ICT




Creating Europe's Most Attractive Environment for Intellectual Property

Strictly Private & Confidential

Submission by:

The Irish Academy of Engineering, The Institution of Engineers

to SFI

February 2004

Foreword

The creation of Intellectual Property and its commercialisation has become a vital competitive factor in the modern industrial economy. In recent years, Ireland's competitive advantages have come under threat from the Far East, and from Central and Eastern Europe. This has given a new urgency to focusing on the creation of a knowledge economy where innovation, research and development, patenting and licensing are crucial competitive advantages which will help to sustain and increase Irish living standards.

The ICT sector is a key sector of the Irish economy, and accounted for 33% of Irish exports in 2001. It is a more important sector in Ireland than in any other European country. It is essential that its existence and expansion is underpinned by a vibrant innovation environment focused on the creation of patents and other forms of intellectual property which can be exploited commercially.

This study aims to Create Europe's Most Attractive Environment for Intellectual Property in Ireland in the ICT sector. It was conducted under the auspices of a Task Force comprising the Irish Academy of Engineering, the Institution of Engineers of Ireland, and ICT Ireland in the period from November 2003 to February 2004. The Task Force comprised members drawn from industry, academia, venture capital, and patent agents.

The Task Force compared Ireland's innovation performance in the sector with other EU member states, and focused in particular on Sweden, which ranks near the top on many of the relevant metrics. In general terms, Ireland ranked about the middle of the European league in relation to the number of researchers, and patents granted per million of population.

Examination of the structures for supporting research indicated that while very great progress has been made in funding world-class research projects in the earlier part of the innovation chain (3 to 10 years from commercialisation) there is a significant gap in funding the latter part of the chain (up to 5 years from commercialisation). Furthermore the scale of Irish research networks is modest when viewed in a European context. In Ireland, the links between Higher Education Institutes (HEIs) and industry are weak with only a minuscule percentage of the research resources outsourced by industry spent in higher education.. It is clear that there is need to foster a much closer relationship than currently exists. The report therefore recommends the creation of a significant Applied Research Fund for research projects conducted in HEIs and which would be jointly funded by industry. This will enable interested third level institutions to build substantial HEI based research networks, and to create a collaborative culture of partnership and commercialisation with the industrial research community.

Other recommendations include, amongst others, support for IP protection, a doubling of the country's ICT research and development capacity and initiatives to foster an IP culture in this country. The Task Force believes that the recommendations contained in the report and summarised below will, if implemented, go a long way to enabling Ireland to match the best European performance over the next five years.

Foreword: Mr. Liam Connellan, Mr. Dan Maher, Chair and Co-Chair of the Task Force

Summary of Recommendations

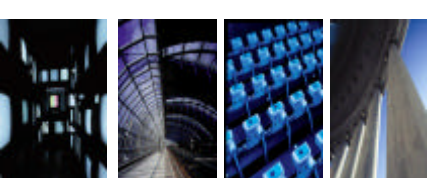
- **€100m ICT Applied (up to 5 years to commercialisation)**

Research Fund over 5 years

- **ICT IP Commercialisation Centre – 5 year life - €10m patent**

fund

- **European-scale HEI-based Research Networks**
- **Anchor in Ireland strategic MNC R&D centres**
- **Increase annual ICT PhD output from c.124 to 300**
- **Allow SFI projects to be industry led**
- **Increase awareness initiatives around IP commercialisation**
- **Ensure that 'joined-up' thinking on ICT occurs at policy level**



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Section 1: Background, Objective and Methodology

Background and Objective

- The Irish Academy of Engineering, The Institution of Engineers of Ireland and ICT Ireland agreed to prepare a joint submission for presentation to the SFI. The purpose of the submission was to make recommendations which would enhance the environment for ICT activity with its resultant spin-off for the Irish economy. The primary objective of the work was to make recommendations which, when implemented, would create Europe's most attractive environment for patent development (i.e. IP generation and exploitation) with particular reference to the ICT sector.
- A Task Force was established which included representatives from industry and from academia and its composition was as follows:

Task Force Member	Position
Liam Connellan	Chair (Irish Academy of Engineering, Institution of Engineers of Ireland)
Dan Maher	Co-Chair (ICT Ireland)
Brian Caulfield	Member (ICT Ireland)
Prof. John Lewis (RIP)	Member
Lionel Alexander	Member
Brendan Cremen	Member
Prof. Gabriel Crean	Member
Prof. Alec Reader	Member
Prof. Padraig Cunningham	Member
Dr. Breffni Tomlin	Member
Donal O'Connor	Member
Prof. Ove Granstrand	Visitor (One meeting)
Prof. Tom Allen	Visitor (One meeting – sub-group of Task Force)

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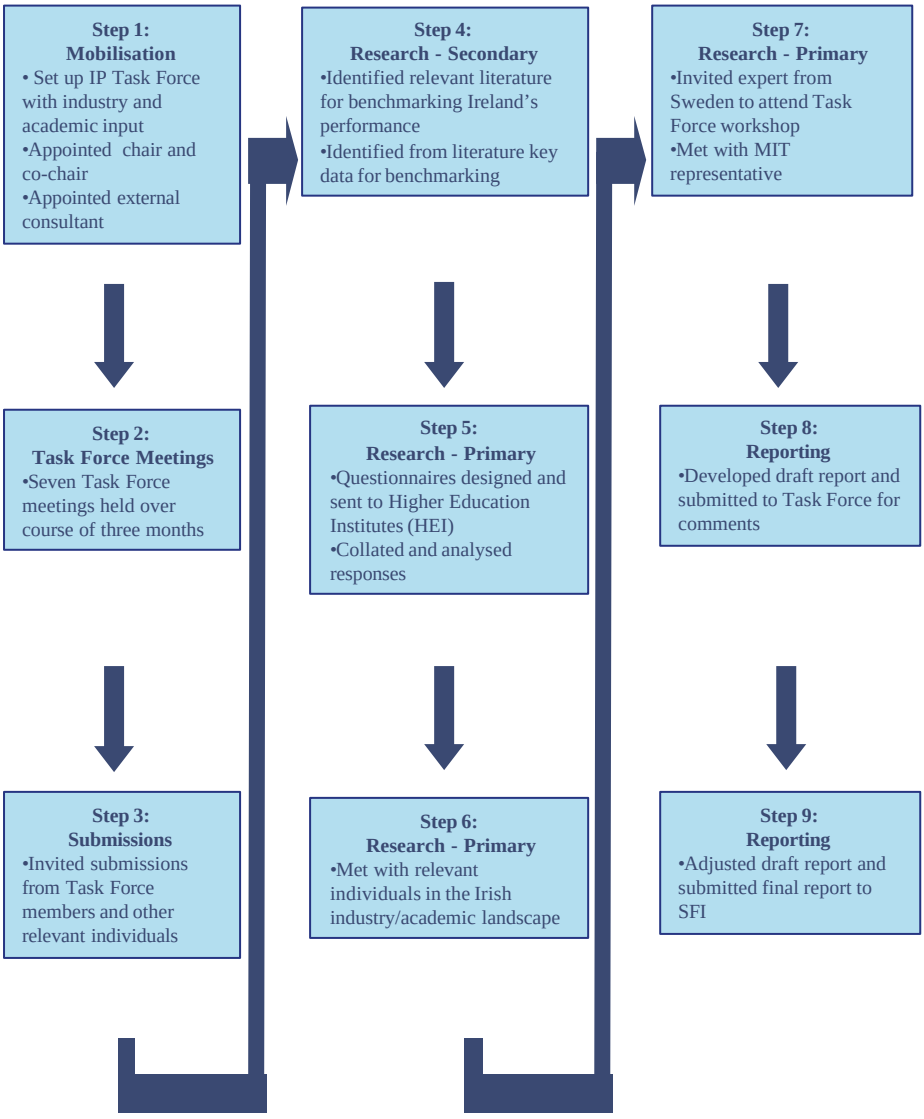
- aff of the Institution of Engineers of
  thank them for their assistance.

Task Force Methodology

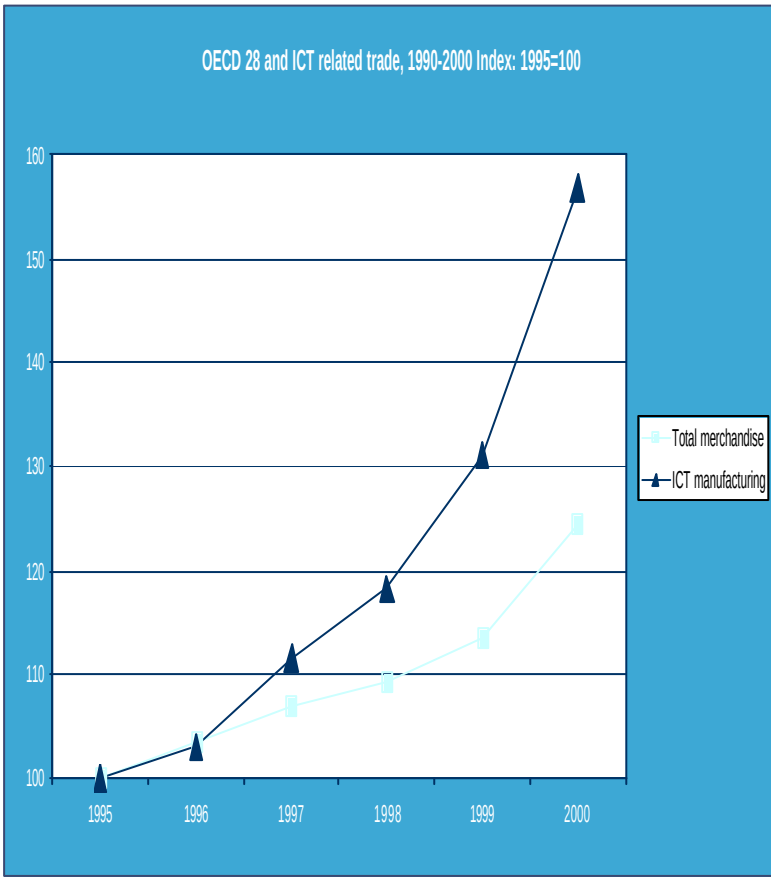


Section 2: Importance of ICT to the Global and Irish Economies

The contribution of the ICT sector to international

trade is growing in importance

- During the 1990s, there was a shift in the composition of the OECD international trade in manufactured goods towards ICT products.
- OECD reports show the growing importance of the ICT sector in total manufacturing trade.
- In 1990, trade in ICT goods, defined as the average of imports and exports, accounted for over 12% of OECD-wide trade in goods but by the year 2000, the share had reached almost 20%.

