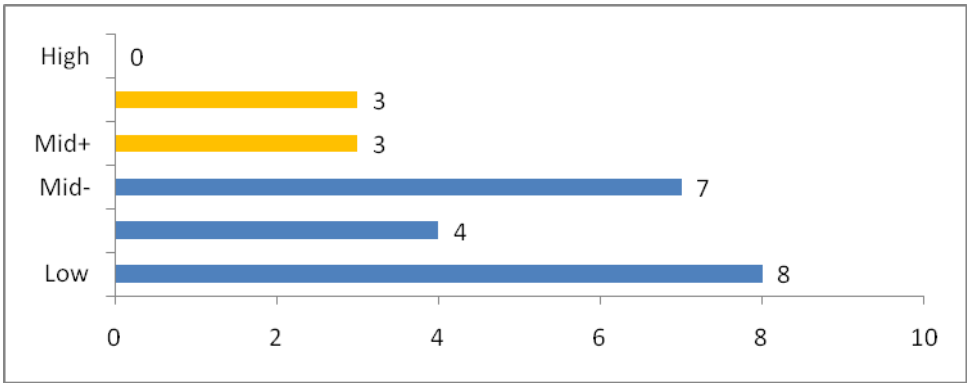


A.5 Industry representation in the institutions governing boards



This indicator is of lower importance as a proxy for the impact of business interaction, but could be retained to check it.

A.6 Level of incentives for the staff of your research unit to engage with industry and commerce during 2004-2007



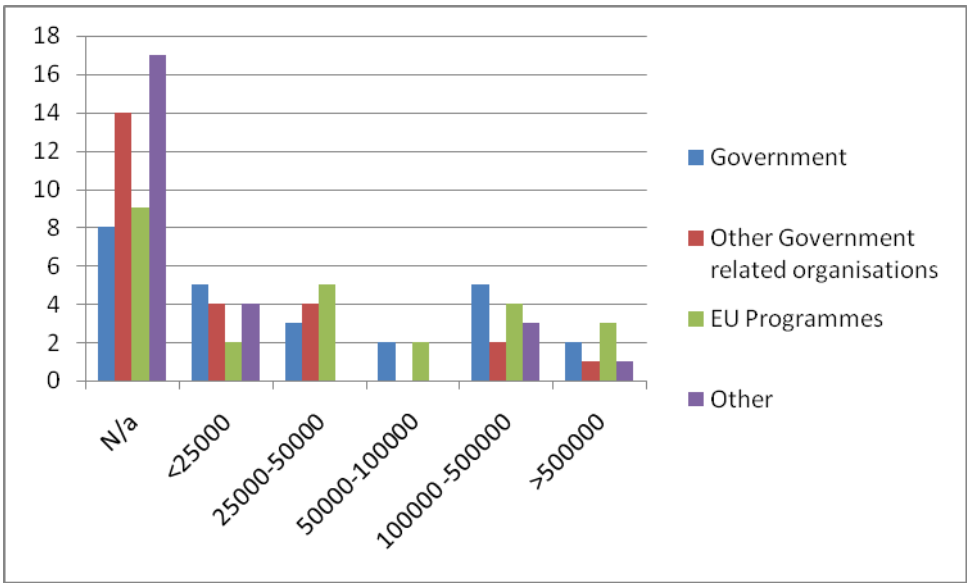
There is a strong trend towards lower incentives for staff to engage with industry.

B: Collaborative research with industrial companies

Questions in this section refer to collaborative research activities[24] , contract research or potentially net revenue generating.

[24] some of which have a public funding component

B1. Income from public-funded collaborative research grants involving business co-funding or formal collaboration with industry



It is one of the question with the highestr "N/A" response rate. The question is considered as highly "sensitive".

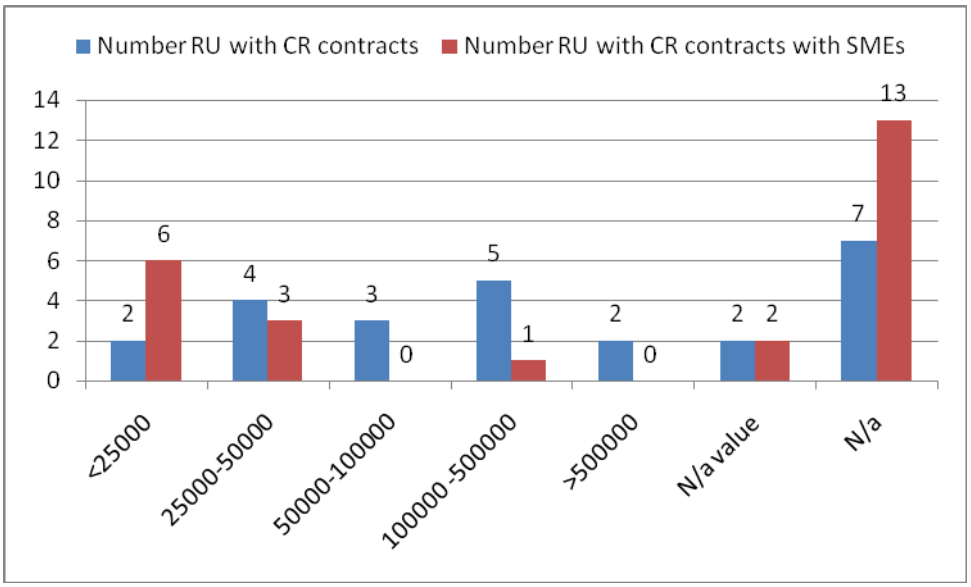
B2. Collaborative research contracts with businesses during 2004-2007

