

Dublin City University
Ollscoil Chathair Bhaile Átha Cliath



Leading through Challenge
University Strategy 2009-2011

Leading through Challenge 2009 - 2011

Research Strategy 2009-2014

Executive Summary

DCU's Research Strategy 2009–2014 builds on substantive achievements from previous *Towards 2000* (1997-2000), *Leading Change* (2000–2005) and *Leadership through Foresight* (2006–2008) strategic plans which have helped to guide the dramatic growth of DCU's research activity over the last twelve years.

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.

Building research capacity and achievement

Dublin City University celebrated the 25th anniversary of its first intake of students on the 11th November 2005. Today with 10,000 students including 2,600 postgraduate students of which 780 are postgraduate research students, DCU continues to be a significant agent for change within the Irish third level firmament.

DCU's research is carried out through its faculties, schools and **prioritised inter-disciplinary research centres (Table 1 p21)**. The latter, building on infrastructural investments enabled by various HEA PRTL cycles and subsequent SFI and EI successes, work in strategically significant areas, with a wide range of external collaborators including industrial partners.

DCU's externally sourced research expenditure has grown from €5m to over €40m per annum within the last 6 years. 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. Postgraduate research student numbers have grown to over 750, with PhDs graduating exceeding 100 for the first time in 2007. External bibliometric analysis shows that DCU is performing very well internationally. Publications per annum have doubled since 1999 and citations trebled over the same period to over 6000 per annum. 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 grown its invention disclosures to 36 per annum, patents to 27 per annum and has spun-out 12 companies.

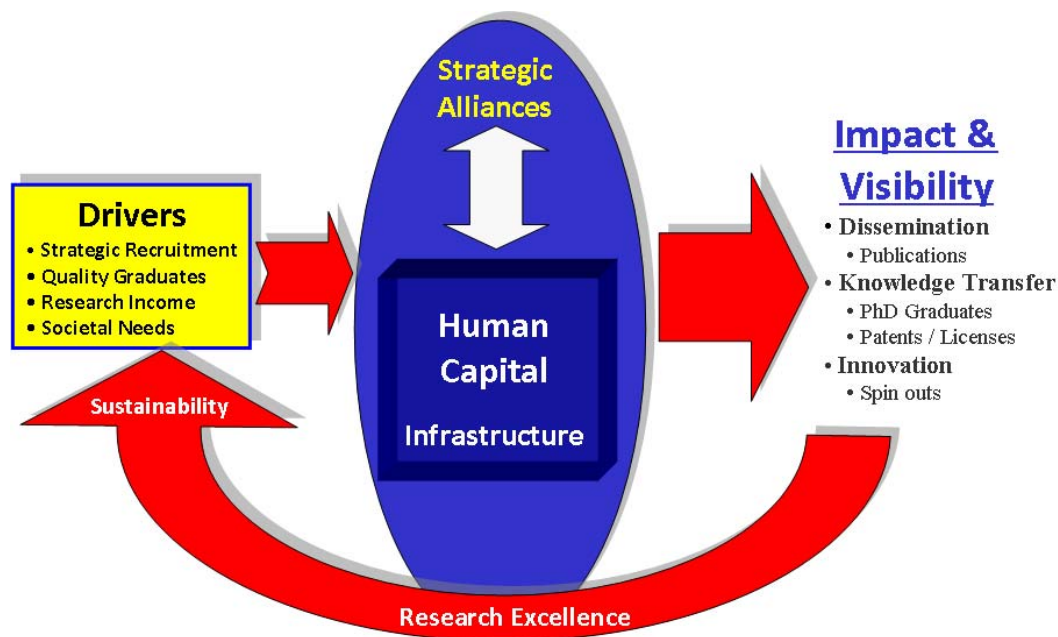


Figure 1. DCU Research Strategic Framework 2009-2014

Strategy for 2009 – 2014

Figure 1 shows schematically the virtuous inter-relationship between performance, external impact and ultimate sustainability. To enable and enhance our research efforts we need to maintain our competitiveness in winning external funding and in recruiting the best and brightest students and staff to address strategic areas of research. Through developing our physical and soft infrastructures and strategic partnerships, we can optimally create and support the research environment to lever the best from our human resources. Active engagement with innovative business/industrial/societal/governmental agencies can ensure continuing relevance of our research and deliver a ‘real-world’ experience to our young researchers. This in turn will ensure maximum impact from our research efforts in terms of research training and the development of entrepreneurial skills of our young researchers. It will enhance the creation and exploitation of scholarship and Intellectual Property through commercialization and the continuous generation of a pipeline of internationally leading-edge research projects.

Our new research strategy for the period 2009 – 2014 maintains, and builds further on our **strategic prioritization of translational research** and support for our **critical mass research teams** through targeting of **enhanced facilities, strategic alliances and structured graduate programmes**. The strategy emphasises the importance of enhanced **external impacts** of our research in terms of **knowledge transfer and commercialisation**.

Research strengths

Appendix B (P34) shows the university’s academic themes and the associated near and longer term priorities.

In Cycles 1 and 3 of PRTL, DCU received funding to establish national centres of excellence in the areas of

- **Sensors (NCSR),**
- **Plasma Science and Technology (NCPST)**
- **Networks and Communications Engineering (RINCE)**

- **Cellular Biotechnology (NICB)**

The establishment of these Centres supported the creation of critical mass interdisciplinary research teams and provided high quality infrastructure critical for subsequent successes in leveraging further funding from SFI, the Research Councils, Enterprise Ireland, HRB, EU and other national and international agencies. Furthermore they have underpinned the university's capacity to engage with business and industry.

In PRTL Cycle IV DCU received support for national programmes including **therapeutics/theranostics, bio-photonics and imaging, photonics and nanotechnology, humanities and social science** which further developed experimental facilities and provided essential support for the formation of **structured PhD programmes** exploiting internal and national collaborations.

DCU's Translational Research Focus

DCU's translational focus is best exemplified by its large-scale **prioritised SFI/IDA supported Centres** (Table 1 P21) which all involve deep industrial partnerships within a translational framework and which pioneer a range of outreach and access activities aimed at primary, secondary and tertiary level students and the general public, particularly in the Science, Technology, Engineering and Mathematics (STEM) disciplines.

SFI / Industry Research Programmes	Research Area	Partners
Biomedical Diagnostics Institute BDI (SFI CSET)	Diagnostics	NUIG, RCSI, Hospira, Enfer, Analog Devices, Inverness Medical, Becton Dickinson
BMS Centre for Bioanalytical Science CBAS (SFI / IDA)	Bio-processing / Bio-Analytical Science	NUIG, Bristol Myers Squibb
' Separation Science ' SFI Strategic Research Cluster	Separation science for complex biological systems	UCC, Dionex, Pfizer, Bristol Myers Squibb, Agilent Technologies, Waters Technology.
International Centre for Neurotherapeutics (ICNT)	Neurotransmitter release, K+ channels	Allergan Pharmaceuticals
The Centre for Next Generation Localisation CNGL (SFI-CSET)	Machine translation	UCD, TCD, UL, IBM, Microsoft, Symantec, DNP, Idiom, Traslan
Clarity (SFI-CSET)	Adaptive Sensing and Information Discovery	UCD, Tyndall National Institute, Vodafone, Ericsson, IBM, ChangingWorlds, Oracle
' Precision ' SFI Strategic Research Cluster	Plasma processing	UCD, Intel, Stratuum, Lexas Research, Impedans, Holfield Plastics

The first four address the Life Sciences and Health and Science, Discovery and Technological Innovation themes while the CNGL and Clarity CSETs address the ICT theme, building on DCU's leadership in machine translation and the sensor-web. DCU has nationally unique expertise in plasma science particularly applied to materials processing and precision manufacturing. Table 1 (P20) also lists other university designated research centres spanning Humanities and Social Sciences, Business and Innovation and Educational research, which are developing emerging research strengths

Research Assessment and Foresight Exercises

In its successful implementation of its (2006-2008) strategic plan just concluded, DCU carried out an extensive **Research Assessment** including an externally facilitated bibliometric analysis. The results clearly evidence the growth in the external impact of our research. DCU also carried out during 2008 a major **Review of the Organization and Governance of its Research Centres** with a view to enhancing the positive synergies between Research Centres and Schools/Faculties and the provision of infrastructural facilities in the most cost-effective and efficient manner. Furthermore DCU carried out a substantive **Foresight Exercise** (www.dcu.ie/themes/foresight/index.shtml) which has, in a creative way, looked towards the future, with the vision of future-proofing the university's research agenda and helping to identify emerging areas for future investment. The results of these externally validated initiatives have informed our new research strategy.

Structured PhD programmes

As part of its commitment to fostering graduate research excellence DCU established its university wide **Graduate School** in 2007 which is supported by the Graduate Research Office. The Graduate School in conjunction with DCU'S Faculties is driving the further development of advanced PhD training, including cross-campus and inter-institutional structuring of postgraduate research.

Campus Planning

Major challenges include the sustainability of our research efforts in terms of the maintenance of research centres, investment in buildings and equipment and enhancement of the general research infrastructure. This includes provision of administrative support for researchers, on-going maintenance and upgrading of equipment, research facilities management and adequate numbers of research technicians. One of the critical outcomes of the Research Centres Review Report was the recognition of the added-value to be obtained through **co-location of specialised leading-edge core facilities** and the associated development of efficient and cost-effective administrative and technical supports. DCU's strategy addresses the need to further develop our campus through the provision of additional space and specialist facilities to underpin, in particular, the future research potential of our CSET and SRC teams.

Specialist facilities will be flexibly available to DCU researchers and through access programmes to researchers nationally.

Strategic Alliances

The strategy emphasises the development of deep external alliances to add critical mass through complementary skills and facilities. DCU, TCD, UCD, DIT and NUIM have agreed that there is a compelling case to work closely together, through the Dublin Region Higher Education Alliance (DRHEA) in the context of postgraduate training.

Through the development of a **Translational Research Hub (TRH) between DCU, RCSI and NUIM** we will build on already demonstrated collaborations and develop unique national capabilities for the North Dublin Leinster region. The TRH will deliver quality access to worldclass translational research infrastructure and clinical expertise of the Royal College of Surgeons and RCSI researchers will benefit from access to advanced technology platforms and expertise in physics, chemical biology and bio-engineering.

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 have an international reputation for **technology transfer and commercialisation** of research
- 3 Host at least four sustainable large-scale research **CSETs** contributing to economic welfare
- 4 Through the **Translation Research Hub** based, in the North Dublin-Leinster region, DCU will make substantive and tangible economic contributions to the Irish economy
- 5 Grow our **postgraduate research** population to over 900 with access for all to structured programmes
- 6 Complete its Glasnevin **Campus Development Plan**
- 7 Double our **external citation** rates
- 8 Have achieved at least three **European Research Council successes**
- 9 Be in the **top 200** universities worldwide and top 25 in Europe for commercialisation of research
- 10 Increase its **annual research income** by 30% with 40% from non-exchequer sources

Research Strategy 2009 - 2014

Preface

Research forms an essential part of our university mission. Research stimulates student curiosity, imagination and creative abilities, underpins the recruitment and retention of first class staff and optimizes the contribution of the university to economic, cultural and social development nationally and internationally.

DCU's Research Strategy for the period 2009–2014 builds on substantive achievements from previous ***Towards 2000 (1997-2000)***, ***Leading Change (2000–2005)*** and ***Leadership through Foresight (2006–2008)*** strategic plans which have helped to guide the dramatic growth of DCU's research activity over the last twelve years.

This document:

- Provides the context for and the objectives of DCU's 2009-2014 research strategy with detailed specific objectives for the 2009-2011 period.
- Provides an overview of DCU's track record in strategic plan implementation and in the development of its research portfolio
- Illustrates DCU's continuing emphasis on the successful translation of research results into real societal benefits
- Evidences the development of critical mass in defined fields of scholarship through prioritization
- Shows how DCU is performance driven and
- Emphasises our engagement with key external partners to enhance DCU's competitiveness through collaboration and our ability to respond to the needs of society.