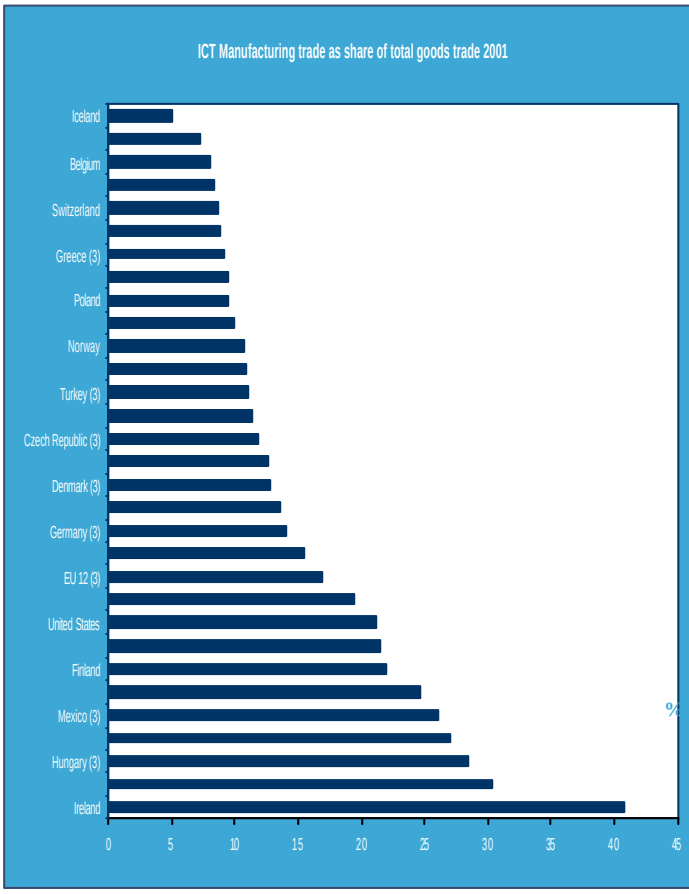


OECD 28 includes all Member countries except for the Slovak Republic and Luxembourg.
Source: OECD, International Trade in Commodity Statistics (ITCS) and Structural Analysis (STAN) databases, August 2002.

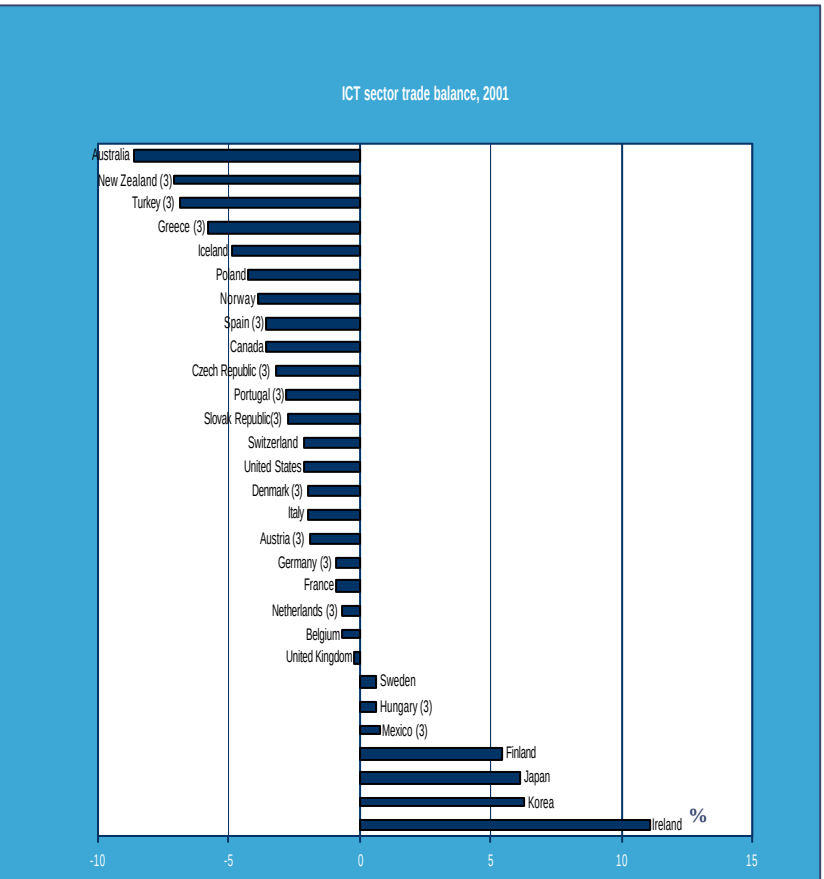
The importance of ICT trade to the Irish economy

- Some key statistics†:
  - The ICT sector employed over 90,000 people in 2001.
  - 47% of these were employed in manufacturing with 53% being employed in ICT services.
  - ICT accounts for c. 17% of employment in manufacturing and 8% of employment in the service sectors.
  - Turnover in the ICT sector was in excess of €51b in 2001 and value added in the ICT sector, at €11b, accounted for 18% of total value added in industry and services.
  - In 2001, total exports of ICT products and services from Ireland amounted to €31b representing 33% of all exports.
- The charts on the following pages demonstrate very well the importance of ICT to the Irish economy when compared to other economies primarily in Europe but also further afield.

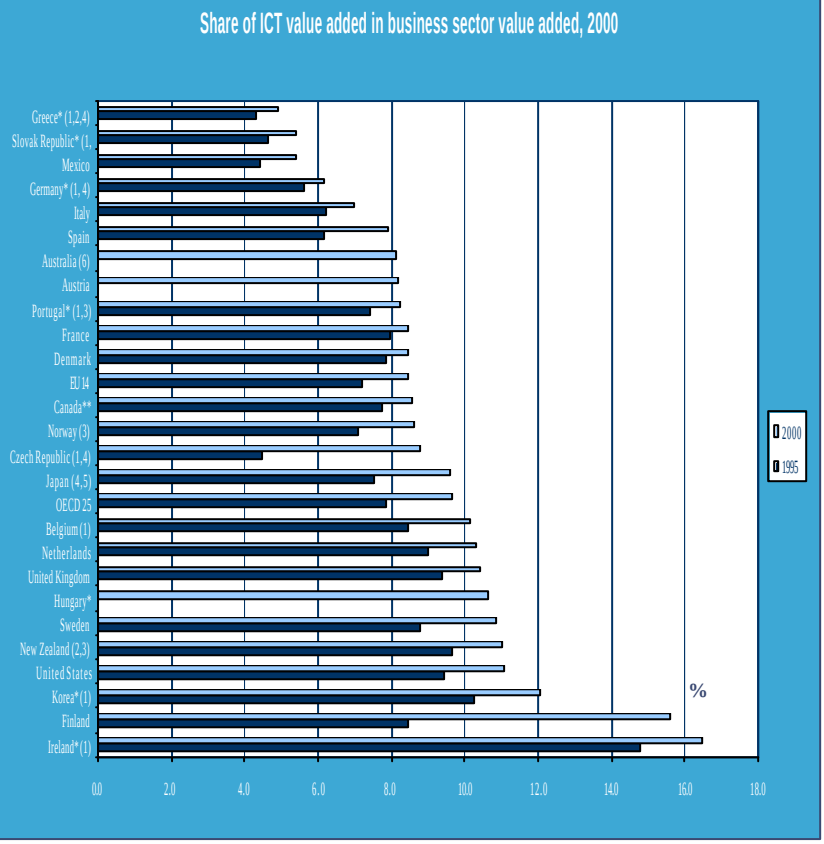
- †*Information Society / CSO data*



1. Average of imports and exports.
3. 2000 data
Source: OECD, International Trade in Commodity Statistics (ITCS) and Structural Analysis (STAN) databases, August 2002.

