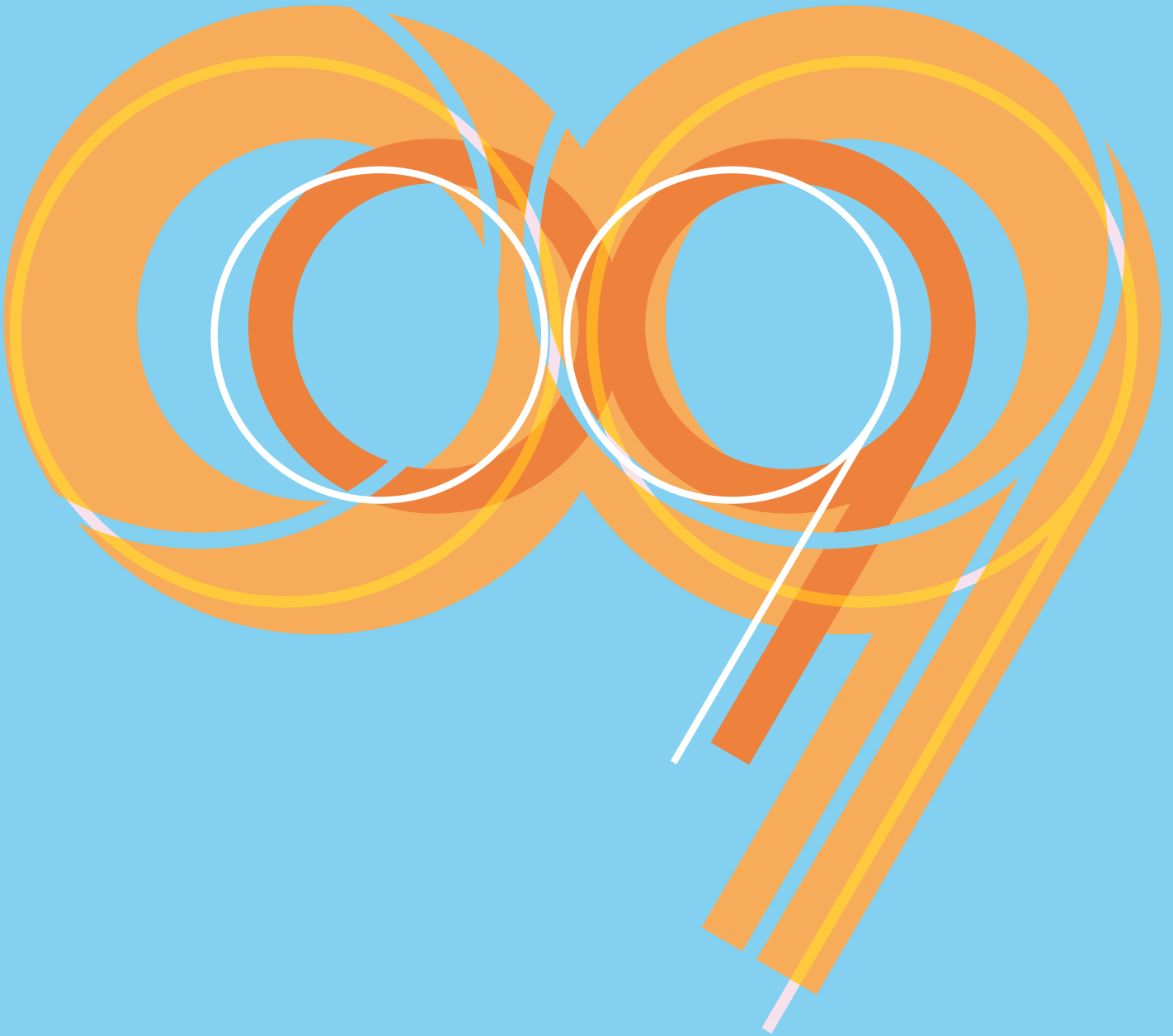




Institutes of Technology Ireland

# IOT Research and Innovation Yearbook 2009





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# Foreword by Conor Lenihan, T.D., Minister for Science, Technology and Innovation

This Research and Innovation Yearbook, published by the Institutes of Technology is a comprehensive summary of the remarkable strides in research and innovation that have been made by the Institutes of Technology in a relatively short number of years.

