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Giving It Away: Free Technology Transfer to the Irish SME Sector

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ABSTRACT

One of Europe's major weaknesses lies in its inferiority in terms of transforming the results of technological research and skills into innovations and competitive advantages (European Commission, 1995, p. 8).

Technology transfer is a key aspect of economic development and research administration. These concerns are shared equally between academia and industry on both sides of the Atlantic. As technology is developed at a greater rate, concerns about the technology transfer will heighten. This article focuses on technology transfer in Ireland, particularly in the SME (Small and Medium size Enterprises, under 250 employees) sector. As the main Lisbon Objective has not been met in Europe ("Europe is to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion"), the authors suggest a better model of technology transfer applicable not only to Ireland and Europe, but with possibilities for the United States. Demonstrating the international dimensions of technology transfer, the article also provides an American perspective, demonstrating commonality of interest yet subtle differences.

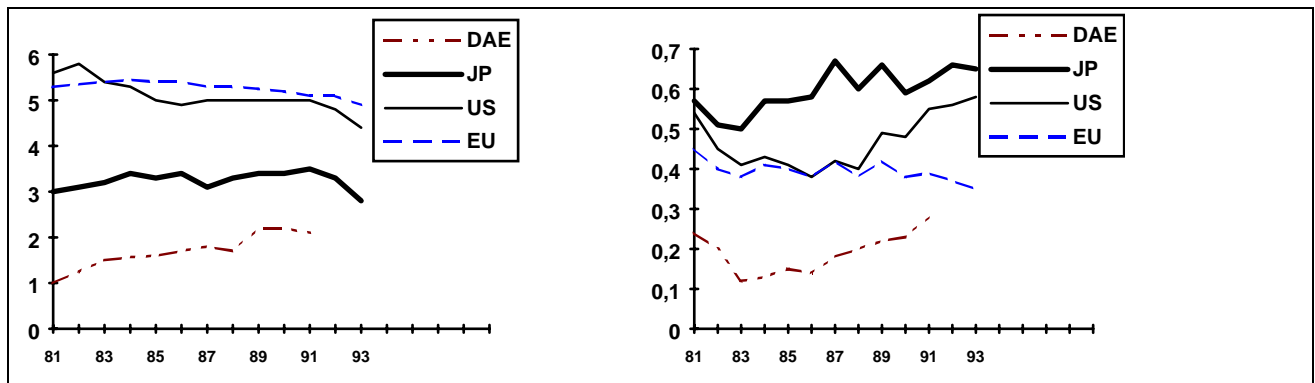
THE EUROPEAN UNION'S STRATEGIC OBJECTIVE FOR INNOVATION

Since the publication of the European Commission's Green Paper on Innovation, there has been general acknowledgment of the need to address the European Paradox, as outlined in Figure 1, in which EU scientific performance, as measured by number of scientific publications, was deemed superior to the that of the U.S. and Japan but technical performance, as measured by patents, was deemed inferior. Half a decade later, the European Council of Ministers proudly stated in Lisbon that they had reached a clearly identifiable measurable strategic objective. By this decade's end, Europe is "to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion" (Fontaine, 2000, p. 5).

Propensity of the EU, U.S., Japan and the DAE to produce results

a. Scientific performance (number of publications per million ecus, at 1987 U.S. prices, non-BERD)

b. Technological performance (number of patents per million ecus, at 1987 U.S. prices, BERD)



Note: DAE=Developing Asian Economies; BERD=Business Enterprise Expenditure on R&D

Figure 1: First European Report on Science & Technology Indicators (European Commission, 1994)

For the past five years, very influential and powerful European Commission mechanisms, supported by national policies and directives, have driven wave after wave of initiatives, pushing research and enterprise with the aim of overtaking Europe's main trading partners in terms of effectively commercializing new knowledge. The European Commission's Enterprise and Industry Directorate has closely measured Europe's activity in this area, with its latest release in January 2005 of information on EU member country performance as compared to that of the other main trading blocks (European Commission, 2005a). Figure 2, in summarizing recent performance, shows that European performance has not been as good as might be expected. The recent review by The World Economic Forum concludes: "the EU as a whole receives lower scores than the US in seven out of eight Lisbon dimensions" (Blanke & Lopez-Carlos, 2004, p. 14). This has led to open acknowledgment by the highest levels of the Commission that the gap is actually widening. José Manuel Barroso, the EU President, bluntly states, "the EU is falling behind on its Lisbon objective of making Europe the most competitive economy in the world" (Barroso, 2005).