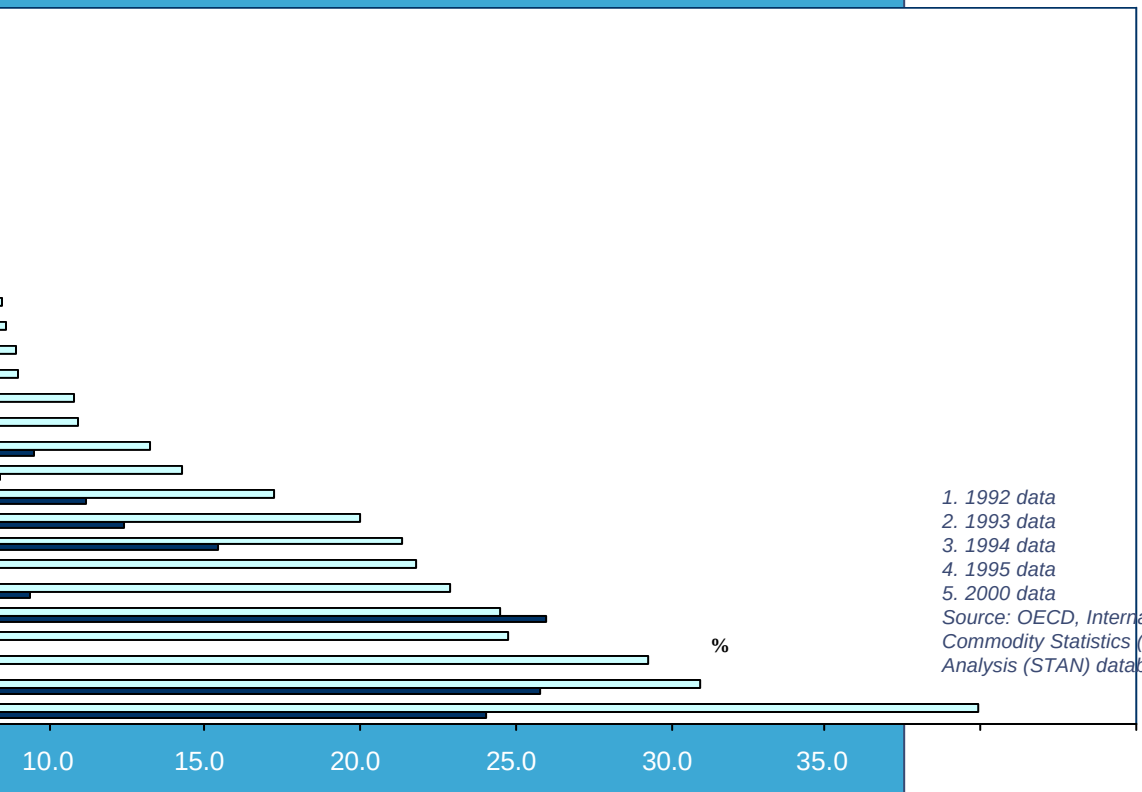


3. 2000 data
Source: OECD, International Trade in Commodity Statistics (ITCS) and Structural Analysis (STAN) databases, August 2002.



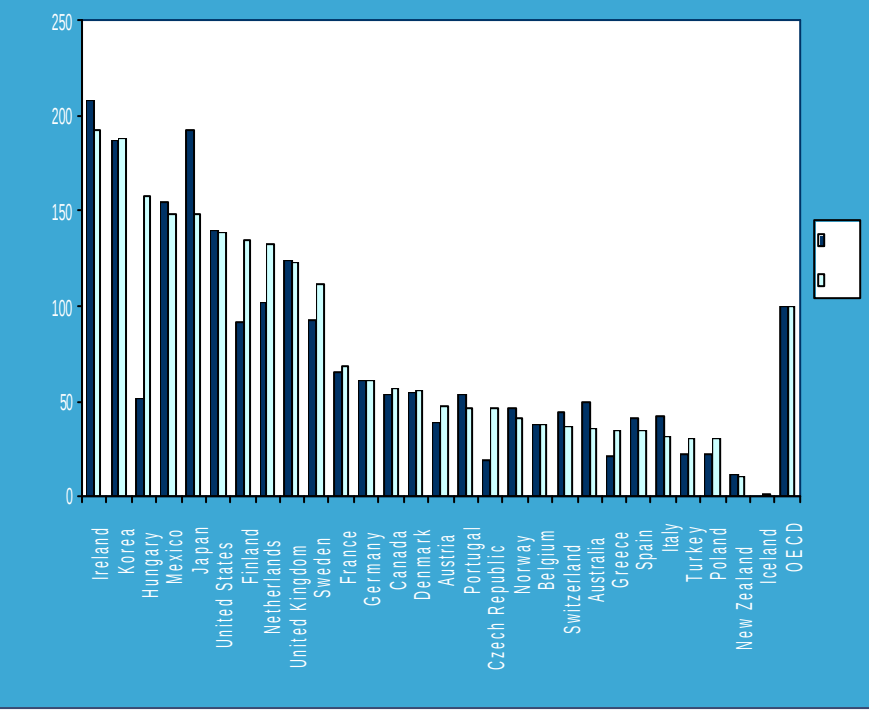
** 1999; ** 1998*
1. Rental of ICT goods (7123) is not available.
2. Postal services included with telecommunication services.
3. 1996 instead of 1995.
4. ICT Wholesale (5150) is not available.
5. Includes only part of computer related activities.
6. 2000-2001.
Source: OECD estimates, based on national sources; STAN and National Accounts databases, September 2002.

Share of ICT sector exports in total merchandise exports, 1990-2001



1. 1992 data
2. 1993 data
3. 1994 data
4. 1995 data
5. 2000 data
Source: OECD, International Trade in Commodity Statistics (ITCS) and Structural Analysis (STAN) databases, August 2002.

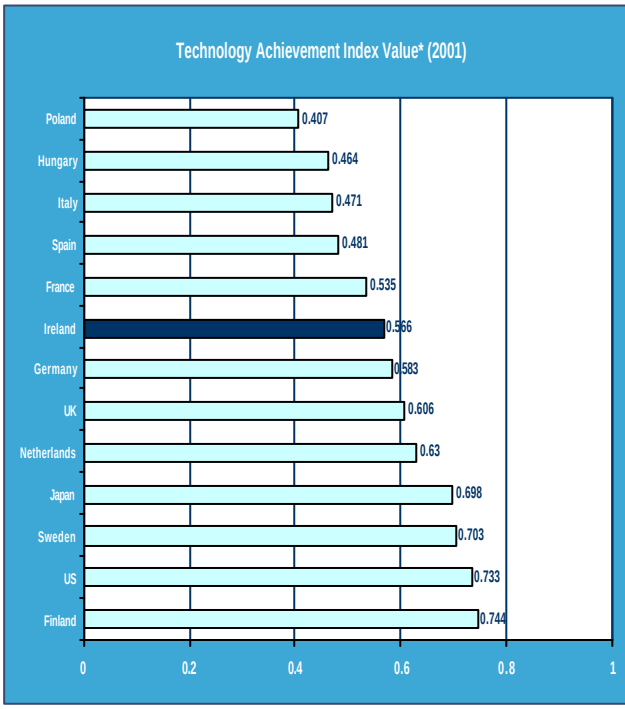
ICT Export specialisation index 1995-2000

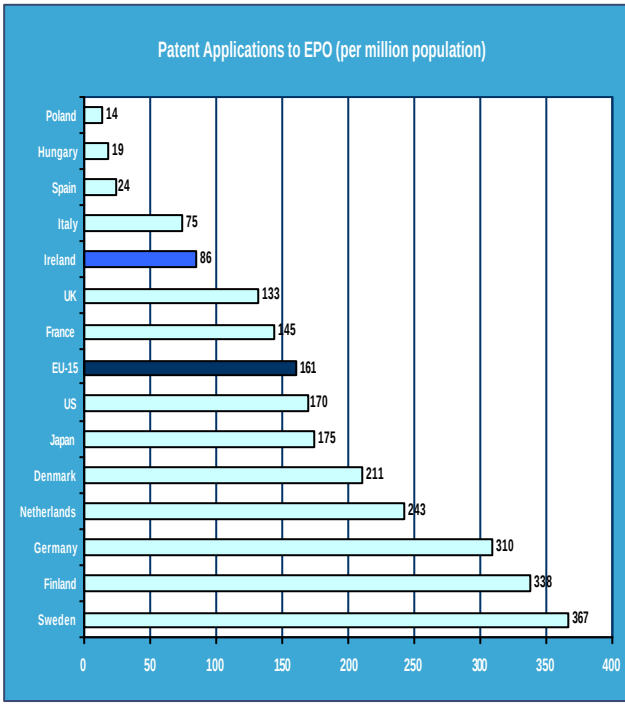


Source: OECD, based on STAN indicators, Aug

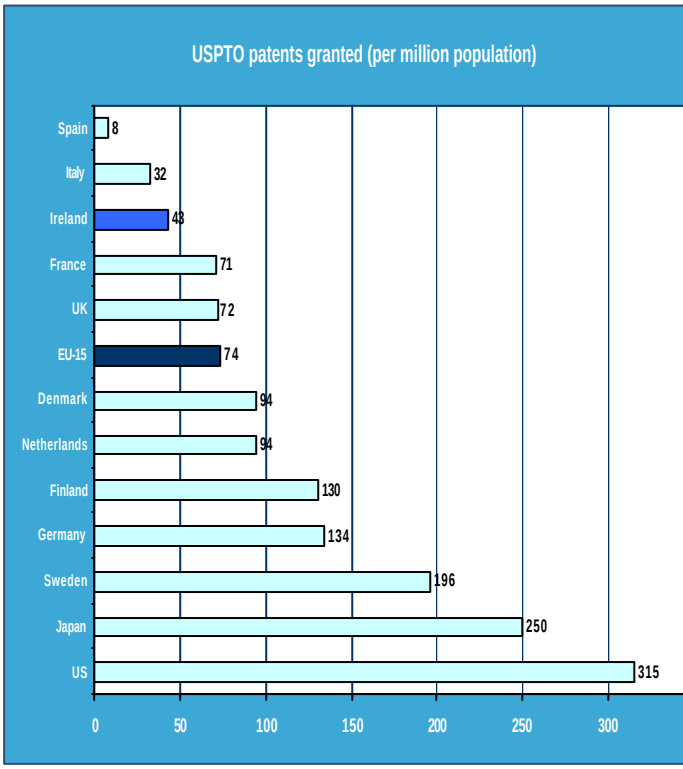
Section 3: Ireland's Innovation Performance

- It is widely acknowledged that ICT in Ireland needs to move from lower value manufacturing and processes to innovative, knowledge-led technology creation and diffusion.
- To date, Ireland's performance against a range of Innovation metrics has been low to average. On a 2001 OECD Technology Achievement Index, Ireland had a score of 0.566 compared with a US score of 0.733 and a Swedish score of 0.703. This Index reflects four dimensions of technological capacity: a.) creation of technology; b.) diffusion of recent innovations; c.) diffusion of old innovations; and d.)human skills.
- **Patents**
- In terms of patents, which is a key metric for innovation performance in an economy, the most recently published data shows that Ireland performs poorly vis a vis its European neighbours.
- Ireland had 86 patent applications to the EPO per million population in 2001, compared with the highest performer, Sweden which lodged 367 patent applications in the same time frame.
- In terms of patents granted by the USPTO in 2000, Ireland was granted 43 per million population which again compares unfavourably with Sweden which was granted 196.
- More importantly perhaps, Ireland was granted 6.1 high tech patents from the USPTO per million population while the equivalent figure for Sweden was 47.3.