As Minister for Science, Technology and Innovation, I am delighted to see how Government investment through State Agencies such as HEA, Enterprise Ireland and SFI as well as European investment is being utilised to support economic and social growth in all of Ireland's regions. I would like to acknowledge the outputs that the Institutes of Technology are delivering for this investment. These include the Masters and PhD students who will contribute to the future growth of our society and economy, the industry/academic relationships which are delivering new ideas and innovation to drive economic growth, patents, licences, spin-out and spin-in companies which are providing a direct return to the regions in which they are based. I would also like to acknowledge the effectiveness of the Institutes of Technology in working together in presenting a coherent statement of their research and innovation.

The Institutes of Technology have recognised that the Government's investment in research and innovation must translate into social and economic benefits for us all. Some of these benefits will be delivered in the long-term, but some must also respond to the challenging times in which we currently live. It is a significant challenge, but one that I believe the Institutes of Technology are working to address. I encourage and wish them well in their continued efforts and look forward to watching their future development.



**Conor Lenihan, T.D.**

*Minister for Science, Technology and Innovation*

# Foreword by Michael Carmody, Chairperson, Institutes of Technology Ireland

Ireland is currently in the midst of significant economic challenges. The Government's strategy for medium-term economic recovery is focused on the development of a smart economy that will support our future enterprise development. The Institute of Technology (IOT) sector has a critical role to play in Ireland's economic recovery and is perfectly positioned to fully contribute to the establishment of Ireland as an 'Innovation Island'. Over the past few years the Government has increased its investment in research, innovation and commercialisation. It is clear that these investments in research in the IOT sector are delivering results that are essential for the future sustainable growth of the economy. Recent Government funding for collaborative Applied Research Enhancement (ARE) Centres and incubator facilities has resulted in development of a research, innovation and commercialisation ecosystem within the IOT sector.

Since 2004, the IOT sector has significantly increased its research capacity, quality and output. There has been a threefold increase in research awards, from €18 million in 2004 to €62.5 million in 2008. There has been an increase in the number of successful research centres and groups under six strategic research themes. These centres and groups boast internationally recognised researchers, producing postgraduates with the skills that are desirable to companies and are using the research to support industry and enhance the undergraduate teaching and learning process. This increase in research capacity has translated onto a considerable escalation in the number of peer-reviewed academic publications, books and book chapters, generation of Intellectual Property, successful patent applications and numbers of companies supported.

The IOT sector is demonstrating its capacity to effectively translate knowledge and technology into jobs. Researchers within the IOTs collaborate with Applied Research Enhancement (ARE) centres that are focused on industrial needs and are interacting and collaborating with national and international companies. Indeed the IOTs are currently delivering returns on investment by supporting start-ups and SMEs in key target areas such as information and communications, biopharma, medical technologies and creative industries. An estimated €38 million has been invested to establish incubation centres on IOT campuses, through the Enterprise Ireland's Campus Incubation Programme. These incubation centres offer a strong support structure for entrepreneurs and knowledge-based start-up companies and house an increasing number of highly innovative campus spin-outs.

This Research and Innovation Yearbook describes the commitment of the IOT sector to conduct internationally recognised research and to convert the outcomes of this research into innovation and economic impact. It emphasises the fact that State investments into research and innovation in the IOT sector are delivering results that benefit both the economy and society as a whole.