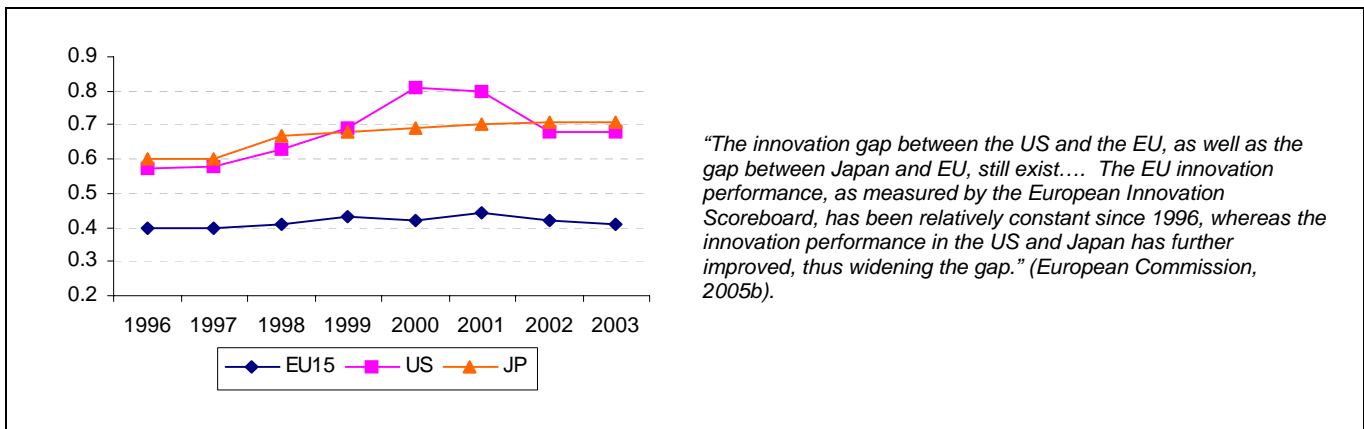


Figure 2: Gap among the U.S., Japan, and the EU as Measured by the Summary Innovation Index (European Commission, 2005b)

For Europe, it is imperative that the Innovation Gap be effectively addressed. An obvious starting point is to postulate the reasons why the Lisbon Objective is not being met. Standard business analysis would conclude:

- The target was always too ambitious.
- Innovation has a long lead time and the time under review is too short to assess the investment impact.
- Like all cultures, the culture of innovation in Europe is tradition-bound and will take time to change.

Parenthetically, it should be noted that the use of quantifiable objectives in the field of innovation is a robust intellectual topic with differing viewpoints about its appropriateness, originally carried into mainstream management theory in the 1950s by Peter F. Drucker (*The Practice of Management*, 1955).

The system in place that aims to enable Europe “to become the most competitive and dynamic knowledge-based economy in the world” (Fontaine, 2005) ought to be questioned. By first analyzing weaknesses in the system, more efficient and effective alternatives may be identified.

The Current Support System for Achieving the Strategic Objective

In narrowing the gap, particular emphasis in Europe has been given to the SME sector, and especially to the knowledge-intensive high-technology field, due to U.S. statistics highlighting the ways in which SMEs have been among the main drivers of U.S. economic growth. Generating 60–80% of net new jobs in the U.S. annually, the SME sector produce 13 to 14 times more patents per employee than large firms (U.S. Small Business Administration, 2004). There is no doubt that SMEs in economic, social, and political terms are the most effective vehicles through which to implement effective knowledge-based innovation, with European SMEs accounting for 66% of private-sector employment and 50% of new jobs (BrainWin, 2004).

The most effective way to assess the system by which an SME seeks publicly funded assistance for innovation and research resources is to adopt the SME perspective and see what needs to be done. The starting point for this analysis, assuming an established strategic direction, is the identification of required technology and technological resources.

1. Range of Funding Programmes

In Ireland, SMEs are eligible to apply for assistance across a wide range of initiatives that can involve the Third Level Sector (TLS) or other RTD (Research & Technical Development) providers. Considering that

other public and private funding programs are available, even being simply aware of the resource options available becomes difficult to manage for time-constrained SMEs.

Funding programs include local initiatives, such as local enterprise boards; national initiatives, such as Science Foundation Ireland (SFI), Enterprise Ireland, and the Department of Education and Science; cross-border initiatives, such as Intertrade Ireland-Fusion and Intertrade Ireland-Innova; and EU Transnational initiatives such as Co-operative Research (CRAFT) and Collective Research. The authors are aware of more than 30 such programs (details are available by contacting the authors). Opportunities are plentiful.

2. Program-specific Details

Once the SME has become aware of a program offering research and innovation support, the next step requires the business to analyze the program, assess its suitability, and make a well thought-out application. This duty usually falls to a senior manager while he or she faces the day-to-day commercial challenges that attend developing a business. Each program has unique criteria that require deciphering:

- the application form (including fully grasping the program’s terms and conditions);
- the set of qualifying criteria;
- the funding levels available to the SME (and the funding inputs it may be required to contribute);
- eligible costs for the SME;
- deadline date (and time);
- success rate of applicants;
- reporting demands of the program;
- payment terms; and
- ownership of outputs.

