

Fostering Cross-Campus Entrepreneurship – Building Technology Transfer within UCD to Create a Start-up Environment

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In this chapter we discuss the emergence of commercialization activity, and specifically the TTO and ILO functions, in University College Dublin (UCD). This case emphasizes (1) how a public university has sought to encourage commercialization activity and the organization structures developed to support commercialization; (2) how, over a period of twenty years, the TTO and ILO functions and commercialization activity evolved in the absence of what might be considered many of the university attributes, such as high levels of funded research typically associated with high levels of commercialization; (3) how policies aimed at encouraging the commercialization of university research were embedded within a broader industrial development strategy associated with both attracting inward FDI (Foreign Direct Investment) and developing indigenous entrepreneurial activity in emerging sectors; and (4) how a new president in a traditional public university has sought to emphasize the contribution the university makes to economic development as a means for engaging in a significant restructuring of the university and the adoption of policies that seek to maximize research activity, in particular in emerging sectors such as bio-technology and ICT, to develop external linkages with industry, and to promote commercialization.

1. UCD: History and Mission

UCD is the largest of three public universities located in Dublin, the capital city of Ireland. UCD considers itself among the top 1% of Higher Education Institutes worldwide (UCD is ranked 131 on the QS 2012 World University Rankings). UCD describes its research strengths as Agri-Food; Culture, Economy & Society; Information, Computation & Communications; Energy & Environment; and Health.

UCD was founded in 1854, by Cardinal John Henry Newman as the Catholic University of Ireland. Newman’s vision of the ‘modern’ university, as presented in ‘The Idea of a University Defined and Illustrated’ (1852), included an emphasis on the diffusion of knowledge as central to the concept of the university: “[The university]

is a place of teaching universal knowledge This implies that its object is ... the diffusion and extension of knowledge rather than its advancement. If the object were scientific or philosophical discovery, I do not see why a University should have students.”

The university expanded as Ireland developed during the twentieth century. Reflecting industrial development policies in Ireland aimed at increasing the number of university graduates, UCD expanded rapidly in the 1990s, growing to a student base of nearly 25,000 in 2013 (21,000 full-time and 4,000 part-time), 998 academic staff and a further 618 funded research staff, and 1,752 PhD students. However, like many public universities, a number of external constraints limited UCD’s development.¹ External reviews of UCD conducted in the 1980s and 1990s pointed to the enormous potential that UCD had to offer, based on the quality of its staff, students and facilities. These same reviews, however, particularly when taken together with internal quality assurance assessments, indicated significant underperformance when measured against top ranked international comparative institutions. The reasons advanced for this situation were under-investment by the state in Irish higher education; an excess number of Faculties, Departments and other academic units limiting interdisciplinary collaboration and the emergence of new disciplines; a disconnect between academic and administrative systems, leading to excess administrative burden carried by academic staff and frustration amongst administrative and support staff over lack of clarity of roles; a resource allocation model which failed to encourage the exploitation of new opportunities; archaic recruitment and promotion procedures; confusion between governance and management in the conduct of university business; a lack of target setting and performance metrics; and a lack of integration between strategic planning, academic planning and support services. However, as we show below, despite these constraints, the TTO and ILO functions emerged in UCD in the early 1980s.

UCD’s focus on commercialization activity and university-industry interactions has been intensified during the past decade. In 2004, the university began a major reorganization and restructuring following the appointment of Dr Hugh Brady, a former Professor of Harvard Medical School, as President. The reorganization of 11 faculties

¹ UCD strategic plan, based on various reviews of the university during the 1980s and 1990s. These include the following: In 1998 and again in 2003 UCD was reviewed by the Conference of European Rectors (CRE), now the European Universities Association (EUA); the OECD *Review of Higher Education in Ireland* (September 2004); and in 2004, The Washington Advisory Group carried out a review of UCD’s operations and objectives.

and over 90 departments into a smaller number of colleges and schools sought to exploit new directions in research and possibilities for increasing the research income earned by the university. UCD is currently structured into seven colleges: Agriculture, Food Science, and Veterinary Medicine; Arts and Celtic Studies; Business and Law; Engineering and Architecture; Health Sciences; Human Sciences; and Science. UCD has 944 academic staff and a further 577 research staff funded by the Irish government.

Under the direction of the new president, the university restated its ambition to be a leading research-intensive university. The refocused mission of the university reflects the importance of research as a key contributor to economic development: “the mission of UCD is to advance knowledge, pursue truth and foster learning, in an atmosphere of discovery, creativity, innovation and excellence, drawing out the best in each individual, and contributing to the social, cultural and economic life of Ireland in the wider world” (UCD Strategic Plan, Creating the Future 2005-2008). Specifically, the president recognized that the role the university should play in economic development in Ireland. In the university’s 2005-2008 strategic plan the goals of UCD were stated as “the creation, preservation, interpretation and dissemination of knowledge”. This first strategic plan under the direction of the new president specifically stated that: “there is also an obligation to transfer and apply that knowledge for the betterment of society, whether economically, socially or culturally”. The plan stated: “UCD is committed to knowledge transfer in all areas of research and scholarship” and sets specific objectives such as: to align UCD’s research programs with Ireland’s social, cultural and economic objectives; to realize the full value of research programs; and to engender an entrepreneurial culture.

Listed as means to achieving these objectives were: enhancing knowledge transfer through NovaUCD; initiating a knowledge management program; identifying and protecting UCD’s intellectual property; training staff in knowledge transfer and entrepreneurship; and commercializing UCD’s intellectual property through licensing and spinoff companies; establishing a Centre for Policy Research in support of knowledge transfer from the humanities, human sciences and allied disciplines; establishing the Global Irish Institute as statement of wider interest in and support of the global Irish community; continuing to forge strategic partnerships with industry, the public sector and social and cultural organizations; and developing research services.

Dr Hugh Brady summarized his thinking as follows²: “The success of our recently established research institutes has ensured that UCD is playing a central role in shaping the Irish society and economy of tomorrow. Our prioritizing of research pre-eminence across the academic spectrum as our defining characteristic for the next decade will ensure that UCD will combine sustained academic excellence within this university with playing a key role in sustained progress and prosperity for Ireland.”

This focus was re-affirmed in the current strategic plan:

‘This plan will establish innovation as a third, constitutive pillar of UCD’s activity and identity, building on the achievements in education and research. This will simultaneously challenge our teachers and researchers to translate excellent education and research into contexts where they may be expected to have a high impact, all the while supplementing more traditional educational concerns with the development of innovative and entrepreneurial capacity amongst our students’ (Strategic Plan to 2014, UCD).

