

# COMMERCIALISATION ACTIVITY AND THE EMERGENCE OF A UNIVERSITY INCUBATOR IN A PUBLIC UNIVERSITY IN IRELAND

by *Colm O’Gorman\**

## 1. Introduction

The creation and exploitation of knowledge is an important determinant of regional economic performance (Audretsch and Lehmann, 2005; Audretsch, 1995). Scientists and researchers in public research institutes (PRIs) such as universities are important creators of knowledge. For the economic benefit of this knowledge to be realised, the knowledge must spill-over. Knowledge flows from universities in a number of ways, such as licensing activity and spin-offs (Rothaermel and Thursby, 2005). While scientists who develop new knowledge may choose to appropriate the returns via entrepreneurship, most universities report very low levels of commercialisation via entrepreneurship (O’Shea et al., 2005). Low levels of commercialisation activity have been explained in terms of attributes of the scientist; the resources of the university, and in particular the nature and level of the research funding and the research intensity of faculty; university reward systems; university culture; and attributes of the local region in which the university is located, such as the local demand opportunities and the availability of venture capital (O’Gorman, et al., 2008; O’Shea et al., 2004).

To encourage scientists to consider commercialisation and to support them through the process many universities offer scientists incubation facilities and associated incubation services. A key rationale for developing technological incubators that are closely linked to universities is that they ‘make it easier for academic personnel to exploit knowledge-based business ideas, thus lowering the barriers that inhibit direct commercial application of the results of university research’ (Colombo and Delmastro, 2002:

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1105). While there is ample evidence to demonstrate that there is significant variation in the use of, and perceived value of, supports offered by incubators (Main, 1996), prior research has suggested that incubators can play a critical role in helping firms overcome gaps in knowledge, competencies and resources (Rice, 2002).

Extant research that explores commercialization activity within universities has tended to focus on high performing and exemplar cases, such as, for example, MIT and Cambridge. In this paper we explore the emergence of organizational structures and forms, including the emergence of a university based incubator, in a public university not characterized by the resources typically considered essential to high levels of commercialization and spin-off activity. In our case study we examine a wide range of factors such as resources, institutional mission, policies and procedures to support commercialization, in addition to factors external to the university such as industrial development policies and practices within the region. In addition we describe the forces that shaped the development of the university’s TTO function and its incubation facilities.

The paper is structured as follows. In the next section we briefly describe how we collected the data. In section 3 we profile UCD in terms of (i) the history and mission of UCD, (ii) the resources and capabilities of UCD in terms of research funding and staff expertise, and (iii) the attitudes of academics in UCD and Ireland to commercialisation activity. In section 4 we describe the emergence of the TTO and the incubation facilities in UCD, the current activities of the TTO and some recent developments in UCD in terms of commercialization activity. In section 5 we describe the policy context in Ireland. We conclude with implications of our case study for policy and practice.

## **2. Research method**

Our research is based on a single case study of a public university. The university is University College Dublin (UCD), which is located in Dublin, Ireland. UCD is described below. In designing our case study we identified a number of key issues around which to structure data collection. Specifically we sought to explore the history and mission of the university; the resources and capabilities of the university, and the attitudes of academic staff to commercialisation activity; the emergence of a Technology Transfer Office/Function/UIP; current supports for commercialisation provided by the TTO/incubator; the emerging support structures for commercialisation in the university; and the external policy context, with a particular emphasis on national industrial policy, the regional innovation environment, and supports for entrepreneurs. We collected data primarily through sec-

ondary sources, published archived documents, and in-depth interviews with key actors within the incubator, the university, and the external environment to the university, and in particular, the public policy sphere.

### **3. University College Dublin**

#### *3.1 UCD: History and Mission*

UCD is the largest of three public universities located in Dublin, the capital city of Ireland. UCD was founded in 1854, by John Henry Cardinal 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 over 22,000. However, like many public universities, a number of external constraints limited UCD's development. External reviews of UCD were conducted in the 1980s and 1990s (for example 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). These reviews 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 underinvestment 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 will show below, despite these constraints, the TTO and ILO functions emerged in UCD in the early 1980s.