**Michael Carmody**

*Chairperson*

*Institutes of Technology Ireland.*

# Executive Summary

## Institutes of Technology – Innovation, Research, Solutions with Industry.

### Research and innovation – the context for Ireland's Institutes of Technology

*"Given the concentration of scientific and technological resources in the major cities, companies in regional locations can find it more difficult to access support for innovation. Regional economic development is a key aspect of Government policy and within the broad framework set by this policy, regional innovation will have increasing importance in the future. The Institutes of Technology (IoTs) represent an important resource in this context. Their multi-regional location and openness to working with industry provides a platform upon which real industrial impact can be built".*

**Source:** Strategy for Science, Technology and Innovation, 2006.

*"Ireland should not depend excessively on external investors for its economic future. We already have some notable indigenous enterprises that have become worldwide companies. Ireland must build on this success so that we develop a thriving indigenous enterprise sector. Building the stock of knowledge and know-how in the economy is critical to Ireland's future economic development. Innovation is the key building block in developing a thriving indigenous industry as a complement to Ireland's concentration of multinationals.*

*The presence of multinationals and the evidence of technological convergence - the tendency for different technological systems to evolve towards performing similar tasks - creates a demand for innovation and partnering with start-up companies which gives Ireland a competitive advantage in innovation".*

**Source:** Building Ireland's Smart Economy, Department of the Taoiseach, December 2008.

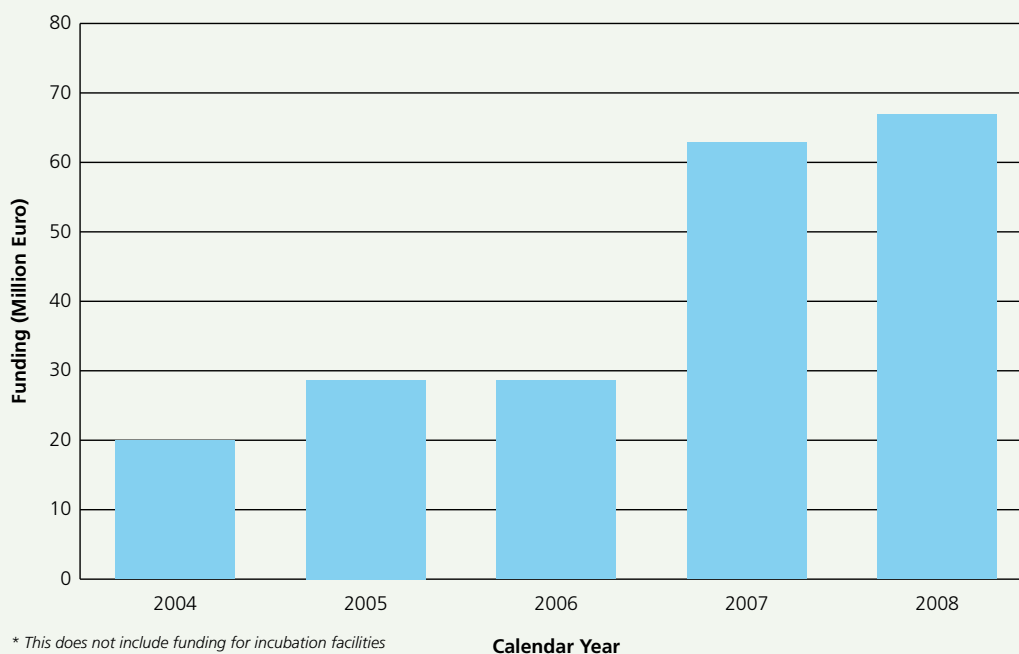
*"Nevertheless, for Ireland to move up the value chain so that it can assert itself not only as an open enterprise economy but also as an open entrepreneurial economy, it is essential that we have the means of converting research, development and innovation into commercialised products and services. This will provide a major driver of Ireland's future prosperity. It will create high-quality and well paid employment".*

**Source:** Building Ireland's Smart Economy, Department of the Taoiseach, December 2008.

In 2006, the Government launched its Strategy for Science, Technology and Innovation (SSTI). This strategy set out a road map for securing Ireland's future prosperity by focusing on developing our national capacity in research and innovation. It is true to say that at the time, the economic challenges that we are now dealing with were not foreseen. As these challenges became more apparent in late 2008, the Government responded with its Smart Economy document. In "Building the Smart Economy", the Government reiterated its belief that research and innovation will be one of the most important tools for rebuilding our economy. However, the timescale and the urgency to deliver tangible outputs from our research and innovation activities has come to the fore. This urgency is to utilise our research and innovation expertise and resources to support industry and to deliver value, jobs and wealth for our own economic recovery.