2. The Policy Context for University Commercialization Activity in Ireland

The development of commercialization activity in UCD occurred in the context of a broader industrial policy agenda pursued by the Irish government. Ireland, and in particular Dublin, experienced rapid economic growth and development during the period 1995 to 2008, popularly referred to as the “Celtic Tiger”. In their review of explanations of the Celtic Tiger the OECD concluded that there is no one singular “silver bullet” explanation. It is generally considered that the following factors were important: a new fiscal strategy adopted in 1987; a model of ‘Social Partnership’ that emerged whereby the government offered tax reductions in return for wage moderation; and the Structural and Cohesion Funds that were transferred from the EU to Ireland, which accounted for 3 percent of the economy for the decade 1989-1999, and allowed for investment in infrastructure and capital projects, which had been put on hold in the 1980s. These funds were spent on three areas: (1) human resource development, including the expansion of higher education; (2) physical infrastructure; and (3) production and investment aids to the private sector.

² Inaugural Foundation Day Address, O’Reilly Hall, Friday 4 November 2004, Speech by Dr Hugh Brady, President, UCD: The Ideas of the University 1854-2004: Celebrating the Past.

Inward FDI played an important role in Ireland's industrial development. Irish industrial policy has focused on attracting export orientated inward foreign direct investment. While Ireland has pursued this policy successfully since the early 1960s, in the early 1990s Ireland experienced a rapid increase in inward FDI, in particular from the US. Of the 1,004 foreign companies with facilities in Ireland, 515 (51 percent) are American, 96 are German (9.5 percent) and 91 (9 percent) are from the UK. Of the 146,000 people employed by foreign companies, 107,000 (73 percent) work for American companies. Of the €114,000 billion sales from all foreign firms in Ireland, €110,000 billion (97 percent) is exported. Employment is in International & Financial Services (including software) (46 percent), Medical/Dental Instruments & Supplies (16 percent), Pharmaceuticals (15 percent), Computer, Electronics & Optical Equipment (11 percent), Metals & Engineering (8 percent), and Miscellaneous Industry (4 percent). Reviewing the effectiveness of policies aimed at attracting FDI, Murphy and Ruane³ argue that three factors partly explain Ireland's success at attracting inward FDI: (a) the emergence of self sustaining clusters in area such as software, electronics, pharmaceuticals, and financial services that resulted from the targeted approach of the IDA and their efforts to build vertical linkages; (b) the extension of incentives to include internationally traded services; and (c) the emergence of a pro-FDI reputation, that reflects the consistency and pro-active nature of Irish government policies towards FDI.

In recent years the focus of inward FDI has shifted towards higher value activities such as R&D and HQ activities. Investments by firms such as Bristol-Myers Squibb, Citigroup, Genzyme Corporation, Pfizer Inc and Xilinx in R&D facilities in Ireland requires access to highly skilled workforce and often occurs in the context of explicit collaborations with Irish universities or commercial research facilities in Ireland.

In addition to a focus on FDI, industrial policy in Ireland since the 1980s has focused very selectively on supporting and encouraging indigenous firms and entrepreneurs that trade internationally. For this relatively small number of firms and entrepreneurs, generous state assistance in terms of capital grants, tax breaks, and marketing and selling supports in overseas markets are available. Much of indigenous manufacturing industry in Ireland was in decline up to the late 1980s. During the 1990s new firms emerged in new sectors of activity, including among them a sizeable number of software firms focused on product development and exporting. These firms are centered round Dublin city. The evolution of the software sector was an important development

³ Murphy, A. and Ruane, F. 2004. Foreign Direct Investment in Ireland: An Updated Assessment, in Central Bank and Financial Services Authority Annual Report 2003, Dublin, Ireland. (pp135).

in Dublin as it is associated with the subsequent emergence of a small but growing venture capital industry in Ireland.

One aspect of Irish government policy that stemmed from the desire to attract inward FDI was investment in third level education. During the 1980s the government recognized that inward FDI would require skilled workers, in particular those with technical skills. The policy response was to invest state and EU funds in expanding student numbers in existing universities and in the creation of new National Institutes of Higher Education that provided third level courses that focused on science and technology, paying particular attention to the needs of industry. The focus of this investment in third level education was on the number of graduates, and in particular, on the number of graduates in science and technology related disciplines.

However, such a focus on education was not in the context of a fully developed national strategy for Science, Technology and Innovation. There were little explicit attempts by policy makers to integrate sectoral and socio-economic research into a STI policy until the 1990s. This reflected a general lack of research capacity and funding for research in Universities, Institutes of Technology and in industry and a lack of research and technology absorption capabilities by companies and weak commercialization structures.

More recently policy focus has shifted within the third level education sector. In the late 1990s the government increased research funding for universities to reflect the evolving needs of inward FDI, and the policy objective of moving into higher value-added activities. These new funds, administered largely through Science Foundation Ireland (described below), are effectively the first major support for research within universities. Funding has prioritised areas of activities such as ICT and bio-technology, the key focus of industrial policy. More specifically, within the support system for indigenous industry and entrepreneurs, the universities have been identified as a potential source of entrepreneurs and innovative new firms. State development agencies began a program that supported the building of new incubators in the third level sector, and of directly supporting commercialization activity through a number of programs.

Following the start of the economic downturn the Irish Government launched its new economic policy, 'Building Ireland's Smart Economy: A Framework for Sustainable Economic Renewal' in December 2008. Specifically this policy sets out the ambition that Ireland will be a 'country where there will be a critical mass of

companies - both Irish and international - at the forefront of innovation, creating the products and services of tomorrow' and 'a country where entrepreneurs from anywhere in the world will want to come because it provides the best environment for the commercialization of innovative, leading-edge products and services'.⁴

A core aspect of this new policy framework was the objective of 'Building the Ideas Economy- Creating the 'Innovation Island'. This aspect of the new framework set out specific objectives, some of which impact on the role of Higher Education Institutes. Some of the relevant objectives were:

- Build on the concentration of multinational enterprises by encouraging convergence of technologies and processes and the intensification of research investment;
- Continue to expand the research and development base;
- Provide a favourable tax environment for research and development and private capital;
- Concentrate research investment and recruitment of top international research talent;
- Foster an entrepreneurial culture at second, third and fourth levels.

The framework document also argued that the Higher Education Sector needs a 'fractionalization and reconfiguration of roles', suggesting that 'the challenge to the higher education sector itself is to create new possibilities through new alliances and new organizational arrangements that can advance our knowledge capacity and generate opportunity for new levels of efficiency, performance, innovation and growth'. This provides the policy context for the TCD/UCD Innovation Alliance announced in 2009 (discussed below).

However, the recent economic crisis resulted in a rapid and significant contraction in the Irish economy in 2008 and subsequent years. This has restricted the Irish government's ability to invest in Higher Education and to fund Research at Higher Education Institutes.

Institutional supports for research and commercialization activity

A number of new institutions were developed in the 1990s to support research and commercialization activity. Additionally, some existing state bodies such as Enterprise Ireland focused some of their resources at

⁴ An Taoiseach (Prime Minister) Mr. Brian Cowen, Speech on Thursday 18th December 2008.

developing and supporting commercialization activity. Some of these initiatives and institutions are described below.