Efforts at developing commercialisation activity and university-industry interactions have been intensified in recent years in UCD. Recently the university has begun a major reorganisation and restructuring following the appointment of Dr Hugh Brady, a former Professor of Harvard Medical School, as President in 2004. The current president of the university has led a major restructuring and refocusing of the university. The reorganisation of 11 faculties and over 90 departments into a smaller number of colleges (5) and schools (35) seeks to exploit new directions in research and possibilities for increasing the research income earned by the university. UCD is currently structured into five colleges: College of Art & Celtic Studies; College of Business and Law; College of Engineering, Mathematical & Physical Sciences; College of Human Sciences; and College of Life Sciences. UCD has 1,000 academic staff.

Under the direction of the new president, the university has 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 has recognized that the role the university plays in economic development in Ireland. In the university’s strategic plan the goals of UCD are ‘the creation, preservation, interpretation and dissemination of knowledge’. The plan specifically states that ‘there is also an obligation to transfer and apply that knowledge for the betterment of society, whether economically, socially or culturally’. The plan states: ‘UCD is committed to knowledge transfer in all areas of research and scholarship’ and sets specific objectives such as: to align UCD’s research programmes with Ireland’s social, cultural and economic objectives; to realize the full value of research programmes; and to engender an entrepreneurial culture.

Listed as means to achieving these objectives are: enhancing knowledge transfer through NovaUCD; initiating a knowledge management programme; identifying and protecting UCD’s intellectual property; training staff in knowledge transfer and entrepreneurship; and commercializing UCD’s intellectual property through licensing and spin-off 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 summarised his thinking as follows (Brady, 2004):

*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.*

### *3.2 UCD- Resources and Capabilities*

UCD now comprises five colleges, two of which relate to the areas of science and engineering: College of Engineering, Mathematical & Physical Science and the College of Life Sciences, and a number of new research institutes, principal amongst these the UCD Conway Institute of Biomolecular and Biomedical Research. In terms of staff numbers the College of Engineering, Mathematical & Physical Science comprises approximately two hundred academic staff and fifty technical staff. The College of Life Sciences comprises 750 academic staff, including the staff in the UCD Conway Institute. UCD Conway also has associated teams of approximately 300 postgraduate students and 150 postdoctoral fellows. Specifically, the College of Life Sciences comprises seven schools: Architecture, Landscape and Civil Engineering; Chemical and Bioprocess Engineering; Computer Science and Informatics; Electrical; Electronic and Mechanical Engineering; Geological Sciences; Mathematical Sciences and the School of Physics.

In terms of the research capacity and performance of staff, internationally recognized research experts. For example, UCD Conway Institute investigators have in recent years published over 430 articles in peer reviewed journals and were awarded a total of €31 million in peer reviewed grant income. Between 2003 and 2005, a total of seven patents were filed and three licensing agreements were negotiated by Conway Institute investigators and six campus companies were established. 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 programmes, and differing strategic priorities and policies within various units in the university have resulted in unequal research capacity and performance across the university.

In absolute terms the level of external research income generated by the university has been low. More recently, there has been a significant increase

in income and in terms of proposals to raise income (Table 1). Current research income (2005) in UCD is approximately €80 million. To put this in context, about twenty years ago (1985) UCD raised approximately €4 million of external research funding, 85% of which was from state, EU or other international bodies and 15% 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 dominant source of funding is Science Foundation Ireland (Table 2).

Tab. 1 - Research awards in UCD, 2002-2005

Year (Oct. to Sept.)	Total value of contracts signed incl. indirect costs	Total indirect costs (€ million)	Income (annualized) (€ million)	Total number of contracts awarded	Number of proposals submitted
2002/03	45.8	4.5	32.3	384	584
2003/04	49.8	5.6	45.6	405	685
2004/05	62.5	8.1	54.1	495	1,074

Tab. 2 - Funding sources 2004 and 2005

Funding Source	Number of contracts	Value (€ million)
Science Foundation Ireland	156	50.6
Other Irish Funding Organizations	281	21.9
- Health Research Board	- 91	
- IRCSET	- 79	
- IRCHSS	- 24	
- Food Safety Promotions Board	- 10	
- Heritage Council	- 10	
- Others	- 67	
Enterprise Ireland	84	6.8
European Commission	66	10.8