This Research and Innovation Yearbook sets out the combined research strengths of the Institutes of Technology as developed during the period between 2004 and 2009. During this period, Ireland's thirteen Institutes of Technology increased their activities in research and innovation by three-fold. This growth took place in a unique space, in which the Institutes carry out research that is both relevant and responsive to industry and is highly consistent with the policy objectives set down in key Government documents.

#### Research Funding in the IOT Sector (2004-08)\*



In total, over **€273 Million** has been invested in research and innovation at the thirteen Institutes of Technology since 2004. In keeping with their statutory responsibilities and in an effort to respond to Government policy, each of the Institutes have directed this investment to carry out and translate research within six main thematic areas, all of which are relevant to major technological, social and economic challenges.

**Theme 1:** Communications, Software and Sensor Technologies Research

**Theme 2:** Health and Biotechnology Research

**Theme 3:** Renewable, Sustainable and Environmental Technologies Research

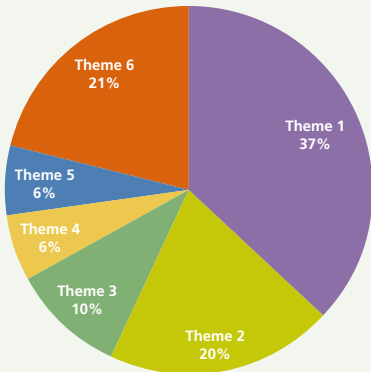
**Theme 4:** Medical Devices, Engineering and Materials Research

**Theme 5:** Creative Arts and Technologies, Social Sciences and Humanities Research

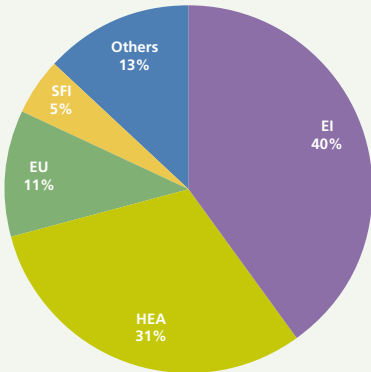
**Theme 6:** Entrepreneurship Research, Entrepreneur Support and Business Incubation

As illustrated here, over 75% of activity in research and innovation falls into three main areas: ICT, life sciences and entrepreneurship.

Percentage of Total Sectoral Funding awarded to each Research Theme



Total Research and Innovation Funding in the IOT Sector by Agency



## Research and Innovation in the Institutes of Technology – Key Facts and Figures

### General facts and figures (June 2009)

- Approximately **€273million** in research and innovation funding from 2004-2009
- **4,869** Academic staff
- **512** Academic research staff
- **52,206** Undergraduate students
- **2,152** Postgraduate students
- Over **570** Postgraduate students associated with established research groups
- **83** Research centres and groups
- **16** Enterprise Ireland-funded Applied Research Enhancement centres
- **9** HEA PRTL-funded research centres
- **1** SFI-funded Strategic Research Cluster
- **14** Incubation Centres, offering 18,000m<sup>2</sup> of incubation space
- **250** spin-in Incubation Centre companies with 695 employees
- Over **3,500** peer reviewed journal and conference papers
- **300** collaborative research projects with industry
- Over **850** entrepreneurs supported on Enterprise Platform Programmes
- Over **80** books/book chapters
- Over **60** group and solo exhibitions held
- **48** patents granted to spin-in companies
- **20** patents granted to research groups
- **15** campus spin-out companies



## Summary of main research income and sources

### Enterprise Ireland: €109.4 million

- Applied Research Enhancement (ARE) Programme
- Equipment Grants
- Companies supported using Innovation Vouchers
- Innovation Partnerships
- Proof of Concept
- Commercialisation Fund
- Campus Incubation Programme