The 2009-2014 strategy continues our consolidation of our research strengths within the context of the overall national framework and recognizes the challenging external environment arising from the recent dramatic deterioration in national finances and the emergence of key global challenges, requiring a targeted strategy delivering greater-short to medium term impact and with a clear focus on value for money.

DCU's research performance to date is testimony to the efforts of our researchers and support staff throughout the university and to our collaborators nationally and internationally. I hope this research strategy and the many associated actions will enable us together to continue to grow DCU's research success.

I would like to express my deep appreciation to all those who have contributed to the development of this strategy.

Best wishes



Prof Eugene Kennedy
Vice-President for Research

ACRONYM LIST

Alphabetised list of Acronyms used in the Dublin City University PRTL I V submission

HIGHER EDUCATION INSTITUTES (partnering with DCU)

AIT	Athlone Institute of Technology (http://www.ait.ie)
CIT	Cork Institute of Technology (http://www.cit.ie/)
DCU	Dublin City University (http://www.dcu.ie/)
DIT	Dublin Institute of Technology (http://www.dit.ie/)
DKIT	Dundalk Institute of Technology (http://www2.dkit.ie/)
ITS	Institute of Technology, Sligo (http://www.itsligo.ie/)
MIC	Mary Immaculate College (http://www.mic.ul.ie/)
NUIG	National University of Ireland, Galway (http://www.nuigalway.ie/)
NUIM	National University of Ireland, Maynooth (http://www.nuim.ie/)
QUB	Queen's University Belfast (http://www.qub.ac.uk/)
RCSI	Royal College of Surgeons in Ireland (http://www.rcsi.ie/)
SPCD	St. Patrick's College, Drumcondra (http://www.spd.dcu.ie/main/index.shtml)
TCD	Trinity College Dublin (http://www.tcd.ie/)
UCC	University College Cork (http://www.ucc.ie/en/)
UCD	University College Dublin (http://www.ucd.ie/)
UL	University of Limerick (http://www.ul.ie/)

RESEARCH CENTRES (* *Research Centres at DCU.*)

BDI*:	Biomedical Diagnostics Institute (SFI CSET; DCU; http://www.bdi.ie/)
BSI:	BioSciences Institute (PRTL I; UCC; http://www.bsi.ucc.ie/)
CASTel*:	Centre for the Advancement of Science Teaching and Learning (a DCU UDRC)
CBAS*:	BMS Centre for Bioanalytical Sciences (IDA, BMS; DCU based)
CISC:	Centre for Innovation and Structural Change (PRTL I; NUIG +UCD & DCU, http://www.cisc.ie/)
LiNk*:	Learning, Innovation and Knowledge Research Centre
CSCB:	Centre for Synthesis and Chemical Biology (PRTL I; UCD + TCD & RCSI; http://www.ucd.ie/cscb/)
CTTS:	Centre for Translation and Textual Studies (a DCU UDRC; http://www.ctts.dcu.ie/)
DMMC:	Dublin Molecular Medicine Centre (PRTL I; TCD, UCD, RCSI; http://www.dmmc.ie)
EATRIS:	European Advanced Translational Research Infrastructure in Medicine (http://www.eatris.com/scripts/home/publigen/content/templates/show.asp?P=113&L=EN&ITEMID=4)
ESFRI:	European Strategy Forum on Research Infrastructures (http://cordis.europa.eu/esfri/home.html)
IBC:	Integrative Biology Centre (Conway Institute, UCD)
ICLRD:	International Centre for Local and Regional Development (North-South-US partnership, Armagh, NI http://www.iclrd.org/)
ICNT*:	International Centre for Neurotherapeutics (DCU; http://www.dcu.ie/icnt/index.shtml)
ICRIN:	Irish Clinical Research Infrastructure Network (http://www.icrin.ie/index.cfm)
IPS:	Institute for Photonic Sciences (planning phase)
IRCEP:	International Research Centre for Experimental Physics (QUB, http://www.ircep.qub.ac.uk/)
LiNk*:	Learning, Innovation and Knowledge Research Centre (a DCU UDRC, http://www.dcu.ie/dcubs/link/index.shtml)
MI:	Marine Institute (http://www.marine.ie/Home/)
MMI:	Molecular Medicine Ireland (http://www.molecularmedicineireland.ie/home)

NCAD: National College of Art and Design (<http://www.ncad.ie/>)
NCBES: National Centre for Biomedical Engineering Science (PRTL1; NUIG; <http://www.nuigalway.ie/ncbes/>)
NCG: National Centre for Geocomputation (NUIM)
NCPST*: National Centre for Plasma Science and Technology (PRTL1 1; <http://webpages.dcu.ie/~ncpst/>)
NCSR*: National Centre for Sensor Research (PRTL1 1; <http://www.ncsr.ie/>)
NCTCC: National Cell and Tissue Culture Centre (<http://www.dcu.ie/~nctcc/>)
NIBRT: National Institute of Bioprocessing Research and Training (IDA founded)
NICB*: National Institute for Cellular Biotechnology (PRTL1 3; www.nicb.dcu.ie/)
NIRSA: National Institute for Regional and Spatial Analysis (PRTL1 2; NUIM; <http://www.nuim.ie/nirsa/>)
RINCE*: Research Institute for Networks and Communications (PRTL1 1; <http://www.rince.ie/>)
SIM*: Centre for Society Information & Media (DCU UDRC; <http://www.dcu.ie/communications/sim.shtml>)
VHRC*: Vascular Health Research Centre (<http://www.dcu.ie/biotechnology/vhrc/>)
VSG*: Vision Systems Group (<http://www.vsg.dcu.ie/>)

OTHER

ABCRF: Analytical and Biological Chemistry Research Facility (University College Cork)
ANRG: Applied Neurotherapeutics Group (Conway Institute, UCD)
APC: Alimentary Pharmabiotic Centre (UCC, SFI funded CSET: <http://apc.ucc.ie>)
CSET: Centre for Science, Engineering and Technology (SFI funded Centres: campus-industry partnerships)
DHO: Digital Humanities Observatory
EI: Enterprise Ireland (develops indigenous business sector; <http://www.enterprise-ireland.com/>)
ERC: European Research Council (<http://erc.europa.eu/>)
HEA: Higher Education Authority (<http://www.heai.ie/>)
HEI: Higher Education Institution
NDP: National Development Plan
H&SS: Humanities and Social Sciences
HRB: Health Research Board (<http://www.hrb.ie/>)
IDA: Industrial Development Agency
IRCSET: Research Council for Science, Engineering and Technology (<http://www.ircset.ie>)
IRCHSS: Irish Research Council for the Humanities and Social Sciences (<http://www.irchss.ie/>)
KbE: Knowledge-based economy
PRTL1: Programme for Research in Third Level Institutions (HEA supported programme)
SFI: Science Foundation Ireland (www.sfi.ie)
SRC: Strategic Research Cluster (a SFI initiative)
SSTI: Strategy for Science Technology & Innovation (<http://www.entemp.ie/science/technology/sciencestrategy.htm>)
UDRC: University-Designated Research Centre

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1. DCU RESEARCH

1.1. The Development of DCU's research profile

Dublin City University celebrated the 25th anniversary of its first intake of students on the 11th November 2005. Known as the National Institute for Higher Education Dublin for its first decade, the campus has seen enormous progress during the last quarter of a century. Established as Dublin City University in 1989 through an Act of Parliament, DCU accelerated its research drive supported by national and European funding. Today with 10,000 students including 2,600 postgraduate students, of which over 700 are postgraduate research students, DCU is a very significant agent for change within the Irish third level firmament. As a young and radical university DCU has pioneered many innovations in terms of its continually expanding teaching and research programmes.

The drive towards research excellence began very early. Even before the first intake of students, the first research grant was received early in 1980. The first Masters award was conferred in 1984 to a graduate in the School of Physical Sciences and the first PhDs emerged from the School of Biotechnology in 1986. During the calendar year 2006, DCU graduated over 100 PhD students for the first time (102 PhDs and 31 Masters by research) across the breadth of its faculties.

This rapid very early integration of research was a great tribute to the energy, commitment and vision of the academic and support staff who were also engaged with building up from scratch the many new interdisciplinary degree programmes. DCU has continued to build on excellence in both its teaching and research programmes. A striking characteristic has been the bringing together of different disciplines for the formation of multi- and inter-disciplinary teams to develop innovative undergraduate degree programmes and internationally leading research teams.

DCU's externally sourced research expenditure has increased dramatically over the last 10 years (Figure 1), illustrating the competitiveness of our research community. In the last three years alone DCU has been awarded research contracts valued in excess of €151m. Through its research programmes DCU nurtures and develops future generations of young researchers to underpin and drive Ireland's emerging knowledge intensive society.

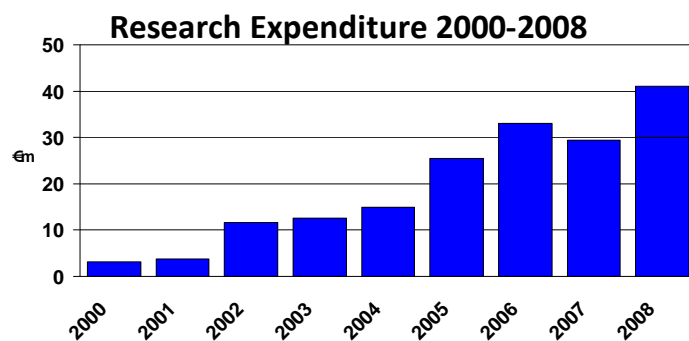


Figure 1.: DCU Research Expenditure 2000-2008

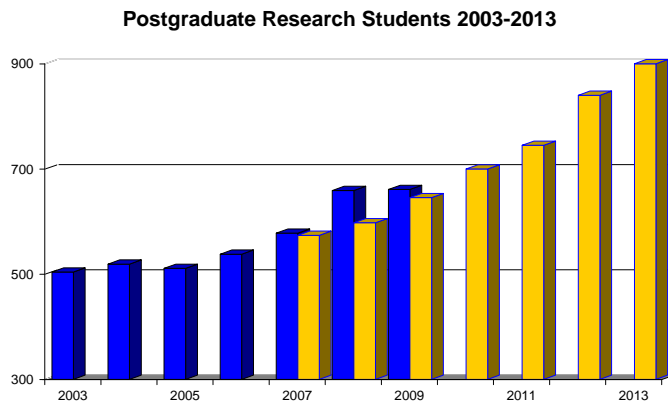


Figure 2: DCU Postgraduate Research Students: Actual numbers 2001-2009 (blue) and growth projections (yellow)

Research helps to instil key qualities of curiosity, critical enquiry, confidence, international awareness and competence in specialist skills in our young people. The outputs of research can lead to the development of new insights, applications and technologies which directly improve the lives of individuals or provide indirect benefits through increasing competitiveness of business/industry. Innovative

research can also add to the quality of life within society through contributions to policy initiatives and policy development in the governmental, private and voluntary sectors of society. Alignment with national and EU strategic areas such as Information Communications Technology /Materials / Photonics; Biotechnology / Life Sciences / Health; Intercultural Studies, Digital Media, Environment, Energy, Food, Marine and our contribution to the development of national or regional facilities are key to our capacity to increase our research efforts and ensure more direct societal benefits from our research.

Strong interactions between our research and teaching & learning missions are essential to optimise of our performance as a university in the broadest sense. Increasing emphasis on innovation, technology transfer and commercialisation recognizes emerging opportunities arising from the targeted investment of resources in areas of national economic significance and the need to more effectively translate research results into economic and societal gains.

DCU's research is carried out through its faculties, schools and prioritised inter-disciplinary research centres (Table 1 P20). The latter, building on infrastructural investments enabled by various HEA PRTL cycles and subsequent SFI successes, work in strategically significant areas, together with a wide range of external collaborators including industrial partners.

