

Dublin City University
Ollscoil Chathair Bhaile Átha Cliath



Leading through Challenge
University Strategy 2009-2011

Leading through Challenge 2009 - 2011

Knowledge Transfer and Innovation Strategy

2009-2014

Executive Summary

Dublin City University is a modern technology-orientated University where there is a strong consciousness that research and knowledge transfer plays a central role in the economic and social development of the community. Since its establishment in 1980 DCU has spearheaded the involvement of the business and industrial sector in providing placements for third year undergraduate students through the Integrated Training (INTRA) programme. DCU's ongoing commitment towards successfully translating research results into real society benefits is well illustrated by our prioritization of interdisciplinary research centres and their innovative research programmes the majority of which involve substantive industrial collaborations.

DCU's Knowledge Transfer and Innovation Strategy 2009–2014 builds on substantive achievements from previous strategic plan *Leadership through Foresight (2006–2008)* which have helped to guide the dramatic growth of DCU's research and knowledge transfer activities over the last three years.

The concept of successful translation of research results into real society benefits drives our research and knowledge transfer agenda.

The global recession has necessitated a review of Ireland's economic policy and a realignment of expectations of the economic impact from the past decade of investment in third level R&D activities. The timeline for tangible economic outputs has been moved to near-term. It is no longer a medium-term goal to develop Ireland as a knowledge economy – this is now a short-term and very real immediate need. It is time for DCU and other third level institutions to play their role to help underpin the economic recovery over the next 3 to 5 years. It is essential that Ireland creates a vibrant indigenous high tech industrial base that in time can grow and mature into globally competitive multi-nationals. It is in this context that the DCU **Knowledge Transfer and Innovation Strategy** has been developed and DCU is fully aware of the crucial role it can and has to play in that national economic recovery plan.

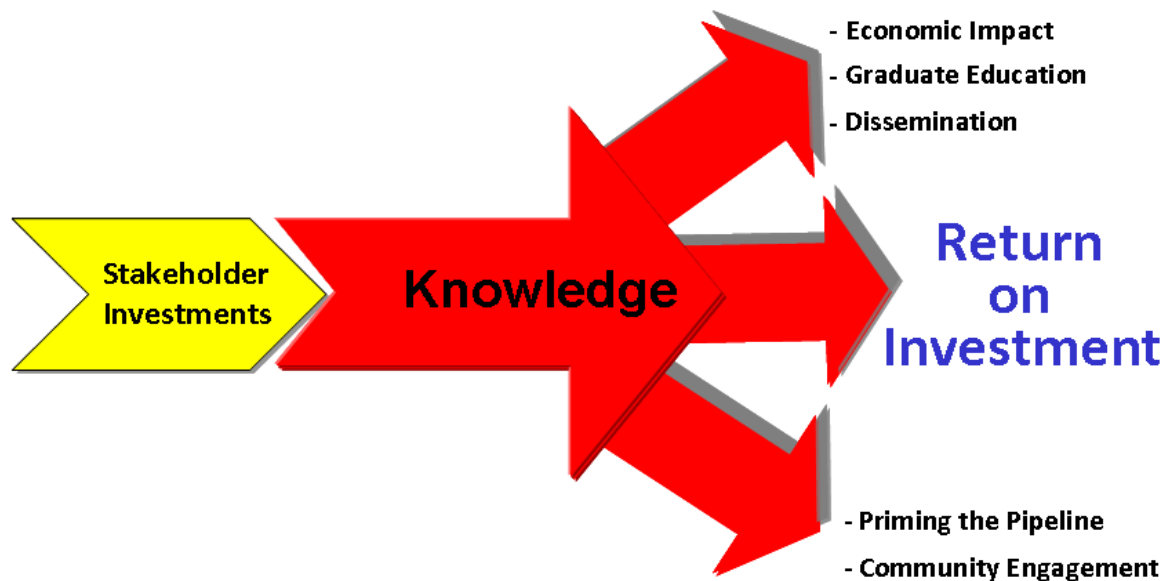
Responsiveness, flexibility and commercially pragmatic engagement with Irish and overseas industry have been and will remain central to maintaining and enhancing DCU's reputation as an industry friendly institution.

Strategy for 2009 – 2014

Strategic Intent

DCU aims to distinguish itself through our ability to translate research and teaching activities into tangible impact for the socio-economic development of Ireland. We seek to provide an unparalleled support environment for start up enterprises to grow into internationally competitive businesses providing high value employment in Ireland. Achieving this vision will require research teams delivering first class research outputs and tangible economic spin-offs in terms of graduate training and the development of know-how, IP and start-up companies. Strategic partnerships with academic partners and companies, which can help to deliver research excellence and exploit the resulting research results and which will provide staff/researcher interchanges and postgraduate training opportunities will be crucial.

Knowledge Transfer & Innovation Strategy



The key elements of **DCU's Knowledge Transfer and Innovation strategy** are focussed on measures to:

1. Accelerate the development of, and add value to, a strong and vibrant globally competitive Irish indigenous high tech sector
2. Encourage the development of relationships with a new generation of agile Irish entrepreneurs
3. Collaborate with the existing MNC base to continually innovate and deepen roots through collaborative research partnerships
4. Support IDA Ireland in attracting new knowledge intensive MNC's
5. Disseminate DCU's output to a wide range of stakeholders and promote the added value of DCU's R&D activities to SMEs and MNCs
6. Prime the pipeline with the next generation of ambitious researchers in particular in the science and engineering fields.

The current DCU strategic plan fully recognises the central role **knowledge transfer and innovation** from the HEI sector to the overall aims of the Government's Smart Economy strategy. The development of and the protection of intellectual property, technology transfer, licensing and the creation of campus companies are the traditional mechanisms identified for the transformation of University knowledge into economic wealth and new employment. However, this Knowledge Transfer and Innovation Plan recognises that the university has an extensive knowledge-base that resides in its staff and students and the onus is on the university to ensure its effective translation, beyond traditional IP/patenting models, to end-users and thereby maximise the return to all stakeholders.

The strategy for 2009 - 2014 continues our consolidation of our research strengths within the context of the overall national framework. It recognizes the challenging external environment arising from the recent dramatic deterioration in national finances and the emergence of key global challenges. This requires a targeted strategy delivering greater-short to medium term impact and with a clear focus on value for money. The strategy document provides information on achievements to date which evidence the university's

research track record and underpin its clear commitment to delivering on its future objectives.

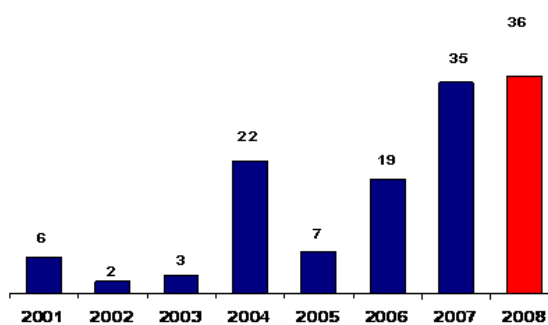


Figure 1a. DCU Intellectual Property Invention Disclosures 2001-2008

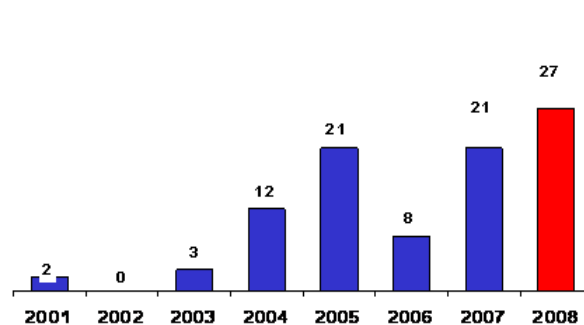


Figure 1b. DCU Patent applications 2001-2008

This strategy builds on the Knowledge Transfer and Research record of DCU to date where over the past seven years Invent DCU has supported 14 spin-off companies while also providing space and facilities for another 36 virtual client and spin-in companies. Invention disclosures have grown from a very low base to over 36 per annum and patent activity has ramped up to 27 patents in 2008. Innovation partnerships with indigenous industry have increased from an average of two annually in 2004 to seven in 2008 with royalty bearing licenses to background and foreground IP in most cases.