- Overall 75 CR contracts signed with 46 companies and organizations (see the table below)
- On average 4 collaborative contracts per RU have been signed during this period
- RU have a large proportion of contracts with SMEs - 33% = 25 contracts

Company Name	SME
AgemSoft	Yes
Archimede, editeur	Yes
ARCI	
Arw (Duisburg)	Yes
Bamboo Media Casting, Israel	
Beta Technologies	Yes
Britair	
Chartwell-York LTD	Yes
Cnotinfor	Yes
Con-Tent	
DIDAEL	Yes
DISC	Yes
Doukas private school	Yes
EA games	
EADS	

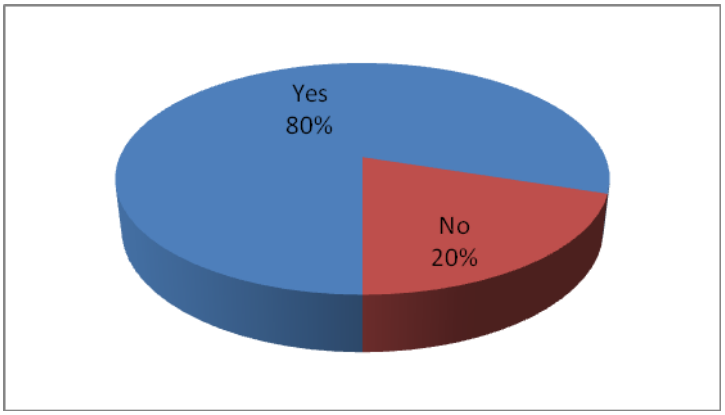
Company Name	SME
Enterprizer Technologies	
Faster Imaging AS	
Forthnet, Greece	
France Telecom	
Giunti	
Harcourt	
HP	
Indra	
Interactive Learning	Yes
Intrasoft International, Spain	
Lateral Visions	Yes
MEDIAROUND	
Microsoft	
Moving Knowledge Inc, USA	
Pentila	Yes
PT Inovaзro	
Redhada	Yes
Rhombus, editeur	Yes
Sharp Labs Europe	
Silogic (Toulouse)	Yes
Soda	Yes
Talent S.A.	Yes
Tecsidel	
Telefonica I D	
Telia Sonera, Telecom Operator, Sweden	
The Swedish public service broadcaster – Sveriges Television (SVT)	
T-Mobile Hungary	
Tribal Education	
Volvo IT	
Non-disclosed company for automating liquid flows	Yes
Non-disclosed metallurgical company	Yes

B.3 Value of collaborative research contracts with industry during 2004-2007 (in Euro)



Data on total numbers of contracts and income are highly relevant to the survey but the "sensitivity level" is very high.

B.4 Research cooperation activity with other research units



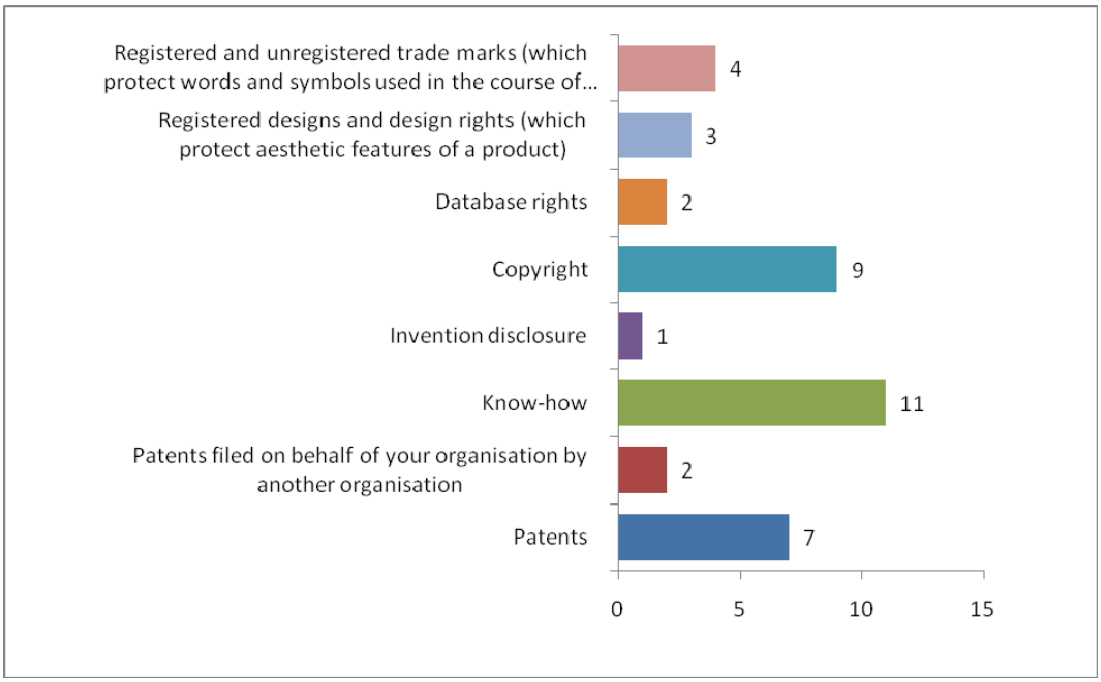
B.5 Research projects including industrial partners as well as RUs