DCU's exceptional research performance to date, in terms of its size and age, is evidenced through key performance indicators which include: postgraduate numbers (Figure 2 demonstrates the growth in postgraduate research student numbers including projections to 2013); research income per staff member; fraction of our overall effort engaged with business/industry; invention disclosures; patents and spin-offs. Particularly significant has been DCU's clear success in highly competitive SFI programmes supporting critical mass inter-disciplinary research teams (See section 4.2). Another clear indicator of external impact is the fact that DCU is one of the youngest university to appear in the Sunday Times top 300 universities world-wide (www.timeshighereducation.co.uk).

Since its inception DCU has valued its relationship with business and industry. This trend permeates much of our research effort and the dynamic environment which this provides is key for innovation, commercialisation and the unique development of our young researchers.

1.2. The External Environment: opportunities and challenges

DCU does not operate in isolation and must be cognisant of the external environment, both national and global, within which it is operating. The very dramatic changes in the macroeconomic environment during the later half of 2008 have resulted in very serious fiscal problems for the Irish government and a renewed emphasis on the role of universities in supporting the Irish Smart Economy policy objectives (www.taoiseach.gov.ie/attached_files/BuildingIrelandsSmartEconomy.pdf). These pose both opportunities and threats that must be taken into account in the development of the current university research strategy.

A key challenge in this context is the **sustainability** and **further growth** of our unique research strengths which rely on continuing competitively won resources. In addition to researcher funding, large-scale initiatives require substantial infrastructural supports for technology platforms with concomitant demands for effective administrative and technical support.

DCU recognises that it is through the coordinated approach enabled by critical mass teams that its overall research profile becomes truly internationally competitive. By working in true collaboration with complementary strengths from other institutions and external agency / business / industrial partners, DCU levers the maximum returns from our research expenditure and ensures best value for money for the State's investment.

Over the past three decades, Ireland has rapidly changed in terms of population, employment patterns and global positioning. Through the very rapid growth in its economic performance, widely acknowledged as the Celtic Tiger phenomenon, Ireland was able to improve its infrastructure and achieve virtually full employment. With its strong Foreign Direct Investment successes spearheaded by the Industrial Development Agency (IDA), Ireland attracted 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. One of the primary reasons for the success of this strategy was the investment through the seventies and eighties by Government, 'ahead of the curve' in supporting the development of the university **third-level undergraduate** sector, particularly in the science and technology areas. This led to a continuous pipeline of highly educated young graduates, underpinning the growth of the multi-national company sector in Ireland.

Since the late nineties, an additional far-sighted parallel strategy of Government has been to greatly increase the investment in research and development within the higher education institutions (**HEIs**) and industry/business sectors. By strengthening the **fourth level postgraduate** educational sector, in order to deliver an increasing number of creative and highly trained **research graduates**, Ireland is building an **innovative, knowledge intensive environment** to support multi-national company ambitions and foster a strong indigenous base.

The dramatic change in the national research environment in Ireland, particularly evident over the last decade, was initially fuelled through the exemplary lead and associated investments from Atlantic Philanthropies (www.atlanticphilanthropies.org). The Programme for Research in Third Level Institutes (**PRTLII**), initiated in 1998 by the Higher Education Authority and funded from the Department of Education and Science, has been hugely instrumental in supporting the development of **strategic**

research strengths in the HEI sector, building the **physical infrastructure** required for large scale research efforts and in funding associated **postgraduate programmes**. Following the formation of Science Foundation Ireland (**SFI**) and the Irish Research Councils for Science and Engineering Technologies and Humanities and Social Sciences (**IRCSET** and **IRCHSS**) at the turn of the century and the growth in the funding levels of other agencies such as the Health Research Board (**HRB**), Environmental Protection Agency (**EPA**), investments in **internationally leading researchers** ranging from postgraduate students through world-leading Principal Investigators have enabled the establishment of leading research groups across many discipline boundaries. Enterprise Ireland (**EI**), the government agency responsible for supporting indigenous industry, is providing key support to facilitate the **commercialisation** of research outputs and has enhanced the technology transfer capability of HEIs through targeted addition of key personnel, support for patenting and the introduction of a phased portfolio of awards based on academic-industry collaborations. Its most recent innovation is the development of the Competence Centre initiative aimed at supporting industry-led research programmes.

Dublin City University has been an active participant and leader in these developments and for its age and size has performed exceptionally well. As outlined in the following sections, DCU has been in many ways exemplary in terms of positioning its research agenda to recognize the need to translate the outputs of research for the benefit of the economy and wider society. Fuelled by success in competitive research funding DCU has built up its physical and soft infrastructural supports and hosts a number of nationally leading and internationally competitive research centres. Through its clearly articulated **prioritization of translational research**, DCU is responding to the needs of society in a coordinated and strategically significant manner.

International ranking of universities is an emerging trend which may influence future recruitment of high quality students and staff from abroad. 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. DCU researchers are actively engaged in many successful international collaborative projects, which add value to our research effort and enhance our external visibility. Nevertheless, it is recognized that enhanced efforts are required to engage even more forcefully in the future in EU 7th Framework (FP7) programmes and in bi-lateral programmes such as Ireland-US. DCU's research portfolio matches well onto FP7 priorities and through the provision of additional research supports within the university, for project proposal preparation and co-ordination, is delivering significant increases in FP7 activity and success to date.

During the latter half of 2008, the external environment has changed at an alarming rate. With the national and global economies undergoing unprecedented contractions Ireland is now faced with enormous challenges. In his December 2008 address on **Building Ireland's Smart Economy** (www.taoiseach.gov.ie) the Taoiseach, as Leader of the Irish Government, 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 Government's National Development Plan (www.ndp.ie) has the Strategy for Science, Technology and Innovation (**SSTI**) as a central plank with ambitious targets set for research growth in terms of quantity and quality of research and technology transfer in terms of licensing and start-ups. Several more recent seminal documents further emphasize these considerations including SFI's Strategic Plan to 2011 (www.sfi.ie/uploads/documents/upload/SFI_Smart_Economy.pdf), The Irish Government's policy documentation '**Building the Smart Economy**' develops the concept of the **Innovation Island** requiring our educational and research environments to empower our young researchers through specific courses on **innovation** and **entrepreneurship**. In the new strategic plan DCU has committed to providing all Science, Engineering and Technology (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 DCU Business School 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.

Structured interactions between the worlds of academia and industry are essential to give real substance to efforts to underpin Ireland's economic recovery.

1.3. Sustainability, Engagement and Impact

The very difficult national fiscal circumstances coupled with our need to compete within an ever more competitive global environment means that it is essential that the best and most strategic of DCU's research strengths are protected and enhanced, while providing real measurable spin-offs into the economy and wider society. **Sustainability** of our research effort and output can only be achieved through continuing prioritization and working in an ever more collaborative way both internally and externally. Increasing **Engagement** with external partners with complementary research expertise and facilities will be essential to lever maximum return from our efforts.

DCU will continue its commitment to ensuring that multi-disciplinary research teams of critical mass, working closely with external partners, are supported on the basis of measured performance and strategic need and that our research infrastructure investments are targeted at our unique research strengths.

As part of its successful implementation of the (2006-2008) strategic plan just concluded, DCU carried out an extensive **Research Assessment** process including an externally facilitated bibliometric analysis. This has helped to inform the university regarding the research areas which deliver substantial external impact as determined by key performance indicators. DCU has also carried out during 2008 a major **Review of the Organization and Governance of its Research Centres** with a view to enhancing the positive synergies between Research Centres and Schools/Faculties and the provision of infrastructural facilities in the most cost-effective and efficient manner. In addition to developing a new taxonomy for our research centres, the Review also identified two new enabling initiatives **UDRFs**

(University Designated Research Facilities) and **UDRIs** (University Designated Research Initiatives). Furthermore DCU has carried out a substantive **Foresight Exercise** (www.dcu.ie/themes/foresight/index.shtml) which has, in a creative way, looked towards the future, with the vision of future-proofing the university's research agenda and helping to identify emerging areas for future investment.

A further area of recent development has been the **enhanced technology transfer supports** now available through **DCU Invent** (www.invent.ie), the commercialisation arm of the university. With essential support from Enterprise Ireland and Science Foundation Ireland, DCU Invent has substantially increased its professional staffing, leading to greatly enhanced focus on identifying and managing Intellectual Property (**IP**) for maximum **Impact**. This is particularly important for our PRTL research centres, SFI supported Centres for Science and Engineering Technologies (CSETs) and SFI Strategic Research Clusters (**SRCs**), which involve substantial industrial partnerships. This increased DCU Invent team, targeted towards enabling innovation and entrepreneurial activities, is already showing dividends in enhanced technology transfer through increasing numbers of invention disclosures, patents, spin-off companies and critical mass research teams involving industrial/business partnerships.

Through its internal efforts and open and proactive approach in developing structured collaborations with other institutions and industrial partners, DCU is delivering a coordinated and supportive research environment to drive its strategic areas of research for maximum external Impact

The enhanced research environment created by DCU in conjunction with our external collaborating partners, adds great value to the training of many young researchers who carry out their work within teams involving internationally leading PIs collaborating across educational institutions, external business/industrial partners and countries. Several of our leading research centres have industrial partners placing some of their own research staff in DCU to work alongside their academic colleagues. To further enhance the training of our young researchers DCU has put in place an institutional framework for **structured PhD** programmes in consultation with our institutional partners.

Sustainability also has another meaning which will increasingly influence DCU's research portfolio. **Global challenges** such as the *environment, climate warming and energy* require research directed at developing **sustainable technologies** for the future. Specific potential solutions for Ireland, based on our unique positioning as a small island country, need to be addressed within the international context due to the increasing inter-connectedness of these issues. Sustainability was identified through the Foresight process as a key area for future development. If DCU is to make real inroads, in the near term, into developing Irish leadership in these areas, it can most effectively do so through the formation of strategic partnerships which exploit DCU's current strengths allied to complementary collaborators.

2. RESEARCH STRATEGY 2009-2014

2.1. 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 proactively 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 was 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.

In its strategic plan for (2001-2005) '**Leading Change**' the University established the following Academic Themes to shape and guide its research and teaching and learning strategies.

DCU Academic Themes

1. Science, Discovery and Technological Innovation
2. Life Sciences and Health in Society
3. Information Technology and the Knowledge Society
4. Internationalisation, Interculturalism and Social Development
5. Education and learning
6. Business and Innovation

The profile of our overall research portfolio across these themes is indicated schematically in Figure 3, as measured by postgraduate research student numbers. Further information on the DCU Themes is provided in Appendix A. These themes were maintained through DCU's next Strategic Plan '**Leadership through Foresight**' (2006-2008). In this case the strategic planning cycle was reduced to three years in order to accelerate implementation and also in recognition of the rapidly evolving external environment.

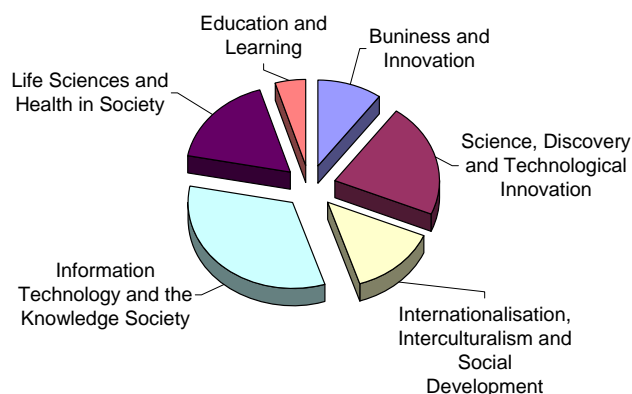


Figure 3. DCU Postgraduate Research Students broken-down by DCU Academic Theme

'**Leadership through Foresight**' recognized the increasing importance of peer review and the role of research performance indicators in assessing the international competitiveness of research programmes, implying that we must continue to support high quality, original research that is disseminated through high impact publications which influence the future directions of their disciplines. The strategy 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 drove, and continues to drive our research agenda.