Our new Knowledge Transfer and Innovation strategy for the period 2009 – 2014 maintains, and builds further on, the **strategic prioritization of translational research** coupled with a highly supportive research **commercialisation and knowledge transfer** infrastructure. DCU will build on its track record of **industrial collaboration**, drive greater company **spin-out activity** and support the development of a pipeline of talented scientists and engineers through innovative **education and outreach** activities. The strategy emphasizes the growing need to show enhanced **external impacts** of our research and teaching activities in terms of **knowledge transfer** and **commercialisation**.

By 2014 DCU will:

1. Provide **national and international leadership** in our strategic research strengths complemented by national access to **specialist facilities**
2. Provide national leadership and develop an international reputation in **technology transfer and commercialisation** of research
3. Through the **Translation Research Hub** based, in the North Dublin-Leinster region, DCU will make substantive and tangible economic contributions to the Irish economy
4. Be in the **top 25 in Europe** for commercialisation of research
5. Have 25% of staff providing invention disclosures on an annual basis
6. Spin-out **15 companies** and file **135 patents**
7. Attain a conversion rate of disclosures to patent applications of 65%
8. Double the **incubation space** available on campus to over 4800m²

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1 Introduction

Dublin City University is a modern technology-orientated University where there is a strong consciousness that research and knowledge transfer plays a central role in the economic and social development of the community. Since its establishment in 1980, DCU has spearheaded the involvement of the business and industrial sector in providing placements for third year undergraduate students through the Integrated Training (INTRA) programme. DCU's ongoing commitment towards successfully translating research results into real society benefits is well illustrated by our prioritization of interdisciplinary research centres and their innovative research programmes, the majority of which involve substantive industrial collaborations. Despite its relatively small size and short history, DCU leads the Irish university sector in developing successful SFI (BDI and CNGL) supported flagship CSETs and Strategic Research Clusters (Precision, Separation Science and the pending Cancer Cluster) each involving many industrial participants including indigenous and multinational companies based in Ireland. These successes together with other initiatives outlined in this plan, provide evidence of DCU's proven commitment to establishing strong external partnerships with industry as a strategic approach to developing research teams working at the cutting-edge of commercially significant research. DCU has acquired significant experience and knowledge of factors which influence CSET and other large scale multi-partner agreements and is now a significant national player in terms of practical IP management.

Ireland has experienced unprecedented economic growth over the last 10 years, the Celtic Tiger Years, primarily as a result of success in attracting large-scale foreign direct investment (FDI). The third level sector supported that rapid economic development through the provision of increased numbers of high quality graduates. Recent years have seen however, an erosion of the competitiveness of this country as a location for FDI. Ireland is no longer a low cost economy and must move up the value chain. **Knowledge and Innovation** are the new drivers through which Ireland must compete in a globalized world.

In the later half of 2008 the global economy experienced unprecedented downturn as a result of the asset bubble and global financial crisis. Ireland, as a small open economy has been particularly susceptible to this downturn which has required swift and dramatic policy and fiscal correction steps by the Irish Government.

The Irish Government's policy document ***Building Ireland's Smart Economy*** (December 2008) states that 'at its core, [is] an exemplary research, innovation and commercialisation ecosystem'. The Irish Government's ***Strategy for Science, Technology and Innovation 2006-2013*** describes the vision that by 2013 Ireland "will be internationally renowned for the excellence of its research, and will be to the forefront in generating and using new knowledge for economic and social progress, within an innovation driven culture". The transfer of knowledge from higher education institutes into the market place and society has been identified as a key issue in the development of a world class research and commercialisation environment.

The concept of successful translation of research results into real society benefits must therefore continue to drive our research agenda.

The current DCU strategic plan fully recognises the central role of **knowledge transfer and innovation** from the HEI sector to achieving the overall aims of the Government's Smart Economy strategy. The development of and the protection of intellectual property, technology transfer, licensing and the creation of campus companies are the traditional mechanisms identified for the transformation of University knowledge into economic

wealth and new employment. However, this Knowledge Transfer and Innovation Plan recognises that the university has an extensive knowledge-base that resides in its staff and students and the onus is on the university to ensure its effective translation, beyond traditional IP/patenting models, to end-users and thereby maximise the return to all stakeholders.

2 The External Environment: opportunities and challenges

Over the past three decades, Ireland has changed beyond all recognition in terms of population, employment levels and global positioning. Through the very rapid growth in its economic performance, widely acknowledged as the Celtic Tiger years, Ireland was able to improve its infrastructure and achieve virtually full employment. With its strong Foreign Direct Investment successes spearheaded by IDA Ireland it was able to attract world-leading industries in all spheres of economic activity. Within the ICT and Biopharma sectors, almost all the leading companies worldwide have facilities in Ireland.

In the Celtic Tiger years, the Irish third level sector has benefited from nearly €1 billion investment by the Irish Government in research infrastructure and capacity through successive cycles of the PRTL which laid the ground work for the subsequent establishment of large scale SFI CSETs and SRCs and the imminent establishment of the first Enterprise-Ireland support Competence Centres. These investments were complemented in 2007 with the Enterprise Ireland **Technology Strengthening Initiative** which helped to accelerate the process of bringing a greater commercial urgency to exploiting knowledge and IP by providing significant resources to third level institutions to strengthen their technology transfer operations. Under this initiative DCU was able to recruit an additional three technology transfer professionals with extensive international industrial experience.

The latter half of 2008 has brought an unprecedented change in the both the Irish and global macroeconomic environment that has forced a radical reassessment of Irish Government economic policy. In December 2008 the *Building Ireland's Smart Economy* (www.taoiseach.gov.ie/attached_files/BuildingIrelandsSmartEconomy.pdf) policy document was published which stressed the importance of continuing the momentum built up in establishing a world-class research and innovation environment within Ireland. It is increasingly clear that in addition to enhancing the ability of the third/fourth level sector to compete internationally in terms of research excellence, it is essential that the increased national spending on R&D, predominantly coming from the State, must show increasing **economic impact** and **value for money**.

The global recession has necessitated a review of Ireland's economic policy and a realignment of expectations of the economic impact from the past decade of investment in third level R&D activities. The timeline for tangible economic outputs has been moved to near-term. It is no longer a medium-term goal to develop Ireland as a knowledge economy – this is now a short-term and very real immediate need. It is time for DCU and other third level institutions to play their role to help underpin the economic recovery over the next 3 to 5 years. It is essential that Ireland creates a vibrant indigenous high tech industrial base that in time can grow and mature into globally competitive multi-nationals. It is in this context that the DCU **Knowledge Transfer and Innovation Strategy** has been developed and DCU is fully aware of the crucial role it can and has to play in that national economic recovery plan.