Project	Industrial partners
COLLAGE	ForthNet
CONNECT	Intrasoft International
Connecting messaging systems and Second Life	PT Inovaзro
E4	Sparky Ltd
Enquiring Minds	Microsoft
Feedback	Zonith, Nordvestjysk Elforsyning Amba, Sydvest Energi Net A/S, Energy Piano, B&O
French Rhone Alpes Region cluster GOSPI, projet ASPIC	Volvo IT

Project	Industrial partners
Infovekacik	AgemSoft
IPSCY	undisclosed SME
ITALES (EC-IST)	Undisclosed
KP-lab	Safran
Learning at work	Statoil and Visma Services
LUISA	EADS, Giunti
MEKAST-GSRT	Talent. S.A.
Metrics for virtual commerce	Beta Technologies
Mini-project	Randers Central Hospital
Mobile learning e-portfolio	Nokia
MUSIS	TeliaSonera, Bamboo Media Casting
My Sports Pulse	Moving Knowledge Inc
Noe Kaleidoscope	Pentila (SME)
PhD School in education at the Budapest Univ. of Technology and Economics	Undisclosed
PhD School in philosophy at the Univ. of Pacs	Undisclosed
PI: Personal Inquiry	ScienceScope
ReMath	TAlent. S.A.
REMATH (EC-IST)	Undisclosed
STREP Re-Math	Talent SA
Teaching with Games	EA
ToonTalk activity book for preschools	Cnotinfor
WEB-LABS (EC-IST)	Undisclosed

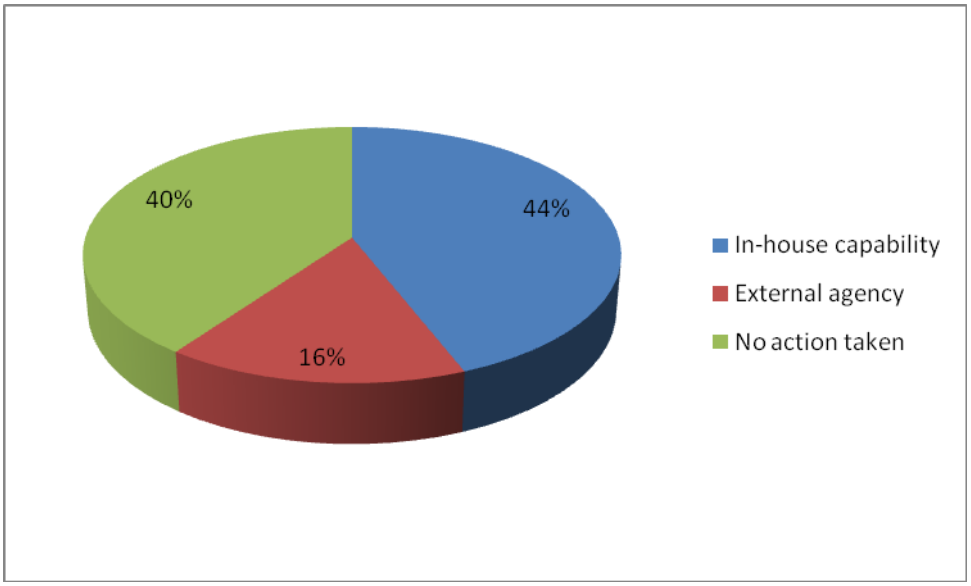
C - Intellectual property (IP) transfers

C.1 IP (legal rights) ownership over that are, in whole or in part, outcomes of your research



Data returned under this question display surprisingly high level of patents for TEL industry.