All of this must be done before the real work starts and before any funding is received. In their analysis of SMEs and their problems in participating in European Research Programmes, Dawley and Hodgson (2003, p. 8) state that “by far the commonest (problem) concerned the administrative burden paced on the participating companies.”

3. Program-specific Details—An Example

Funding applications to each HTSF consume valuable senior management time. With rejection, the application will be totally in vain. It can be argued that no payment for failure to progress is normal in the commercial world but in the commercial world it is always the input effort required versus successful output possibilities that dictates where limited resources are applied. Taking CRAFT as an example (European Commission, 2005c), the EU’s headline program to encourage SMEs to leverage the applied research capabilities of Third Level Institutes (TLI) and other RTD organisations, the input effort can be considerable. A call was issued on CORDIS on December 15, 2004 for horizontal research involving SMEs (European Commission, 2004). Table 1 lists the documentation that supported the call:

Table 1: Supporting Documentation

| Document Type | # Pages |
|----------------------------|----------------|
| Call Details | 5 |
| Proposer’s Guide | 50 |
| Work Package | 14 |
| Supporting Financial Guide | <u>246</u> |
| Total | 305 |

All of this material is developed to assist in completion of the extensive application form. After this sizable input, the currently reported success rate for CRAFT submissions is 1:10 receiving assistance (European Commission, 2005d). The successful 10% are by no means guaranteed success in terms of commercial results.

Each and every program requires a unique approach, as do those that are not listed. It is not difficult to see how all of these programs place a considerable administrative burden on SMEs. One must ask, is this the most efficient and effective approach for European Small and Medium size Enterprises to follow in seeking to become more innovative as compared to their competitors in other trading blocks?

4. Design, Promotion, Implementation, and Management of Programs

The uniqueness of each program puts a heavy burden on those applying and a major burden on the European and national bodies that design, promote, and manage the actual program itself. Considerable skilled labor hours are spent developing the qualifying criteria, designing the application form, promoting the program, agreeing to the weighting in scoring applications, getting funding allocated, managing the receipt of applications, assessing applications, and managing the program. The more programs there are, the more complex the system management becomes, and the bigger the super-structure required to effectively manage its administration.

ALTERNATIVE SYSTEMS: LOOKING OUTSIDE THE BOX

Can those that promote technology transfer learn from other disciplines? Other fields have built up operational systems over time only to come under scrutiny and find the modus operandi of the sector fundamentally altered in a relatively short period. In their seminal study, Womack, Jones and Roos (1990) outlined how Toyota achieved twice the productivity of other car manufacturers while also delivering higher product quality. This was achieved by continually reviewing their operational systems with reference to the output they wished to achieve.

The techniques used by Toyota and emulated by many other large successful enterprises have led to sweeping changes in industries, from new technologies to retailing under the concepts of lean manufacturing and supply chain management. One of the fundamental tools used by enterprises looking to develop lean processes is benchmarking. Benchmarking seeks to improve the efficiency and effectiveness of a system through the study of other systems that face a similar output requirement to see if anything can be learned. For example, Xerox analyzed the warehousing procedures of L.L. Bean, the largest mail order firm in the U.S. (Letts, Ryan, & Grossman, 1999). What revolutionary new technique did they find? While Xerox organized its parts in all of its warehouses by product, L.L. Bean placed the most frequently used items nearest the goods-out door and the less frequently used items further back. With such benchmarking exercises there is one common theme—the output focus. How can the provider do what he does better so that the user is not distracted by input issues and can better focus on his own output?

In terms of the Lisbon Objective, the question is, can Europe improve the output focus of its research while maintaining, if not even lowering, costs in terms of system development and management?

The Irish Example: As Xerox looked to L.L. Bean, Europe can look to Ireland

As Europe now looks to its gaps with its main trading partners in terms of innovation and knowledge-based economic development, so Ireland constantly stared at the widening economic gaps between itself and its European and North American neighbours.

To anyone who knew Ireland from the foundation of the state in 1923 to the 1950s, it was obvious that highly innovative economic action was required to narrow the widening gaps (Haughton, 2000). The country was being bled dry of the young and adventurous who went overseas to make their fame and fortune, returning with stories of streets paved with gold. This is not unlike Europe at present (European Commission, 2003), with top researchers being pulled to North America to drive the innovation and knowledge-based economic development activity so desperately sought in Europe—researchers who regale their impoverished colleagues back home with stories of resources, developments, and contacts that would whet the appetite of any sane postdoctoral researcher. Those with experience in Ireland 50 years ago would not, in their wildest dreams, have predicted the economic transformation that has happened. In getting to the main thesis of this paper it is worth understanding where Ireland has come from, highlighting along the way how it has got to where it is today.