Our new research strategy for the period 2009 – 2014 maintains and builds further on the **strategic prioritization of translational research** and support for our **critical mass research teams** through targeting of **enhanced facilities, strategic collaborations and structured graduate programmes**. The strategy emphasises the growing need to show enhanced **external impacts** of our research in terms of **knowledge transfer** and **commercialisation**.

The strategy was developed by 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 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 discussions with key partners and 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 Research Committee and annually by the DCU Executive.

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

DCU Component Strategies:

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

3. STRATEGIC INTENT

Continued strong research branding is necessary to enhance visibility, nationally and internationally, and maintain external credibility with funding agencies, government and knowledge intensive industries. This process is well underway with increasing recognition for specific research strengths represented, for example, by our national Research Centres, SFI supported teams and UDRCs (See Table 1 P20). Continued improved dissemination and promotion of research success is important in order to create even more widespread awareness.

Crucial to DCU's early successes were recognition of strong track records and the encouragement of cross-school/faculty collaborations together with strategic external linkages.

To remain competitive we need to continue to build on these successes by cementing national leadership in prioritized areas.

Individual excellence must also continue to be encouraged and we must establish more effective ways to recognize emerging areas of opportunity at an early stage. However, as repeatedly highlighted in recent agency and government reports, HEI 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 must therefore continue to drive our research agenda.

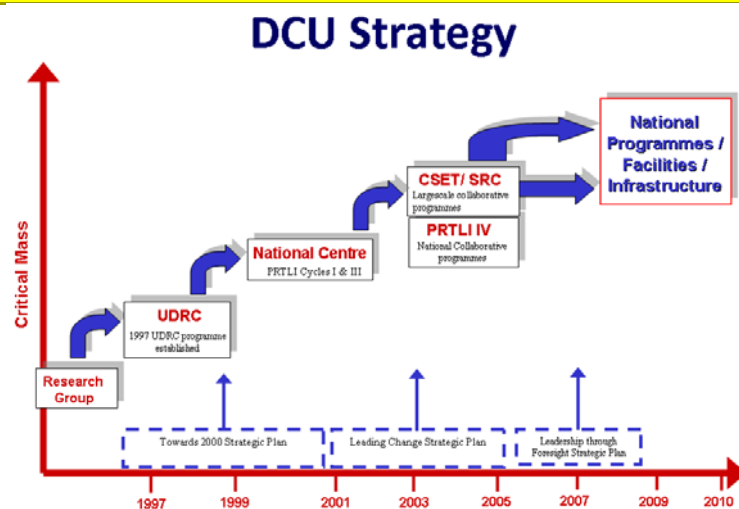


Figure 4 illustrates DCU's consistent strategy (through consecutive strategic planning periods) of building critical mass interdisciplinary research teams, beginning with the establishment of relatively small scale University Designated Research Centres (UDRCs), growing through subsequent years to PRTL/SFI supported major centres. These nationally leading centres target strategically important areas which facilitate significant societal and economic impact. Involvement with external partners is a key part of our overall strategy and all our large research centres are intimately involved with other HEI and business/industrial/agency partners. Optimal positioning of these large centres within the overall national framework requires a concomitant strategic development of supporting infrastructural research platforms, building on our differentiated expertise and research strengths.

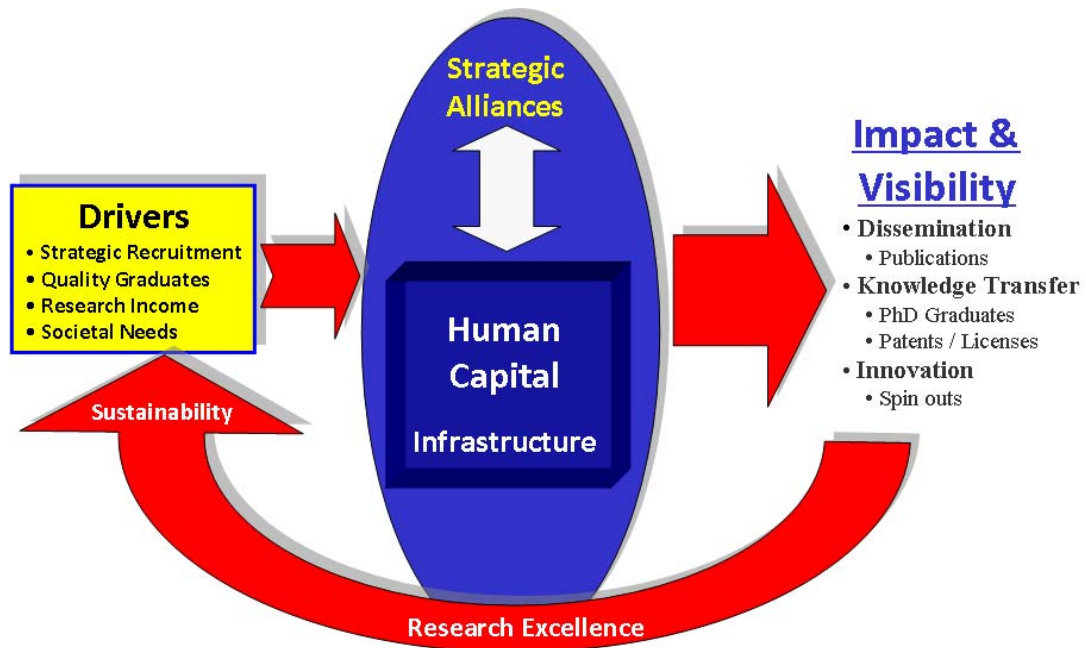


Figure 5. DCU Research Strategic Framework 2009-2014

Achieving this vision requires research teams delivering first class research outputs and economic and social impacts in terms of graduate training, the development of know-how and IP and the creation of commercialization avenues, including spin-off companies. Increasing awareness among our research community of the successful management and exploitation of know-how and IP is critical to maximize the impact of our future research successes. Strategic partnerships with leading international and indigenous companies, which can help fast-track the exploitation of research results through the commercialisation of research and which will provide staff/researcher interchanges and postgraduate training opportunities are crucial.

Figure 5 shows schematically the virtuous inter-relationship between performance, external impact and ultimate sustainability. To enable and enhance our research efforts we need to maintain our competitiveness in winning external funding and in recruiting the best and brightest students and staff to address strategic areas of research. Through developing our physical and soft infrastructures and strategic partnerships, we can optimally create and support the research environment to lever the best from our human resources. Active engagement with innovative business/industrial/societal/governmental agencies can ensure continuing relevance of our research and deliver a ‘real-world’ experience to our young researchers. This in turn will ensure maximum socio-economic impact from our research efforts in terms of research training and the development of entrepreneurial skills of our young researchers. It will enhance the creation and exploitation of scholarship and intellectual property through commercialization and the continuous generation of a pipeline of internationally leading-edge research projects.

Increasingly through regular performance evaluation against KPIs which emphasize external impacts we will deliver better value for money in a sustainable manner.

3.1. Key Elements of DCU's Research Strategy

DCU will continue to prioritise translational research through world-class strengths which occupy unique roles in academic and public discourse and contribute creatively to the needs and goals of Ireland's future.

DCU will continue to be distinctive through its:

1. National leadership in transforming research results through to commercial success and national policy developments
2. International leadership in specific niche research areas
3. Growing staff research and supervisory capacity
4. Strong focus on supporting early stage researchers
5. Service to local, national and international communities
6. Research activity of its undergraduates (integration of research and teaching)

3.2. Guiding Principles

DCU continues to be characterised in its teaching and research activities by its positive and supportive interactions between staff and students. This reality of a student-friendly and informal campus will be maintained and enhanced while increasing the scale, intensity, quality and sustainability of our research programmes. We will carry out our research within a safe environment which supports equal access and equality of opportunity.

Our research effort will be guided by the following key values:

Innovation and Enterprise: We strive to extend the frontiers of knowledge through innovation and creativity, which are the cornerstones of our research efforts.

Excellence: DCU is performance-driven and works towards the pursuit of excellence at all levels and in all disciplines, within a research environment characterised by curiosity, excitement and intellectual freedom.

Engagement through Collaboration: DCU is committed to developing interdisciplinary collaborations through interactions among our academic community, from within schools and across faculties. We strive to form strategic external collaborations and strong alliances with academic and knowledge-intensive industry/agency partners nationally and internationally.

Commitment to our Research Community: DCU is committed to rewarding staff members who achieve international recognition and show the highest quality in their research, through our promotion and award systems. We endeavour to support and encourage staff members, particularly young faculty, who are striving to develop their

research to this level. We will enhance the research environment and career opportunities for our young postgraduate and postdoctoral researchers.

Commitment to the Wider Community: Through our research activities we seek to contribute to social empowerment through the advancement of knowledge and the enhancement of the quality of life in the local and national community. In particular we seek to promote the development of greater Civic Engagement through community /knowledge exchange to the benefit of the community and the university alike. Our research will always be guided by the highest ethical standards and will ensure that the welfare and dignity of the individual is protected at all times.

Outreach and Access: DCU will continue to build on its national leadership in providing access to higher education for under represented groups. The work of the Access Service is of central importance to the University's commitment to equality of educational opportunity. DCU will play its part in helping address the challenge of maintaining a long-term pipeline of scientists, engineers and computer specialists as a result of falling numbers in mathematics, physics and chemistry at second level. DCU, through innovative outreach programmes will engage with schools and the general public to enhance interest and achievement in Science, Technology, Engineering and Mathematics (STEM) subjects.

Access to Research Infrastructure: DCU is committed to providing open access to its research infrastructure to support research excellence and strategic collaborations underpinning national policy objectives.

Respect: Dublin City University believes that its entire staff, students and visitors have the right to work and study in an environment that is free from sexual harassment, harassment, and bullying, where each individual has a right to dignity and where his or her integrity is respected. The policy on Promoting Respect and Protecting Dignity in Dublin City University is integral to the University's Equality and Access policy.

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 Host at least four sustainable large-scale research **CSETs** contributing to economic welfare
- 4 Through the **Translation Research Hub** based, in the North Dublin-Leinster region, DCU will make substantive and tangible economic contributions to the Irish economy
- 5 Grow the **postgraduate research** population to over 900 with access for all to structured programmes
- 6 Complete its Glasnevin **Campus Development Plan**
- 7 Double our **external citation** rates
- 8 Have achieved at least three **European Research Council successes**
- 9 Be in the **top 200** ranked universities worldwide and top 25 in Europe for commercialisation of research
- 10 Increase its **annual research income** by 30% with over 40% from non-exchequer sources

3.4. Strategic Objectives and associated actions (2009-2011)

The following objectives and actions build on achievements through the last planning period, as evidenced later in Section 4. 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.

The following four overall strategic research objectives map onto the Research Strategic Framework (Figure 5).

- Objective 1 addresses the further development of our **unique research strengths** and support for **new emerging areas**, through which we will underpin our ability to win external funding and recruit top quality students and staff.
- Objectives 2 and 3 address our university **environment and strategic links** and the needs to support our research community through targeted initiatives.
- Objective 4 emphasises the need to enhance the external **visibility and impact** of our research effort, ensuring **societal relevance** and enhanced economic impact.

Specific actions are detailed against each overall objective, which through the associated implementation plan have clear responsibilities, milestones and deadlines.

Underpinning all our strategic objectives is the need for **research excellence** and **sustainability**.

Objective 1.

Sustain and consolidate current research strengths and support new emerging areas of research of economic and societal importance

The economic outlook for Ireland remains challenging in the medium term which will result in even greater competition for limited national resources. It is therefore essential that DCU takes steps now to optimally support our areas of current research excellence and expand the diversity of research activities, in particular in fields of societal and economic importance to Ireland. DCU must build on the investments by Irish government agencies to attract even greater levels of research funding from non-exchequer and international sources.