C.2 In-house capability to seek opportunities for its IP

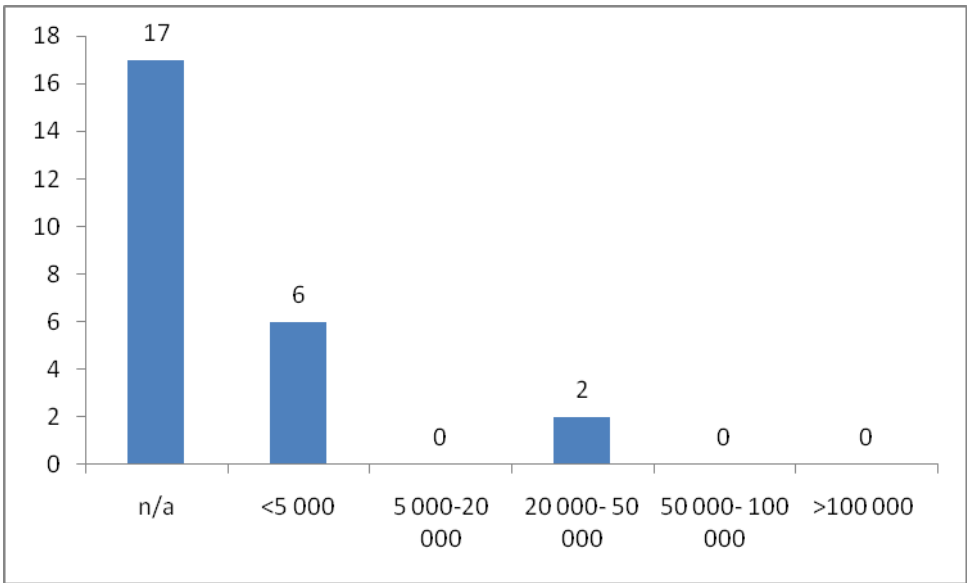


There is a clear preference for research institutions to manage their own IP.

C.3 Licences/options have been granted to external parties based on RU intellectual property during 2004-2007

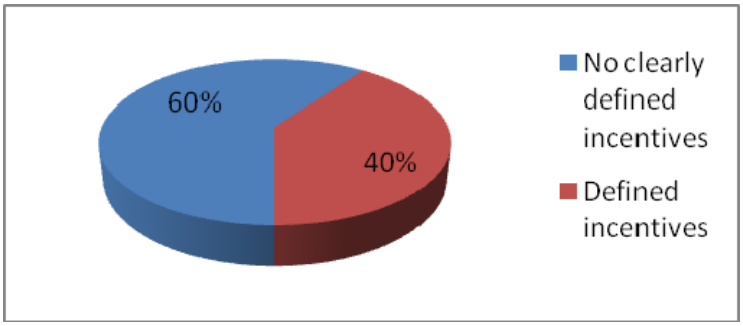
Number of partners issuing non-software licences	2
Number of partners issuing software licences	7

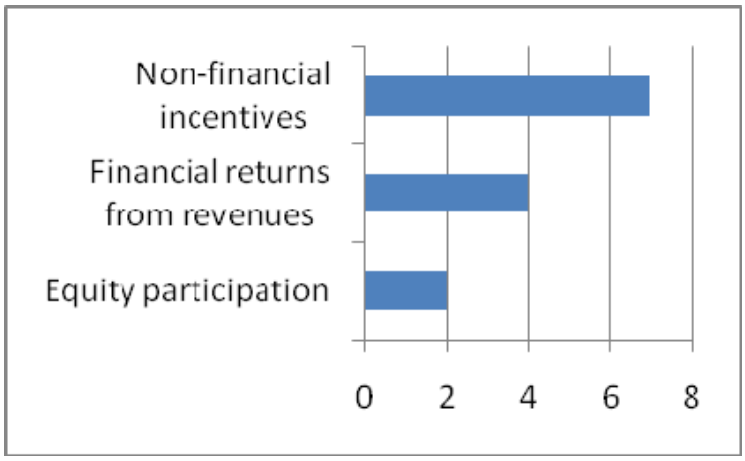
C.4 What were the total costs of IP protection activities? (in Euro)



There is limited confidence in the IP costs figures.

C.5 Incentives for staff taking part in knowledge or technology transfer



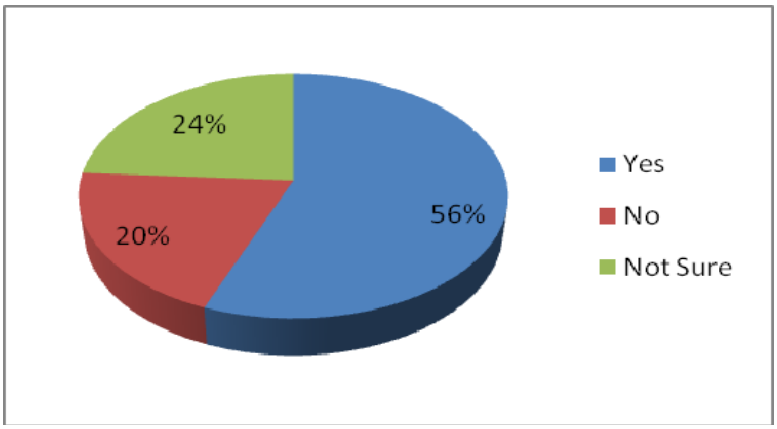


Even though these results show a static position, the rewarding of academic staff is more complex than simple finances, and RU could have a range of schemes which were not precisely captured by the question.