A Brief Economic History of Ireland

Ireland's economic historic past does not contain aspects of industrialization. As Europe industrialized in the mid-1800s, the south of Ireland starved. Ireland's main export for the next 100 years started, as Ireland exported its people. There was no industry in the 26 counties that make up the Republic of Ireland. "In 1841, the population of Ireland was over three times that of Scotland and more than one-half that of England and Wales" (Cullen, 1987, p. 65). From that period the population of the southern counties went from an estimated 7.2 million in 1841 (Cullen, 1987), to an all-time recorded low of 2.8 million in 1961 (Kennedy, Giblin, & McHugh, 1988, p. 70). With the continually dropping population (especially of those of working age) there was no dynamic to industrialize, yet the leaders of the time were only too aware of the need to do something radical, to stop the downward spiral, to narrow the gap.

After World War II, with an abundance of labor and no industry in the state and none likely to develop, the situation was hopeless. Something radical had to be done. Policy makers agreed that two areas had to be ring fenced for continual development if Ireland was to have any chance of getting out of its morass. These were education and industrial policy. Ireland, like the rest of Europe, always gave and continues to give, as Galbreith put it in *The Affluent Society* (1988), a position of primacy to education. Yet in this period, the commitment to education was increased at a time when it could least afford it.

At the same time the Economic Minister, Sean Lemass, was asked to identify the greatest "lack" in the Irish economy. Lemass's nonchalant response was 'good ideas' (O'Sullivan, 1994). Lemass started to get what he felt the nation needed with the development of the world's first duty-free shopping in 1947 in a glorified cow field in the west of Ireland—what is now Shannon Airport. Other initiatives followed, culminating in 1958 with the publication of "a remarkable study entitled Economic Development, organized and written with government approval by its new Secretary, T.K. Whitaker" (Kennedy, Giblin, & McHugh, 1988, p. 65). The preceding initiatives and the theme of this report not only transformed Ireland, but have been used by Rotterdam, Singapore, and in recent times, regions of China to guide economic development. The report gave the government of the day the impetus to develop the first industrial zone that charged no tax on profits on any export sales. In next to no time cow fields hanging to the edge of Europe became a centre for industrial activity, the likes of which Ireland had never seen before. The result was that some lucky workers were now able to remain at home, with the state gaining from taxes on wages and also from sub-contractors who supplied the exporters, and so the revenue benefits multiplied throughout the economy.

The tax-free status for export profits was spread nationwide. With accession to the EEC the policy's success accelerated. While it has been modified through EU regulatory requirements, it has undoubtedly been the cornerstone of Ireland's economic transformation. Akin to Ireland in the 1950s, Europe is beginning to find itself in an analogous situation in terms of the effective commercialization of research.

The Reality of the Policy

Understanding the concept of tax-free profits on export earnings is straightforward. It is important in a benchmarking analysis to look at the process that delivers the benefit. Can Europe learn from an analysis of the Irish process to benefit its commercialization of innovation policies?

The key to the success of the economic policies that started in Ireland in the 1950s, culminating in the Whitaker report, was the allocation of resources directly to companies, allowing the rest to follow. The costs in terms of bureaucracy for the applicant and for the administrator were low. No new programs needed to be invented, avoiding all of the inherent additional costs, not to mention the confusion in the mind of the applicants. It was one cap fits all, simple to manage centrally and requiring very few staff.

Ireland gave up its profit on products it was never going to manufacture. It did so in a very cost-efficient and revenue-effective manner. The benefit to Ireland is that the gap has gone and the economy is now out-performing that in many of those nations to whom it exported its labor over the years.

Ireland has achieved what Europe wishes to achieve by giving it away. Europe needs to give away knowledge-based commercializable innovations in areas in which the present system is failing. The piloting of just such a scheme is what is proposed here.

APPLICATION TO TECHNOLOGY TRANSFER

The Status Quo

Forfas, the Irish National Policy and Advisory Board for Enterprise, Trade, Science, Technology and Innovation, commissioned Technopolis to carry out a study of the capacity of Irish small- and medium-sized enterprises to absorb and use knowledge from outside of the firm. Technopolis published its findings in February 2005 (Forfas, 2005) and these findings are of relevance to the proposals put forward in this paper.

The absorptive capacity of a firm is defined as its ability to recognize the value of new, external information, assimilate it, and apply it to commercial ends.

Positioned now in a rapidly expanding economy with a hitherto unimaginable investment in research, and with a plethora of world-class high-tech multinationals in residence, it would appear that the environment for the emergence of a growing indigenous high-calibre industry in Ireland could not be better. However, the absorptive capacity in the indigenous SME (Small to Medium Size Enterprise) sector to take advantage of this is questionable and its relationship in this regard with the Third Level Sector (TLS) is worth a proper examination.