### 3.3 Attitudes to commercialisation 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 activity (Jones-Evans, 1998). The survey was 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; the survey response rate was 43%. While no direct measure of attitudes within UCD academic staff towards commercialisation activity is available, a survey (from 1998 as part of an EU funded study of commercialisation) relating to academics in Ireland, including UCD, suggests that in terms of attitudes of academics towards their host institution support for academic entrepreneurship activity, 58% reported their university as 'supportive', 33% as 'no effect', and 10% as a 'hindrance'. There was a very high level of awareness of industrial liaison office (71%), while 22% reported having used an ILO in developing external links. A significant number, 58%, 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 3). This survey suggested the conditions for broadly defined academic entrepreneurship were favorable in that 63% of respondents had prior fulltime work experience in industry; while 35% reported having prior small business experience; 36% reported that immediate family members who own/have owned a small business; 15% reported having started or owned a business; and 9% reported other entrepreneurial experience. In terms of direct contact with industry in the previous five years, 28% reported 'no direct industry contact', 52% reported that they had approached an industrial organization, while 56% reported that they had been approached by an industrial organization.

*Tab. 3 - Commercialisation activity among Irish academics (% of all academics that performed the activity)*

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

*Source. TSER Report 1998.*

## 4. The Emergence of a Technology Transfer Office<sup>1</sup>

### 4.1 NovaUCD

The technology transfer function and the provision of incubation space and supports for academic researchers and entrepreneurs in UCD is organised under NovaUCD, the Innovation and Technology Transfer Centre. NovaUCD is located on a three acre site in UCD’s Belfield Innovation Park, some 4 km from Dublin city centre. Formerly this technology transfer and incubation activities of UCD were organized under the University Industry Programme (UIP), with two separate physical locations: the University Industry Centre and the Campus Innovation Centre (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 business men 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), 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 E. Galvin, Operations Manager, Guinness Group plc). The objectives set for the University Industry Programme in 1988 were as follows: (i) the promotion of research and development projects with UCD in co-

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<sup>1</sup> NovaUCD contact details: NovaUCD, Belfield Innovation Park, University College Dublin, Belfield, Dublin 4, Ireland. Tel: 00-353-1-716 3707, fax: 00-353-1-716 3709, e-mail: nova@ucd.ie, web: www.ucd.ie/nova



operation with, and funded by, Irish industry; (ii) the organisation within UCD of a structured approach towards the provision of advanced training and continuing professional education to meet the needs of Irish industry; (iii) to become the principal venue in Dublin for high-tech and industrially oriented meetings, exhibitions and conferences; (iv) to become involved in what was described as 'the potentially lucrative spin-offs from research through licensing and patenting'; and (v) to improve communications between academics and industry, including the establishment of research centres 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. The aim of the CIC was to provide an environment that facilitated the start-up and development of knowledge-based industrial enterprises utilising 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 must be new knowledge-intensive companies or spin-offs from the research and development departments of established companies wishing to develop and commercialise new innovative products and services. Firms locating in the incubator should 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 to locate 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; the provision of techno-economic consultancy services.

Academic spin-offs were encouraged by the IDA, 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 compa-

nies 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-outs. The UIP supported a small number of these companies (or spin-outs) 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 (now part of the UCD School of Biology and Environmental Science). 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. To date this licensing arrangement has generated almost €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; the first delivery of an education programme by satellite). By 1993 continuing professional education programmes 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, was a nine-month programme involving one four hour workshop each month (a Business Innovation Centre is a support organization, public or private, for innovative small and medium sized businesses (SMEs) and entrepreneurs). 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 programme. There was also an awards ceremony at the end of programme at which the businesses which made most progress during the course of the programme were awarded 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 3-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). This committee considered the role the UIP could play, looking at international models in other universities and industry, surveying the companies in the CIC and external companies, and surveying academics within the university, and 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 programmes in Health & Safety and Sports Management and other multi-disciplinary courses out of the UIP (and therefore the many 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.

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 (i) technology transfer (identifying, protecting, and exploiting IP created in the university); (ii) continuing professional development focussed on innovation and technology transfer (the provision of short courses to industry and internal courses to UCD staff); (iii) liaison with industry (for example, identifying specific industry research linkages); and (iv) enterprise (supporting the development of entrepreneurship and campus-based ventures).

An implementation plan was developed, and by October 2001, the plan had been implemented, 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 (the ILO) raised funds from Enterprise Ireland 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% of the €10 million raised to develop the first two phases (3,750 m<sup>2</sup>) of a planned 8,000 m<sup>2</sup> 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 programmes 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 refur-

bishment of the main part of Merville House (consisting of 900sq.m). Phase III(a), 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.