Responsiveness, flexibility and commercially pragmatic engagement with Irish and overseas industry have been and will remain central to maintaining and enhancing DCU's reputation as an industry friendly institution.

The key elements of **DCU's Knowledge Transfer and Innovation strategy** are focussed on measures to:

1. Accelerate the development of, and add value to, a strong and vibrant globally competitive Irish indigenous high tech sector
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5. Disseminate DCU's output to a wide range of stakeholders and promote the added value of DCU's R&D activities to SMEs and MNCs
6. Prime the pipeline with the next generation of ambitious researchers, in particular in the science and engineering fields.

3 Knowledge Transfer and Innovation Strategy 2009-2014

3.1 Strategic Planning Process

DCU was one of the first universities in Ireland to recognise the importance of a strategic approach to building its research portfolio. Allied with the development of its first strategic plan for research in the 1990's, an early decision to pro-actively support the development of competitive research teams has paid rich dividends. Introduced in **Towards 2000 (1997–2000)** DCU's University Designated Research Centre (**UDRC**) programme provided additional resources to help build up critical mass in key strategic research areas. A particular strength of this internal university support scheme is that it encouraged the early formation of interdisciplinary teams which pioneered new research initiatives which have led ultimately to large scale nationally leading research centres.

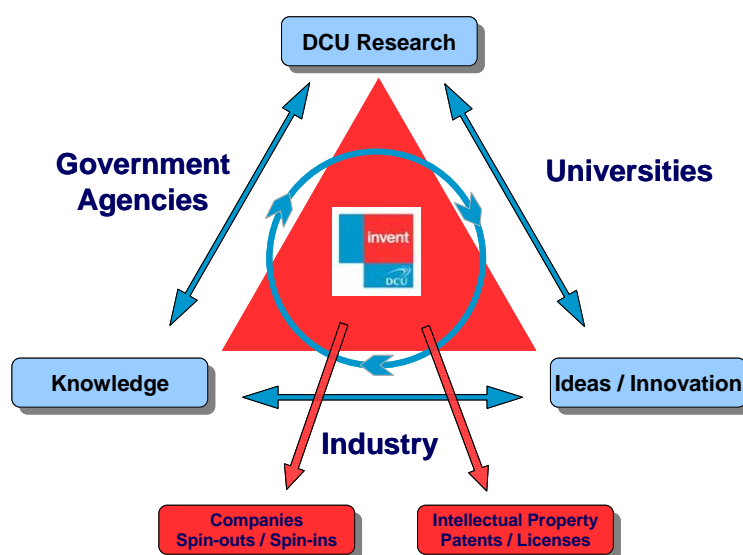


Figure 1. Invent DCU – the university's commercialisation gateway.

In its strategic plan for (2001-2005) '**Leading Change**' the University established Invent DCU Ltd to manage and commercialise university intellectual property. In 2001, the post of Vice-President for Research was established with responsibility for research and knowledge transfer in the university. In 2004, the Invent building, a purpose built 2800m² facility comprising 52 units over four floors was opened on campus at DCU. To ensure effective and professional delivery of knowledge transfer and commercialisation of DCU research Invent DCU Ltd was established as a wholly owned company limited by guarantee with a majority of external directors (see Appendix A). Invent DCU is the 'commercialisation gateway' for the university whose mission is '**to leverage the university's research activity to the economic benefit of Ireland by connecting DCU to industry through the creation of a professional infrastructure**'.

'**Leadership through Foresight (2006-2008)**' recognized that this research must have demonstrable and measurable impacts on the economic and social development of the country. The concept of **successful translation of research results into real society benefits** therefore drives our research and knowledge transfer agenda.

Our new Knowledge Transfer and Innovation strategy for the period 2009 – 2014 maintains, and builds further on, the **strategic prioritization of translational research** coupled with a highly supportive research **commercialisation and knowledge transfer** infrastructure. DCU will build on its track record of **industrial collaboration**, drive greater company **spin-out activity** and support the development of a pipeline of talented scientists and engineers through innovative **education and outreach** activities. The strategy emphasizes the growing need to show enhanced **external impacts** of our research and teaching activities in terms of **knowledge transfer** and **commercialisation**.

The Knowledge Transfer and Innovation strategy has been developed by the Board of Invent DCU Ltd. in conjunction with DCU's Research Committee working closely with the Faculty Deans and the Associate Deans for Research, to ensure communication between university and faculty plans, continuity of purpose and coordination in implementation. The strategy is cognisant of the Five Year Review (2001-2005) of Invent DCU and results of our externally facilitated Research Assessment, Governance and Organisation of Research Centres Review and Research Foresight exercises. It takes into account the lessons learned from external reviews of our major research centres and the feedback from international panels which have accompanied our external bids for research funding, in particular those arising from SFI, EI, HRB and the Research Councils programmes. It is informed by the many national and international reports of recent months which point out the urgent need for enhanced commercialisation spin-offs from the ongoing research investment.

The strategy recognizes the need to have interim milestones in order to expedite advances while maintaining consistency of purpose through the National Development Plan lifetime. In line with previous strategies this plan is accompanied by a detailed implementation plan, which will be tracked quarterly by the Board of Invent DCU and annually by the DCU Executive.

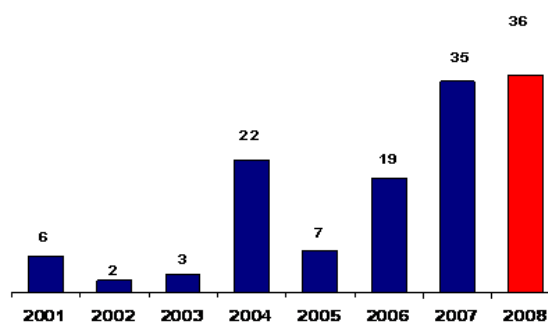


Figure 2a. DCU Intellectual Property Invention Disclosures 2001-2008

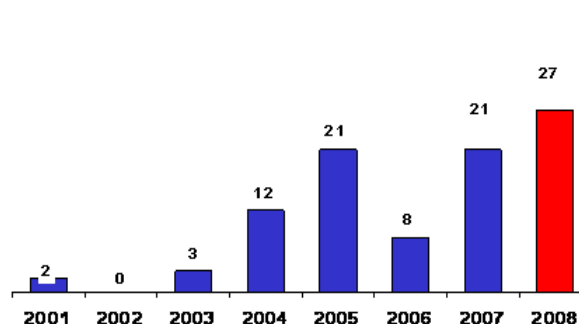


Figure 2b. DCU Patent applications 2001-2008

This strategy builds on the Knowledge Transfer and Research record of DCU to date where over the past seven years Invent DCU has supported 14 spin-off companies while also providing space and facilities for another 36 virtual client and spin-in companies. Invention disclosures have grown from a very low base to over 36 per annum and patent activity has ramped up to 27 patents in 2008. Innovation partnerships with indigenous industry have increased from an average of two annually in 2004 to seven in 2008 with royalty bearing licenses to background and foreground IP in most cases.