D. Consultancy and training services

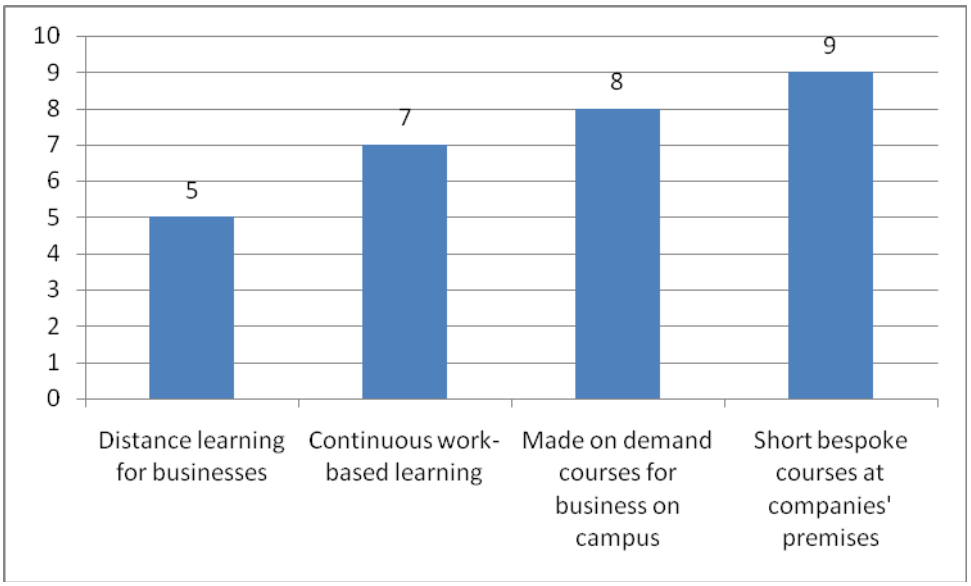
Questions in this section refer to the provision of expert advice and work as well as to training services. It is dependent on a high degree of intellectual input from the RU to business. Such work is usually paid for at a market rate, and may deliver stronger IP rights to the business client than would apply in a collaborative research relationship. Where consultancy develops into research, the generation of new knowledge or understanding, it would more properly be recognised as research rather than consultancy, and the RU would often expect to reap academic benefits.

D.1 Commercialisation and industrial liaison offices / persons to manage consulting or training links and other external interactions with the industry

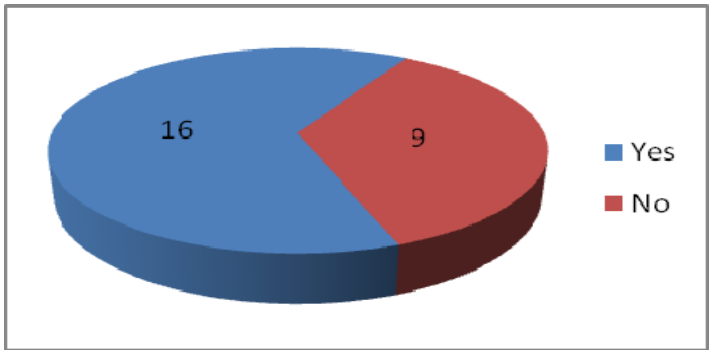


D.2 Does your research unit provide the following training services?

15 Research Units provides one of below mentioned training services under external contracts.



D.3 Provision of consulting services for industry

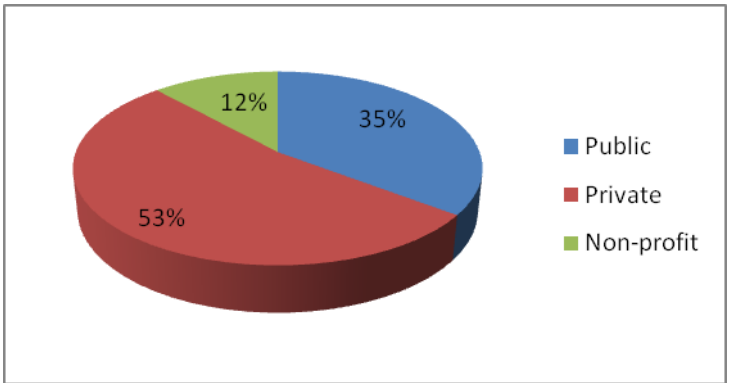


D.4 Training or consulting services please name the organizations

8 RU only provided data for this question

	Organisation	Public	Private	Non-profit
1	CASER insurance		1	
2	CORREOS		1	
3	France Telecom		1	
4	Harcourt		1	
5	Hill School Athens	1		
6	Karavanas Schools Larissa			1
7	Linguaemundi		1	
8	Metro Madrid	1		