#### *4.2 NovaUCD: Supporting Commercialisation at UCD*

Dr Pat Frain, Director of NovaUCD now leads a team of eight professional staff with expertise and experience in technology transfer, new venture formation, communications and continuing professional development. In addition funding has been received from Enterprise Ireland to fund the appointment of five additional staff to support Technology Transfer. A further four staff are employed in a support capacity. NovaUCD contains 42 incubation units ranging in size from 15m<sup>2</sup> to 64m<sup>2</sup>. It also contains 14 desk spaces for individuals, who are at the early stages of forming a company, to undertake feasibility studies and 340m<sup>2</sup> of bioincubation space to accommodate 4-6 biotechnology companies.

NovaUCD promotes innovation and technology transfer by: (i) identifying, protecting and exploiting intellectual property arising from UCD research; (ii) supporting entrepreneurs, campus companies and other knowledge-based ventures; (iii) promoting a culture of innovation and entrepreneurship among researchers, staff and students at UCD; and (iv) promoting contract research and other forms of university-industry co-operation.

##### *Protecting and exploiting IPR*

NovaUCD has adopted a structured approach to ensure that intellectual property is 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 can provide appropriate assistance to the researchers at different stages of the research projects. Specific activities include 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 form; due diligence on invention disclosures; undertaking searches of patent databases in association with creator of intellectual property; and the preparation of patent filings in association with patent agents.

NovaUCD works with researchers to identify and develop the most appropriate business model for commercialisation of the intellectual property. This may involve licensing to commercial partners or the creation of a

spin-off company. A number of different services form 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 determines that an invention could potentially be exploited, a NovaUCD technology transfer professional will be assigned to the project. The technology transfer professional will contact prospective licensees with a non-confidential description of the invention. A prospective licensee who wants further information about the invention may 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, working prototype, etc. In addition, the strategy for commercialisation may or may not involve seeking patent protection and licensing patent rights.

However, Dr Pat Frain suggested that successfully negotiating technology transfer is challenging. 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 licence 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, the numbers have doubled over the last number of years. For example, in 2006 37 invention disclosures were submitted to NovaUCD, compared to less than 15 in 2003. In terms of patent activity, fifteen priority patent applications were filed by UCD in 2006 across all areas of life sciences, engineering and information communication technology (Table 4). In terms of licensing activity, UCD is currently recording the highest earnings from licensing income of the nine universities in Ireland. NovaUCD is responsible for the implementation of the UCD Intellectual Property (IP) policy and supporting the development of a strong pipeline of intellectual property.

*Tab. 4 - Priority patent applications 2006*

Title	UCD School
A meta search engine	Computer Science and Informatics
A microwavable cheese product	Agriculture, Food Science and Veterinary Medicine

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A search engine and method	Computer Science and Informatics
Association routing table for multi-homed point-to-point communication	Computer Science and Informatics
Compositions and methods for modulating an immune response	Biomolecular and Biomedical Science
Compositions for treating prion disease	Biomolecular and Biomedical Science
Methods and compositions for identifying and using p21 regulated proteins	Biomolecular and Biomedical Science
Methods and products for diagnosing progression of melanoma	Biomolecular and Biomedical Science
PAPR reduction technique of OFDM signals	Electrical, Electronic and Mechanical Engineering
Semliki forest replicating vector	Agriculture, Food Science and Veterinary Medicine
Sensor for use in surface plasmon resonance measurements	Physics
Spatial sampling grid recovery	Computer Science and Informatics
Spread spectrum stimulation for rapid estimation of a visual evoked potential	Electrical, Electronic and Mechanical Engineering
Titanocene C	Chemistry and Chemical Biology
Wearable optical posture sensor	Physiotherapy and Performance Science

Source. NovaUCD

### *Supports for entrepreneurs*

UCD staff can choose to exploit IP by forming a spin-off company. In such circumstances UCD takes a 15% stake in the spin-off company. NovaUCD supports entrepreneurs, campus companies and other knowledge-based ventures in a number of ways. The NovaUCD Campus Company Development Programme (CCDP), which commenced in 1996, is the main support programme run by NovaUCD for academic entrepreneurs who are spinning-out campus companies. This annual programme, which in 2005 and 2006 was delivered in association with BT, the leading UK Telecommunications Company, and Enterprise Ireland, offers a mix of monthly workshops, mentoring and one-to-one consultancy. It is 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. In the last eleven years more than 125 projects and 175 individuals have completed the NovaUCD CCDP.