DCU's externally sourced research expenditure has grown from €5m to over €40m per annum within the last 6 years. Research contracts worth over €151m have been signed within the last three years. DCU has an exceptional record in leading two major SFI

CSETs, (BDI and CNGL), a half share in a third (Clarity) and significant involvement in a fourth (LERO), all of which involve substantial industrial partnerships. During 2008 DCU had three out of seven SRC proposals short-listed nationally from an initial forty proposals. Two have been awarded (Precision and Separation Science) and the third (Cancer) is still under consideration. DCU, despite its relative youth and small size, has broken into the top 300 universities worldwide according to the Sunday Times Listing (www.topuniversities.com) and was named the University of the Year in Ireland in 2007. This recognition was primarily based on the research achievements of staff members, who brought in the largest amount of external funding per faculty member of any university within the State.

DCU has always been proactive in the development of innovative education and outreach activities to communicate the excitement of research to the next generation of budding researchers. One of the leading examples of such activities is the DCU Science Bus, which was launched in 2000 in response to decreasing numbers of students studying the physical sciences at Leaving Certificate and at third level institutions. The Irish Centre for Talented Youth (CTYI) at DCU works with young people of exceptional academic ability from the age of six years. Such students have been acknowledged by the Irish Department of Education as having “special educational needs”. DCU’s faculties, schools and major research centres work with the CTYI, support participation by young second level students in physics, chemistry, biology and language international Olympiads and engage in specific targeted initiatives such as the Me & My Body (MAMBO: www.bdi.ie/mambo) aimed at primary school children.

One of the objectives of the university Strategy, Leadership through Foresight (2006-2008) which has been carried forward into the new strategy, is to increase the quality of DCU refereed publications. In 2008, the university commissioned the Centre for Science and Technology Studies (CWTS) at the University of Leiden in the Netherlands to carry out an international benchmarking of our research performance through a detailed professional bibliometric analysis. The CWTS study showed that the Citation Index output of DCU researchers has increased by 63% between 1997-2000 and 2003-2006. The analysis covered a ten-year period from 1996 to 2006 analysed on a 4-year sliding time-interval. DCU’s overall institutional research performance exceeds the world average (mostly determined by the US, UK, Australia and Canada universities). It was also found that DCU researchers publish in journals with an impact-level that is 6% higher than the world average. The impact of DCU researchers is highest compared to the world subfield average in two broad ISI subfields: ‘*Chemistry, Analytical*’ and ‘*Computer Science, Theory & Methods*’.

The DCU institutional strategy is composed of a number of critical component strategies, of which Knowledge Transfer & Innovation is one, that were developed in parallel with the university strategy. The Knowledge Transfer & Innovation Strategy should be read in conjunction with the other University Component Strategies with particular reference to the Enhancement of Learning and Research strategies:

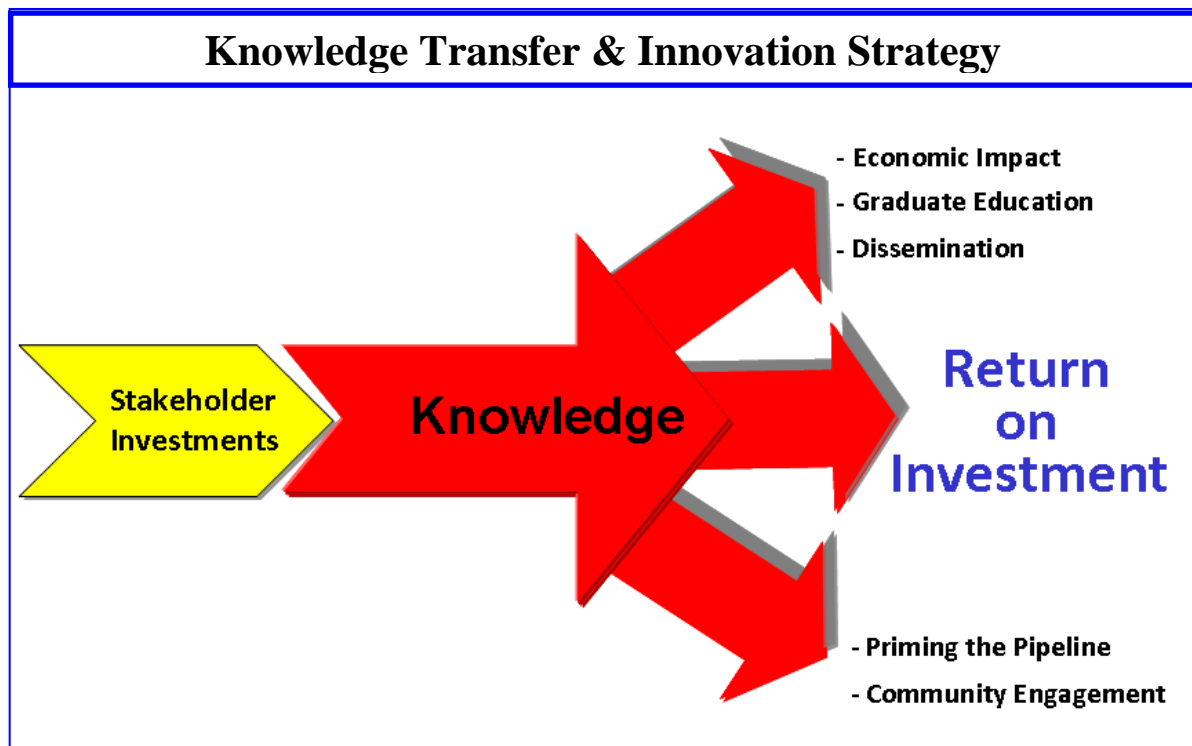
DCU Component Strategies:

1. Enhancement of Learning
2. Research
3. Knowledge Transfer and Innovation
4. Civic Engagement
5. Internationalisation

3.2 Strategic Intent

The concept of **successful translation of research results into real society benefits** drives our research and knowledge transfer agenda.

DCU aims to distinguish itself through our ability to translate research and teaching activities into tangible impacts for the socio-economic development of Ireland. We seek to provide an unparalleled support environment for start up enterprises to grow into internationally competitive businesses providing high value employment in Ireland. Achieving this vision will require research teams delivering first class research outputs and tangible economic spin-offs in terms of graduate training and the development of know-how, IP and start-up companies. Strategic partnerships with academic partners and companies, which can help to deliver research excellence and exploit the resulting research results and which will provide staff/researcher interchanges and postgraduate training opportunities will be crucial. This agenda also supports DCU's interactions with the Investment and Development Agency (IDA) and Enterprise Ireland and their activities to support the indigenous and multinational sectors in Ireland. The successful development of large-scale industry-academia centres such as SFI Centres for Science, Engineering and Technology (CSET) and Strategic Research Clusters and EI Competence Centres will also enable DCU to deliver on its Knowledge Transfer and Innovation strategy with increasing impact nationally and internationally.



3.3 DCU Strategic Objectives 2009-2014

By 2014 DCU will:

1. Provide **national and international leadership** in our strategic research strengths complemented by national access to **specialist facilities**
2. Provide national leadership and develop an international reputation in **technology transfer and commercialisation** of research
3. Through the **Translation Research Hub** based, in the North Dublin-Leinster region, DCU will make substantive and tangible economic contributions to the Irish economy
4. Be in the **top 25 universities in Europe** for commercialisation of research
5. Have 25% of staff providing invention disclosures on an annual basis
6. Spin-out **15 companies** and file **135 patents**
7. Attain a conversion rate of disclosures to patent applications of 65%
8. Double the **incubation space** available on campus to over 4800m²

The following objectives and actions build on achievements through the last planning period, as evidenced later in Section 3. They address the three-year strategic planning period 2009-2011 as an interim target timeline within our longer term overall research strategic vision to 2014.