1.1 Support current areas of research excellence through:

- Performance-driven allocation of internal resources
- Prioritization for major external institutional research proposals
- Succession planning
- Development of an enhanced research awards system to recognise achievements

1.2 Enhance research grant competitiveness by providing support for the development of high quality research proposals for funding from diverse sources

- Increase research income with a focus on value for money and impact
- Source 20% of research income from EU 7th Framework
- Source 30% of research funding from non-exchequer sources

1.3 Encourage greater staff participation in contract research and consultancy activities

- Provide courses aimed at encouraging staff to apply for research funding
- Provide master classes for writing of competitive applications
- Update the university Consultancy Policy to provide a support and incentivisation framework for contract research and consultancy activities.

1.4 Support new emerging areas of research through:

- Targeted high calibre strategic recruitment
- Internal University Designated Research Initiative (UDRI) calls
- Support for educational and pedagogic research

Objective 2.

A university increasingly attractive to existing and potential staff, students, researchers and distinguished visitors.

DCU staff and students are responsible for our current success and our future ability to build on that success. It is therefore a central component of the university research strategy to ensure that we continue to attract and retain high calibre staff and students. Through the provision of a highly supportive research environment we will ensure that Ireland's *Smart Economy* will be enabled by our ability to deliver an innovative experience for our next generation of postgraduate students and young postdoctoral fellows. DCU considers meaningful integration of research and teaching a fundamental success factor in preparing undergraduates to be effective in a knowledge economy as well as preparing them for fourth-level study. For this reason,

greater integration of teaching and disciplinary research will be prioritised across the University (cf. Enhancement of Learning Strategy)

2.1 Develop the next generation of research leaders

- Provision of best in class training and Continuing Professional Development opportunities
- Provision of mentoring opportunities for our best postdoctoral fellows

2.2 Develop enhanced career structures for postdoctoral fellows and researchers

- Implement the DCU Researchers Career Framework (Ratified in Dec 2008)
- Schools and Faculties will provide doctoral and postdoctoral students with opportunities to contribute to teaching activities and develop their teaching competencies.

2.3 Enhance the depth and breadth of DCU research through national and international strategic alliances

- Build on our successful established links
- Further develop our research links with our linked colleges
- Maximise opportunities for regional research collaborations
- Develop the **Translation Research Hub** based, in the North Dublin-Leinster region, to make substantive and tangible economic contributions to the Irish economy

2.4 Develop best in class Graduate School

- Enhanced postgraduate training through structured PhD programmes
 - Participation in national programmes
 - Transferable Skills
 - Enhanced Discipline specific training
 - Leaders in Science, Engineering and Technology (L-SET) programme
- Enhance the quality and capacity of postgraduate supervision
- Promote greater involvement of UG students in DCU research
- Promote synergies between units, committees and structures for teaching and research will continue to be developed. In particular, there will be bi-annual joint meetings of the Learning Innovation Advisory Panel and the Research Advisory Panel.
- Develop DCU postgraduate 'experience' exit survey

Objective 3.

Provision of key infrastructure and an integrated research support system which fosters and sustains internationally competitive research and prioritises translational research

DCU is located on the northside of Dublin City on a modern campus with high quality research infrastructure. However, the dramatic increase in research activity in recent years has placed severe pressure on the available research infrastructure. The ongoing success of DCU research will depend on the provision of essential additional research space as outlined in the Campus Development Plan. There will also be an opportunity through consolidation and targeted investment to develop truly national research facilities.

3.1 Sustained investment in the DCU Research Infrastructure

- Implement a phased development of the Campus Development Plan

- Integrate campus IT systems across university units
- Maximise efficiency and effectiveness of current research space
- Support the development of shared research facilities

3.2 Implementation of DCU Research Centres Review report

- Implementation of Research Centre Code of Good Research Practice
- Optimise synergies between Faculties, Schools and Centres
- Roll out research centre taxonomy framework
- Establish Research Facilities (UDRF) and New Initiatives (UDRI) programmes

3.3 Enhance DCU supervisory capacity

- Supervisory capacity will be strengthened by the provision of best practice in supervision training for all supervisors
- Increase percentage of research active staff
- Implementation of cross-campus workload models to include structured PhD training programmes (cf Learning Enhancement Strategy)

Objective 4.

Enhanced visibility and impact as a major, inter- and multi-disciplinary research and teaching institution.

DCU is a university that will continue to be responsive to societal and economic needs. We will carry out regular assessment of the external impacts of our research activities.

DCU will deliver value for money, and carry out research supporting the development of the Smart Economy. DCU Invent's strategy underpins our ability to enhance knowledge transfer and commercialisation of our research efforts.

4.1 Embed research assessment activities in the university

- Annual tracking and publication of Research KPIs and external impact measures
- Develop a best-in-class DCU Research Executive Dashboard
- Promote and recognize research outcomes of high quality and impact

4.2 Enhance the impacts of our translational research efforts through:

- Strategic partnerships with societal and government agencies and knowledge-intensive industry / business
- Greater participation in national influencing bodies/committees
- Enhanced IP awareness and commercialisation training for staff and students
- Increased innovation partnership, contract research and consultancy activity
- Increased collaboration with indigenous industry / SMEs
- Increased number of IP disclosures, patents, licences and spin-out companies

4.3 Enhance the national and international visibility of DCU Research

- Partnership in national and international programmes
- Enhance the Conference support programme
- Better exploitation of DCU's institutional repository and research support system
- Enhanced websites at institutional, faculty, school, research centre and individual levels

4.4 Improved internal / external communication systems

- Enhanced Media Training Skills for staff
- Refined press release and news story gathering process

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4. APPENDIX A: IMPLEMENTATION OF RESEARCH STRATEGY: BUILDING ON PREVIOUS SUCCESS

Previous university plans have delivered on a range of strategic objectives that have helped underpin the success of DCU Research in particular over the past 6 years. The momentum associated with the (2006 – 2009) strategic plan and its associated successes are carried forward and help to shape the new Research Strategy (2009-2014). The following sections provide brief overviews of some of those strategic initiatives and their implementation to date, which help to provide the context for priorities of the new research strategy.

4.1. Building Research Capacity

DCU's pioneering strategic plan **Towards 2000 (1997–2000)** introduced the concept of the University Designated Research Centre scheme. This was particularly timely as it preceded the HEA's PRTLTI programme aimed at supporting strategic research projects across the third level sector, which was introduced a couple of years later. DCU was therefore particularly well placed in competing for early support under PRTLTI, as it had already identified major research strengths where the university had a clearly recognised nationally leading position.

In Cycle 1 of PRTLTI, DCU received funding to establish national centres of excellence in the areas of **sensors, plasmas and information and communications technology**. These centres are known as the **National Centre for Sensors Research (NCSR)**, the **National Centre for Plasma Science and Technology (NCPST)** and the **Research Institute for Networks and Communications Engineering (RINCE)**. DCU was again successful in PRTLTI Cycle 3 and received funding to establish the **National Institute for Cellular Biotechnology (NICB)**. The establishment of these nationally leading PRTLTI supported Centres, which provide high quality infrastructure, has been critical for the subsequent successes of DCU researchers in leveraging further funding from SFI, the Research Councils, Enterprise Ireland, HRB, EU and other national and international agencies. **Furthermore they have underpinned the university's capacity to engage with business and industry.**

In PRTLTI Cycle IV DCU received support for several national programmes including **therapeutics, bio-photonics and imaging, photonics and nanotechnology, humanities and social science** which all involved DCU research centres and provided essential support for the formation of **structured PhD programmes** exploiting internal and national collaborations. In addition to enhancing research facilities and the provision of PhD stipends and associated postdoctoral funding, the investments built on the success of previous SFI and Research Council supported projects.

New emerging areas will continue to be facilitated through the early development phase by the UDRC process. The DCU 2008 Review of the Organisation and Governance of Research Centres emphasises the symbiotic relationship between schools and research centres which encourage and support the development of new initiatives aimed at enhancing the impact and value-for-money of our overall research portfolio.

DCU's Inter-disciplinary Research Centres		
SFI / Industry Research Programmes	Research Area	Partners
Biomedical Diagnostics Institute BDI (SFI CSET)	Diagnostics	NUIG, RCSI, Inverness Medical, Analog Devices, Becton Dickinson, Hospira, Enfer
The Centre for Next Generation Localisation CNGL (SFI-CSET)	Machine translation	UCD, TCD, UL, IBM, Microsoft, Symantec, DNP, Idiom, Traslan
Clarity (SFI-CSET)	Adaptive Sensing and Information Discovery	UCD, Tyndall National Institute, Vodafone, Ericsson, ChangingWorlds, Oracle
BMS Centre for Bioanalytical Science CBAS (SFI / IDA)	Bio-processing / Bio-Analytical Science	NUIG, Bristol Myers Squibb
'Precision' SFI Strategic Research Cluster	Plasma processing	UCD, Intel, Stratuum, Lexas
'Separation Science' SFI Strategic Research Cluster	Separation science for complex biological systems	UCC, Dionex. Pfizer, Waters Technology, Agilent Technology
International Centre for Neurotherapeutics (ICNT)	Neurotransmitter release, K+ channels	Allergan Pharmaceuticals
University Designated Research Centres	Research Areas	
Materials Processing Research Centre (MPRC)	Powder Based Processing, Rapid Prototyping, Biomedical Devices	
Centre for Scientific Computing and Complex Systems Modelling (Sci-Sym)	Theoretical and computational modelling	
Centre for Translation and Textual Studies (CTTS)	Computer-assisted translation, community/ conference interpreting	
Centre for Society, Information and Media (SIM)	Research in print, audiovisual and digital media.	
The Learning, Innovation and Knowledge Research Centre (LinK)	Knowledge intensive firms, health services management	
Centre for International Studies (CIS)	Development, Conflict and Security Studies	
Centre for the Advancement of Science Teaching and Learning (CaSTeL)	Science and mathematics education	
HEA PRTL I Cycle 1 Centre	Research Areas	Scale
National Centre for Sensors Research (NCSR)	Biomedical, Environmental sensor technology	219 staff / researchers
National Centre for Plasma Science and Technology (NCPST)	Sustainable Energies from Plasmas , Nanoscience, Photonics and Materials	89 staff / researchers
Research Institute for Communications and Network Engineering (RINCE)	Image Processing & Analysis, High Speed Devices & Systems, Next Generation Networking	18 Academic staff / 12 PD/ 54 PGRs
HEA PRTL I Cycle III Centre		
National Institute for Cellular Biotechnology (NICB)	Cancer biopharmaceutical production, adult stem cells	79 staff / researchers

Table 1. DCU's prioritized inter-disciplinary research centres and their main research foci. Almost all involve cross-faculty teams working with key external partners nationally. The major funding sources are shown. In addition to centres addressing science and technology challenges there are a number which have emerged from the humanities, social sciences and business areas. The SFI CSET and SRC teams, in particular, work closely with external industrial partners underpinning their translational focus. DCU research centres activities are supported through competitive grants from national and international sources including Enterprise Ireland, Health Research Board, Marine Institute, Environmental Protection Agency and EU Framework 7.

4.2. Continuing Prioritisation of Translational Research

The Irish Government's **Strategy for Science and 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*"

DCU's ongoing commitment towards successfully translating research results into real society benefits is well illustrated by our prioritization of inter-disciplinary research centres (Table 1 P20) and their innovative research programmes. Despite its relatively small size and short history, DCU leads the Irish university sector in developing successful SFI supported flagship CSETs. These successes together with other initiatives outlined below, evidence DCU's proven commitment to establishing strong external partnerships as a strategic approach to developing research teams working at the cutting-edge of commercially significant research.

A primary example is the **Biomedical Diagnostics Institute (BDI)** SFI CSET, which exemplifies university-industry interaction. Growing out of the National Centre for Sensor Research (PRTL Cycle I), BDI is developing next-generation, self-diagnostic devices to provide early warning of illnesses such as cancer, diabetes and heart disease, through analysis of disease related molecules in blood, saliva or breath. It is supported by an SFI grant of €17.7m under its programme for Centres for Science, Engineering and includes humanities and social sciences researchers working together with their scientific colleagues. Six industrial partners (Inverness Medical Innovations, Becton, Dickinson and Company, Enfer, Hospira, Analog Devices and Amic) have invested a further €6m while additional companies are in course of being added. BDI includes researchers from the Royal College of Surgeons, NUI Galway and University College Cork.