Advisory Council for Science, Technology and Innovation (ACSTI)

In 1997, the Government established the Irish Council for Science, Technology and Innovation (ICSTI) to advise it on all aspects relating to the strategic direction of science, technology and innovation (STI) policy. The Advisory Council for Science, Technology and Innovation (ACSTI) was established in April 2005 as a successor body to the ICSTI. ACSTI serves as the primary interface between policy makers and industry and universities and others involved in the STI arena. Its remit is to contribute to the development and delivery of a coherent and effective national strategy for STI and to provide advice to government on medium and long-term policy for STI. Its role encompasses all aspects of STI policy including: primary, second and third level education; scientific research, technology and research and development in industry; prioritization of state spending in STI; and public awareness of STI issues. The ICSTI/ACSTI was one of a number of state agencies that developed the National Code of Practice for Managing Intellectual Property Arising from Publicly Funded Research (launched in 2004) and the National Code of Practice for Managing and Commercializing Intellectual Property Arising from Public-Private Collaborative Research (launched in 2005).

The Programme for Research in Third-Level Institutions (PRTLII)

Launched in 1998, the stated objective of the Programme for Research in Third-Level Institutions (PRTLII) is to provide integrated financial support for institutional strategies, programmes and infrastructure and to ensure that universities and third level educational institutions have the capacity and incentives to formulate and implement research strategies, which will give them critical mass and world level capacity in key areas of research. Since 1998, the PRTLII has awarded €1.22 billion (both government funds and private matching funds) to support both physical and human infrastructure.

Science Foundation Ireland (SFI).

Science Foundation Ireland (SFI) provides awards to support scientists and engineers working in biotechnology and information and communications technology development. It emerged after an intensive study commissioned by the Irish government in 1998. Representatives from government, academia, and industry assessed industrial sectors in the Irish economy and concluded that biotechnology and information and communications technology represented “the engines of future growth in the global economy... A world class research capability in selected niches of these two enabling technologies is an essential foundation for future growth”. As part of its response, the government initiated the Technology Foresight Fund, which totals more than €646 million. SFI was created in 2000 to administer this fund as a sub-board of Forfás: The National Policy and Advisory Board for Enterprise, Trade, Science, Technology, and Innovation.

In July 2000, SFI announced its first call for proposals from leading researchers. On completion of the international peer review process, SFI announced its first awards to 10 outstanding researchers from Ireland, the United Kingdom and the United States. The Agreed Programme for Government, published June 2002, provided for establishing SFI as a separate legal entity and in July 2003, SFI was established on a statutory basis under the Industrial Development (Science Foundation Ireland) Act, 2003. Science Foundation Ireland (SFI) had a budget of €646 million to invest between 2000-2006 in academic researchers and research teams in the fields underpinning two broad areas: Biotechnology and Information and Communications Technology. This was followed with €1.4 billion for the period 2006-2013. By 2013, SFI was supporting approximately 3,000 researchers in Ireland’s higher education institutes, led by 300 lead scientists.

Enterprise Ireland

The Irish Government provides supports to entrepreneurs through a number of separate agencies and programs. Of particular importance to the emergence of knowledge-based new enterprises and university spin-offs are Enterprise Ireland's direct supports for innovative new ‘high potential’ start-ups and the Commercialization Fund Programme. In addition academic spin-offs often benefit from the Employment and Investment Scheme, a tax based incentive to encourage individuals to invest risk capital in new or established indigenous manufacturing or internationally traded service firms.

Enterprise Ireland is a government operated business development agency. One of its duties is to support “high potential” entrepreneurship, and specifically to support the commercialization of research from third level educational institutions. Its activities include funding the development of incubators; promoting and stimulating early stage equity investments by venture funds and private business angels; supporting scientists in their commercialization activities; and providing supports such as equity investment, mentors, and export assistance to new and established firms with export aspirations in the manufacturing and internationally traded services sectors. Specifically, it supports approximately one hundred “high potential” start-ups each year, a small minority of which are new businesses originating in third level educational institutions.

Enterprise Ireland provides a range of financial that support academics and researchers to bring a new product idea or business venture from a third-level educational institution to market. Under the Commercialization Fund Programme, researchers can get between €10,000 and €15,000 to perform a market analysis, investigate routes to commercialization, or create a prototype. For researchers that choose to commercialize via a spin-out, there are extensive supports available if the spin-out is technology based and will trade internationally.

In addition to supporting the development of incubators, Enterprise Ireland played an active role in the development of the venture capital industry in Ireland. The Irish venture capital industry emerged in Ireland in the 1990s as new technology based firms, principally software firms, started to make their mark. In the 1990s Enterprise Ireland has increased the flow of venture capital into new ventures by co-financing new venture capital funds. For the period 2007 to 2011, Enterprise Ireland invested €113 million into venture capital and seed capital funds.

3. UCD- Resources, Capabilities and Attitudes

UCD now comprises seven colleges: Agriculture, Food Science, and Veterinary Medicine; Arts and Celtic Studies; Business and Law; Engineering and Architecture; Health Sciences; Human Sciences; Science; and a number of research institutes, principal amongst these the UCD Conway Institute of Biomolecular and Biomedical Research.

In terms of research activity UCD produced over two thousand peer-reviewed publications in 2011 (Table 1). DCU reports a doubling of publications for the period 2002 to 2011; with a 58% increase impact in journals for the period 2002-2011. In terms of the research capacity and performance of staff, UCD has, in some areas of activities, internationally recognized research experts. However, as noted above, UCD faces many challenges in developing its research capabilities. A number of factors such as under-investment in higher education, a lack of national funding for university research programs, and differing strategic priorities and policies within various units in the university have resulted in unequal research capacity and performance across the university.

Table 1: University College Dublin: number of publications by year: 2007-2011

	Number of publications*	Number of books
2007	1,355	114
2008	1,617	66
2009	1,782	73
2010	1,993	81
2011	2,054	62

*Peer reviewed publications in *Web of Science*

Source: University College Dublin, Report of the President, 2011-2012.

In absolute terms the level of external research income generated by the university has been low. Over the past decade there has been a significant increase in income and in terms of proposals to raise income (Table 2). Current research income (2011/2012) in UCD is approximately €75 million. To put this in context, over twenty five years ago (1985) UCD raised approximately €4 million of external research funding, 85 percent of which was from state, EU or other international bodies and 15 percent was from industry. This increase in research income reflects the increased availability of national funding for research, through Science Foundation Ireland, the increased attention and emphasis by senior management within the university to the strategic imperative of raising external research funds, and the efforts of individual academics. The largest single source of funding is Science Foundation Ireland (Table 3).