Objective 1.

Drive increased economic impact from DCU Research

DCU will work closely with industry, government agencies and the local community to support and encourage the transformation of DCU cutting edge research, know-how and expertise into innovative and commercially exploitable products and services and spin-out companies to underpin economic development in Ireland.

1.1 Increased revenue from DCU IP licensing activities

- Increased conversion rates for IP disclosures to performing patents
- Exploit its portfolio of IP through links with experienced entrepreneurs through the EI Business Partnering Programme
- Market Innovation Partnerships in sensor technologies, ICT and physical sciences to create a pipeline of licensing opportunities with favourable IP terms for Irish industry and DCU
- Expand joint IP marketing activities with national and international partners

1.2 Increase the volume of intellectual property identified, protected and commercialised

- Increase the rate of invention disclosures from translational research from CSETs, and SRCs and promote spin-off potential to entrepreneurs
- Provision of regular IP audit facility for DCU research programmes

1.3 Enhance IP & commercialisation culture among DCU researchers

- Recognise and reward innovation and scientific discovery through high profile public events such as the **DCU Mallin Innovation Award** and annual **Invention Disclosure Awards**
- Show improved success rate in winning Enterprise Ireland proof of concept, technology development grants and commercialisation plus grants through involvement with Invent personnel and OVPR at an early stage.
- Develop appropriate IP training courses and commercialisation courses for PhD students in association with the DCU Business School with emphasis on the strategic competitive advantage of IP protection.
- Host academia-industry showcase events in DCU where researchers can profile their achievements and industry can be informed of research outcomes and influence research challenges

1.4 Develop with RCSI and NUIM partners an enhanced, co-ordinated commercialization strategy to support the Translational Research Hub (ref. Research Strategy)

Objective 2. Support and develop Ireland's industrial base

DCU has a long and impressive record of collaboration with industry. However, there is scope for further improvement in particular in terms of the development of in-depth and highly productive collaborations with indigenous industry. DCU will work proactively with government agencies e.g. Enterprise Ireland, IDA Ireland to support the development of globally competitive industrial client base in Ireland support through highly trained graduates and a pipeline of valued intellectual property and know-how.

2.1 Strengthen DCU links with indigenous industry

- Proactively market Innovation Partnerships in areas associated with DCU research strengths to create a pipeline of licensing opportunities with favourable IP terms for industry and DCU.
- Promote intangible knowledge transfer through industry sponsored/IRCSET PhD scholarships as mechanisms for licensing to Irish SMEs.
- Offer licence terms and IP options to Irish SMEs which are commercially attractive and responsive to market needs while fairly reflecting the added investment risk and intellectual contribution required from industry.
- Promotion of CSET / SRC collaborative opportunities to Irish SMEs .
- Deepen strategic partnerships with key stakeholders in the North Dublin / Leinster region including complementary incubator facilities.

2.2 Strengthen DCU links with MNC's

- Increase the rate of patent filings in key areas such as biomedical diagnostics, bio-pharmaceutical process technologies and drug screening and discovery to further attract multi-national companies to Ireland
- Pro-actively support IDA Ireland corporate client visits and external trade delegations

Objective 3.

Enhance the climate for Entrepreneurship and Innovation within DCU

The continued pursuit of cultural change within DCU will be a major institutional priority to ensure that: **a).** traditional academic disciplines work even more closely together on translational multi-disciplinary research challenges in the ultimate service of society and **b).** that a culture of entrepreneurship is pro-actively supported.

3a. Increase the number of spin-out and spin-in companies

- Continued dedicated and highly focused technology transfer support for SFI CSETS, SRC and similar large-scale research programmes
- Promote IP from DCU research centres bundled with IP from partner institutions as catalysts for emerging spin-out opportunities
- Allow extended leave of absence for staff / researchers to drive / join spin-out companies
- Celebrate and promote entrepreneurship with DCU role models
- Expand the Invent DCU's Resident Experts programme with new initiatives for early stage spin-in companies to enhance their IP absorptive capacity

3a. Supportive entrepreneurial climate

- Recognise research commercialisation achievements in internal staff promotion assessments
- Support entrepreneurship in the undergraduate student body through targeted seminars and business idea competitions
- Launch of **Leaders in Science, Engineering and Technology (L-SET)** entrepreneurship and innovation training provided by DCU Business School for all DCU postgraduate students
- Support staff secondments to industry and vice versa
- Support DCU Alumni events with successful DCU graduates

Objective 4.

Enhance Knowledge Transfer and Dissemination of Research Outputs

DCU is supporting the development of the next generation of researchers, through undergraduate education and innovative education outreach programmes at the primary school level through to the fourth level with the DCU Graduate School. The development of the DCU library e-repository, DORAS, provides a highly cost effective means of disseminating DCU research output to a global audience.

4.1 Dissemination

- >80% of DCU refereed journal output to be made available in e-repository
- All research Master and PhD theses to be made available in the e-repository
- Enhancement of the DCU Conference Support Programme to facilitate the hosting of major international conferences

4.2 Supporting the Pipeline of the next generation of researchers

- Provide opportunities for all undergraduate students to engage in a variety of research-based/research-oriented learning activities and assessment appropriate to the discipline areas they are studying.

- Education & Outreach programmes targeted at primary and second level students
- Secondary Science Teacher training and summer internships
- Re-launch of the DCU Science Bus
- Support for the 'DCU in the Community' project in Ballymun through customized courses and start up business seminars
- Support mainstreaming of the DCU Science Shop (cf. Enhancement of Learning Strategy)

4 **Appendix A: Implementation of Knowledge Transfer and Innovation strategy: Building on Previous Success**

3.1 ***Economic Impact***

DCU is an agent for cultural and economic development in Ireland through its innovative taught programmes and ‘use inspired’ translational research.

The continued pursuit of cultural change within DCU will be a major institutional priority to ensure that traditional academic disciplines work even more closely together on translational multi-disciplinary research challenges in the ultimate service of society.

Invent DCU has many years of helping individuals to start their own business and provides 2,800 square metres of purpose built incubation space for technology based start-up companies, as well as offering a range of early stage and developmental business support services to its client companies. Since 2001 more than **50 companies** have used Invent’s services and facilities to develop their early stage ideas and **14 spin out companies** have been created based on know-how and scientific discoveries originating in DCU. In recent years Invent DCU has intensified working relationships with DCU researchers, as evidenced through the dramatic increase in IP disclosures and patents, to identify innovations with commercial potential and manages the process of evaluating and protecting the University’s research based IP through technology transfer, licensing and spin outs. Invent provides advice through a network of professional advisers and business people on marketing strategies for possible commercialisation. Invent has continually expanded the range of services and training support schemes and incentives to academics/researchers to achieve a higher rate of spin-out company formation. Through its **Resident Experts Programme** Invent ensures best practice advice is available to its clients. Professionals from the following list of advisors make their expertise available to Invent clients, free of charge, for a half day each month:

- Tomkins & Company (Intellectual Property)
- Arthur Cox (Legal)
- DCU Business School (Business, Economics)
- Three Little Pigs Co. (Strategic Marketing)
- Grant Thornton (accountancy)
- Aristo (Presentation Skills)
- Farrelly & Mitchell (PR & Communications)
- Island Bridge (Brand Development)
- Nolan and Associates (Management Experts)
- RedMere Technology (Entrepreneurship)

The large-scale research programmes such as SFI CSET’s led by DCU have posed real challenges for DCU in terms of the **negotiation of collaborative IP agreements** with multiple academic and industrial partners. The development and promotion of intellectual property agreements fairly regulating the access to discoveries and innovations is an important challenge for DCU and this process is led by Invent. Reconciling the sometimes diverse commercial and legal requirements of stakeholders including funding agencies and in many cases, numerous industrial partners in complex research programmes, is a resource intensive key priority to ensure that maximum scope for spin-

out companies is preserved, whilst recognising the contractual IP constraints and obligations which come with such industrial involvement.