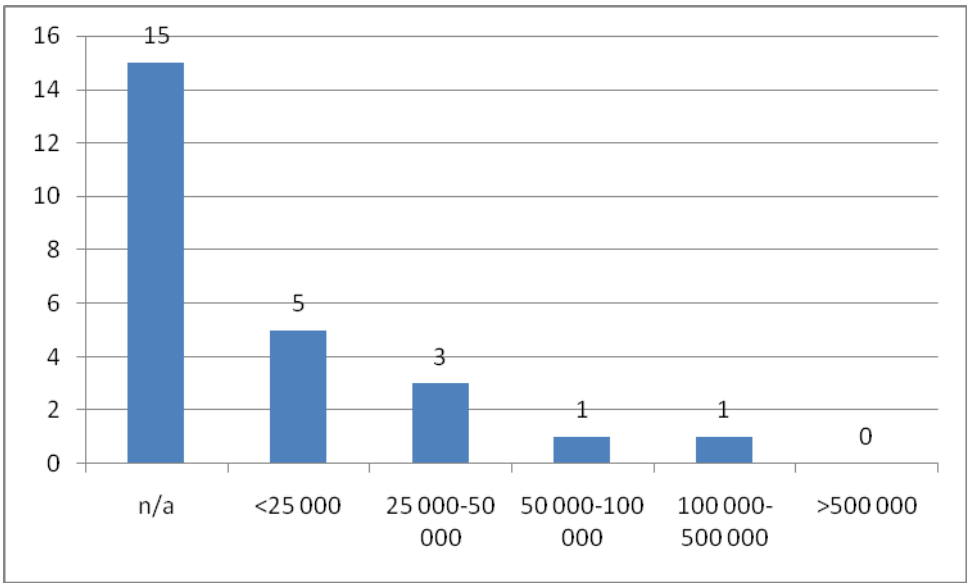
	Organisation	Public	Private	Non-profit
9	Ministry of Justice	1		
10	Promethean		1	
11	Psychico College Athens			1
12	Safran, IT industry		1	
13	Telefonica I D		1	
14	Ukraine Ministry of Financ	1		
15	Ullern Upper secondary school	1		
16	University hospital, A-HUS	1		
17	Volvo IT		1	
		6	**9**	**2**



D.5 Number of consulting or training contracts signed during 2004-2007

Overall 25 consulting or training contracts have been signed during 2004-2007 by the 12 RUs who have answered this question.

D.6 Approximate income distribution from training or consulting handled through formal channels during 2004-2007 (in Euro)



E. Spin-off firms / Spin-outs / Start-ups

Note: 'Spin-offs' are enterprises created by the organisation or its employees to enable the commercial exploitation of knowledge arising from academic research. Other 'start-up' companies may be formed by staff or students without the direct application of intellectual property.

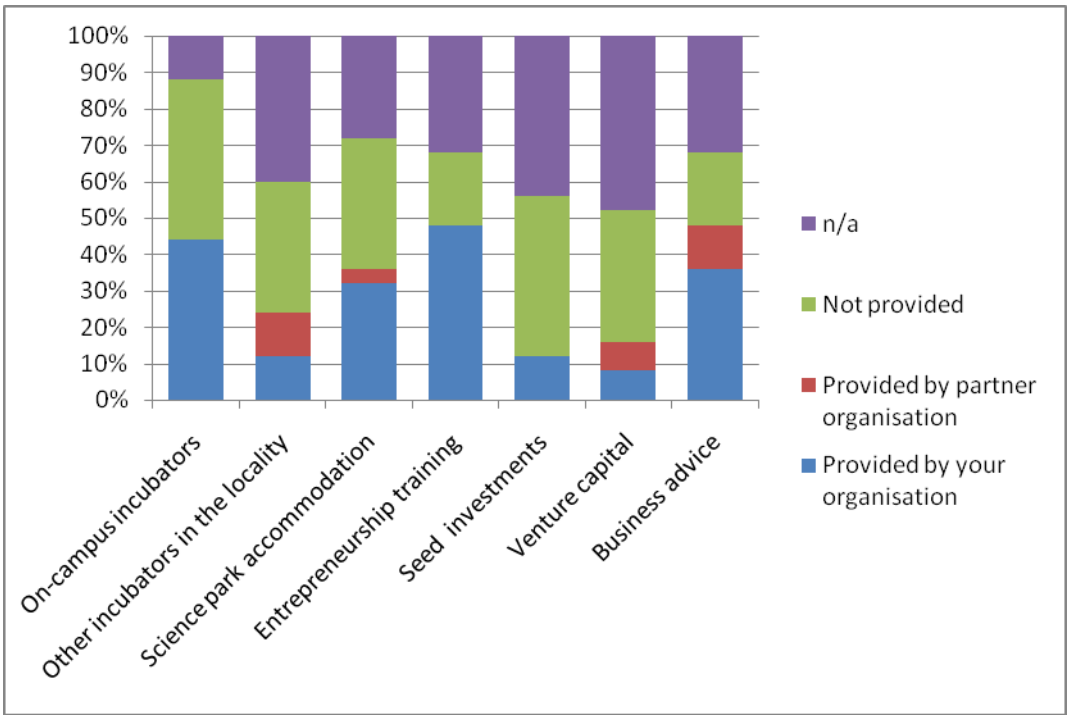
Questions in this section refer to the establishing of new legal entities and enterprises created by the RU or its employees to enable the commercial exploitation of knowledge arising from academic research.