Table 2: Research awards in UCD, 2002-2012

Year	Total value of of contracts signed (€million)	Total number of contracts awarded	Total number of proposals submitted
2002/03	45.8	384	584
2003/04	49.8	405	685
2004/05	62.5	495	1,074
2005/06	83.1	558	1,245
2006/07	95.4	452	1,234
2007/08	115.9	445	1,090
2008/09	116.8	537	1,150
2009/10	45.6	444	970
2010/11	103.3	520	1,120
2011/12	75.1	525	1,257

Source: UCD Data

Table 3: Funding sources 2011/2012

Funding Source	Number of contracts	Value of contracts (€ million)
Science Foundation Ireland	60	18.6
European Commission	40	14.1
Irish Research Councils (IRCSET & IRCHSS)	99	6.1
Enterprise Ireland	85	5.1
Others	241	31.2

Source: UCD Data

Attitudes to commercialization by academics

There is some evidence to suggest that scientists in Ireland believe that universities are generally supportive of academic entrepreneurship and engage in external activity⁵. While no direct measure of attitudes within UCD academic staff towards commercialization activity is available, a survey (from 1998 as part of an EU funded study of commercialization)⁶ relating to academics in Ireland, including UCD, suggests that in terms of attitudes of academics towards their host institution, 58 percent reported their university as “supportive”, 33 percent as “no effect”, and 10 percent as a “hindrance”. There was a very high level of awareness of the industrial liaison office (71 percent), while 22 percent reported having used an ILO in developing external links. A significant number, 58 percent, of all researchers and teachers (1,542 individuals) at the faculties of science, engineering and medicine in Ireland have some form of external activity (Table 4). This survey suggested the conditions for broadly defined academic entrepreneurship were favorable in that 63 percent of respondents had prior fulltime work experience in industry; while 35 percent reported having prior small business experience; 36 percent reported that immediate family members own or have owned a small business; 15 percent reported having started or owned a business; and 9 percent reported other entrepreneurial experience. In terms of direct contact with industry in the previous five years, 28 percent reported “no direct industry contact”, 52 percent reported that they had approached an industrial organization, while 56 percent reported that they had been approached by an industrial organization.

⁵ Based on a mailed questionnaire survey of all researchers and teachers (1,542 individuals) at the faculties of Science, Engineering and Medicine in three regions in Ireland in 1997 (a 43 percent response rate).

⁶ Jones Evans, D. (1998) ‘Universities, Technology Transfer and Spin-off Activity in Different European Regions’, Targeted Socio-Economic Research Report No. 1042 (1998). (<http://improving-ser.jrc.it>)

Table 4: Commercialization activity among Irish academics (percent of all academics that performed the activity)

Contracted research	Undertaking specific research projects within the university system for external organizations	69 percent
Consulting	The sale of personal scientific or technological expertise to solve a specific problem	68 percent
Large scale science projects	Obtaining large externally funded research projects, either through public grants or through industrial sources	68 percent
External teaching	Provision of short courses to non-university personnel/ students and external organizations	73 percent
Testing	Provision of testing and calibration facilities to non university individuals and external organizations	40 percent
Patenting/licensing	The exploitation of patents or licenses by industry from research results	26 percent
Other		26 percent
Spin-offs	The formation of a new firm or organization to exploit the results of the university research	19 percent
Sales	Commercial selling of products developed within the university	6 percent

Source: TSER Report 1998.

4. NovaUCD (Centre for New Ventures and Entrepreneurs): The Emergence of a Technology Transfer Office at UCD⁷

NovaUCD (Centre for New Ventures and Entrepreneurs) is involved in technology transfer through the provision of incubation space and supports for academic researchers and entrepreneurs in UCD. It is organized under the Office of the Vice-President for Innovation. NovaUCD is located on a three acre site in UCD's Belfield Innovation Park, some 4 km from Dublin city centre. Technology transfer and incubation activities were previously organized under the University Industry Programme (UIP), with two separate physical locations: the University Industry Centre and the Campus Innovation Centre (this evolution is described below).

In 1982, the newly formed Graduates Association of the UCD School of Engineering set itself the target of raising funds for a University Industry Centre, which would be built alongside the new engineering building which was due to be built in 1983. The Graduate Association included leading businessmen on its council, and it was their belief that the future of Irish industry could be greatly assisted by closer cooperation between industry and the university. They envisaged that the University Industry Centre would be the focus for interactions between industry and the university, with personnel from industry attending for technical meetings, industrial exhibitions and seminars. Approximately four hundred and fifty individuals and businesses contributed to the financing of the building of the new Centre (including Ericsson, Digital, AIB, Bank of Ireland, Guinness, CRH (Cement Roadstone Holdings) and Phillips). The Centre, which was opened in 1985, comprised a 230-seat auditorium, two smaller seminar rooms and a small exhibition area.

UCD appointed an 'Industry Liaison Office' and established the University Industry Programme in 1988. The university allocated a very modest budget, which was supplemented by a state grant that supported the establishment of ILOs in universities. At the time, such activity was not considered central to the activities of the university, with a senior university officer describing the UCD of 1988 as "anti-enterprise". The UIP operated as an autonomous unit, with its own board, and reported to the Registrar of the University. The board was chaired by a senior manager from industry (initially the Operations Manager of Guinness Group plc). The objectives set for the University Industry Programme in 1988 were as follows:

⁷ Centre for New Ventures and Entrepreneurs (NovaUCD): NovaUCD, Belfield Innovation Park, University College Dublin, Belfield, Dublin 4, Ireland. Tel: 00-353-1-716 3700, fax: 00-353-1-716 3700, web: www.ucd.ie/innovation

- The promotion of research and development projects with UCD in cooperation with, and funded by, Irish industry.
- The organization within UCD of a structured approach towards the provision of advanced training and continuing professional education to meet the needs of Irish industry.
- To become the principal venue in Dublin for high-tech and industrially oriented meetings, exhibitions and conferences.
- To become involved in what was described as ‘the potentially lucrative spin-offs from research through licensing and patenting’.
- To improve communications between academics and industry, including the establishment of research centers in areas such as biotechnology and robotics.

The first fulltime ILO appointed by UCD was Hugh Quigley who remained for one year. With a grant from the Industrial Development Authority (IDA) and a university “loan”, incubation space comprising of 3,000 sq feet of office space (12 offices or units ranging in size from 150 to 380 sq feet) was developed on campus. The university loan was to be repaid from the rent generated from the units. The Campus Innovation Centre (CIC) began operation in 1988/1989. The aim of the CIC was to provide an environment that facilitated the start-up and development of knowledge-based industrial enterprises utilizing the unique range of expertise and facilities on campus.

In 1988 Dr Pat Frain was appointed Director of the newly established University Industry Programme. In 1989 he was supported by a project manager, responsible for continuing professional education, and an administrative staff member responsible for conference and exhibition facilities in the University Industry Centre. Frain set about attracting companies to locate in the CIC. The criteria used to identify and select companies was that they had to be new knowledge-intensive companies or spin-offs from the research and development departments of established companies wishing to develop and commercialize new innovative products and services. Firms locating in the incubator were expected to have the potential to benefit from the specialist skills and knowledge of UCD staff and the equipment, facilities and information services available on campus.

The activities of the initial companies located at the CIC included developing test rigs for electrical connectors; researching and developing new products and processes for the recycling of waste materials; development of thermal vacuum process control equipment for use in the repair of advanced composite elements in the aviation and marine industries; a television and film production company; the genetic testing of blood and tissues from cattle and other animal species; the provision of market information services; and the provision of techno-economic consultancy services.