The effective marketing of intellectual property and patents remains a challenge not only for DCU but the entire Irish third level sector. It is in this context that in 2008, DCU and **Arizona State University** (ASU) signed an agreement to enter into a reciprocal arrangement to market the partner university's IP and technologies in their respective regions. This collaboration will allow DCU to draw on the legal and business development resources in ASU and to identify complementary technologies from ASU which can be made available to Irish start-up companies in addition to DCU IP. Also, Irish start-up companies associated with Invent will have the possibility to access the impressive business development resources and extensive advisory network at ASU's recently opened flagship \$300m+ business centre 'Skysong' located in Scottsdale, Arizona.

Invent DCU and the Business School have worked closely to support the development of **entrepreneurship education** modules informed by real world commercial criteria. The academic and commercial synergy between with the DCU Business School and Invent DCU helps to ensure that projects based on relevant and practical business problems are made available to undergraduate and postgraduate students across the university. Invent's team of commercialisation specialists has extensive start-up, commercial and industrial experience which complements the academic and rigorous approach of the business school. This knowledge is communicated to the students through taught modules that are given by business school staff and Invent staff. These will be further developed to ensure that research commercialisation seminars for masters and PhD students can inculcate a 'can do' entrepreneurial attitude in students and post doctoral researchers with a keen sense of practical knowledge transfer mechanisms and commercialisation options.

Recognition for active involvement with practical knowledge transfer at the industrial level is now a factor in promotion to senior lecturer. DCU is committed to further initiatives to give recognition to those researchers who not carry out traditional academic activities but who help to enhance the institutional reputation by effective industrial engagement and knowledge transfer.

The promotion of IRCSET funded **PhD studentships with industrial sponsorship**, on favourable IP licensing terms, is seen as an early stage development of a pipeline of commercialisation and licensing opportunities for emerging technologies. Invent DCU intends, working even more closely with the **DCU Graduate School**, to ensure that its PhD graduates emerge with a broad base of skills not just in research but also in the methodology employed by business in selecting and defining the criteria for technology development.

3.2 Priming the pipeline – the next generation of researchers

DCU is supporting the development of the next generation of ambitious researchers, through undergraduate education and innovative education outreach programmes at the primary school level through to the fourth level with the DCU Graduate School. The Government's SSTI programme has set an ambitious target of doubling PhD graduate output by 2013. Securing sufficient supply of PhD candidates will be crucial. The following sections provide an overview of the various activities on-going at DCU to attract the next generation of researchers:

Undergraduate Education

A university wide objective for DCU is to ensure that knowledge is transferred to society through effective and relevant teaching, thereby contributing to the emergence of confident competent and creative graduates who can contribute to the business environment from an early stage. The process starts during the student's education. DCU has spearheaded and will continue to promote the involvement of the business and industrial sector in providing placements for third year undergraduate students through the Intra programme. This programme ensures that the students and the teaching staff who guide them are constantly exposed to the evolving needs of companies in which academic qualifications, when backed by appropriate in service training and skills, are increasingly viewed as catalysts for increased innovation and business development in a knowledge economy. A priority objective is to ensure that our graduates can think creatively and act innovatively in a technological and global economy. A further advantage of this placement scheme is the breaking down of cultural barriers which often exist between business and academia leading to informal and effective sharing of ideas.

DCU enthusiastically supports enquiry-led and experiential learning especially by linking undergraduate research and education. To achieve this objective, staff mentor undergraduate students pursuing their final year research projects as part of their honours undergraduate programmes. At the lecturing level, DCU has a policy of supporting a research informed curriculum and has a policy that requires all members of academic staff to teach a minimum of one module regardless of research workload.

DCU also provides **Summer Internship** opportunities through a number of SFI CSET supported programmes in the **Biomedical Diagnostics Institute, Clarity, Centre for Next Generation Localisation**, among others. The primary goal of the Summer Schools are:

- To afford undergraduate students the opportunity to participate and contribute to exciting research projects at leading research facilities and to inspire these students to take the first step on a path to a research career.
- To expose students to novel research problems, cross-cutting research exploration, specialised state of the art equipment and inter-disciplinary research expertise.
- To provide a foundation of basic research skills to the undergraduate interns which will aid them in transforming their research internship experience into a long-term plan for final year research or subsequent research career options.

The **Compute TY** (www.computing.dcu.ie/computety/) course for transition year students has run successfully for a number of years at Dublin City University (DCU). This programme is a self-taught course where students learn to create their own websites on the topic of their choice. At the close of each week students get a chance to present their web sites at a special concluding ceremony. At the end of the ceremony each student receives a certificate of completion. ComputeTY 2008 was held in the computer labs at DCU's School of Computing from 7th January to 1st February with over 750 students attending.

The Irish Centre for Talented Youth

The Irish Centre for Talented Youth (CTYI) at DCU works with young people of exceptional academic ability from the age of six years. Such students have been acknowledged by the Irish Department of Education as having "special educational needs". The Centre aims to address these needs by identifying high ability students throughout Ireland through annual Talent Searches. CTYI provides services for 3,500 students each year, which includes Saturday classes, residential summer programmes, correspondence courses and Discovery Days. The Centre supports parents and teachers as well as undertaking research in the area of gifted students.

The Science Bus

The Science Bus, developed in response to decreasing numbers of students studying the physical sciences at Leaving Certificate and at third level institutions, was launched in 2000 as a working science laboratory for children aged between 9-12 years and promotes science among primary school children. The Science Bus is best described as a fully equipped mobile interactive laboratory that travels to primary schools and public venues nationwide. Since its launch the Bus has visited over 650 schools and has accommodated over 40,000 students. Most of the schools visited are in the greater Dublin area. However, the bus travels to schools in other counties at least once every two months and has also attended events in the UK. Furthermore, with the recent introduction of science to the primary curriculum, the Science Bus has adapted its function accordingly – offering teacher training courses in practical science to better equip teachers for the change in the curriculum as well as its usual school visits.

Science Olympiads

The annual IBM/DCU Irish Science Olympiad (ISO) established in 1992 at Dublin City University challenges Post-Primary School Students throughout the country to enhance their knowledge and understanding of **Biology, Chemistry, Computer Programming and Physics** by participating in Olympiad activities. A series of events starting at school level builds up to National and International standards. Students are offered the opportunity to compete for All-Ireland gold, silver and bronze medals in their chosen science subject and to better equip themselves for further study and career development. Those who achieve the ultimate level of excellence in ISO events have the opportunity to represent Ireland at one of the International Science Olympiads. In 2009, a new Olympiad in Computational Linguistics will take place hosted by the DCU-led Centre for the Next Generation Localisation SFI CSET.