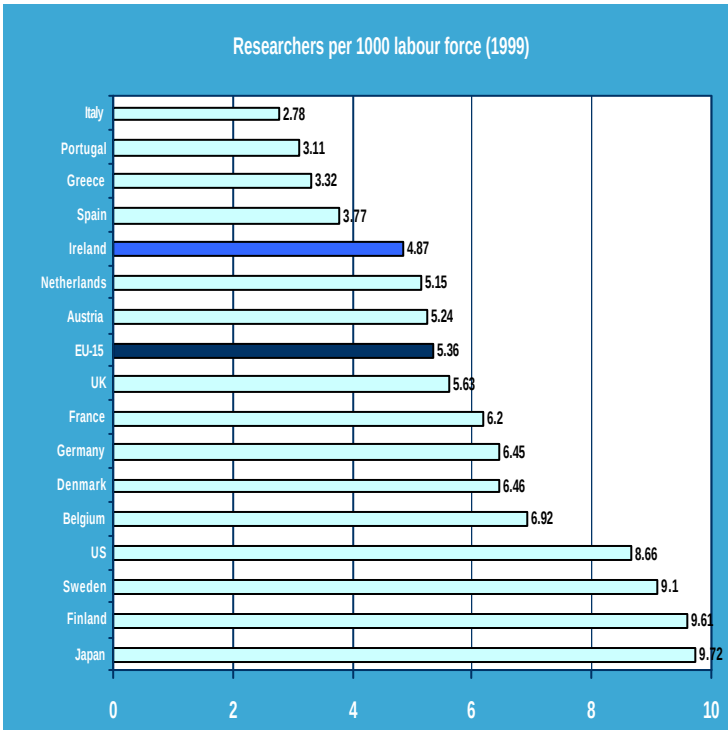


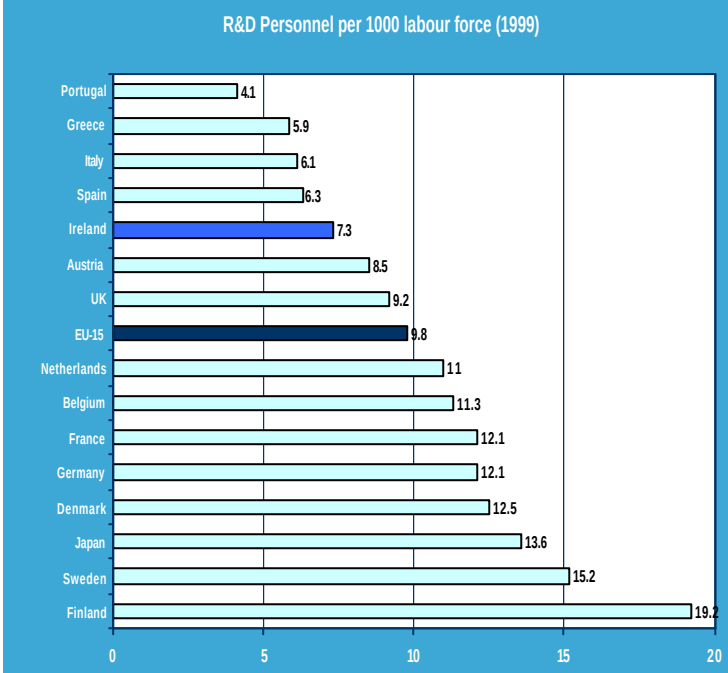
- **Patents cont'd**
- In terms of 'patents per researcher, Ireland compares quite favourably with some high commercialisation centres such as MIT.
- In 2001, the number of patents granted to R&D active companies with a total researcher headcount of 5796, was 304 (software and computer related and electrical and electronics), representing one patent for every 19 researchers. This ratio was broadly similar to the number of US patents granted to MIT reseachers in the same year.
- One of the primary drivers of an uplift in ICT patent production, therefore, is expected to be a significant increase in the number of ICT researchers in Ireland combined with an uplift in ICT R&D investment.



Annual Competitiveness Report: National Competitiveness Council 2003

- **Intellectual Capital**
- According to the 'Third European Report on Science and Technology Indicators', 2003, the number of researchers in Ireland per '000 labourforce, at 4.87, was well below the European average of 5.36 in 1999.
- Sweden had 9.1 while Finland was even higher at 9.6.
- When the scope was widened to include total R&D personnel, Ireland's performance vis a vis the EU was similar, having 7.3 per '000 against an EU-15 figure of 9.8.
- The highest performers again were Sweden with 15.2 and Finland with 19.2*.
- It is clear that a significant gap exists between the research strength of Ireland and the top performers in this regard.





Third European Report on Science and Technology Indicators, Europ

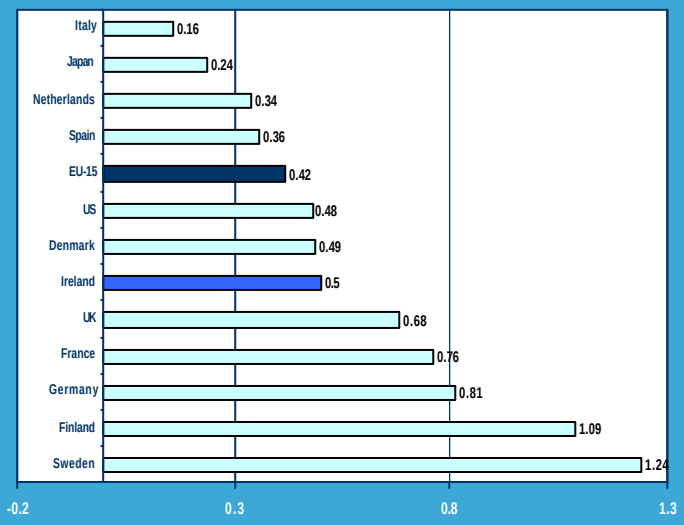
**the higher number of support personnel per researcher in some countries may point to a preponderance of hardware over software R&D in those countries*

•It is important to highlight that Sweden and Finland are endowed with a number of large R&D intensive indigenous ICT companies (example Ericsson, Nokia).

Ireland's Innovation Performance

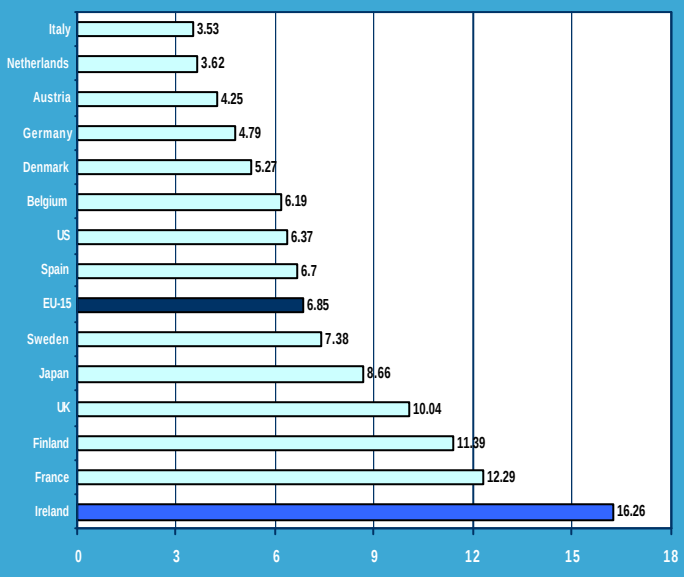
- In terms of the production of S&E PhDs per '000 population aged between 25-34, Ireland, at 0.5, performs better than the EU-15 average of 0.42 but significantly worse than Sweden which produces 2.5 times the Irish figure at 1.24.
- By contrast, Ireland excels in the production of S&E graduates, with 16.3 being produced in 2000 compared with an EU average of 6.85 and a Swedish figure of 7.38.
- In addition, the focus in Ireland on S&E graduates as a proportion of all graduates is very strong with S&E graduates representing 35% of all disciplines in 2000.
- The Irish S&E figures are skewed in favour of science with science representing 62% of all S&E graduates. In Sweden, the reverse is true with 68% of the S&E graduates being in engineering.
- It would appear from the graduate and PhD figures that Ireland is less successful than other countries in converting S&E graduates into S&E PhD's.