In June of 1989 UCD adopted a policy on college procedures relating to the establishment of campus companies. This document recommended that all spin-off companies be required to give UCD a standard 15 percent share of the equity of the company. In return UCD would, over a three year period, make a contribution “in kind” to the company. This “in kind” contribution would include “seed funding” (through a college department or research group or through a seed fund), rent subsidy, access to college technology and expertise, association with the UCD name, etc. It was not envisaged that UCD would make direct cash contributions to spin-off companies. These procedures were superseded by the university’s IP policy. Academic spin-offs were encouraged by the IDA (Industrial Development Agency) when in 1989 it announced a new package of supports for academic entrepreneurs, allowing for the involvement of academics on a part-time basis, provided they could demonstrate that there was an adequate management structure in the company. However, during the period of the 1990s, most of the companies located in the CIC were external companies attracted to the university. At one stage, of the 15 companies located in the CIC, twelve were “external” and only three were “internal” university spin-offs. The UIP supported a small number of these companies (or spin-offs) with their own funds, in return for a shareholding. For example, in 1993 UCD formed a joint venture company, Pharmapro Ltd, with a UK firm Proteus Molecular Design Ltd, now called Protherics plc, to develop commercial diagnostic tests and vaccines for animal diseases including bovine TB and the then emerging disease, BSE. The research relating to BSE was carried out in UCD by Professor Mark Rogers, a professor in zoology. His research led to the development of the TSE (Transmissible Spongiform Encephalopathy) diagnostic technology, which was licensed to Enfer Scientific Ltd in 1996. Enfer subsequently developed a rapid test for BSE using this technology. This licensing arrangement generated over €2 million in royalty income for UCD.

Reflecting its broad remit, industry linkages, and lack of resources, the UIP became involved in a number of activities. It started to deliver Health & Safety courses to industry (at the time, the relevant faculties within the

University did not consider such activity as part of their remit). A second course in the area of Sports Management was also developed. These initiatives were very successful, and after a number of years became profitable for the UIP. They also included a number of “firsts” for the university- for example, the first digital broadcast in Ireland; and the first delivery of an education program by satellite. By 1993 continuing professional education programs accounted for fifty percent of UIP revenue. The UIP used these funds to support activity, including the development of the Campus Company Development Programme, and in developing patenting and licensing activity. The Campus Company Development Programme, which it had developed in conjunction with the Dublin Business Incubator Centre (BIC)⁸, was a nine-month program involving one four hour workshop each month. Participants received the support of a mentor from the BIC and other experts, and were required to present their business idea/business plan at the start and the end of the program. There was also an awards ceremony at the end of program at which the businesses which made most progress during the course of the program were presented with prizes.

While plans started to emerge in 1993 for developing a new purpose-built incubation centre, it was not until the late 1990s that these plans were developed. The newly appointed chairman of the UIP Board, Ian Cahill, approached the then President of the University to establish what role the UIP should play during his three-year term of office. The President agreed to a review of the role of the UIP, and a committee comprising Ian Cahill, the ILO (Dr Pat Frain), two university staff, and two external managers from industry (from the ICT sector) was established. This committee considered the role the UIP could play, looked at international models in other universities and industry, surveyed the companies in the CIC and external companies, and surveyed academics within the university, and from this work developed a specific set of recommendations. Principle amongst these was that UCD should develop a clear policy on interaction with industry and the role and purpose of the UIP. Specifically this review recommended the transfer of the profitable programs in Health & Safety and Sports Management and other multi-disciplinary courses out of the UIP (and therefore the main revenue source of the UIP), in return for the allocation of a specific budget to support the UIP, including new senior posts in a number of key areas to enable the UIP to focus on supporting innovation and technology transfer.

⁸ A Business Innovation Centre (BIC) is a Support organization, public or private, for innovative small and medium sized businesses (SMEs) and entrepreneurs

The proposals were presented to the University's Officers, who agreed to a written response. The outcome was a UIP with specified roles, each of which was to be supported by a fulltime post. The roles were:

- Technology transfer (identifying, protecting, and exploiting IP created in the university).
- Continuing professional development focused on innovation and technology transfer (the provision of short courses to industry and internal courses to UCD staff).
- Liaison with industry (for example, identifying specific industry research linkages).
- Enterprise (supporting the development of entrepreneurship and campus-based ventures).

An implementation plan was developed and by October 2001 it had been implemented, with most of the new posts filled, and the Health and Safety courses transferred out of the UIP. In parallel with the implementation of the plan the Director of the UIP sought to develop a new innovation and technology transfer centre at the site of the 1750s Merville House. The Director (of the ILO) raised funds from Enterprise Ireland⁹ and a number of external parties during the summer of 2000. The six private sector sponsors were AIB Bank, Arthur Cox, Deloitte, Ericsson, Goodbody Stockbrokers and Xilinx who contributed 75 percent of the €10 million raised to develop the first two phases (3,750 m²) of a planned 8,000 m² development. In return for this contribution the private sector sponsors receive a small equity stake in the companies that locate in the new centre. The sponsors were chosen to bring an appropriate mix of expertise and experience to the support programs offered at the new centre. The balance of the €10 million was contributed by Enterprise Ireland and UCD. Additional "wet-lab" space to accommodate biotechnology start-up companies was also subsequently funded (€1 million) by Enterprise Ireland and UCD.

The new innovation and technology transfer centre, named NovaUCD, emerged in a number of phases. In Phase I a new development (2,850 sq meters) was added to Merville House. This phase officially opened in October 2003. Phase II, completed in September 2004, comprised the refurbishment of the main part of Merville House (consisting of 900sq m). Phase III, completed in spring 2005, comprised 340 sq m of "wet-lab" or bio-incubation space which can accommodate 4-6 biotechnology companies originating both on and off the campus.

⁹ Enterprise Ireland is the public development agency responsible for developing indigenous industry in Ireland. This includes promoting what they term 'high potential' entrepreneurship.

In addition to developing the physical facilities, Dr. Pat Frain, Director of NovaUCD, continued the development and expansion of NovaUCD. Over the period 2004 to 2011 NovaUCD recorded over 300 industry partnerships; 21 new UCD spin-out companies incorporated; 370 inventions disclosed; 239 patents filed (including 125 priority patent applications); 88 licence agreements concluded; over 60 start-up companies occupied incubation space at NovaUCD; over 115 new ventures supported at NovaUCD; and 101 new ventures and 170 individuals completed the UCD Campus Company Development Programme.

Over this period, under the Director, NovaUCD developed a range of services that promoted innovation and technology transfer. These included:

- Identifying, protecting and exploiting intellectual property arising from UCD research;
- Supporting entrepreneurs, campus companies and other knowledge-based ventures;
- Promoting a culture of innovation and entrepreneurship among researchers, staff and students at UCD;
- Promoting contract research and other forms of university-industry co-operation.