E.1 Information concerning spin-off/spin-out/start-up directly or indirectly related to research unit during 2004-2007

Company	start-up	spin-off	Still active
Cabrilog	1		1
Educaffix	1		
Polymechanon		1	1
Smalti Technology	1		1
Wiki Media		1	1

A substantial number of RUs were unable to provide comprehensive data, especially related to turnover. Moreover, validation of data could be complex, and confidence is higher for the number of spin-offs established than for financial information.

E.2 Support provided for spin-offs/spin-outs/start-ups



Other responses

- an Entrepreneurship fostering initiative, although I am not sure it really encourages Spin-offs
- the University provides support for start-ups, but not our research
- developed as part of national testing services in mathematics

F. Personnel links and "knowledge marketing" activities

F.1 Number of RUs' skilled employees (including young graduates) hired by the industry during 2004-2007

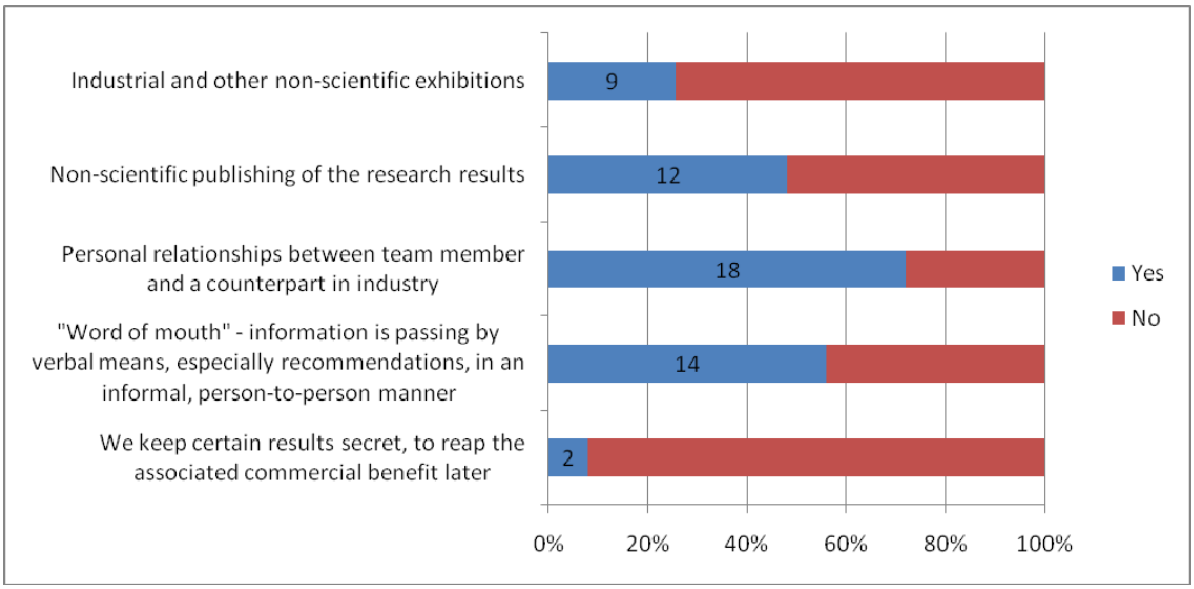
16 RUs have answered this question: over 83 of their RUs' skilled employees, have been hired by the industry.

F.2 Number of "person/days" RU's personnel performed under direct contracts with industrial companies during 2004-2007

Only 12 RUs have answered this question, due to complexity of data tracking. On average (among 12 RUs) 100 person.days per RU per year were performed during 2004-2007 or 1273 person.days.

F.3 Actions to promote research outcomes visibility

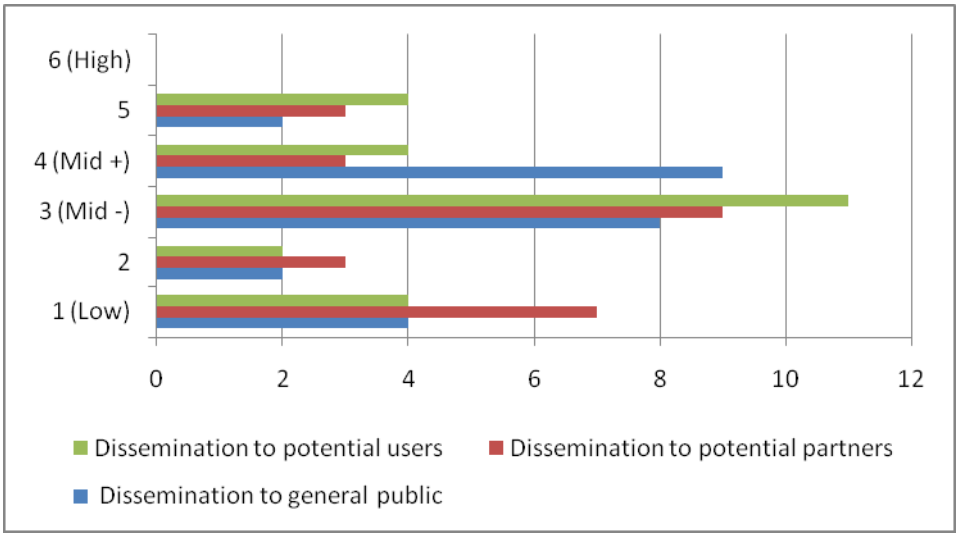
These actions consist in promoting research outcomes to external stakeholders. They aim at developing their exploitation/commercialisation/transfer.