The three Dublin universities collaborate together in the area of machine translation through a new SFI CSET (established in January 2008) which is also led from DCU. The **Centre for Next Generation Localisation, (CNGL)** is an inter-disciplinary Centre including computer, engineering and language specialists from DCU's faculties of engineering and computing and humanities and social sciences, respectively, who work on adapting digital content to culture, locale and linguistic environments at high quality and speed. The CNGL includes researchers from DCU, TCD, UCD and UL, together with a range of world-leading companies in the localisation sector, including Alchemy, DNP, IBM, Idium, Microsoft, Speechstorm, Symantec, Traslan and VistaTEC The National Centre for Language Technology UDRC provides an associated supportive postgraduate training environment.

The **Clarity** SFI CSET led from UCD is an almost 50:50 partnership with DCU with support from the Tyndall Institute at UCC. Clarity's research focus is in the areas of Adaptive Sensing and Information Discovery to develop innovative new technologies of critical importance to Ireland's future industry base and contribute to improving the quality of life of people in areas such as personal health, digital media and management of our environment and includes scientists, engineers, computer specialists, sports related researchers, educationalists and also involves a wide range of companies (IBM, Vodafone, Ericsson, Foster-Miller Fidelity Investments, Critical Path, and UCD spin-out Changing Worlds Ltd., as well as national agencies, such as the Environmental Protection Agency (EPA) the Marine Institute and the National Museum of Ireland.). Through the NCSR and Clarity, DCU has developed a strong environmental research programme exploiting DCU's unique experience in

sensors. DCU computing researchers are also involved in the **LERO** Software Engineering SFI CSET led from UL.

Most recently, DCU's researchers have succeeded with **Strategic Research Cluster** applications to SFI. The new projects, starting in 2009, include substantial collaboration with partner universities (UCD and UCC) and build on DCU's well established and internationally recognized expertise in the areas of **Plasma Science** and **Separation Science**. They both involve DCU scientists and engineers working with external industrial partnerships. These programmes build on the NCPST and NCSR PRTL I funded centres and the MPRC UDRC (Table 1).

The International Centre for Neurotherapeutics (**ICNT**) receives substantial research funding from industry and other non-exchequer sources and has benefited, in collaboration with other DCU PIs, from recent PRTL I IV investments.

With support from the IDA and SFI, DCU established a groundbreaking collaboration, the BMS Centre for Bioanalytical Science (**CBAS**), between DCU, NUI Galway and the pharmaceutical multinational Bristol-Myers Squibb. New York based Bristol-Myers Squibb is a global manufacturer of pharmaceutical (with two facilities located in close proximity to DCU) and related health care products. A striking characteristic of all these SFI/IDA sponsored centres is the intimate involvement of industrial partners, most directly evidenced by their researchers working alongside their academic partners within DCU's laboratories. This proactive co-location of industrial partner researchers is aimed at maximizing both the scientific collaboration and knowledge transfer (ref. HEA / Forfas 'Research Infrastructure in Ireland – Building for Tomorrow' Report 2007 p 47).

DCU's National Institute for Cellular Biotechnology (**NICB**), identified the very real need of the pharmaceutical industry to develop new methods to reduce the cost of developing and manufacturing biopharmaceutical products if the benefits of new drug development are to reach all those in need. This objective has led to an eight year SFI supported collaborative research programme between the NICB and Wyeth Biotech scientists at Grange Castle, Dublin and Andover in the US. NICB has also been successful in establishing a spin-off company, **Archport Ltd**, in 1998, based in a 800 m² state-of-the-art production facility designed to European GMP standards, located on campus at DCU. In 2006 the company was sold to BioEutikon Ltd (www.biuetikon.com) which is part of the Swiss based CPH Chemie + Papier Holding AG multinational with DCU remaining a minority shareholder.

Further examples include DCU's role in establishing the off-campus National Institute for Bioprocessing Research and Training (**NIBRT**: www.nibr.t.ie) in partnership with UCD, TCD and IT Sligo and the establishment of the National Digital Research Centre (**NDRC**: www.ndrc.ie) by DCU, UCD, TCD, IADT and NCAD to carry out translational research in the communications and digital media research areas.

Emerging nursing and sports science research strengths address important societal challenges such as healthy living, obesity and cardiovascular diseases, primarily through preventative medicine approaches. The most recently established UDRC, SCI-SYM, has twelve faculty members spread over a number of disciplines. Its research currently encompasses topics ranging from bioinformatics, simulation of biologically relevant systems, propagation of radio waves for communications and astrophysics. Its formation is helping to prepare DCU's young researchers to exploit high-end computing facilities emerging nationally.

The concept of translational research also applies to the humanities and social sciences.

DCU has established an **Institute of Ethics** based in the Faculty of Humanities and Social Sciences led by Prof. Bert Gordijn (Editor of the journal *Ethics, Law and Technology*) to help inform debate and research in important ethical questions arising from advances in technology and globalisation

The humanities and social sciences UDRCs, the Centre for Translation and Textual Studies, (CTTS), Centre for International Studies (CIS) and the Centre for Society, Information and Media (SIM) (Table 1) are helping to develop national structured postgraduate programmes in conjunction with a wide range of external partners with support from PRTL I V. Through a project enabled by Irish Aid, H&SS researchers are working on enhancing links between African and Irish universities. The importance of effective science communication to the general public is being supported through several collaborative projects.

The opportunity to further consolidate research within the faculty was taken by the university during 2008 through allocation of additional space and the consequent bringing together of several H&SS university designated research centres, enabled by support from the HEA's Research Facilities Enhancement Programme. This contiguous location enhances the postgraduate student experience through exposure to different disciplines within a collaborative environment.

DCU's Business School has also recognized the need to build critical mass in its research teams, to enhance the structured postgraduate training environment and the capacity to bring a multi-disciplinary approach to its programmes. By establishing the Learning, Innovation and Knowledge Research Centre (**Link**) as a UDRC, the research team has now grown to 14 PIs across several disciplines. The Centre received valuable support in the PRTL I V Cycle to explore the effectiveness of university research teams in transferring knowledge and innovation to the economy. Recent professorial appointments are driving further initiatives and the Business School has combined with the School of Mathematical Sciences, within the Faculty of Science, in establishing the SFI Edgeworth Centre for Financial Mathematics.

The previous examples show that DCU has had a long and successful track record in terms of proactive and constructive engagement with business, industry and external agencies. Established first at undergraduate level through student work placements it is now growing apace at postgraduate and research levels. The university has not only actively encouraged these partnerships but has provided real support through financial contributions, particularly in terms of pump-priming, space provision through refurbishments or new space build, and inclusion in institutional bids for external support.

Continuing support for this process of concentration and consolidation of our research teams, in translational research areas, is an essential and central component of our overall research strategy.

A key aspect of these inter-disciplinary research centres is their very active involvement in **Outreach** activities through which they engage with schools, undergraduates, external organizations and the general public, adding to their external impact. For example, our faculties, schools and major research centres work with the Centre for Talented Youth (**CTYI**) based at DCU, 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.

Furthermore our centres are active in access programmes which enable participation by second level students and teachers and undergraduate students.

An important initiative has been the establishment of the Centre for the Advancement of Science Teaching and Learning (**CaSTeL**) UDRC, jointly between DCU staff and researchers from our linked teacher training college, St Patrick's College, Drumcondra. Aimed at addressing science, engineering (and mathematics) educational challenges at primary, secondary and tertiary levels, CaSTeL can play an important, research enabled role, in meeting the nationally identified need to enhance interest and accomplishment in science and mathematics amongst our young people.

Enhancing outreach and access are key actions of our major research centres. They will continue to work with primary, secondary and third-level students in addition to engaging with the media and the general public.

4.3. Benchmarking performance and identifying emerging areas

Leadership through Foresight committed the University to:

- Conduct a university-wide **Research Assessment** programme
- Establish a **Foresight** group to help identify important emerging areas for future research

Research Assessment: In 2007 DCU upgraded its Research Support System (RSS) to allow for capture of all research contract information, in addition to the capacity to capture the various research interests and outputs of individual members of staff. DCU agreed a common set of research indicators for all disciplines. Additional discipline specific indicators were agreed at faculty levels to reflect the often very different research culture and publishing behaviour.

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 combination of internal data capture and international benchmarking will form the basis for ongoing monitoring and evaluation of the university's performance.

Published Items in Each Year

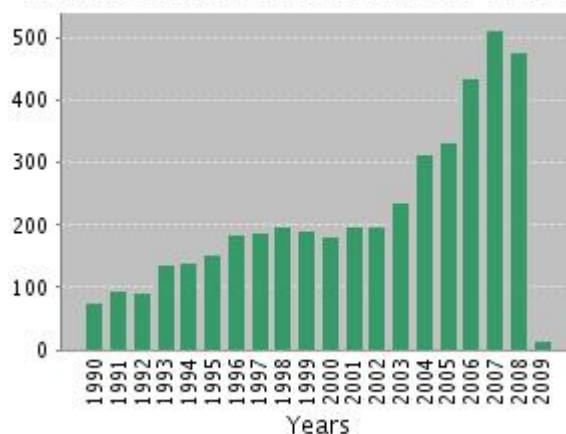


Figure 6. DCU publication 1990-2008 from ISI Thompson database

Citations in Each Year

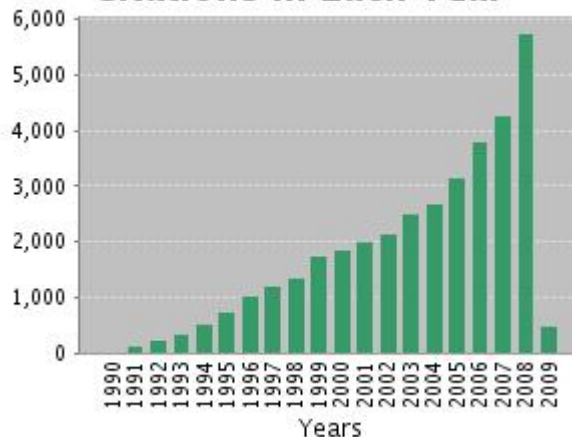


Figure 7. DCU citations 1990-2008 from ISI Thompson database

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 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*'. These represent key areas of research activity at DCU such as analytical science, diagnostics, sensors, plasmas and computing. A study of the users of DCU knowledge, measured through citations of DCU researchers' published papers in journals, indicates that '*DCU work is used by researchers of high impact, at the forefront of the research frontier*'.

DCU will complement future bibliometric analyses at three-year intervals by selected peer review for fields where existing citation database coverage is sub-optimal.

The use of a four-year sliding time interval dampens out year to year fluctuations while still enabling trend behaviour to be identified. However it has insufficient response time to uncover the rapid gains in recent years. Figure 7 shows the Web of Science citations rate for DCU based publications (searched on the basis of 'Dublin City Univ' as an address) over the last twenty years (**Note: DCU was only established in 1989**). The most notable feature is the almost exponential growth in recent years, following the initiation of major research funding associated with the various PRTL I Cycles and support primarily from SFI and Enterprise Ireland. It should be noted that the data in Figures 6 and 7 are an underestimation of DCU publications and citations as others accrue to other DCU related addresses and the complete 2008 data set is uploaded onto the ISI database. Nevertheless, it is useful as an indicator of the rapid progress the university is making.

We will continue to track our performance in the future and will introduce a comprehensive Research Dashboard system so that we can better monitor our applications and success rates and the external impacts resulting from our research activities.

DCU has also gained valuable insight into the performance of many of its key researchers through feedback from the international reviewers appointed by the funding agencies. On an individual basis for SFI PI programmes, this is particularly significant during the visiting panel based evaluation phases associated with assessment of large-scale SFI CSET and Strategic Research Cluster submissions. Our significant achievements in CSET and SRC programmes speak highly of the quality of our researchers and the nationally significant strategic nature of their research areas.