Protecting and exploiting IPR

The impetus for an IP policy at UCD emerged from the University Industry Programme in the late 1980s. The ILO was aware of developments in the USA, and specifically the Bayh-Dole Act, and considered it appropriate that UCD had an IP policy. The development of an IP policy was a slow process, meeting with resistance from some academic staff. The then Registrar of the university engaged in a consultation process, which involved passing the proposed policy to the Deans of each of the faculties. A policy was adopted by the Governing Authority of the University in 1992. It stated “patents are owned by the university where the university deemed that there had been significant use of university facilities”. Prior to this, under common law, the university, as employer, assumed that it had ownership rights. During the 1990s a number of developments required the university to revisit the policy. In particular the development of research funding streams from Science Foundation Ireland (SFI) and Enterprise Ireland required that the university identify and protect IP. Under the terms and conditions of many of the funding agencies, e.g. SFI and Enterprise Ireland, the University has an obligation to report inventions arising from the funded research to the funding agency in a timely manner. A draft of a new policy was developed in 1998, though because of changes in senior officers in UCD the

development of the policy was delayed. This policy was adopted by the governing authority of the university in July 2006 and was formally launched by the UCD President in March 2007. This policy distributes net income from IP exploitation across the creators, the university and the NovaUCD (Table 5).

Table 5: IP policy in UCD

Net Income	Creators of IP	College	University/NovaUCD
Up to €100,000	75 percent	15 percent	10 percent
€100,000-€200,000	50 percent	30 percent	20 percent
€100,000-€200,000	40 percent	30 percent	30 percent
Over €1,000,000	30 percent	30 percent	40 percent

NovaUCD adopted a structured approach to ensure that intellectual property was identified and captured. NovaUCD staff met with UCD researchers on a regular basis to provide advice on commercial aspects of research proposals and contracts; to monitor the progress of research projects; to remind researchers of UCD's contractual obligations to funding agencies; and to ensure that they provide appropriate assistance to the researchers at different stages of the research projects. Specific activities included the preparation of non-disclosure agreements, material transfer agreements and research contracts; meeting contractual obligations including timely reporting of newly discovered intellectual property to relevant funding agency; assisting researchers in identifying intellectual property and completing invention disclosure forms; due diligence on invention disclosures; undertaking searches of patent databases in association with the creator of intellectual property; and the preparation of patent filings in association with patent agents.

NovaUCD worked with researchers to identify and develop the most appropriate business model for commercialization of the intellectual property. This might involve licensing to commercial partners or the creation of a spin-off company. A number of different services formed part of this process including: building market knowledge and a high level of understanding of the relevant market sectors; access to advice, diagnostic tools and data; sourcing of licensees and marketing of inventions; negotiation and drafting of license agreements; and the sourcing of finance. If NovaUCD determined that an invention could potentially be exploited, a NovaUCD technology transfer professional was assigned to the project. The technology transfer professional's role was to identify and contact prospective licensees with a non-confidential description of the

invention. A prospective licensee who wanted further information about the invention could then sign a confidentiality agreement (sometimes known as a Non-Disclosure Agreement (NDA)) prepared by NovaUCD staff in order to review confidential information about the invention, such as a scientific manuscript, drawings, and working prototype.

Even within this structured environment, Dr Pat Frain noted that successfully negotiating technology transfer was still a challenge. NovaUCD's experience suggests that few unsolicited offers to transfer technology to developed larger firms are successful. For example, Dr Pat Frain cited examples from large companies who reported that they only license a small number of the many technologies presented to them (as little as a few in every ten thousand). Frain believes that approaches to larger firms have a greater chance of success where there is a specific relationship between the firm and the university or research team working on the technology. Irish industrial policy aims to develop such relationships by encouraging industry collaboration on funded research projects. UCD is developing the Belfield Innovation Park on campus which will seek to develop linkages between firms and researchers.

In terms of invention disclosures, Frain successfully grew the numbers. For example, in 2010 57 invention disclosures were submitted to NovaUCD, compared to less than 15 in 2003. Over the period 2004 to 2010, 326 inventions were disclosed to NovaUCD. In terms of patent activity, twenty eight patent applications, including fourteen priority patent applications, nine patent co-operation treaties (PCTs) and five national/regional patent applications were filed by UCD in 2010 for IP arising from research in life sciences, engineering and information and communication technology (Table 6). For the period 2004 to 2010, UCD filed 204 patent applications, of which 107 were priority patent applications. In terms of licensing activity, UCD recorded the highest earnings from licensing income of the nine universities in Ireland.

Table 6: UCD Priority Patent Applications 2010

Title	Patent Application	UCD School of
A new design for DSSC	A US provisional patent application	Chemical and Bioprocess Engineering
A polymeric nanoparticle	An UK priority patent application	Agriculture, Food Science and Veterinary Medicine with TCD
Catalyst for the release of dihydrogen from ammonia borane	An UK priority patent application	Chemistry and Chemical Biology
Compounds	An Irish priority patent application	Chemistry and Chemical Biology
Effective product recommendation using the real-time web	A US provisional patent application	Computer Science and Informatics
Energy monitoring system	An Irish priority and US provisional patent application	Computer Science and Informatics
Markers of oocyte quality	An European priority patent application	Agriculture, Food Science and Veterinary Medicine with National Maternity Hospital and Merrion Fertility Clinic
Methods of manufacturing photovoltaic electrodes	An Irish priority patent application	Electrical, Electronic and Mechanical Engineering
MSTN polymorphism, MSTN insertion/discovery	An Irish priority patent application	Agriculture, Food Science and Veterinary Medicine
Non-linear magnetophoretic, separation device, system and method	An UK priority patent application	Chemistry and Chemical Biology
Novel biomarkers for cardiovascular disease	An Irish priority patent application	Medicine and Medical Science with Heartbeat Trust and St Vincent's University Hospital
Phenotyping tumourinfiltrating Leukocytes	A US provisional patent application	Biomolecular and Biomedical Science with UCSF
Plasma shutter	An Irish priority patent application	Physics
Protease anti-prion protease	An Irish and European priority patent application	Biomolecular and Biomedical Science

Source: NovaUCD

Supports for entrepreneurs

NovaUCD provided supports to staff that chose to exploit IP by forming a spin-off company. UCD's policy on intellectual property, which has the objective to 'actively support the commercialization of University Intellectual Property', seeks 15% of the 'fully diluted share capital' of campus companies. NovaUCD supported entrepreneurs, campus companies and other knowledge-based ventures in a number of ways. The NovaUCD

Campus Company Development Programme (CCDP), which commenced in 1996, was the main support program run by NovaUCD for academic entrepreneurs spinning-out campus companies. The annual program, which was delivered in association with Enterprise Ireland, offered a mix of monthly workshops, mentoring and one-to-one consultancy. It was delivered by NovaUCD staff, with support from the NovaUCD sponsors and other outside experts. It is designed to assist campus-based academic entrepreneurs in the establishment and development of knowledge-intensive enterprises, by reducing the lead-in time associated with setting-up a business and providing the skills necessary to transform ideas into commercially feasible ventures. Since starting, over 156 ventures and 235 individuals have completed NovaUCD's Campus Company Development Programme.