Total new science and engineering PhDs per 1000 population aged 25-34 years



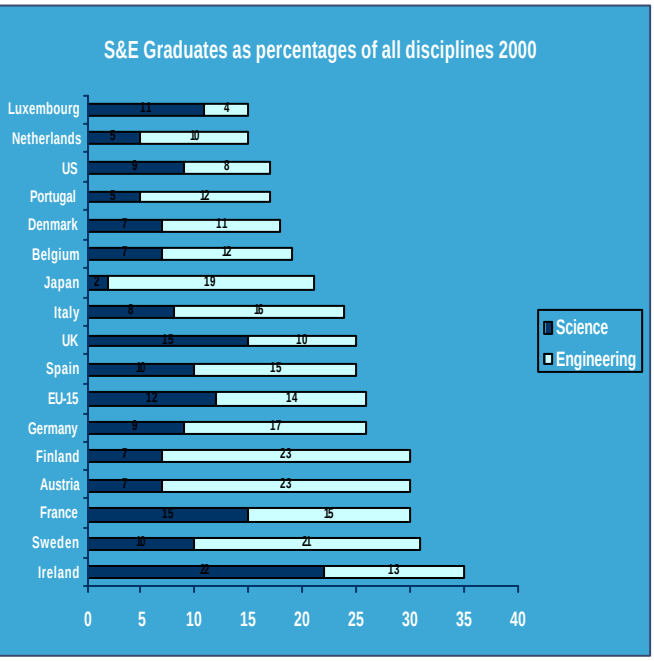
Annual Competitiveness Report: National Competitiveness Council 2003

S&E Graduates per 1000 population aged 20-34 in 2000



Third European Report on Science and Technology Indicators 2003

Ireland's Innovation Performance



Third European Report on Science and Technology Indicators 2003

- In terms of higher degrees in S&E, according to the HEA/Forfás report: '*Creating Ireland's Innovation Society: The Next Strategic Step*', 670 graduates qualified with higher degrees in Science and Engineering in the year 2000.
- Of the 670, 355 were awarded PhD degrees. Using IRCSET grant application information for 2003, approx. 35% of the S&E doctoral graduates were in the area of ICT (computer science (19%), electronic engineering (6% representing one third of total engineering at 18%), physics (10%)) with the remainder in lifesciences.
- Applying the 35% to the 2000 data, this would put the ICT doctoral output in the region of 124 in 2000. It is the view of the Task Force that a serious uplift is required in this figure if Ireland is to reach the levels achieved by the leading countries in this regard such as Sweden

- **R&D Expenditure**
- In addition to an uplift in R&D personnel, Ireland needs to continue to increase the level of R&D funding.
- When expenditure on R&D is examined, the gap between Ireland and the leading countries is very wide. In 2000, Ireland ranked 22 out of 26 OECD countries in terms of Higher Education Expenditure on R&D as a % of GDP*.
- In 2001, Ireland ranked 17 out of 24 OECD countries in terms of government funding of BERD as a % of GDP*.
- In both cases, the performance had fallen from earlier years. In the case of HERD, from 16th place in 1996 to 22nd in 2000. In respect of government expenditure on BERD, Ireland had fallen from 13th place in 1995 to 17th in 2001.
- Business Expenditure on R&D performs equally poorly. BERD as a % of GDP* in Ireland in 2001 was 0.95 compared with an EU average of 1.56 and a Swedish figure of 2.84
- In order to:
  - achieve the aim of creating the best environment in Europe for IP generation and commercialisation, and
  - achieve the ERA target of R&D expenditure of 3% of GDP

  it is critical that Ireland dedicates more financial resources to R&D

- ***In the case of Ireland GNP was used**

- It can be seen from the foregoing data that Sweden* is a leading European performer across a range of innovation metrics.
- The objective of the Task Force is to
  - 'create Europe's most attractive environment for IP generation and exploitation with particular reference to ICT'
- The recommendations set out in this submission, therefore, seek to create an ICT environment in Ireland which should ensure that Ireland can match or surpass the performance of Sweden in respect of its innovation performance.
- The recommendations are based on: discussions at Task Force meetings; conversations with other relevant individuals both from Ireland and overseas; research into relevant published material; and the results of a HEI questionnaire. The Task Force notes that ICT Ireland is in the process of completing an industry questionnaire and anticipates that the results of same will support the recommendations in this report.
- It should be noted that the most recent published data used in the foregoing pages pre-dates the SFI investment in Biotechnology and ICT.

"Ireland which has been tremendously successful in attracting foreign investment for manufacturing, now faces the need to justify higher wages and higher local costs without yet having developed a world-class innovation structure"

Global Competitiveness Report, 2001-2002

Section 4: Key Challenges and Recommendations

There are a number of key challenges facing Ireland Inc. if the objective is to be achieved.

IP Generation Challenges

- Inadequate Supply of Intellectual Capital
- Sub-Optimal Funding of Applied Research (up to 5 years to commercialisation)
- Sub-Optimal Industry Participation in SFI Research Programmes
- Small Base of ICT MNC R&D in Ireland
- Lack of scale of ICT research in Ireland

IP Commercialisation Challenges

- Weak Commercialisation Structures
- Poor Commercialisation Culture

Policy Challenges

- Lack of 'joined-up' policies in respect of ICT

Inadequate Supply of Intellectual Capital

Background

- The general thrust of Irish economic development policy is to migrate Ireland from a low-cost manufacturing economy to a high innovation, knowledge-based economy. The primary resource required to underpin such a migration is that of Intellectual Capital and a number of recent studies have highlighted the fact that Ireland needs a significant uplift in the numbers of graduates and post graduates being produced if it is to match the performance of the leading OECD countries.
- "*the Expert Group on Future Skills Needs in its report published in July 2001, noted the establishment of the new sources of research funding and recommended that national research policy should aim to achieve a substantial increase in the output of doctorates, particularly in science, engineering and technology*" Creating Ireland's Innovation Society – the next Strategic Step – HEA/Forfás
- The data presented earlier in this report underlines the need for a substantial uplift in the doctoral and post-doctoral performance of ICT in Ireland

Recommendation

- Ireland currently produces in the region of 124 ICT PhD's annually.
- In order to emulate the achievement of Sweden in terms of PhD production, the Task Force estimates that this figure should rise to approximately 300 per annum. This could be achieved by way of measures such as:
  - Increased Research Council Funding;
  - Greater collaboration between industry and HEI sector;
  - Inflows of students from overseas, etc
- In addition, PhD graduates should be encouraged to work within the Irish R&D infrastructure in preference to working overseas;
- The absorptive capacity of the Irish R&D sector will have to increase in order to a.) absorb the PhD graduates currently going overseas; and b.) absorb the additional PhD graduates. The recommendations which follow, if implemented, will ensure that there is a significant uplift in the absorptive capacity of the country in respect of such PhD numbers.

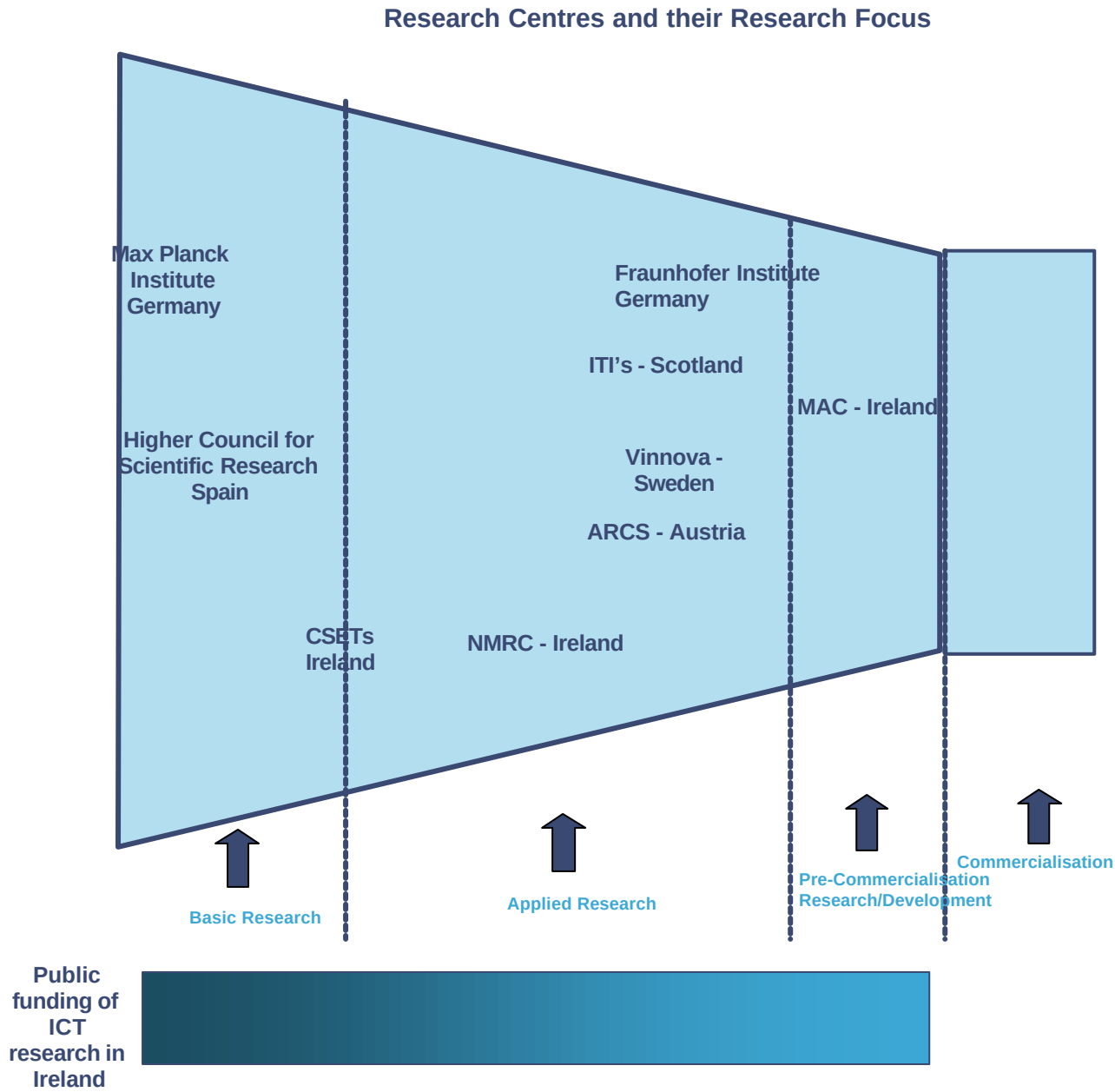
Sub-Optimal Funding of Applied Research (up to 5 years to commercialisation)