Since January 2004 NovaUCD has been a partner organization in the M50 Enterprise Programme. This Programme targets graduates with com-

mercial experience who wish to leave full-time employment to starting a high potential, knowledge-intensive businesses. The Programme provides training, business coaching and mentoring, incubation facilities, networking, peer-learning opportunities and financial support to entrepreneurs over a 12-month period. By joining the Programme, NovaUCD provides participants another choice of location and access to its services. NovaUCD's partners in the Programme are the Institute of Technology Blanchardstown, the Institute of Technology Tallaght, Dublin City University and Enterprise Ireland.

For entrepreneurs in the ICT sector NovaUCD and Select Strategies created and ran a programme for ICT entrepreneurs, 'Executive Entrepreneur'. The objective of this programme was to allow ICT entrepreneurs test the commercial potential of their ideas before taking them to market. The Programme is a practical, hands-on, 3-day Programme that provides a framework for participants to assess and validate early stage business ideas.

In 2006 twenty-two companies were located in NovaUCD (Table 5). These included direct spin-offs, joint ventures between an external entrepreneur and a university faculty member, and external companies (over half of the twenty two companies). Since the mid 1990s, NovaUCD and its predecessor, the University Industry Programme, have supported over one hundred knowledge-based companies including the UCD spin-outs 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.

*Tab. 5 - NovaUCD client companies in 2006*

Company Name	Activity
Aonta Technologies	Taking advantage of new technological advances to create innovative rich media conferencing solutions for the global enterprise and service provider market place
Berand	Develops novel neurotherapeutics for the treatment of neurological and psychiatric disease and provides specialist consultancy services to the pharmaceutical and biotechnology industries
BiancaMed	Medical technology company
Bioscientific Diagnostics	Contract research organisation to the drug development industry
Biosystems Engineering	Research focused engineering company
Broadcast Learning	Software solutions company specialising in e-Assessment and e-Learning solutions
Celtic Catalysts	A life-sciences and process optimisation company which is focused on the niche area of chiral catalysis
ChangingWorlds	Mobile software company which provides personalisation and mobile portal solutions for mobile network operators

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Duolog Technologies	Supplier of intellectual property, verification and design services in software and integrated circuit technologies
Enzolve Technologies	Commercialises novel enzyme products particularly in the area of protein engineering
Eventznet	Software development company which develops and markets software for event management and marketing
gsmExchange.com	An online trading platform for the GSM and telecommunications industry
HomeInstead Senior Care	Provides comprehensive home care services for the elderly
Ionic	Develops web-based products that are sold as services through multiple sales channels
Intelligent Health Systems	Healthcare technology research, consultancy and training company
Java Clinical Research	Full service contract research company which provides a full clinical trial service to the pharmaceutical, biotechnology and medical device industries
Lightwave Technologies	Environmental technology company
Madingley	A mobile technology company that develops unique solutions for operators of mobile data services
Neosera Systems	Focused on developing innovative solutions for the verification of silicon chips in the microelectronics design market
Novus Financial and Management Solutions	Financial services management and consultancy company
Q-Validus	An international certification services and product company
Visor	Information technology and management information system solutions company

Source. NovaUCD

### *Promoting a culture of innovation and entrepreneurship*

NovaUCD introduced the NovaUCD Innovation Award in 2004 and has arranged a series of events and courses to increase the awareness of related issues among UCD personnel and students. Since 2003, over 360 events have been arranged by NovaUCD to increase awareness of innovation, technology transfer and entrepreneurship. These events, which are aimed at researchers, staff and students, cover aspects of commercialisation including intellectual property identification, protection and exploitation, commercialisation and new venture formation. During 2006 NovaUCD with the support of Dún Laoghaire-Rathdown County Enterprise Board ran thirteen seminars in the “Entrepreneurs Live!” seminars series. The seminars are 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, emphasising the highs and lows on their entrepreneurial journey, and highlighting the lessons they learnt along the way.

### *NovaUCD and Enterprise Ireland*

NovaUCD works closely with Enterprise Ireland in supporting technol-



ogy transfer. Two Enterprise Ireland Commercialisation Specialists work on a day-to-day basis as part of the NovaUCD team. NovaUCD is also involved in a number of organizations at national and international levels 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) levels.

#### *Licensing and Spin-offs from UCD Dublin/NovaUCD*

NovaUCD and its predecessor the University Industry Programme has assisted over 150 spin-off companies. However the first 'recorded' spin-off from UCD Dublin 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'.