Promoting a culture of innovation and entrepreneurship among researchers, staff and students

NovaUCD introduced the NovaUCD Innovation Award in 2004 and it arranged a series of events and courses to increase the awareness of related issues among UCD personnel and students. These events, which were aimed at researchers, staff and students, covered aspects of commercialization, including intellectual property identification, protection and exploitation, commercialization and new venture formation. Each year NovaUCD organised over 100 events aimed at increasing 'awareness of intellectual property and other commercial issues and to promote a culture of entrepreneurship and innovation among researchers, students and staff'. NovaUCD also delivered accredited PhD modules in innovation and knowledge transfer.

NovaUCD, with the support of Dún Laoghaire-Rathdown County Enterprise Board, ran an "Entrepreneurs Live!" seminar series. These seminars were targeted at undergraduate and postgraduate students with the aim of promoting a spirit of entrepreneurship among the staff and student population across the University campus. The seminars involve well known entrepreneurs who talk about their experiences of setting up and running their own business, emphasizing the highs and lows on their entrepreneurial journey, and highlighting the lessons they learnt along the way.

NovaUCD and Enterprise Ireland

NovaUCD worked closely with Enterprise Ireland in supporting technology transfer. NovaUCD were involved in a number of organizations at national and international level which were established to develop best practice, standards and recognition for the knowledge transfer profession and to provide a voice for knowledge transfer at national (AURIL Ireland), UK and Ireland (Institute of Knowledge Transfer) and European (ProTon Europe) organisations.

Licensing and spin-offs from UCD/NovaUCD

By 2011, NovaUCD and its predecessor the University Industry Programme assisted over 150 spin-off companies. These included the UCD spin-offs BiancaMed (medical devices), Celtic Catalysts (chiral catalysis), ChangingWorlds (provides intelligent mobile portal solutions), NTERA (develops NanoChromics displays technology) and WBT Systems (provides intelligent learning solutions), which have attracted over €150 million in investment.

The first recorded spin-off from UCD predates any formal supports for technology transfer. In 1966 a Professor in Engineering, Seamus Timoney, started the Timoney Technology Group, a firm that manufactured fire engines and tanks. At the time engaging in such activity was considered as “swimming against the tide”. One of UCD’s most successful licenses to date relates to the development of a BSE (Bovine Spongiform Encephalopathy) or “mad cow disease” test which has earned over €2 million in royalty income for UCD. As noted above, this test was developed following the formation of a joint venture company, Pharmapro Ltd, between a UK firm Proteus Molecular Design Ltd, now called Protherics plc, and UCD in 1993. Pharmapro was established to develop commercial diagnostic tests and vaccines for animal diseases including bovine TB and the then emerging disease, BSE. Professor Mark Rogers, UCD School of Biology and Environmental Science carried out the research related to BSE in UCD. His research led to the development of TSE (Transmissible Spongiform Encephalopathy) diagnostic technology, which was licensed to a small Irish company Enfer Scientific Ltd in 1996. Enfer subsequently developed a rapid test for BSE using this technology. The developed BSE test, which reduced the time for a BSE diagnosis from 14 days to 3.5 hours, was validated by the Irish Government’s Department of Agriculture in 1997. The test became commercially viable in 1999 when the European Commission validated it as one of three tests acceptable for use in the diagnosis of BSE in Europe. Enfer has generated significant jobs, turnover and profits from selling diagnostic BSE test-kits.

University-industry engagement

In addition to core supports for spin-offs, a number of initiatives demonstrate increased industry-interaction within UCD over the past decade. The university reserved a 25-acre facility in the southwest corner of the campus that houses NovaUCD for the Belfield Innovation Park. This provided a site for National Institute for Bioprocessing Research and Training (NIBRT). In 2005 the government approved a proposal from the IDA to fund the establishment of NIBRT at UCD to the value of €72 million over seven years. NIBRT's partners include other Irish universities and institutes of technology (UCD, TCD, DCU and IT Sligo). It is the state's first research and training facility for the biotech sector. In establishing the Institute the government hoped it would meet a shortfall in biotechnology skills in Ireland and attract investment to create a new "biotech cluster". UCD has also been successful in attracting a number of foreign MNEs to locate research groups at the university. For example, in late 2005 Wyeth Corporation announced its subsidiary, Wyeth Research, would establish a bio-therapeutic drug discovery research facility in the UCD Conway Institute of Biomolecular and Biomedical Research. Wyeth Corporation has four existing facilities in Ireland employing over 3,000 people.

Re-organization of NovaUCD

In 2012 innovation activities were re-organized in UCD and a new office, the Office of the Vice-President for Innovation, was established. This resulted in both a re-organisation of innovation activities and a renaming of NovaUCD. NovaUCD was renamed as the Centre for New Ventures and Entrepreneurs, and it became part of the new Office of the Vice-President for Innovation.

The Office of the Vice-President for Innovation was developed to 'enhance the value and quality of UCD's innovation activities in order to achieve the maximum impact for the University, its partners, and for social and economic life in Ireland in the wider world'. The Office of the Vice-President for Innovation is focussed on four innovation themes (Table 7).

Table 7: Office of the Vice-President for Innovation, 2013

Theme	Objective	Activities
1. Inspiring Creative Graduates	Support and enable initiatives to inspire creative graduates	Programmes include the UCD Horizons Programme, the TCD-UCD Innovation Academy, the UCD Campus Company Development Programme and Executive Education and Continuing Professional Development programmes.
2. Putting Knowledge to Work	Promotes initiatives that provide solutions to global problems through problem-driven research	Commercialise the outputs of their research programmes via Technology Transfer team.
3. Partnering with Industry	Promotes the creation and development of business partnerships including the licensing of UCD technology	NexusUCD, the Industry Partnership Centre, manages facilities and provides related supports to enable industry and business to locate on campus in close proximity to the UCD research community.
4. Growing and Supporting New Business	Support new high-tech and knowledge-intensive companies	Centre for New Ventures and Entrepreneurs (NovaUCD).

Source: UCD

5. NovaUCD (The Centre for New Ventures and Entrepreneurs)

As part of a 2012 re-organization of innovation activity, Centre for New Ventures and Entrepreneurs became focused on providing office space and related business supports to entrepreneurs and new ventures. Centre for New Ventures and Entrepreneurs is managed by the UCD Office of the Vice-President for Innovation, which is located at NovaUCD and UCD's technology transfer team is part of this Office.

NovaUCD is UCD's purpose-built facility which supports new ventures and entrepreneurs. At NovaUCD clients are offered a comprehensive business support programme in addition to office space. This programme comprises of advice, seminars and workshops, as well as facilitated access to the NovaUCD network of

researchers, business leaders, and investors. This highly networked environment attracts innovative entrepreneurs, experienced business partners and staff. The NovaUCD facility contains 55 business incubation units (ranging in size from 12m² to 85m²), 14 desk spaces for individuals who are at the early stages of forming a company, and 10 bio-incubation units (ranging in size from 15m² to 64m²).