Background

- ICT innovation activity in Ireland occurs along the full spectrum from R to D. While the research, which is undertaken fits at different stages of the continuum, there tends to be a notional categorisation into basic and applied research. For the purposes of this report, we define applied research as that which is undertaken in respect of a product which can be expected to be commercialised within a five year period.
- The existing SFI fund: a.) tends to focus on projects which have a longer timeline to commercialisation (e.g. 3-10 years); b.) restricts itself to research which is world-class in nature; and c.) is, in the main, HEI-driven. The SFI funding structure is an integral part of the funding 'jigsaw' for ICT in Ireland. It is key to the development of a thriving, research environment that longer term, world-class research is adequately funded.
- The CSETs, which are emerging as a result of the SFI funding, are perceived to be closer on the research continuum to research centres for whom basic research is the central mission than they are to those which focus on shorter term, industry focused applied research.
- It is the view of the Task Force that there is a funding gap in respect of industry-focused applied research which may not quite reach the SFI world-class criteria. The absence of this represents a significant obstacle to the creation of a fully-functioning ICT research environment in this country. The applied nature of the research undertaken generally by industry means that a lack of funding in this area results in Ireland being unable to exploit the potential of the existing ICT industry base.
- There are a number of international examples of research centres which are/plan to be heavily engaged in the application of their capabilities and are therefore termed applied research centres. Examples of these are VINNOVA in Sweden, the Fraunhofer Institute in Germany, the ITI's in Scotland and the ARCS in Austria.
- According to the 'Third European Report on S&T Indicators', 2003, research institutes in Europe have different ownership models "*There is a variety of ownership profiles across EU countries. In Germany, Spain, Sweden, the Netherlands and Portugal, ownership by central government is relatively infrequent (less than 25% of entities in Eurolabs*). At the other extreme, this is the only model in Greece while Italy, Ireland and Finland all have more than 80% in this category'*
- VINNOVA in Sweden is a government backed programme which will establish 18 applied research centres in Sweden as Centres of Excellence in particular technology areas. The centres will be equally funded by government and by industry.
- The Fraunhofer Institute in Germany has 12,700 staff, the majority of which are scientists and engineers; owns 55 institutes; and is located in 40 different geographies. It has an annual budget of over €900m of which 310m comes directly from industry for contract research.
- Overleaf, we set out the research 'funnel' from basic research to commercialisation and show, in broad terms, where the different types of research institutes are located.

*Eurolabs is part of the 'Common Basis for Science, Technology and Innovation Indicators' programmein the EU's Fifth Framework Programme to investigate the evolution of research centres. Includes public, semi-public and recently privatised research centres

Sub-Optimal Funding of Applied Research (up to 5 years to commercialisation)



Note: The location of the named institutes/centres on this diagram is indicative – for illustrative purposes only.

Sub-Optimal Funding of Applied Research (up to 5 years to commercialisation)

Background

- The Austrian Research Centres Siebersdorf (ARCS) has an ownership structure in which central government holds 51% of the shares, while a consortium of the country's leading industrial and commercial organisations retains a 49% interest.
- Government supported research institute structures between industry and universities are in place in Norway (SINTEF), Finland (VTT), Netherlands (TNO) and Denmark (Danish Technological Institute). The role of these institutes is to work at the applied end of the research continuum and in close cooperation with industry.
- In Ireland, the closest example of a semi-autonomous research institute that has strong industry links resulting from the undertaking of contract research on behalf of industry would be the NMRC.
- The Microelectronic Applications Centre (MAC) in Limerick (on a much smaller scale) is also involved in applied research but focuses on pre-commercialisation research with industry.
- Some reasons cited by HEI sector for weakness of IP generation and commercialisation:

"Limited funding for pre-product or applied research in comparison to basic research."

"Shortage of research funding - although the amounts of funding for research have increased in the last 5 years, Ireland's expenditure on R&D as % of GDP is still significantly less than the EU average. Low volume of industrial funding for research in universities. Lack of academic recognition for generation of intellectual property".

"Most of the funding sources are only suitable for established academics, leaving many new academics unable to fund research students, conference travel, etc".

"In order to build research capacity and capability, additional funding is required and the IoT sector finds it extremely difficult to compete for SFI/PRTLI funding".

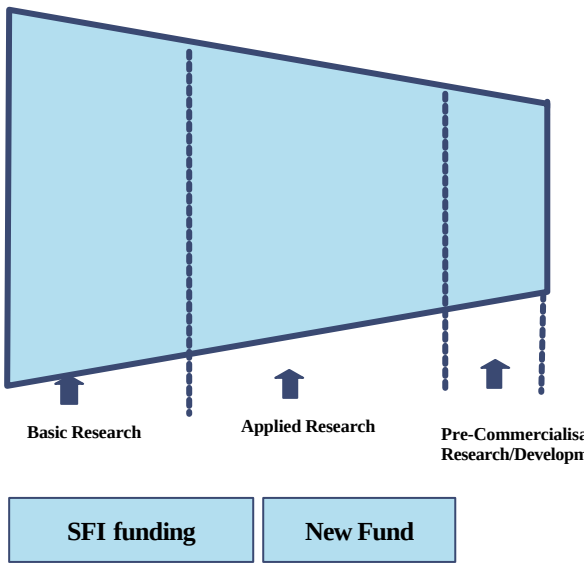
"Inequitable funding structures for research in Institutes of Technology V's University sector".

"Lack of central funding for research in Institutes of Technology in contrast to the Universities - Lack of research space"

Sub-Optimal Funding of Applied Research (up to 5 years to commercialisation)

Recommendation

- According to the Forfás, 2001, survey of BERD, the level of outsourced ICT research by businesses in Ireland in 2001 was €68.7m (Software and Computer (15.5); Electrical and Electronics(53.2)) . Of that amount, only €8.3m was outsourced to entities within Ireland with less than €1m being outsourced to HEIs.
- It is proposed that an *ICT Applied Research fund of €100m* over 5 years (€200m when industry funds are included) be put in place to bridge the applied research funding gap which currently exists.
- This fund of €20m (€40m including industry) per annum would provide for joint public/private funding of industry/HEI projects in order to:
  - bring about an uplift in the level of research being undertaken by industry in Ireland both MNC and indigenous;
  - encourage the location in Ireland of a significant amount of the R&D which is otherwise moving overseas;
  - encourage the location in Ireland of R&D which is currently being undertaken overseas without any reference to Ireland.
- The programme would have the following characteristics:
  - project based with 50:50 funding for joint industry-HEI projects;
  - administered by a project team set up under the auspices of the Department of Enterprise, Trade and Employment but with participation from IDA, Enterprise Ireland, SFI, HEA and ICT Ireland.
- Access to the fund would be wide, the objective being to 'kick-start' the industry/third level networks in the area of ICT, the absence of which is seen as a particular weakness of the existing Irish ICT landscape. Projects, therefore, that do not meet the existing SFI world-class criteria can be funded under this fund.
- The purpose of the fund is to bridge the funding gap demonstrated earlier:



Sub-Optimal Industry Participation in SFI Research Programmes

Background

- One of the findings of the Task Force was that industry has a perception that the SFI rules in terms of research leadership are restrictive and hinder the extent of industry/academic collaboration which is likely to result from SFI projects.
- In certain instances, where ICT companies are interested in participating in SFI funded projects, they are keen to have a company researcher lead the research programme and are reluctant to get involved where control of the project resides with a third party.
- It is the view of industry that SFI precludes leadership of an SFI funded project by a researcher in industry.

Recommendation

- Where industry is willing to participate in SFI research programmes, and the fundamental SFI research criteria are met, it is recommended that consideration should be given to allowing a project to be led by a researcher from a private company.

Small Base of ICT MNC R&D in Ireland

Background

- Ireland has been a significant beneficiary of international FDI flows with the IDA succeeding to attract a large number of particular types of activities from leading Multinational Corporations from the US and other countries. In terms of ICT, Ireland was particularly successful in attracting manufacturing activity and gained a good international reputation in this regard.
- At the same time as Ireland's labour costs have increased, many international ICT MNCs have been seeking ways in which to further reduce their cost base and are looking to regions such as eastern Europe, China and the Far East as low cost manufacturing locations.
- Ireland's success in attracting ICT investment is now seriously threatened by rapidly intensified competition from China, South East Asia and Eastern Europe
- In the case both of companies moving their manufacturing to lower cost locations and those whose manufacturing is still located in Ireland, the IDA has been seeking to attract additional and higher value activities to Ireland. In particular, the government has been keen to anchor in Ireland ICT R&D projects and other high-value activities such as Intellectual Property Management; Supply Chain Management and Customer Relationship Management activities.
- It is the view of the Task Force that achieving a quantum leap in Ireland's IP Generation and Commercialisation performance will necessitate the 'anchoring' in Ireland of a number of strategic MNC R&D projects
- The 'window of opportunity' available to the Irish government in respect of attracting such activity is now open since a significant amount of R&D is expected to move out of the US over the next five years. There is significant international competition, however, for these projects and Ireland must approach the opportunity from a client-centric perspective.

Recommendations

- One Stop Shop - It is proposed that the Development Agencies should be equipped to attract the large-scale MNC R&D projects in an integrated and 'joined up' fashion. A 'one-stop-shop' project team should be assembled with:
  - sufficient funding to attract the MNC R&D project – this is still seen by many MNCs as a differentiator. Where funding is a key consideration, the project team should include representatives from the different 'funds' (such as SFI, Applied Research Fund, IDA Fund etc) and be in a position to agree participation in those funds in an efficient and non-beurocratic fashion;
  - sufficient knowledge to assess the MNC technology road-map – The team should be in a position to access individuals with deep knowledge of the technology(ies) who can ensure that the R&D is strategic in nature and that the roadmaps presented are viable in an overall technology context. A 'virtual team' could be assembled for each significant sized investment. This team could be drawn from the state/funding agencies, the relevant technology experts (professors etc), and other relevant experts (e.g. Intellectual Property Management, Supply Chain Management and Customer Relationship Management etc). A development agency project manager would be appointed for the period until the project is agreed and embedded. The team would then be disbanded. The composition of a team would vary in line with the nature of the project being assessed. This type of system would be similar to that put in place by DARPA (Defense Advanced Research Projects Agency) in the US.
- In order to meet the Task Force objective of doubling the number of ICT researchers over five years, it is estimated that an annual uplift of 750 research positions will be required from MNCs.