In this section of the paper we focus on the degree to which technology in reality is emerging from the TLS, the degree to which it is being commercially utilized, and its significance in this rapidly changing environment. Of course, it is clearly only one means of influence on industrial innovation in the state. The point is that it is one that should, when the considerable investment being made is considered, be playing a more prominent role in this regard. According to the Forfas (2005) report, Ireland requires ‘catching up’ policies for absorptive capacity development, on the one hand, and must improve links that “were poor and relationships often characterised by mistrust” (Forfas, 2005, p. iii) with higher education, on the other. It must be stated, though, that Ireland is not unique as an EU member in this regard. Crowley, in his report (Crowley, 2004) on main sources and resources for innovation in the EU between 1998 and 2000 states that only 4% of all manufacturing industry and 6% of all service industry were used the Third Level Education Sector.

However, it's obvious as a member of the EU Community that Irish industry must improve its own absorptive capacity, including tapping its TLS source, if the growth of a technologically confident and innovative indigenous industry base is to come about. The Forfas report (2005) makes some very clear general and predictable recommendations that revolve around improvement of Irish industry's human capital, networking, organizational structures and procedures, learning processes, and systemization of tacit knowledge. It is also obvious that the Third Level Sector needs to take drastic action to make potential commercial technology accessible to indigenous Irish industry. The objectives therefore can hardly be clearer. The key of course is to come up with a badly needed new approach to achieve them.

During the 'catch-up' process, research plays a limited role for the SME sector. Even in leading U.S. technology-based companies, well over half of all R&D projects are cancelled (Leonard-Barton & Doyle, 2004) and of those completed very few are highly profitable. The SME sector, therefore, must, in the main, dip with ease and effectively into existing resources as these stem from R&D results. Using this strategy, 'catch-up' countries have an opportunity to develop their economies more quickly than leader countries. In the Forfas survey (2005), the faster growing high-tech companies used more structured processes to capture and exploit innovation opportunities and more formally managed innovation.

Having said that, it was also reported in the same review that none of the businesses interviewed for the survey had supported the report and used the TLS for product or process innovation. Perhaps they should include this potential source of R&D results within whatever innovation management systems they are developing. Likewise, the TLS should examine its own systems for their ability to deliver such results in an efficient and realistic fashion. Underpinning all of this must be a national optimal innovation support system.

As discussed in the first section of this paper, the public funding bodies appear to be playing their role in creating innovation with incentive but with a good deal of complexity. The hope is that the deployment of this support is optimal in terms of the TLS contribution to improving the innovation process and that the industrial sector as a good partner will increase its commitment.

Another useful source of information on the current major state financial commitment to innovation and its impact is the review of patent registration and technology transfer, published by Forfas (2004). This report shows that in support of the National Development Plan (2000–2006), the government committed €2.48 billion for "Research, Technological Development and Innovation" in order to underpin Ireland's objective to become a knowledge-based economy. The review, coming at the halfway stage of the plan, is useful in assessing the status of progress in RTDI (Research, Technological Development and Innovation). It is summarized below:

- **Patent activity**

The level in Ireland is particularly low—18th out of 28 OECD countries in terms of EPO appreciation and 18th out of 23 countries in U.S. patents granted. However, the growth rate of patent filing at the EPO from 1995–2000 for Ireland was the highest—most notably in computing and electronics.

- **Technology transfer**

There is a need, acknowledged by all stakeholders, to improve technology transfer (Forfas, 2004). Our focus here is on the transfers being affected by interaction between the Third Level Sector (TLS) and industry. As mentioned earlier, the interaction involving the SME sector is very low and reasons for this are given. It is stated from the industry/venture capital side that TLI expectations are unrealistic. For example, there is often an expectation by the TLI of a 15% equity undiluted in a spin-off company and the reversion of licenses in the event of company failure. Many venture capitalists view these demands as prohibitive. Other factors inhibiting such transactions, according to industry (Forfas, 2004), are:

- Underdeveloped technologies.
- Unreasonable licensing terms.
- Too complex/bureaucratic.

A Way Forward

These perceptions reflect the poor performance in the level of technology transfer from the TLS to Irish industry. It is clear from the various reviews that whether it is due to poor supply management from the TLS or a poor absorptive capacity from the industry sector or a combination of both, a cultural mismatch exists.

As stated previously, Ireland is not unique in this regard. In a Royal Society of Chemistry review (Fyfe & Townsend, 2005) of spinouts from UK universities, similar inhibiting factors are uncovered and similar recommendations are made.

In the authors' opinion all of these recommendations are laudable and high on aspiration, but in most cases they just seem to be emphasizing more of the same thing. A culturally influenced "log-jam" is affecting really significant technology transfer when it comes to the SME sector. Only through a major lateral shift will a meaningful unblocking of the pipeline be realized: this thesis is being presented here as a specific recommendation.

The Lambert Review (2003), commissioned by the UK government, comments that universities may be setting too high a price on their Intellectual Property and that public funding for research and technology transfer activities is aimed at benefiting the economy as a whole rather than creating significant revenues for the universities.