CaSTeL

The Centre for the Advancement of Science Teaching and Learning is a university designated research centre with staff from both DCU and St. Patrick's College Drumcondra. CaSTeL's aim is to promote best practice in science and mathematics teaching at all levels (primary through tertiary), with stated aims of improving not only the understanding of the science learned, but also the attitudes of students towards science and mathematics. The specific objectives for CaSTeL lie in the following areas:

1. Activity-based learning methodologies and strategies in science and mathematics at all levels of education.
2. Teacher education strategies and structures that draw on the best education research from psychology to the use of technology in education, for teachers at all levels.
3. Improving assessment methodologies in science and mathematics so that we assess meaningful and relevant subject matter in an appropriate manner and thereby drive good practice.

3.3 Graduate School

The strength of Ireland's third level sector has been identified as a key ingredient in enabling and sustaining Ireland's economy. A ready supply of motivated and highly competent young third level graduates, particularly in science and engineering disciplines, has attracted very many of the world's leading industries to Ireland. For example, 13 out of the 15 top international pharmaceutical companies have branches here. As the economy moves further up the value chain through increasingly knowledge dependent industries, the need for a corresponding development of a competitive **fourth level** educational sector is clear.

The fourth level will be distinguished by much greater numbers of young researchers at postgraduate levels undertaking projects within internationally competitive teams and with systematic supports from improved structures. Increased funding of research and

development through agencies such as Science Foundation Ireland, the Higher Education Authority, Enterprise Ireland, the Health Research Board and the Research Councils, has succeeded in attracting strong researchers to Ireland and in building up the research base in our universities.

In *Leadership through Foresight* DCU has ambitious targets for postgraduate research growth (ref. Figure 2), as part of Ireland's drive towards developing an internationally competitive Fourth Level. A key strategy was the implementation of the institution wide single **DCU Graduate School** that provides a structured and much improved support system for young postgraduate researchers. The single university – wide model approach has been adopted to take account of the scale of the DCU postgraduate population and also reflects the practice that is currently used in a number of institutions of similar size to DCU: Princeton, Warwick, University of Stirling, University of York Graduate College. The Graduate School provides benefits to the whole postgraduate population, combined with more specific disciplinary or multidisciplinary advanced training programmes based primarily on our research strengths. The latter provides key opportunities for inter-institutional collaboration and success will depend heavily on the quality of the PIs involved in the training networks. It is clear that if DCU is to succeed in doubling its postgraduate research student numbers by 2013 this will involve considerable expansion of our space, equipment, facilities, and the number of associated PIs, technical and other support staff.

The first step in moving these ambitious plans forward was the appointment of a **Director of Graduate Research and Training**, who is responsible for the development of the DCU Graduate School that will optimise the use of our resources and maximise benefits to our research community. The Graduate School has built on the extensive graduate training programmes that have been established in recent years in the four faculties and supported by the Office of the Vice-President for Research. The key objective is to improve the postgraduate research experience at DCU, through the provision of improved frameworks and structured course supports, which will complement students' core research activities and improve their career opportunities.

A key aim of DCU's strategic plan is the first class contribution of its research graduates to the growing knowledge-intensive Irish economy. In that context DCU is committed to a research culture which sustains and supports the next generation of research leadership. Integral to the expansion of a competitive fourth level sector is the development of a more structured approach to graduate education. While the core component of a structured PhD programme is the advancement of knowledge through original research; at the same time the structured PhD is designed to meet the needs of an employment market that is wider than academia. In that context the DCU Graduate School established a formal training across its four faculties for all its research students. In June 2008 DCU adopted a fully credit based system for all its incoming research students from the academic year 2008/9. Incorporating such credit allows the University to recognise and give value to the various training elements involved in PhD programmes and allows DCU the flexibility to actively participate in inter-institutional graduate research programmes.

Currently DCU offers formal training in the following areas to all its research students:

- Research Design
- Experimental Design and Research Methods
- Intellectual Property and Commercialisation of Research
- Statistics
- Qualitative and Quantitative Research Methods
- Interviewing Skills
- Data Analysis

- Research Ethics

In the new strategic plan DCU has committed to providing all SET doctoral students with an opportunity to take part in a **Leaders in Science, Engineering and Technology (L-SET)**. This is a new innovative taught programme that has been developed in conjunction with the DCU Business School and Invent to provide the **entrepreneurial and business skills** identified as crucial to the commercialisation of innovation. This programme will comprise a suite of modules in the key areas of innovation (e.g. commercialisation, intellectual property, personal development, people management, R&D management, research centre management, entrepreneurship) and will thereby provide the education and training for SET doctoral students, which has been identified by Government as crucial to the growth of the Smart Economy. Crucial to this programme will be the use of case studies from Irish entrepreneurs.

At a disciplinary level DCU is a key player in a number of structured programmes in the delivery of advanced disciplinary modules. These advanced courses provide the opportunity for research students to acquire significant skills in their respective disciplines and allow for wide dissemination of knowledge transfer amongst the next generation of research leaders. The following programmes offer significant disciplinary training modules in conjunction with a variety of partner HEIs:

- **PRTL I V** graduate training programme in Therapeutics and Theranostics
- The **Marie Curie** Early Stage Researcher training programme in Mechanical and Manufacturing Engineering
- SFI funded CSET: **CLARITY**: Centre for Sensor Web Technologies
- SFI funded CSET: **Centre for Next Generation Localisation**
- **Lero** Graduate Programme in Software Engineering
- National Social Sciences Graduate Platform
- Structured PhD programme in Politics and International Relations

As part of the **Dublin Regional Higher Educational Alliance** DCU is centrally involved, through SIF 2, in structured graduate training developments at a disciplinary level. Graduate researchers in Chemical Sciences, Physical Sciences, Biomedical Sciences, Engineering, and Politics have the opportunity to take advanced disciplinary modules and attend summer schools and master classes for which they will attain credit throughout the participating institutions.

Other developments at the postgraduate level include the launch of a new **Professional Doctoral** programme in 2006 by the DCU Business School. This is a part-time, research-based programme that affords senior managers the opportunity to undertake research on issues and problems of direct relevance to their own professional interests and organisational requirements. This initiative was expanded within DCU when the School of Education Studies initiated its own Professional Doctorate in Education (leadership) in 2007.

DCU is committed to providing a structured Ph.D. experience for its research students. We view such an approach as essential to achieving our strategic aims in graduate research in providing the next generation of research leadership with significant transferable skills, advanced disciplinary skills and rigorous entrepreneurial skills which will enable DCU researchers to provide wide dissemination of knowledge transfer.

3.4 Knowledge Dissemination

Publication of Knowledge

Traditionally, refereed papers, articles, books, conference proceedings and other forms of publication are core to assessing academic excellence. However, DCU is placing an increased emphasis on quality rather than quantity, where high ranking journals/publications and corresponding citation rates are the true measures of performance and impact.

Electronic Repository

The Internet has fundamentally changed the practical and economic realities of distributing scientific knowledge and cultural heritage. For the first time ever, the Internet now offers the chance to constitute a global and interactive representation of human knowledge, including cultural heritage and the guarantee of worldwide access. DCU has taken steps to ensure full utilization of the internet to disseminate its research output through the development of, DORAS (<http://doras.dcu.ie/>), an **Electronic Repository** in the university library.