In 2013 thirty five 'knowledge-intensive' ventures were located in NovaUCD (Table 8). These included direct spin-offs, joint ventures between an external entrepreneur and a university faculty member, and external companies. In 2012 these 35 companies employed over 200 people, raised over €35million (in 2012), and collectively planned to create 300 jobs over the 2 year period 2012 to 2014.

Table 8: Selected client companies in 2013

Company Name	Activity
Aonta Technologies	Provides carrier grade voice conferencing solutions to Conferencing Service Providers and Telcos
AIB Seed Capital Fund	Provides venture capital for companies at the seed and early stages of development
APC	Delivers process solutions and proprietary processing technologies for both small and large molecules.
Berand Neuropharmacology	Identifies and develops novel and effective drugs for use in the treatment of brain illness.
bioMerieux	Tests for clinical decisions in the areas of infectious diseases, cardiovascular emergencies and targeted cancers.
Biosensia	RapiPlex: A Rapid Inexpensive Multiplex Immunoassay platform for universal application at the Point of Care.
Cernam	Specialist digital investigations firm with a focus on online evidence and investigation.
CityHook	A service that shows and compares transport options between the airport and nearby city locations.
Connectors Marketplace	A suite of professional networking tools.
Credit Expo Research	System for measuring and managing credit risk.
Crescent Diagnostics	Developed an osteoporosis screening tool (BQT® - Bone Quality Test). Test identifies the risk of osteoporosis.
DOCOSoft	Document management and workflow software solutions for the global insurance and financial services markets.
Enbio	CoBlast replaces the oxide layer of reactive metals with an application-specific chemically bonded and particulate-free thin surface.
Equinome	Development and provision of novel genetic tests to the bloodstock industry.
HeyStaks Technologies	A solution to optimize knowledge flow and deliver zero-effort collaboration in a world of Big Data.
IncaPlex	Cloud development and implementation: Salesforce and Google App Engine.
Innovios	Innovios is about the smart application of ideas to improve the information flow and performance in organisations.
Ionic Business Systems	Design and build content managed websites and use web technology to create online software.
Life Scientific	Bringing off-patent crop protection products to market.
MuteButton	A novel technology that alleviates the symptoms of Subjective Tinnitus.
OncoMark	Biomarker panels, supporting oncology clinical decisions and drug development.
Q-Validus	A provider of international certification and management services.
RendezVu	Language learning technologies to provide an authentic English practice environment.
ServiceFrame	Software and services that enable the institutionalization of core governance processes.
SmartBuilder Software	Software system for construction, engineering and property management.
Socowave	A commercial-grade active antenna system solution.
Sportora	App connecting sports fans.
Synference	Predictive analytics software.
Talentevo	Employee performance management software.
Tethras	App Translation Service.
VideoCrisp	Cloud-based video editing software.
VoucherPages.ie	Online discount voucher directory.
Wattics	Energy management. Software solution for energy management.

Source: UCD

6. Recent Developments in Support Structures for Commercialization and University-Industry Interactions

Innovation Alliance- UCD and TCD

A recent development in developing commercialization activity was the announcement of an innovation alliance between UCD and TCD. In March 2009, as a response to the economic crises and the Government's call for re-organization within the third level sector, UCD and TCD set out the ambition to 'to develop a world-class ecosystem for innovation that will drive enterprise development and the creation of sustainable high value jobs'¹⁰. TCD Provost Dr. John Hegarty and UCD President Dr. Hugh Brady stated that "this is a time of national crisis. Evidence shows that during recession, innovation thrives. New realities bring with them new opportunities. The Government's Smart Economy framework pinpointed the ingenuity of our people as the way forward for the country. In that context, as institutions with a relevant responsibility, we felt impelled to act and set out how we could advance the nurturing of that ingenuity".

The UCD-TCD Innovation Alliance is described by UCD as the 'pivotal development in innovation' during the period up to 2014. The alliance has three major components:¹¹

1. A joint venture in business development which will involve bringing together technology transfer and enterprise development activities. The objectives set for the Alliance is the development of an enterprise corridor between TCD and UCD, that will be home for up to 300 new enterprises with advanced technology centres to support indigenous industry.
2. The Innovation Academy. The Innovation Academy's mission is: 'the pursuit of fresh ideas and new ventures. Through the creation of a vibrant multi-disciplinary environment the Academy seeks to transform some of the brightest scholars the two institutions have to offer into energetic and resourceful entrepreneurial thinkers.' The Academy straddles the existing campuses, building on areas of combined strength and individual distinctiveness in the two universities. It focuses particularly on 4th level PhD training, positioning innovation centre-stage in courses, facilitating student mobility between campuses,

¹⁰ March 11th 2009, Launch of the TCD UCD Alliance.

¹¹ Strategic Plan to 2014, UCD

and ensuring that the breadth and depth of expertise and resources at UCD and TCD are available to Ireland's future entrepreneurs.

3. A new partnership with government and its agencies and business. This partnership aims to develop Ireland as a 'thriving innovation ecosystem.'

Central Technology Transfer Office

Another recent development in the management of the technology transfer functions in Irish universities is the decision by Enterprise Ireland and the Irish Universities Association to appoint a Director of the Central Technology Transfer Office (CTTO). The new director, due to be appointed in 2013, will work with Enterprise Ireland and the Directors of Technology Transfer and Vice-Presidents for Research of the seven Irish universities. The Director will work to develop systems to support industry-university engagement, through activities such as standardizing IP commercialization policy, commercialization agreements, and IP systems across the universities; work to increase industry engagement with public research by acting as a central contact point for industry looking for IP opportunities from universities; and will engage with Technology Transfer Offices within the universities and monitor the performance of the TTOs.

Conclusion

In terms of its resource profile UCD represents a 'mid-range' university. UCD is a traditional public funded university that has had to cope with many of the resource constraints characteristic of such universities. Yet despite the relative lack of public funded research, the teaching focus of many staff, and the relative absence of incentives for commercialization activity, UCD initiated efforts to begin supporting and encouraging commercialization as early as the mid-1980s. While such efforts may have been peripheral to the activities of most of the university's academics, they represented tangible resource commitments, such as the funding of the TTO and the development of incubation space. Building on these commitments, a strategy emerged that began to encourage commercialization by providing supports for academics interested in engaging in the process. External factors, such as the Irish government's industrial development strategy of attracting inward foreign direct investment and of developing high-technology entrepreneurship, contributed to these efforts by providing

resources to support the development of the TTO and the incubator on campus. The efforts of the TTO to develop commercialization led to a unique public private partnership that funded the building of the current purpose built incubator. This emerging TTO had significant success. In 2004, under the direction of the then newly appointed president, UCD sought to build on its underlying research infrastructure and the TTO and NovaUCD, and develop innovation as the 3rd pillar of UCD's core mission.