Lack of Scale of ICT Research in Ireland

Background

- Economies of scale are necessary to gain maximum synergy from complementary research and to create the critical mass necessary to enable the provision of highly qualified technology transfer professionals.
- ICT research in Ireland suffers from a lack of scale. While there are a number of clusters of researchers, there are no large-scale labs with 300-1000 researchers as exist in many countries.
- Within the Eurolabs project, there are 151 research centres with an average of 224 researchers. A further 18 organisations within Eurolabs have an average of 2,513 researchers each.
- It was not clear to the Task Force that the establishment of a large ICT research centre would address the issue of scale. Rather the Task Force concerned itself with solutions which might, in a virtual sense, address the issue of scale as well as the issue of distributed effort in particular ICT technology areas.
- An interesting model exists in the biotech area in the form of the Dublin Molecular Medicine Centre (DMMC), which is a virtual community of scientists. The total research community involved in the DMMC comprises 500 researchers of which 110 are principal investigators. It is expected that the DMMC may grow to a community of 1000 researchers within a five year time scale. The total research budget is c. €80m – 100m over 5 years and is supplemented by additional research income. The DMMC generates in the region of 12 patents annually.
- The key advantages of an organisation such as DMMC are considered to be: a.) flexibility in negotiation; b.) national and international visibility on behalf of constituent organisations; and c.) free collaboration in intellectual property

Recommendations

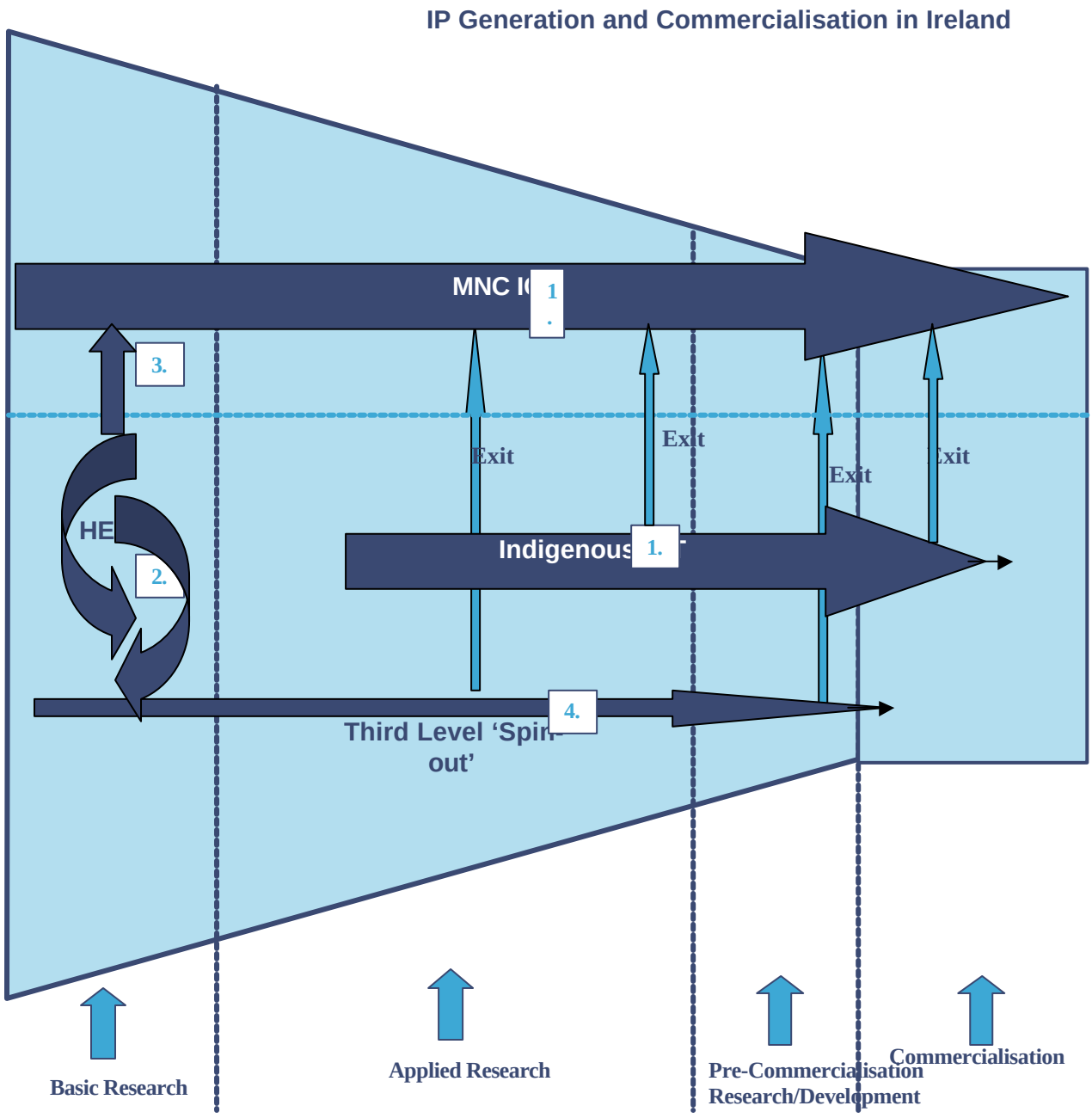
- Establish a managed network between the Dublin area ICT centres (TCD, UCD, DCU, DIT, NUIM), the characteristics of which would be:
  - Virtual research centre;
  - Independence of constituent centres maintained;
  - Facilitation of combined negotiation (for funding to national and international funding sources);
  - Free-flow of IP but IP remains with each institution;
  - Independent board including industry representatives.
- Facilitate the NMRC to grow into a significant sized applied research centre fostering collaboration with industry and deriving revenues from industry by way of contract research.
- Examine the possibility of creating a ‘virtual’ research centre based on an Atlantic University Alliance of selected western HEI’s.

Weak Commercialisation Structures

Background

- A critical weakness of the Irish ICT sector in the opinion of the Task Force is the weakness of the interface between industry and HEIs. There are a number of ways in which ICT IP is generated and commercialised in Ireland:
  - Industry can generate IP and fully commercialise it without any reference to HEI.
  - Only MNCs tend to have sufficient resources to operate across the full research continuum as well as to bring the technology to market and realise its full commercial potential. Many indigenous Irish companies also develop technologies and bring them to market without the involvement of a HEI although they tend to be derived from an applied rather than a basic research function. Moreover, these companies rarely have the necessary resources/competences to fully realise the value of the technology and they tend to sell on to a larger company (usually a MNC), either by way of technology licensing or full company sale;
  - HEI generates IP but does not commercialise.
  - Industry believes that strong, 'commercialisable' IP is potentially being developed as an output of publicly funded research in Ireland which is not being commercialised because of the poor commercialisation culture which exists in the HEI sector in Ireland. Industry also believes that there are in Ireland indigenous companies and MNCs which would be capable of successfully exploiting any such IP;
  - Joint HEI/Industry generation of IP and Industry commercialisation
  - Industry and a HEI can work together to generate IP in two different ways. In one type of relationship, the industry retains ownership of IP and subsequently commercialises it. In the second type of relationship, the HEI retains ownership of the IP and industry licenses it for commercialisation;
  - HEI 'Spin-out' generates and commercialises IP
  - HEI researchers in possession of a technology which has commercial value sometimes will seek to form a company to commercialise the value. These companies rarely have the resources/competences to fully realise the potential and, in the same way as the other indigenous ICT companies, they tend to 'exit' to a larger organisation (often a MNC) by licensing the technology or selling the company.
- The four IP generation and commercialisation models and their interfaces are set out diagrammatically overleaf:

Weak Commercialisation Structures

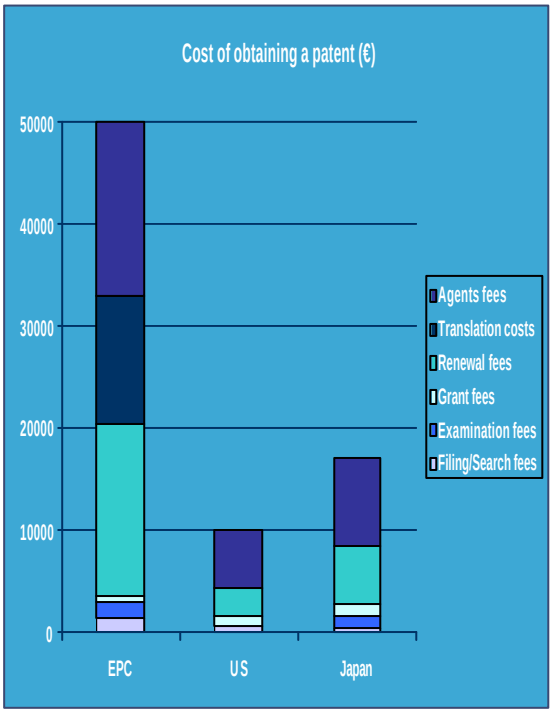


The figure above demonstrates the overall importance of large companies (MNCs) in the commercialisation of ICT - both (indigenous ICT, HEI, HEI spin-outs etc). See previous page for explanation of different generation and commercialisatio

Weak Commercialisation Structures

Background

- In the case of ICT in Ireland, the amount of type 3 generation and commercialisation, as set out on the foregoing page, is very limited with the 2001 Forfás BERD survey showing very low levels of ICT research being outsourced by industry in Ireland to HEI's.
- One of the key reasons for the weakness of the collaboration between industry and HEIs is the absence of good commercialisation structures from HEI and HEI/Industry research. Access mechanisms for industry to third level research are not well developed and the experience of industry has tended to discourage them from subsequent interaction.
- From the perspective of the HEIs, their core purpose is education and mechanisms have not been implemented to allow them to commercialise research in a way which is in keeping with their mission.
- In addition, IP protection is expensive (see graph) and HEIs are neither skilled to identify commercialisable research nor resourced to protect any IP which may emerge from the research being undertaken in that institution. Therefore the expectation that third level institutions would allocate resources to create workable industry/academic interfaces with a view to commercialising IP is perhaps an unrealistic one given the existing constraints.
- Weak commercialisation structures, therefore, represent a key obstacle in the advancement of the ICT sector in Ireland.
- According to 'Creating Ireland's Knowledge Society: Proposals for Higher Education Reform – A Submission by the HEA to the OECD' - "*Higher education is now recognised as an essential contributor to national well being - There are concerns that the institutions have not adequately put in place structures to fully realise their contribution to society (e.g. in terms of technology transfer, development of life-long learning)"*



DG Research Third European Report on S&T Indicators, 2003

- At a European level, according to 'The third European Report on S&T Indicators', 2003, there has been an increasing awareness in recent years that the ownership of knowledge and the corresponding economic benefits are central to innovation and competitiveness. In particular, they draw attention to the management and protection of IP and focus on a.) improving the protection and exploitation of research results emanating from public research organisations and b.) stimulating the use of IPR in SME's.
- A number of different policy initiatives have been developed across the EU to exploit what is generally believed to be the untapped potential of as yet unprotected scientific funding.