For example, UCD's most successful license to date has related to the development of a BSE (*Bovine Spongiform Encephalopathy*) or 'mad cow disease' test which has earned almost €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.

#### *4.3 Recent Developments in UCD*

UCD encourages the commercialisation of research through the Vice-President for Innovation and Corporate Partnership, through encouraging research through the Office of Funded Research Support Services (OFRSS) and through its intellectual property policy. In addition to new structures, new policies have been adopted within UCD to encourage and reward research activity, the winning of research grants, etc. For example, new pro-

cedures were introduced to recognise research excellence in the promotion system with the university. This included an explicit recognition of commercialisation and patenting activity as demonstration of an academics research performance.

#### *Office of Funded Research Support Services (OFRSS)*

The Office of Funded Research Support Services deals with all pre- and post award functions relating to Externally-Funded Contract Research, assisting the members of the academic staff to source external funding opportunities, prepare proposals and manage contracts. The Office is responsible for the implementation of UCD's policy on Externally-Funded Contract Research, including financial controls, budget systems and indirect costs. The Office also administers UCD's President's Research Fellowships Scheme and is integrally involved in the policy and procedures relating to Research Ethics.

More specifically the OFRSS carries out the following: sourcing funding opportunities and alerting researchers to these opportunities (including dedicated search); providing information, assistance and advice in the preparation of proposals, including partner search and set-up of consortia; providing support and advice throughout contract negotiation and duration of contract; providing financial advice from proposal costing stage through contract negotiation, set-up of budgets and accounts, through contract life cycle, including assistance with the preparation of cost statements and final reports; and organizing periodic briefings, presentations and training courses.

#### *Intellectual Property Policy*

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 policy, 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 NOVA (Table 6).

Tab. 6 - IP policy in UCD

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

### *Industry Interaction*

Some recent examples of industry interaction are described below.

*The Belfield Innovation Park.* UCD has reserved a 25-acre facility in the southwest corner of the campus that currently houses NovaUCD. Belfield Innovation Park will provide a site for the recently funded National Institute for Bioprocessing Research and Trai.

*National Institute for Bioprocessing, Research and Training (NIBRT).* During 2005 the Government approved a proposal from the IDA to fund the establishment of the NIBRT at UCD to the value of €72 million over seven years. NIBRT will be located in the Belfield Innovation Park beside NovaUCD. NIBRT's partners include other Irish universities and institutes of technology (UCD, TCD, DCU and IT Sligo). NIBRT will be the State's first research and training facility for the biotech sector. In establishing the Institute the Government hopes that it will meet a shortfall in biotechnology skills in Ireland and attract investment to create a new 'biotech cluster'.

The university has successfully attracted a number of foreign MNEs to locate research groups at UCD Dublin. 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. The €13 million facility will employ twelve scientists. Wyeth Corporation has four existing facilities in Ireland employing over 3,000 people.

*Sigmoid Biotechnologies.* In October 2005 Science Foundation Ireland announced an Industry Research Supplement grant to Dr Cormac Taylor of UCD's Conway Institute of Biomolecular and Biomedical Research. The two-year grant is to facilitate research conducted in Dr Taylor's laboratory in association with Sigmoid Biotechnologies, to develop an enhanced drug delivery system. Dublin-based Sigmoid Bio-

technologies is developing a novel drug delivery technology, LEDDS, which the objective of improving the effectiveness, safety and convenience of existing drugs and enhance next-generation drug development.

*The Applied Neurotherapeutics Research Group (ANRG).* In 2004 Science Foundation Ireland announced the awarding of €7.7 million to UCD’s Conway Institute of Biomolecular and Biomedical Research to fund research into brain diseases, including schizophrenia, depression and Alzheimer’s, involving a cluster of researchers from the Conway Institute, Trinity College Dublin and Wyeth Research. This cluster of researchers, the Applied Neurotherapeutics Research Group (ANRG), is led by UCD’s Professor Ciaran Regan.

## 5. The National Policy Context

The development of commercialisation activity in UCD occurred in the context of a broader industrial policy agenda pursued by the Irish government. Ireland, and in particular Dublin, has experienced rapid economic growth and development in the past decade. This period of rapid growth has led to Ireland been 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% 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: (i) human resource development, including the expansion of the higher education, (ii) physical infrastructure, and (iii) production and investment aids to the private sector.