RUs have overall published more than 70 non-scientific publications and attended more than 40 Industrial (non-scientific) exhibitions. Nevertheless, the publications have mostly consisted in scientific works, press releases and Internal newsletters.

F.4 Level of dissemination activities undertaken by RUs

The level of self-evaluation of dissemination activities tends to be low for all the types of dissemination activities.



5. Analysis and Conclusions

The research has revealed the following data from Kaleidoscope members Academy-Industry interactions:

The RUs' research activities mostly focus on basic and collaborative research, providing consulting and training services through development of partnerships at regional and national levels. The research outcomes level supports this statement – 88% of the outcomes are at early or prototype stage.

The level of incentives for the staff to engage with industry and commercialisation is low., 60% Moreover of the respondents indicated that there are no clearly defined incentives. 56% of RUs' organisations have liaison offices or staff to manage consulting, training links and other external interactions with the industry.

5.1. Research Collaboration

RUs work closely with Educational, ICT, not-for-profit and public sectors. A large variety of topics is covered by partnership: overall 75 CR contracts were signed with 46 companies and organizations, a large proportion of which (33%) concerned SMEs.

Moreover, more than 80% of RUs conduct research cooperation activities with other research units. 14 RUs participated in 30 research cooperation projects which involved 36 industrial partners.

5.2. Consulting and Training Services

65% of respondents reported providing consulting services for industry. Thus, 8 RUs sighted 17 organizations where 53% are private companies. 15 RUs provide various training services under external contracts with industry.

The financial data provided is not reliable due to high level of N/A responses and is considered as very sensitive by the majority of respondents.

5.3. Placements and cross-sector mobility

The responses indicated relatively high level of contribution to professional skills development at regional and national levels. More than 83 skilled employees, from 16 different RUs were hired by the industry. Moreover, on average 100 person/days per RU were performed by RU's employees under direct contracts with industrial companies.

5.4. Spin-off, Start-ups, Spin-out

The Kaleidoscope research units created 3 start-ups and 2 spin-offs during 2004-2007. This result of Kaleidoscope partners is surprisingly high, given that research outcomes are mostly early stage, most of TEL products have a low level of patentability, and support provided to entrepreneurial activity is rather low. Moreover, a considerable amount of time from idea development to its implementation is required for entrepreneurial activity.

Best practices: Aplusix start-up creation by LIG Laboratory

The Aplusix software, designed to help students to learn algebra, has been developed in the LIG laboratory; it has proved to be very efficient. It is distributed through a publisher in France, the UK, Italy and Benelux. J.F. Nicaud, responsible of the project, and N. André and C. Viudez, engineers have decided to found a company to develop and sell Aplusix. The milestones are: beginning of incubation, January 2008 – creation of the company, September 2008 – end of incubation, July 2009. The company will have 4 employees at the beginning: J.F. Nicaud, N. André, C. Viudez and a commercial engineer who will be recruited.

Aplusix is software for the domain of algebra in secondary education. It is highly interactive (it includes the best existing editor of algebraic expressions) and asks students to solve exercises by freely producing calculation steps, including many exercises. Immediate or delayed feedback is given whether the steps and/or the entire solution is correct or not. Aplusix All the students' actions are recorded and students and teachers have access to the past activities of the students (including action by action replay) and to statistics.

The current version is a local network version, and a web version will be developed in 2008. Even though school training is a challenging market, the product has high commercial potential since it is developed in all European languages.

5.5. Patents and Licensing

Technology and knowledge are mainly transferred through patenting and patent based licensing for most of other Industries. However, the TEL industry provides little room for these activities. Nevertheless, 7 patents and 1 invention disclosure have been reported. This is an outstanding result by itself in the TEL environment where most of the research outcomes are software based.

5.6. Know-how

Know-how stands for all unpublished knowledge which gives its owner an advantage on his competitors; new processes, advantageous combinations of known features, formulas, processing tricks, cell lines, etc. 11 RUs declared know-how as a major legal right.

5.7. Communication / Marketing of Knowledge transfer relations

The main channels for communication and marketing of research outcomes are personal relationships between team members and a counterpart in industry, the “word of mouth” and industrial exhibitions. However, the main communication channel is scientific publications. The RUs have published over 70 non-scientific publications and attended over 40 industrial exhibitions to present research outcomes.

Nevertheless, dissemination activities undertaken tend to be low for all types of dissemination channels.