Weak Commercialisation Structures

Background

- Germany:
  - created a professional patenting and commercialisation infrastructure
  - Increased further education in the field of IPR
  - Building a network of commercialisation units at public research organisations;
  - Creating partnerships between universities and private patent agents
- Denmark:
  - Legislation similar to Bayh Dole – PRO's entitled to claim IPR for the inventions of their employees. Created formal formula for division of benefits and allows PROs, in limited circumstances, to become shareholders in spin off companies.
- Austria
  - Established Technologie Marketing Austria (TecMa)
  - Locates industrial partners
  - Provides financial assistance during patenting phase,
  - Provides consulting services for exploitation of R&D

- Other SME friendly policies include patent assistance programmes in Germany, abolition of patent fees and reductions in patent renewal fees for small companies and individuals in the UK; Innnovation Awards from the National Institute for IP in France for SME's and research institutes which have successfully used patents for business or innovation development

- It is clear that the issue of technology transfer and commercialisation is uppermost in the minds of policymakers in a number of European countries.
- In Ireland, the National Code of Practice for the commercialisation of publicly funded research is currently being finalised.
- Some reasons cited by HEI sector for weakness of IP generation and commercialisation:

  "The lack of a budget for patenting"

  "Limited available funding and resources for preparation, filing and maintenance of patent specifications and portfolio."

  "Lack of a well-managed and fast-response IP review and management process (e.g. to make decisions about whether to file patent, keep secret or publish)".

  "No focus or support from university or funding agencies on the creation of commercial output".

  "The main constraints are the cost and difficulty of patenting".

  "Prohibitive cost of protecting IP and lack of a suitable yardstick to decide if it is worth protecting anyway".

  "Costs of IP protection".

  "Lack of funds for patenting".

- It is the view of the Task Force that a catalyst is required which will generate, in the first instance, a dialogue between industry and researcher but will also facilitate, from an advice and financial perspective, the commercialisation of IP.

Weak Commercialisation Structures

Recommendations

- It is proposed that an *ICT IP Commercialisation Centre* be established with the following characteristics:
  - Five year life-span;
  - Specialised in ICT;
  - Control over a €10m patent fund;
  - Patent fund accessible to industry/HEA research outputs;
  - Competences to foster industry/third level collaboration;
  - Small management team (PhD level Director with international business experience in R&D in ICT sector)
  - Highly qualified personnel with competence in IP management;
  - 'one stop shop' for industry seeking to partner/collaborate with third level research;
  - Independent Board;
  - Reporting to Department of Enterprise Trade and Employment

- The Task Force believes that the existence of such a highly qualified and well funded entity for a limited period of time would address the very real difficulties facing both industry and third level institutions when faced with the task of commercialising IP. The entity would occupy the ground between the two and understand fully the objectives of, and the constraints on, each as well as the potential for collaboration and the know-how to foster it.

- As is clear from the figure on page 30, the cost of obtaining a patent in Europe is significantly higher than the US. The Task Force supports the introduction of the Community patent with the least possible translation requirements.
- The provision of an International Centre for IP Management (IFSC type of Centre) is a proposal which being made to the Enterprise Strategy Group by the Iris Software Association. The Task Force notes this propo and believes that such a recommendation would complement its own recommendations.

Poor Commercialisation Culture

Background

- The absence of a commercialisation culture amongst researchers in third level institutions was one of the key issues raised by the Task Force, the submissions and the questionnaires. A number of reasons for this were put forward:
  - Aggressive IP policies of HEIs discouraging commercialisation process;
  - There is no long-standing and well-publicised tradition of commercialisation of ICT research in Ireland;
  - With a few notable exceptions, there are few highly visible beneficiaries from commercialisation of ICT research. Those that are high-profile tend to have gained the visibility as a result of a company spin-out from a third level institution. Beneficiaries of other forms of commercialisation such as licensing a technology to industry are less visible;
  - The academic careers of researchers are advanced by way of publications and teaching not patents or industry interaction;
  - For academic funding agencies, patents do not carry the same weight as publications;
  - The status of researchers in the academic community is enhanced by publication and not by commercialisation;
  - Researchers feel that they cannot publish early if they patent;
  - Researchers are not clear on the potential financial gain from commercialisation

- Some reasons cited by HEI sector for weakness of IP generation and commercialisation:

> *"Better collaboration with industry would help. At the moment the aggressive policy on IP pursued by the University makes it more difficult to establish research collaborations with industry".*

> *"Further raising awareness of the value, and benefit of creation of IP among the academic community. EI have taken a proactive stance on this through a re-invigorating of their research funding programmes"*

> *"Preference of researchers to publish result without first filing patents, due to a)perception of greater rewards in terms of peer recognition by publishing; b) fear of being overtaken by competitors if publication is delayed because of a lengthy IP process; c) perceptions that the IP process will demand a lot of time and effort by the researchers themselves with uncertain (or even unlikely) recognition or tangible reward".*

> *"Need for greater awareness/understanding/training in intellectual property and other commercial issues - need to manage publication so that it does not prevent patenting of inventions, to understand contractual obligations in relation to third party research funding".*

Poor Commercialisation Culture

- **Background cont'd (HEI comments)**

Teaching and administrative loads are high relative to international norms".

"*Lack of research culture due to funding and teaching constraints in IoT Sector but certainly with massive potential for growth".*

"*Patenting, or setting up a campus company, or other business, entrepreneurial activity was not given any academic reward or taken as a criteria in promotions or evaluations until recently".*

"*The lack of information directly from researchers with substantial (and profitable) IP patenting experience, e.g. from the U.S. or Europe".*

"*Primary focus for academic researchers is on the generation of publishable material. This is what they are measured on for promotion and international recognition".*

"*Heavy teaching and administrative loads on front-line academic staff becoming increasingly bad".*

"*No support or motivation for commercial exploitation*"

"*General risk-averse culture at third level".*

"*In the present climate third level employees are not willing to jeopardise their employment by undertaking a technology transfer initiative such as a campus company".*

Recommendations:

- The Task Force is conscious of the time required to bring about cultural change. However the need to change the mindset of ICT researchers vis a vis commercialisation is seen as key to the future success of the Irish ICT sector.
- In terms of addressing this core issue, the Task Force feels that further incentivisation of researchers is not likely to improve the current situation as the existing incentives are attractive. Instead there is a need to examine the expectation of performance from the researcher on the part of the HEI. Currently HEIs reward researchers who have successful publication records and it is felt that much greater weight should be given to a researcher's record in terms of interaction with industry and commercialisation of research (including patenting) than is currently the case.
- Greater awareness of the commercial potential of IP is required. Some recommendations in this regard are:
  - Researchers should be encouraged to undertake *sabbaticals* in industry. It is felt that this would change the researcher mindset in respect of commercialisation and would also enhance the level of industry/academic collaboration. This collaboration should be two-way between industry and academia.
  - There should be an increased number of *entrepreneurship programs* in Ireland which would equip researchers with the business skills to commercialise their research.
  - *Masters Programs in Intellectual Property Management* should be introduced and researchers should be encouraged to avail of these programs.

Lack of integrated ('joined-up') policies in respect of ICT

Background

- Policy initiatives in respect of the development of the ICT sector tend to be fragmented in Ireland. A range of different government departments can and do impact the development of the sector by way of the policies which emerge from their respective departments. Examples are:
  - Education – supply of intellectual capital and research structure;
  - Enterprise, Trade and Employment – development agencies, research funding;
  - Finance – taxation and fiscal policies as they pertain to ICT – also special initiatives requiring 'extra-departmental funding';
  - Justice- Immigration policies which can impact supply of intellectual capital;
  - Other
- Other state agencies and state funded entities have a direct or indirect role in the development of the ICT sector:
  - Development Agencies – IDA, Enterprise Ireland, Shannon Development;
  - Policy making entities – Forfás;
  - HEI's (Higher Education Institutes):
  - SFI.

Recommendation

- The importance of ICT to the Irish economy is such that integrated ('joined-up') national policies are required for the further development of the sector. Industry should participate in developing those policies.
- The absence of integrated ('joined-up') thinking could lead to the imposition of unnecessary roadblocks in the development of the sector or the slow elimination of roadblocks which already exist.

Key Recommendations and Prioritisation

- **€100m ICT Applied Research Fund over 5 years (up to 5 years to commercialisation)**
- **ICT IP Commercialisation Centre – 5 year life - €10m patent fund**
- **European-scale HEI-based Research Networks**
- **Anchor in Ireland strategic MNC R&D centres**
- **Increase annual ICT PhD output from c.124 to 300**
- **Allow SFI projects to be industry led**
- **Increase awareness initiatives around IP commercialisation**
- **Ensure that 'joined-up' thinking on ICT occurs at policy level**