There are two distinct aspects to the repository:

A. Institutional Repository (IR)

Simply defined, an institutional repository is a server, linked to other servers by a common protocol and thus becoming part of a global network. The IR can store, and make freely available, digitized versions of research publications created by the host institution and its research community. Such repositories have

two great advantages: they raise the profile of research institutions; and they increase the impact of individual publications. At the local level here in DCU, the Library has developed an IR that acts as both a showcase and a secure central repository of the research output of the university. At the national level, the seven university libraries were recently successful in a SIF project proposal, under the aegis of the IUA, to put in place a network of IRs in Ireland. For the first time, the full texts of Irish published research will be aggregated, and be visible, in one location. Over 1,000 published articles, including 70 research theses, are now available on-line in the DCU e-repository.

B. Electronic Theses

Research Theses represent one of the most tangible outputs of publicly funded research output. From the start of the 2009/1010 academic year it is now mandatory that all research theses are submitted to the DCU library Institutional Repository (IR) where they are catalogued, securely stored, and publicized. The process is based on a stable international protocol (OAI-PMH), which links all servers operating to its standards in a global network. This protocol is the basis of a Strategic Innovation Fund (SIF) project which commenced in 2007, under which all IUA libraries will set up Institutional Repositories, which will contain theses.

Dissemination Support

Dissemination of research knowledge at International conferences/workshops is an important activity. However, even greater impact can be obtained from the hosting of major conferences thereby giving exposure to researchers and the institutions. DCU

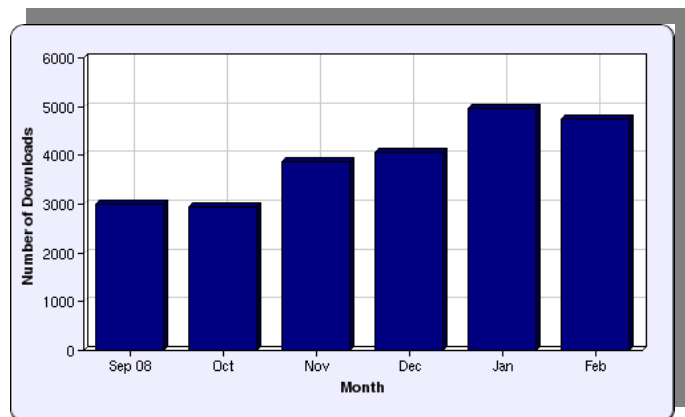


Figure 3. Volume of research documents downloaded from the DCU e-repository Sept 2008 – Feb 2009

recognizes that conferences strengthen the presence of DCU research and scholarship in the academic world at large and are important vehicles in the development of the research agenda of the University. The OVPR **Conference Support Programme** provides targeted funding and additional infrastructural supports to facilitate the hosting of conferences at DCU. Over the last three years the programme has supported DCU staff to host more than 37 conferences / workshops with 4,500 attendees.

The **International Visitors Programme** is designed to assist in creating and building international collaborations to enhance DCU's research activities. The programme supports the costs of bringing individuals to DCU who have achieved a high level of distinction in their field, and whose presence on this campus is likely to have a significant impact.

3.5 Social Engagement

DCU is located in North Dublin, now rapidly regenerating, but once one of the most deprived inner-city areas of the capital that aspires to become a 'City of Learning and Enterprise'. The 'Celtic Tiger' has provided a rapid economic advance for Ireland, but this has not been matched by social advance for all of its citizens. Economic prosperity now creates the conditions for **a truly inclusive city and region** working to the benefit of all its citizens. The challenge is to provide a good quality of life for all the citizens in the urban areas around DCU, and greater educational provision for those in the wider concentric arcs, that constitute the DCU geographical community.

Under *Leadership through Foresight* DCU was the first university to develop a Civic Engagement strategy. This was and is innovative and no comparable high-level strategy exists at other Irish universities. The period of Leadership through Foresight saw the successful launch of **DCU in the Community** (<http://www.dcu.ie/community/index.shtml>) with the launch of the Shangan Road educational outreach facility in association with Ballymun Regeneration Limited. The mission of DCU in the Community is to provide flexible educational opportunities to local residents in order to increase participation and promote equality in third level education. DCU in the Community recognises the individual talents of each student and will develop curricula based on the students' needs. This university outreach centre will promote sustainable community development and serve as a bridge to the resources of DCU. This represents one of the most tangible forms of outreach by a university, where an off-campus education and support facility has been established in the local community, a community that is one of the most socially and economically disadvantaged in the country.

DCU seeks to serve its local and regional communities through the provision of first class innovative teaching, research and training, but also through the creation of employment opportunities and a cultural development role. This Civic Engagement strategy is the vital social component of the overall DCU strategy and thus part of an integrated DCU strategic focus around research and teaching/learning developments and their contributions to the wider society.

The first aim of the civic engagement strategy is to effectively **share knowledge** through a sustainable university-community dialogue based on the principle of **exchange and a mutual learning**, an interactive process leading to knowledge development. This is a two-way process, with learning occurring at both ends of the communication process. DCU, as a producer of knowledge in many scientific and social spheres, has a responsibility to share this knowledge with the community it is part of. Amongst our objectives, a central one is to work with community groups, business and industry to find solutions for community needs by contributing University expertise and knowledge.

It is within this context that DCU established the DCU **Science Shop** subtitled 'community knowledge exchange' to express its social and pedagogic function, in partnership with the NorDubCo.

The Science Shop:

- Acts as a window between a wide gamut of DCU research and the wider community, showcasing key initiatives in the public domain;
- Supports the university's growing relationship with the region's stakeholders, i.e. local government, industry, commercial and professional bodies and community groups.
- Provides a range of 'real world' research experience to students and staff at all levels of their career development, in a manner that will be properly recognised through course credits and promotion criteria.

In specific terms this process will revolve around two distinct but interlinked actions:

A. Regionally-initiated research

An important challenge for DCU's role as a research-focused university is the constant need to relate theory with practice in an effective and rigorous way. It is proposed that the Science Shop would build on various existing initiatives at a number of levels from undergraduate research to MBA team projects.

B. Knowledge Sharing

The primary component of this process is the university's desire to share its knowledge resources with regional stakeholders and increase funding indirectly through much wider publicity for DCU research. This takes a number of forms, including:

- (a) Direct access to staff expertise
- (b) Development of short courses to meet specific community requests
- (c) Placement of DCU staff on the boards of local and regional stakeholders

5 Appendix B: Invent DCU Board of Directors

Dr. Anthony Walsh - Chairman
Chief Executive,
Institute of Bankers.

Mr. Feargal O'Morain
Executive Director
Enterprise Ireland

Mr. Eamonn Cuggy
Finance Officer, DCU

Prof. Eugene Kennedy
Vice President for Research, DCU

Dr. Declan Raftery
Director, Research Support Services
Office of the Vice President for Research

Dr. David Melody FICE,
ex Deputy Chairman and Vice President, R&D
Loctite Ireland Ltd
(Retired)

Dr. Finbar Larkin
Director, Ipsen Manufacturing Ireland Ltd

Dr. Patricia Cullen
Director Research, Henkel Technology

Mr. Aidan McGettigan
CFO, Centric Health

Mr. Patrick Brazel
Chairman, Irish Software Association