DCU includes its major PRTL I Research Centres in its normal Irish University Quality Board monitored Quality Review processes. This is extremely valuable as it involves the Research Centre preparing a fully-fledged self-assessment document, consideration of the overall research performance of the centre, its interactions with parent schools/faculties, outreach, and the effectiveness of its structures. The Reviewing Panel includes internal and external experts and they usually spend two days on campus, during which they interview students and staff of the centre, as well

as senior university management (including the President) and staff from university units which interact with the Centre.



Research Foresight

We live in a rapidly changing globalised world, where the future next year, never mind ten years away, can be unpredictable. However, foresight planning has been used by public and private organizations as a valuable tool to develop potential scenarios of the future and thereby put in place long-term strategic frameworks to best prepare organizations for future challenges and opportunities.

DCU was the first Irish university to carry out a Foresight Planning process. Foresight is based on

the concept that we cannot know the future, but we must plan for it. Foresight research encompasses a number of tools and techniques that have been developed over many years to help organisations from all sectors of the economy – public, commercial and voluntary – to be better prepared for the future, more competitive in their strategy development and more forward looking in their decision making.

The **DCU Foresight** process, involving both internal and external stakeholders, used a multi-stage, collaborative and consultative process based on the foresight process used for the Forfas Socio-economic Scenario Project, which was also led and facilitated by Sheila Moorcroft of Research for Tomorrow, Today. The project ran from October 2007 to March 2008 and it identified six areas for future development based on detailed analysis of the internal and external environments, and **national, EU and global** trends to 2028. The resulting Foresight Report (*Managing our Destiny in Uncertain Times*, DCU Foresight Report 2008) is an extensive document which describes the methodology and the subsequent analysis. Figure 8 shows a schematic diagram of the key outcomes whereby six areas were identified for DCU to develop. ***In terms of research specific recommendations the majority of the areas identified build on existing DCU strengths.***



Figure 8. Six prioritized areas for future development as identified in the DCU Foresight Report.

4.4. Strategic Recruitment for Emerging Areas and Sustainability

A key strategic approach is to recognize the importance of future academic recruitment for building new research areas. We also need to recognize the key roles played by a limited number of individuals in leading and organizing major initiatives which lever large external support and which act as flagships for DCU's research efforts both nationally and internationally. Questions of succession planning and

associated aspects of risk assessment therefore need to be addressed. An examination of our current position and the development of an active and effective policy and process for recruiting new research champions both to complement existing strengths and to enable new initiatives form an essential continuing part of our research strategy.

4.5. Structured PhD Programmes

A key objective of government policy is to deliver on the Innovation Island concept. To enable this, the university sector not only has to increase its capacity in terms of physical infrastructure and supervisory capacity but it also needs to enhance the postgraduate training environment in terms of a more structured framework. Pioneered in Ireland through the HRB PhD Advanced Training Programme, Graduate Research Enhancement Programmes (**GREPs**) are aimed at producing researchers with a broader more innovative approach to problem solving and more attuned to later career opportunities within the Irish industrial and business sectors. DCU's approach of building international competitive research teams strongly partnered with external business/industrial companies provides an ideal postgraduate training environment for developing young researchers within an innovative and economically relevant context.

A focus on young researchers is a key objective of DCU's research strategy.

As part of its commitment to fostering graduate research excellence DCU established its university wide **Graduate School** in 2007 which is supported by the Graduate Research Office. The Graduate School in conjunction with DCU'S Faculties is driving the further development of advanced PhD training, including cross-campus and inter-institutional structuring of postgraduate research.

DCU will

- Enhance its contribution to the HEA's Strategic Innovation Funding graduate training initiative within the Dublin Region Higher Education Alliance (**DRHEA**).
- Exploit our major research centres for the further development of GREPs in order to benefit from their translational focus.
- Add to its portfolio of **Marie Curie Doctoral Training Sites** and deepen its collaboration with RCSI on HRB funded graduate programmes.
- Build on its **Graduate Research Education Programme Development Awards** (IRCSET: Speech and Language Technology and Bioanalytical Science and Technology. IRCHSS: International Relations).
- Deepen its involvement in international programmes through, for example, collaboration of BDI researchers with the **NSF Nanobiotechnology Center at Cornell University** for video-conferencing of their unique graduate course in **Nanobiotechnology** and mutual hosting of workshops.
- Build on the **Professional Doctorate** programme, (initially established by the DCU Business School in 2007), to enhance lifelong learning through support for part-time and industry based postgraduate research programmes.

DCU is prioritising the further development of its structured PhD programmes in collaboration with external partners.

4.6. Career Framework for Young Researchers

Training and Support modules have been put in place to support **postdoctoral fellows** through coordinated actions between the Human Resources Office and the Office of the Vice-President for Research. This programme will be further expanded over the coming years.

Researcher Career Framework: During 2008 DCU developed a new structured framework for our postdoctoral fellows, which was ratified by the university Executive in December 2008. The framework clearly recognises the importance of supporting our young researchers in terms of their research projects and their **continuing professional development**. The Framework recognises three levels of Fellow and for each provides clear requirements for support in terms of training courses, exposure to teaching and career planning.

We will also continue the very successful **DCU Research Fellowship** scheme (https://www.dcu.ie/internal/staff/research/internal_funding.shtml#research_fellowship) which provides funding on a competitive basis to the best of our postdoctoral fellows, aimed at developing their leadership potential and enhancing their international profile. The successful applicants are mentored by senior researchers and provided with teaching experience to enhance their competitiveness for academic positions as they arise.

4.7. Maximising use of existing resources

During 2008 DCU carried out a major review of the Organisation and Governance of its Research Centres (Table 1) through an externally facilitated process. The context was to examine how the research centres functioned and how their relationships with their relevant Schools and Faculties could be strengthened, to their mutual benefit. Based on extensive interviews with relevant Deans, Centre Directors, Heads of School, Researchers, Directors of university Units such as HR, Finance, Secretary's Office and a study of best practice abroad, the output was an extensive report which introduced a **new taxonomy** for research centres, **codes of good practice** and **new university designated support schemes**. The latter included new University Designated Research Facility (**UDRF**) and University Designated Research Initiative (**UDRI**) schemes. The UDRF concept is aimed at developing coordinated provision of key facilities on a sustainable basis and the UDRI scheme aims to recognize and support new cross-centre initiatives without the need to form another research centre. They are intended to further our aim to develop a better concentration of research facilities and enable innovative approaches to inter-centre collaboration.

A key action for the present strategic plan is to fully implement the recommendations contained within the extensive final report.

4.8. Performance driven allocation of internal resources.

The University Budget allocation model is currently being examined with a view to making it more performance based. DCU Research Fund allocations from the Research Committee to faculties are now distributed internally on the basis of a weighted average of verified research outputs. Furthermore when considering **allocations to UDRCs and PRTL**I Centres, an important criterion is their performance against agreed KPIs.

4.9. Developing DCU's campus and facilities

Major challenges include the sustainability of our research efforts in terms of the maintenance of research centres, investment in buildings and equipment and enhancement of the general research infrastructure. This includes provision of administrative support for researchers, on-going maintenance and upgrading of equipment, research facilities management and adequate numbers of research technicians. The introduction of overheads by HEA, SFI, EI and other agencies has been particularly helpful in this regard. However, the university sector needs to be supported through a Full Economic Costing (FEC) model as a matter of urgency, otherwise a growing chasm between the research and teaching missions may occur as research places an ever increasing burden on university resources (HEA/Forfas HEA Infrastructure Report 2007 p41: (IQUB/DCU Conference May 2006)). The IUA is, with the aid of SIF funding, at present addressing this issue in the Irish context.

DCU has over the last several years invested strategically through its Overheads Investment programme in both soft and hard infrastructure, within central university units such as the Library, Computer Services, Human Resources, Finance and the Research Office and at Faculty and Research Centre levels. The university has been most seriously challenged in hosting the growth of new and large research teams working in partnership with external companies. The establishment of BDI and CBAS required the university to self-finance a building extension (1650 m²) to the NCSR laboratories to house these teams. While it was being built the teams were accommodated in refurbished older accommodation. The commitment of the university towards these developments is evident through this major investment and through DCU's continuing support for its PRTL established Centres

It is clear however, that if DCU is to continue to build on its many notable successes to date, then this will require a substantial new building programme.

Of particular importance is the need to support our strong CSET/SRC/UDRC teams



Figure 9: DCU Glasnevin Campus Development Plan highlights the five prioritized infrastructure projects.

with facilities on a sustainable basis. One of the critical outcomes of the Research Centres Review Report was the recognition of the added-value to be obtained through **co-location of specialised leading-edge core facilities** and the associated development of efficient and cost-effective administrative and technical supports. DCU has made very significant

investments over the last several years and our key research teams have important synergies that can be realized through enhanced collaboration enabled by **shared technology platforms**.

Co-locating graduate school infrastructural elements together with university research support services will further enable optimal synergies. Furthermore, integration with space to support industrial collaborations will produce a mutually supportive and sustainable research environment.

Figure 9 shows that the existing DCU campus falls broadly into three sections. To the west lie buildings primarily associated with Business, Humanities and Social Sciences, in the central section the predominantly ICT, materials and photonic sciences related disciplines, while to the east, the chemical/biological/nursing/sports sciences and their related life science centres.

The DCU Campus Development Plan includes future builds relating to Business, Humanities and Social Sciences (No 3 & 4), and Science and Engineering (Nos 1 and 2). These will be addressed through future PRTL I programmes and associated university cost-sharing. Future growth in the School of Health and Human Performance driven initially by undergraduate demand will also provide additional research capacity (No 5). The new builds will add in a logical way to the consolidation of our research strengths through contiguous locations of facilities and research teams. The science and engineering buildings will ultimately be linked through a series of bridges (Figure 9) to provide a unique ring of translational research facilities underpinning the collaborative activities of the associated inter-disciplinary research teams and external partners.

Specialist facilities will be flexibly available to DCU researchers and through access programmes to researchers nationally.

4.10. Strategic Alliances

DCU has a very strong record in building critical mass inter-disciplinary research teams through substantial research funding from PRTL I and SFI CSET and SRC programmes. In doing so, they have been critically evaluated by international peer review panels in terms of their science and potential strategic impact and are subject to ongoing review. Involving many of the university's strongest researchers, these CSET and SRC teams have substantial national and international collaborations. In particular they are notable for their industrial partnerships. Table 1 P20 details these centres, their institutional partners and Section 4.2 provides short descriptions of their roles and lists their industrial collaborators.

Examples of collaborations with academic collaborators other than the Irish Universities, include IT Tallaght, Athlone Institute of Technology and Arizona State University (through recent Memoranda of Understanding). Relationships with leading Chinese universities have been established particularly with a view to growing international graduate and postgraduate recruitment.

DCU, TCD, UCD, DIT and NUIM are working together, through the Dublin Region Higher Education Alliance (DRHEA) on a broad range of HEA SIF funded projects. One focus is the delivery of modules to contribute in a shared way to structured postgraduate programmes in biomedical sciences, chemistry, physics, engineering and politics/sociology/public policy.

DCU, TCD and UCD already collaborate in the context of the National Institute for Biotechnology Research and Training and NDRC and through PRTL I and SFI CSET and Cluster initiatives enabling high quality research student recruitment and training and industrial interactions.

National GREP programmes involving DCU include partnerships with almost all academic institutions in the state.

Translational Research Hub

DCU has had very productive engagement with the Royal College of Surgeons (RCSI) through the BDI SFI CSET, a HRB Graduate Research Enhancement Programme and through the PRTL I Cycle IV funded National Bio-photonics Imaging Platform for Ireland project. A stronger more strategic partnership with RCSI can provide the clinical outlet required for our biomedical related research teams, while we can provide access to strong complementary research and facilities in the physical, chemical and biological sciences. DCU has also a track record of collaboration with NUIM through PRTL I Cycles 3 and 4 across several discipline areas.