Inward FDI played an important role. 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 1,025 foreign companies with facilities in Ireland, 489 (48%) are American. Of the 127,578 people employed by foreign companies, 89,158 (70%) work for American companies. Of the US\$68 billion in 2003 sales revenue from exports by Irish subsidiaries, 75 percent came from American companies. Reviewing the effectiveness of policies aimed at attracting FDI, Murphy and Ruane (2004) 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, industry policy in Ireland since the 1980s has focussed very selectively on supporting and encouraging indigenous firms and entrepreneurs that would 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 were 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 focussed on product development and exporting. These firms are centred round Dublin city. The evolution of the software sector was an important development 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 recognised 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 focussed 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 policy. There was little explicit attempt 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 in Universities, Institutes of Technology and in industry; a lack of research and technology absorption capabilities by companies and weak commercialisation structures; a lack of funding for research within Universities and Institutes of Technology.

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 industry 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 programme that supported the building of new incubators in the third level sector, and of directly supporting commercialisation activity through a number of programmes. Specifically a number of new institutions were developed in the 1990s to support research and commercialisation activity. In addition, some existing state bodies such as Enterprise Ireland focused some of their resources at developing and supporting commercialisation activity. Some of these initiatives and institutions are described below.

*Advisory Council for Science, Technology and Innovation.*

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. The ACSTI serves as the primary interface between policy makers and industry and universities and others involved in the STI arena. The ACSTI’s 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*

The Programme for Research in Third-Level Institutions (PRTLTI) was launched in 1998. The stated objective of the programme is to pro-

vide 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. For the period 2000 to 2006 over six hundred million euros was allocated to third level institutions. Four hundred million was allocated to buildings and equipment, while two hundred million was allocated to research programmes and staff. Over 850 researchers have been funded through the PRTLTI programme, 550 post-graduate researchers and 300 post-doctoral researchers.

#### *Science Foundation Ireland*

Science Foundation Ireland (SFI) provides awards to support scientists and engineers working in biotechnology and information and communications technology development. SFI began with an intensive study commissioned by the Irish government in 1998. Representatives from government, academia, and industry assessed industrial sectors in the Irish economy. They 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, the SFI Principal Investigator. 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.

#### *Enterprise Ireland*

The Irish Government provides supports to entrepreneurs through a number of separate agencies and programmes. Two are of particular importance to the emergence of knowledge based new enterprises and university spin-offs. These are Enterprise Ireland and the CORD programme. In addition academic spin-outs often benefit from the Business Expansion Scheme,

a tax based incentive for individuals for risk capital investments 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 commercialisation of research from third level educational institutions. Its activities include the funding the development of incubators; promoting and stimulating early stage equity investments by venture funds and private business angels; co-funding programmes such as CORD, that aim to support scientists in their commercialisation 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 seventy ‘high potential’ start-ups each year, approximately 10% of which would be new businesses originating in third level educational institutions.

Commercialisation of Research and Development (CORD) grants assist academics to bring a new product idea or business venture from a third-level educational institution to market. To receive a CORD grant the academic must demonstrate that their business idea is (a) an innovative technology or a unique application of an existing technology, and (b) that the business will be an internationally traded service that can be developed into a ‘High Potential Start Up’. Funding can be used to support salaries and activities such as market research, product trials, developing links with potential strategic partners. Maximum funding available is fifty percent of eligible costs, to a maximum of €38,000.

Enterprise Ireland has played an active role in the development of the venture capital industry in Ireland. The venture capital industry in Ireland emerged in the 1990s, reflecting the emergence of investment opportunities as new technology based firms, principally software firms, emerged during the 1990s. Starting in the 1990s the state development agency Enterprise Ireland has increased the flow of venture capital into new ventures by co-financing new venture capital funds. The industry invested €72m in 2003 (€89m in 2002) in venture capital funds in 140 separate firms.

## 6. Discussion and Conclusion

In this paper we sought to explore how commercialisation activity, and the organizational structures that support commercialisation activity, can emerge in a public university. Most public universities face resource constraints and lack experience of commercialisation activity. Despite these constraints the UCD case is characterised by many efforts at commercialisation activity over a long period of time. The UCD case demonstrates



how over a period of twenty years, the TTO and ILO functions and commercialisation 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 commercialisation.