The authors completely agree with this sentiment. Even the most successful U.S. universities obtain only a very small fraction of their income from revenues generated by commercialization of their research results (NHS, 1998). Typically, this might be 2% of research income. The real reason for the activity they acknowledge is to serve the public good. In the same report it is suggested that the development agencies should support those academic researchers who really can demonstrate strong demand from business for their research activities.

This preposition is acknowledged in this paper, where the authors propose a scheme to engineer its implementation with an essential assumption that it is pro bono publico. Linked with the evidence (SPRLI, 2001) that public funding does yield economic and social returns, it would appear that anything that can be done to induce a major increase in engagement between the sectors would greatly increase such benefits.

The added dimension of not inhibiting the researchers' creativity by imposing technological limitations will contribute to a significant innovative process and stimulate major discoveries mostly brought about by the free exchange of inter- and intra-disciplinary ideas. Recent reports from the CBI (2001), the Royal Society (2003), and the Patent Office (AURIL, 2002) confirm that these freedoms are important in academic creative and innovative research.

The output focus of the TLS is the business of providing education through whatever medium is appropriate. This includes, of course, education in the conduct of good research practice. The natural spinout from this research must be the opportunity for eventual commercial applications. The key word here is eventual and the focus must be on clearing all barriers between the two cultures in order to make this happen much more often and sooner than at present. In other words, leave the business of education, including academic research, to the academics and the business of commercializing research results to the industry and business sector. What

remains to be accomplished, then, is the demolition of the inhibiting barricades and the fostering of a new culture and partnership between the TLS and industry.

The authors believe that the following should be piloted as a scheme to help in this demolition. The scheme relates to research results residing in the TLS and not to commissioned research or to research results emerging from collaborative projects between the TLS and industry. The schemes to assist these should continue with appropriate objective review. The advocated process is as follows, shown schematically in Figure 3:

- IP that is assessed as having potentially significant commercial value should be protected with support from the state-funding sector and ownership either left with the TLI (Third Level Institute)/University or put in the ownership of a central state body for administration and management of IP.
- Indigenous SMEs in the relevant sector are invited to separately discuss the protected technology with the TLI/University and the state funding body and prepare a plan for commercial development. The state funding body and the TLI agree on selection of the best candidate company to technically and commercially develop the technology.
- The company is given a royalty-free license to carry out this development within an agreed timeframe. This may require technical assistance from the TLI/University and financial and other assistance from the appropriate state funding body.
- If they do not accomplish this, either the project is dropped or discussed with the next candidate company or considered for licensing under commercial terms to larger enterprises and/or multi-national organizations.
- If the commercialization by the SME is successful, under audit from the state-funding agency, the agency then issues a certificate to that effect to the TLI, which becomes 'negotiable currency' in the TLI's future applications for research funding.
- Within this scheme there could also be the provision to financially reward the researcher(s) involved.
- Companies that successfully innovate under this scheme will be given high priority in their future applications to commercialize research results from the TLS.
- Natural strategic alliances will emerge from this practice and the overall impact must be a significant increase in the real technology transfer of research results.

AN AMERICAN PERSPECTIVE

It is fair to say that many Americans daily immersed in issues of education, industry, technology transfer, business innovation, university-industry relationships, and overall economic competitiveness would agree with the concerns expressed in this paper. This extends to specific ideas in this paper, e.g., reducing administrative burdens associated with R&D programs, encouraging a culture of entrepreneurial ideas and activity, exporting as a means to grow a healthy and diverse national economy, improving technology transfer between university and industrial concerns, and increasing the absorptive capacity of small businesses in a