DCU lies on the north side of the city and is concerned with adding value to this mainly disadvantaged hinterland. By developing a strong long term alliance with the RCSI's Clinical Research Centre at Beaumont hospital, NUIM, Fingal County Council and other partners in the North Dublin – Leinster area, DCU can further its community engagement agenda and catalyse future economic and social progress while taking advantage of shared facilities and research exchanges.

DCU, RCSI and NUIM have agreed to form a **Translational Research Hub** including all three institutions in a coordinated development of research infrastructure and facilities which provide complementary expertise and equipment access and which include shared workspaces. Under PRTL I Cycle 5, DCU proposes to build a new Nano-BioAnalytical Research Facility (with a focus on translational nanomedicine) to integrate and enhance the facilities available to our strong SFI CSET and SRC teams and as a major contribution to the realisation of the Translational Research Hub. This development will link DCU and NUIM directly into the RCSI Research Institute and to the RCSI-associated teaching hospitals.

DCU is committed to the development of a Translational Research Hub with RCSI and NUIM to deliver a world-class Translational Platform in the North Dublin-Leinster region and to support economic and social development

4.11. Enhancement of the Creation, Capture and Exploitation of IP

DCU will continue to recognize the emergence of talent from within, through its annual competitive promotions calls and prestigious awards such as the **President's Research Awards**

(https://www.dcu.ie/internal/staff/research/internal_funding.shtml#individual).

Separate awards are presented annually for outstanding performance in Science, Engineering and related areas and Humanities, Social Sciences and related areas. New awards will be introduced to recognise outstanding publications and theses.

DCU has also initiated an annual **Invention Disclosures** event organized by DCU Invent. This is aimed at encouraging staff to submit invention disclosures which are likely to lead to subsequent patents. Successful submissions are recognized through the award ceremony and prizes are given for the most promising disclosures. The event has motivated an increase in the number of disclosures and has led to the emergence of role models for others within the university. It emphasizes, in a public way, the commitment of DCU to its knowledge transfer and commercialization agendas.

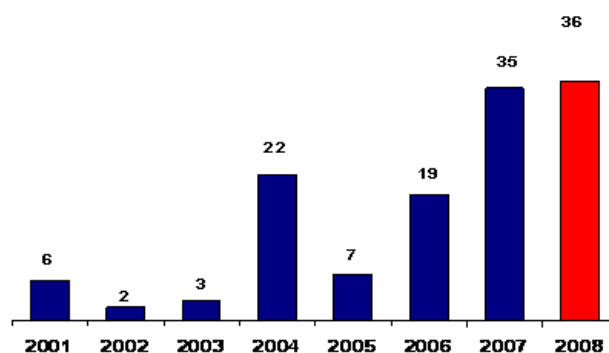


Figure 8a. DCU Intellectual Property Invention Disclosures 2001-2008

Figures 8a and 8b indicate the trends in disclosures and consequent patents over the last eight years. The recent very positive growth in numbers is well evidenced and the anticipated correlation between disclosure rates and subsequent patent rates is pleasingly clear.

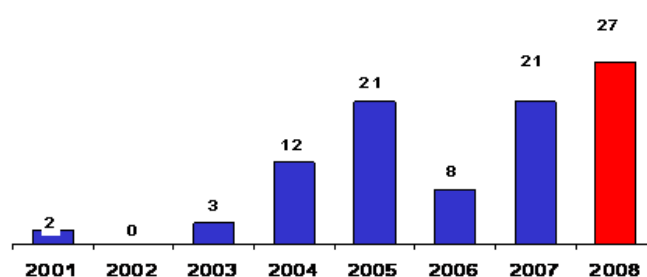


Figure 8b. DCU Patent applications 2001-2008

The Innovation Disclosures Event is helping to drive a continuing culture change throughout our research community in terms of awareness of the importance of IP and its management, from right at the start of research programmes through to eventual exploitation whether through licensing or spin-off avenues. **DCU INVENT** is the vehicle responsible for commercialization of university intellectual property (see Knowledge Transfer and Innovation Strategy). INVENT has an on-campus dedicated building which includes incubator space to host spin-out or spin-in companies in the early stages of their development.

INVENT has recently developed its strategy for the next five years (2009-2013) with the overall aim to **'Leverage the university's research activity for the economic benefit of Ireland'**. In its strategy it has laid down clear targets for the number of invention disclosures, patents, licences and spin-offs to be achieved in that period. Invent will also focus on delivering a dramatic increase in the number of Enterprise Ireland Innovation Partnerships collaborative grants with spin-in companies and established SME's. They will add value to their product lines through innovative technology and process innovations with specific emphasis on environmental sensing, bio-pharmaceutical process and analytical technology and provide market led feedback to the research programmes of the SFI CSET's and Strategic Research Clusters.

The Directors of DCU INVENT, Graduate Research and Research Support Services all report to the Vice-President for Research in a new structure, which facilitates a coordinated approach to building IP/commercialization awareness at all levels within the university. All three research support entities are co-located within the DCU

Invent building. Enterprise Ireland is providing critical support towards enhancing the human resources dedicated to technology transfer and ongoing close collaboration with EI is an important part of our strategy. DCU INVENT will also play an important role in building links with SMEs.

Over the past seven years Invent has supported 14 spin-off companies and 12 spin-ins, while also providing space and facilities for another 28 virtual client companies.

DCU aims at national leadership in transforming research results through to commercial success and national policy developments.

5. APPENDIX B

5.1. Academic Themes and Research Priorities

Building on the University's strategic plans *Leading Change* (2000-2005) and *Leadership through Foresight* (2006-2008) the University's Academic Themes continue to shape and sustain the University's research strategy.

The University's approach in this regard is both pioneering and distinctive. The Academic Themes and organization of Faculties and Research Centres, focus research activity to drive inter- and multi-disciplinary research collaboration. They also point to areas of research strength more clearly visible to the external world in terms of both teaching and research.

1. Science, Discovery and Technological Innovation

DCU is committed to building on existing and emerging research strengths in science, discovery and technological innovation, aimed at contributing to the needs and goals of Ireland's future. The University will continue to enhance its capabilities based on international benchmarking at the interface between complementary technologies in areas such as, sensors, plasmas, photonics, materials processing, optical/wireless networks and bioprocessing. Sensors is a key strength of DCU's research portfolio. Photonic sciences and plasma science and technology research contributes across several theme boundaries.

Immediate priorities:

Sensors

Photonic Sciences

Plasma Science and Technology: advanced manufacturing and materials processing (SFI Precision SRC)

Bio-Analytical / Bio-processing (CBAS / NIBRT / SFI Separations SRC)

Environmental Monitoring

Financial Mathematics (SFI Edgeworth Centre for Financial Mathematics)

Medium to Long-term priorities:

Modelling of Complex Systems

Biomedical engineering

Sustainable Technologies

2. Information Technology and the Knowledge Society

Making a difference in academic and public discourse, DCU is extending the frontiers of knowledge and understanding of information technology and the knowledge society. The transformational implications of advances in information technology for society and the individual is a key element of this research. In particular, this research focuses on the application of information technology in areas such as communication, digital video processing, networks and communication engineering, imaging, machine translation, security, bio-informatics and health and the implications of information technology in society as mediated through regulation, communication and other means. DCU is a leader in developing digital humanities technologies for the Irish language, particularly in creating terminology and placenames resources, in collaboration with national government and EU institutions. DCU is also a founding partner of the National Digital Research Centre based at the Digital Hub in the Dublin Liberties area. This is an important vehicle for trans-institutional translation research in the area of digital media in the broadest sense.

Immediate priorities:

Language technologies (CNGL CSET)
Information analysis, organisation and retrieval (Clarity CSET)
LERO SFI CSET in Software Engineering (UL Led)
National Digital Research Centre (Supported by DCMNR)
Imaging
Science and Mathematics Education

Medium to Long-term priorities:

Information Security
Next generation networking

3. Life Sciences and Health in Society

In keeping with DCU's focus on translational research, DCU has prioritized areas of research at the life sciences and health interfaces. In particular, DCU is continuing its mission to translate technological platforms into solutions and applications for the benefit of society. The University is enhancing its international profile in areas such as sensors/diagnostics, therapeutics / theranostics, biotechnology cancer, diabetes as well as cell and tissue culture with a particular focus on medical and other applications across these technologies. Translating these technologies into societal benefit will be further enhanced in the longer term by building on growing strengths in nursing, health and human performance, focusing on preventative measures. A key overall priority is to marry the physical/engineering sciences with life sciences in order to provide disruptive solutions to medical needs.

Immediate priorities:

Biomedical Diagnostics (SFI CSET)
Nano (bio)science / Nanomedicine
Drug Discovery and Development / Therapeutics
Cancer (SFI Strategic Research Cluster pending)
Diabetes (US – Ireland R&D Taskforce Initiative)
Engineering/Physical Sciences for the Life Sciences

Medium to Long-term priorities:

Healthy Living Centre

Preventative medicine

Health Services Research

Sports Performance related research

Public Health: Environmental Health and Infectious Diseases

4. Education and Learning

As an institution of learning with a mission to harness the transformative power of knowledge, DCU recognizes the value of education and learning as a research setting and will enhance and strengthen its research in education and learning. The University – along with its constituent colleges – has a unique cluster of engagement and expertise in educational research. This includes research in educational disadvantage, science education (represented by CASTeL), management learning and development, technology in education and education research situated in a variety of other disciplines. By leveraging further collaboration in these areas of expertise, DCU will build an international reputation as a center of excellence in the interface between the context and content of education and learning with a view to enhancing the student learning experience and adding to academic discourse and knowledge in this important setting.

The DCU *Enhancement of Learning Strategy* makes an explicit commitment to basing the development of its teaching and learning strategy on analyses of the outcomes from the best available **educational research in higher education**. DCU plans to build further on its reputation for excellence in education by becoming a centre of excellence for educational research with a particular focus on third and fourth level teaching and learning and policy. Discipline-based educational research expertise will be identified and developed in all Faculties. Cross Faculty collaboration and coordination will be encouraged and resourced, in order that, in partnership with our linked colleges, research in all areas and levels of education will be enhanced.

Immediate priorities:

CaSTeL

HE Educational Research (Discipline-based, HE Policy, Assessment and Curriculum Development)

5. Internationalisation, Interculturalism and Social Development

As a University characterised by its contribution to society, DCU's research is cognizant of its position in the world and conscious of its implications for society. Ireland has been deemed the most 'globalised' country in the world and it has become so by pursuing the 'knowledge society' agenda. Through its programmes of research in international studies, communications and translation and textual studies and more generally, DCU is generating a cutting-edge understanding of this complex and ongoing process from a broad comparative and interdisciplinary perspective. Ireland as a globalised knowledge society is of vital interest not only for its own people but as a possible new development paradigm in the era of globalisation. DCU is well placed to make important contributions to the understanding of the intercultural workplace and the impact of globalisation.

Immediate priorities:

Communications
Translation and Textual Studies
Centre for International Studies
Ethics

Medium to Long-term priorities:

Security and development
Multiculturalism and Multilingualism
Consumption and Popular Culture

6. Business and Innovation

Underpinning DCU's research is its desire to contribute creatively to the social and economic needs of Ireland. In this context, recognizing the urgent need for greater levels of innovation in the Irish economy, the University will place business innovation at the core of its activities, through pioneering research on the financial, regulatory, organizational and entrepreneurial aspects of innovation. In particular, with a view to enhancing the adaptive capabilities of university and industry, DCU is actively pioneering strategic research programmes exploring effective organisational implementation of university and corporate research strategies with a particular focus on organizational innovation and research commercialization.

Immediate priorities:

Knowledge sharing and transfer in knowledge intensive firms
Financial Mathematics (SFI Edgeworth Centre for Financial Mathematics)

Medium to Long-term priorities:

Consumption Studies
Enterprise Process Research: Entrepreneurship and Business Growth