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 commercialisation activity, UCD initiated efforts to begin supporting and encouraging commercialisation 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 commercialisation by providing supports for academics interested in engaging in the process. External factors such as the Irish government's industrial development strategy of developing high technology entrepreneurship contributed to these efforts by providing resources to support the development of the incubator on campus. The efforts of the TTO to develop commercialisation led to a unique public private partnership that funded the building of the current purpose built incubator. More recently, the university, under the direction of a new president, has sought to build the underlying research infrastructure within the university that will potentially provide the flow of commercialisation opportunities that may characterize the university going forward.

The UCD case also highlights that the commercialisation activities of the university can only be fully understood in the context of the broader regional environment. In the case of UCD, the industrial development policy of the Irish government is critical to understanding the initiatives undertaken within the UCD organisational context. The industrial development policies aimed at encouraging the commercialisation of university research were embedded within a broader industrial development strategy associated with both attracting inward FDI and developing indigenous entrepreneurial activity in emerging sectors

The case also illustrates how a new president in a traditional public university has sought to emphasise the contribution the university makes to economic development. This activity appears to have been part of a agenda to of a significant restructuring of the university and the adoption of policies that seek to maximise research activity, in particular in emerging sectors such as bio-technology and ICT, to develop external linkages with industry, and to promote commercialisation.

In conclusion, the case emphasises (I) how a public university has sought to encourage commercialisation activity and the organisation struc-

tures developed to support commercialisation; (II) how, over a period of twenty years, the TTO and ILO functions and commercialisation activity evolved in the absence of what might be considered many of the university attributes, such as high levels of funded research and ‘star-faculty’ associated with high levels of commercialisation; (III) how policies aimed at encouraging the commercialisation of university research can be imbedded within a broader industrial development strategy associated with both attracting inward FDI and developing indigenous entrepreneurial activity in emerging sectors; and (IV) how a new president in a traditional public university has sought to emphasise 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 maximise research activity, in particular in emerging sectors such a biotechnology, to develop external linkages with industry, and to promote commercialisation.

The implications of this case for policy makers are that commercialisation activity can be promoted and stimulated in public universities which lack resources and have not traditionally focussed on such activity. However, it is likely that attempts to emulate the most successful universities- the exemplars traditionally described in research- will fail, as the path dependent processes that have lead to the development of significant resources (e.g. levels of research funding, expertise of university faculty, supporting local industry) cannot be easily emulated. As such, those policy makers and leaders within universities interested in promoting commercialisation activity within a local or regional university will need develop commercialisation activity in the context of the resources of the university and of the local regional context.

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## Riassunto

Il presente articolo analizza l’emergere di strutture e forme organizzative (inclusa la creazione di un incubatore) all’interno di un’università pubblica non dotata delle risorse considerate in genere essenziali per livelli elevati di commercializzazione e di attività di spin-off.

La ricerca presentata rappresenta lo studio di un caso singolo di un’università pubblica “tradizionale” che deve affrontare i vincoli di risorse tipici di tali università. Nonostante la relativa carenza di ricerca finanziata dal settore pubblico, la maggiore focalizzazione del personale accademico sulle attività didattiche e la relativa assenza di incentivi per l’attività di commercializzazione, nella metà degli anni ’80 l’Università ha iniziato a sostenere e incoraggiare la commercializzazione. Il presente articolo illustra il modo in cui l’università ha incoraggiato l’attività di commercializzazione e la creazione di strutture organizzative atte a sostenerla, e il modo in cui l’incubatore/TTO è emerso nel corso degli ultimi venti anni.

Il presente articolo offre un importante contributo per la comprensione dei processi dipendenti dal percorso seguito, associati a politiche ed attività di commercializzazione.

## Abstract

We explore the emergence of organizational structures and forms, including the emergence of an incubator, in a public university not characterized by the resources typically considered essential for high levels of commercialization and spin-off activity.

Our research is a single case study of a ‘traditional’ public funded university that has had to cope with many of the resource constraints characteristic of such universities. Despite the relative lack of public funded research, the teaching focus of many staff, and the relative absence of incentives for commercialization activity, the university initiated efforts to begin supporting and encouraging commercialisation as early as the mid 1980s. The paper illustrates how the university encouraged commercialisation activity and the organisation structures developed to support commercialisation; and how the TTO/incubator emerged over a period of twenty years. The paper makes an important contribution to our understanding of the path dependent processes associated with commercialization policies and activity.

**Classificazione Jel:** L 30.

**Parole chiave (Key Words):** Incubatori tecnologici, Università pubbliche, Spin - offs universitari (Technological incubators, Public Universities, Universities Spin - offs).