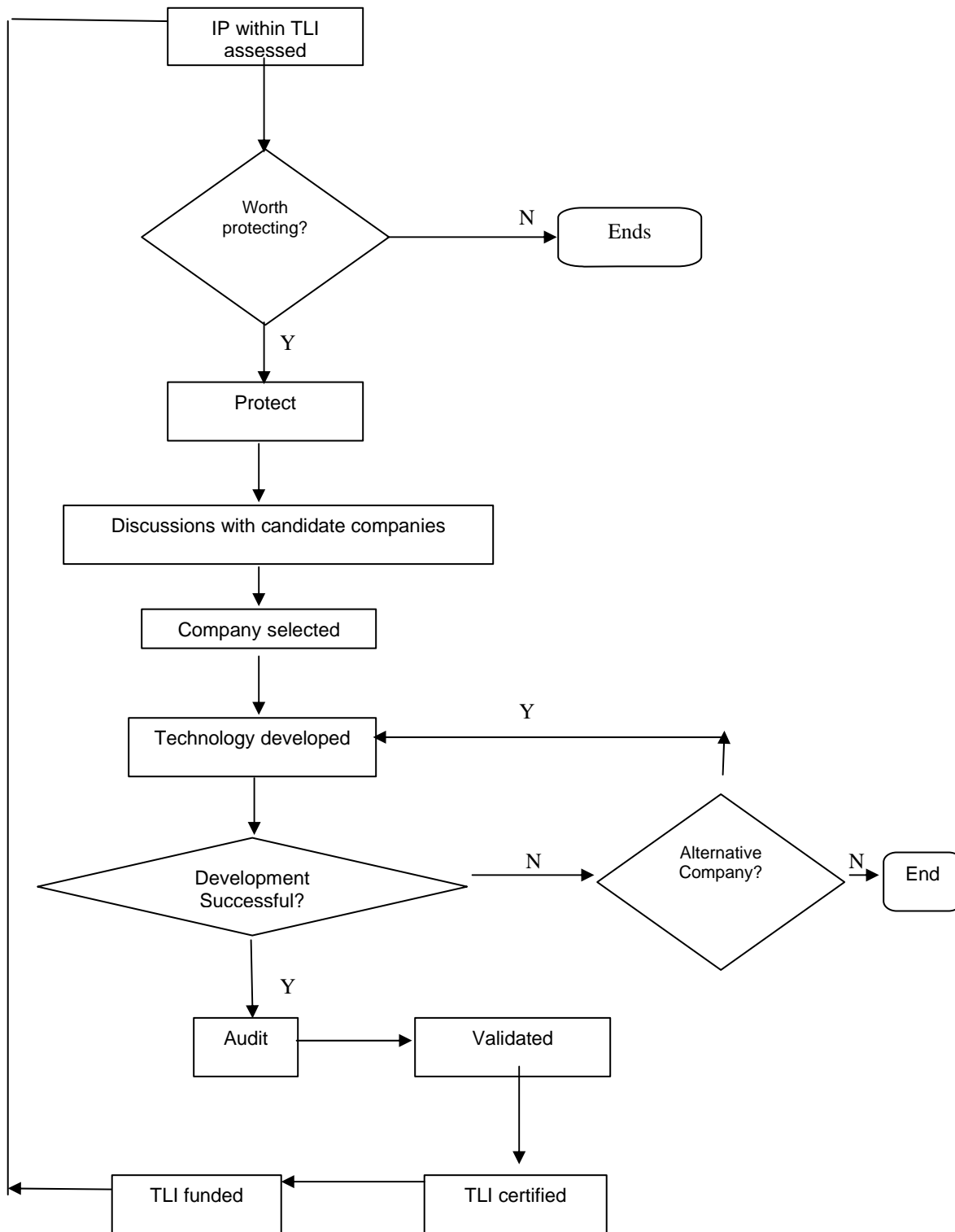


Figure 3: Technology Transfer Flow Chart

global, knowledge-driven economy. Despite this commonality, the American economy differs from the Irish one insofar as the American economy is only starting to play catch-up in a global economy marked by constant shifts in technology, people, and capital.

This section of the paper, therefore, is concerned with providing several examples of how the U.S. government is concerned with the same topics as the Irish and European communities.

Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future

One example of this concern is the Committee on Prospering in a Global Economy of the 21st Century, located under the aegis of the National Academies in Washington, D.C. Senator Lamar Alexander and Senator Jeff Bingaman of the Committee on Energy and Natural Resources, with endorsement from Representatives Sherwood Boehlert and Bart Gordon of the House Committee on Science, requested the establishment of this committee. The committee was asked to respond to the following questions:

What are the top 10 actions, in priority order, that federal policy-makers could take to enhance the science and technology enterprise so that the United States can successfully compete, prosper, and be secure in the global economy of the 21st Century? What strategy, with several concrete steps, could be used to implement each of those actions? (*Rising Above the Gathering Storm*, Executive Summary, p. 3).

The report notes at the beginning:

Today, Americans are feeling the gradual and subtle effects of globalization that challenge the economic and strategic leadership that the United States has enjoyed since World War II. A substantial portion of our workforce finds itself in direct competition for jobs with lower-wage workers around the globe, and leading-edge scientific and engineering work is being accomplished in many parts of the world. Thanks to globalization, driven by modern communications and other advances, workers in virtually every sector must now face competitors who live just a mouse-click away in Ireland, Finland, China, India, or dozens of other nations whose economies are growing (*Rising Above the Gathering Storm*, Executive Summary, p. 3).

Among the recommendations are the following:

1. Sustain and strengthen the nation's traditional commitment to long-term basic research that has the potential to be transformational to maintain the flow of new ideas that fuel the economy, provide security, and enhance the quality of life.
2. Make the United States the most attractive setting in which to study and perform research so that we can develop, recruit, and retain the best and brightest students, scientists, and engineers from within the United States and throughout the world.
3. Ensure that the United States is the premier place in the world to innovate; invest in downstream activities such as manufacturing and marketing; and create high-paying jobs based on innovation by modernizing the patent system, realigning tax policies to encourage innovation, and ensuring affordable broadband access (*Rising Above the Gathering Storm*, Executive Summary, pp. 7–9).

Regarding the third recommendation, the Committee suggests the following action steps:

1. Enhance intellectual-property protection for the 21st-century global economy.
2. Enact a stronger research and development tax credit to encourage private investment in innovation.
3. Provide tax incentives for U.S.-based innovation.
4. Ensure ubiquitous broadband Internet access (*Rising Above the Gathering Storm*, Executive Summary, pp. 9–10).

The report does not advocate the use of tax-free status on export earnings as is used in Ireland, but equally recognizes the role and importance of tax structure on innovation and wealth development. The broad threads and ideas within this National Academies project are consistent with the hopes and initiatives of the Irish government. Attention will now turn to a second effort at the national level.

The University-Industry Partnership Project

The University-Industry Partnership Project, in existence since 2003, is a joint effort of the Industrial Research Institute (IRI) and the National Council of University Research Administrators (NCURA). The Government-University-Industry Research Roundtable (GUIRR), part of the National Academies, is host of the project.

This project is concerned with improving and enhancing university-industry partnerships, primarily at the research level but also more generally focusing on education. The project recognizes that education is a critical component not only in these relationships but also in the economic competitiveness of U.S. businesses in a global economy. Membership includes delegates from a broad depth of academia, industry, and the U.S. government. The corporate delegation includes large companies, small companies, companies from different sectors (manufacturing, pharmaceutical, aerospace, consumer products, chemicals, agricultural), bench researchers, research managers, legal counsel, and venture capitalists. Academia is represented by private universities, public universities, small and large universities; professors, students; sponsored research officers, vice presidents of research, licensing officers, and university entrepreneurs. The U.S. government has representatives from the National Institutes of Health (NIH), the National Science Foundation (NSF), the Department of Commerce, and the Office of Science and Technology Policy (OSTP, located within the Executive Office of the President).

The project primarily focuses on intellectual property and technology transfer, recognizing that those areas remain two of the most significant roadblocks to the commercialization of research. As a result, the project has developed three guiding principles around which better university-industry partnerships can be built:

1. A successful university-industry collaboration should support the mission of each partner. Any effort in conflict with the mission of either partner will ultimately fail.
2. Institutional practices and national resources should focus on fostering appropriate long-term partnerships between universities and industry.
3. Universities and industry should focus on the benefits to each party that will result from the collaborations by streamlining negotiations to ensure timely conduct of the research and the development of the research findings (University-Industry Partnership Project, Outreach PowerPoint Presentation, February 2006).

The University-Industry Partnership Project is having its national summit in Washington, D.C. on April 25, 2006. Senior research and R&D leaders have been invited from the various sectors represented in this project. This project illustrates how U.S. concerns with technology transfer, research, and wealth development coincide with Irish concerns and initiatives.

CONCLUSION

What can be concluded from this paper? At a general level, it is clear that the Irish government is concerned with increasing the technology transfer prowess of TLIs/Universities, particularly in the area of absorptive capacity, and increasing relationships among the Irish government, TLI/Universities, and the private sector. This paper also illustrates that there is much commonality between the Irish and American governments, academia, and private sectors in these areas, and that ideas promulgated by one can be effectively modified and adopted by the other. More specific conclusions can be drawn with respect to the Irish experience:

1. There is plenty of documented evidence that the European SME sector lacks absorptive capacity for innovative technology that would help significantly in its growth. The growth of this sector is of course key to the EU economy.
2. There is a well-identified and long-standing cultural mismatch between the SME sector and the TLI/University sector that is likely to remain if a quantum jump in managing the interface more effectively is not made.
3. The relative amount of revenues coming into the TLI/University from the commercialization of research is insignificant even in the case of major U.S. players.
4. The efforts to manage this are quite costly and the end result very often has a negative impact on the technology transfer process when it comes to the SME sector in Europe because of complex procedures and unrealistic expectations in relation to revenues.
5. Public funding throughout Europe, through the likes of the Framework Programmes, and at national government levels, through the Irish government's establishment of SFI, is putting considerable resources into encouraging research and innovation.
6. It is vital that much more effective technology transfer, particularly to the SME sector, must result sooner rather than later.
7. The authors are proposing a scheme that unlocks Intellectual Property from the TLI/University sector for easy access by SMEs and provides reasonably unfettered research funding to those participating who have a verified track record of technology transfer of value to this industry sector.
8. This scheme should be piloted in an Irish context and reviewed for potential application across Europe.

The challenge facing the Irish and American governments, institutions of higher education, and the private sectors is that the target is always moving, e.g., technology transfer, wealth creation, etc. The challenge facing both parties on both sides of the Atlantic is to maintain flexibility in a global economy that is constantly changing. These are two of the major challenges for the 21st century.

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