### Higher Education Authority: €83.1 million

- PRTL
- TSR Strand I, II & III
- Research Equipment Renewal Fund
- Research Facilities Enhancement Scheme

### European Union Programmes: €30 million

- Framework Programmes 4, 5, 6 & 7
- Interreg Programme

### Science Foundation Ireland: €14.6 million

- Research Frontiers Programme
- Principal Investigator Programme
- Stokes Lectureship Programme
- Strategic Research Clusters

### Others (include): €34.9 million

- Environmental Protection Agency (EPA)
- Teagasc
- Sustainable Energy Ireland
- InterTradeIreland FUSION Programme
- Marine Institute
- IRCSET Enterprise Partnership Scheme, Embark Programme, Graduate Research Education Programme.
- IRCHSS

# Theme 1 Communications, Software and Sensor Technologies Research

## Headline Facts:

- Within this theme there are currently:
  - **19** Established research groups
  - **59** Principal Investigators
  - **137** Postdoctoral researchers/research fellows/contract researchers
  - **119** Postgraduate students
- Since 2004, researchers within this theme have:
  - Been awarded over **€99 million**
  - Published **500** peer-reviewed journal and conference papers
  - Published **10** books/book chapters
  - Engaged in over **80** applied research projects with industry
  - Been granted **6** patents
  - Generated **6** campus spin-out companies

## Technological Expertise:

- Distributed systems and service orientated architectures in the communications and telecommunications domain
- Mobile communications
- Wireless sensor technology and networks
- Adaptive wireless systems
- Photonics
- Optics
- Instrumentation and quasar research
- Software engineering
- Interactive applications
- Games development
- Data mining



Over €99 million  
awarded in  
research funding  
since 2004

## IOT Centres and Groups Conducting Research in Communications, Software and Sensor Technologies



### Athlone Institute of Technology

**Software Research Institute (SRI):** Established in 2003. Research interests focus on pervasive computing including heterogeneous wireless networking, self-adaptive systems, service oriented architectures and systems and interaction with smart objects - as in the Internet of Things. Predominantly funded by Enterprise Ireland and includes the Applied Research Enhancement (ARE) centre: **Seamless Use of Network Abstraction Technologies (SUNAT)**, established in 2007. Main collaborators include Dublin City University, University College Dublin, The Chinese Academy of Science, Waterford Institute of Technology, WPA Mobile, Ericsson, Solanotech.



### Institute of Technology Blanchardstown

#### **The Intelligent Transportation Systems Group:**

Key research themes include computer graphics; machine vision and robotics in the research and development of road signage and delineation. Funded by the National Roads Authority, HEA and TSR Programme Strand I. NUI Maynooth is a key collaborator.

#### **Graphics and Gaming Group, the Computational and Functional Linguistics Group and the Network Security and Forensics Group:**

Conduct research into: computer science, multimedia, computer graphics, computer games research and artificial intelligence; computer science with linguistics, computational linguistics, rich media plus spoken and sign languages and computer science; investigation of application vulnerabilities, information security, digital forensics, network intrusion and activity tracking and information security awareness. Funded by Enterprise Ireland, HEA TSR Programme Strand I, HEANet, HEA Strategic Innovation Fund and the AIB Innovation

Fund with ITB. Key collaborators include Trinity College Dublin, Dublin City University, University College Dublin, Waterford Institute of Technology, the University of Cape Town (South Africa), Havoc, ISSA, RITS, Deloitte, BHConsulting and Espion.



### Institute of Technology Carlow

#### **Interactive Applications Software & Networks**

**(GameCORE):** Established in 2004. Predominantly funded under EU programmes and the HEA. Conducts research focused on industrially relevant and innovative research into software development and networking architecture for interactive applications. Current thematic areas include: networks; games engines; serious games for strategy, sports and health. Main collaborators include Dublin City University, University College Dublin, Trinity College Dublin, University of Limerick, Dublin Institute of Technology, University College Cork, NUI Maynooth, Swinburne University of Technology (Australia), Temasek Polytechnic (Singapore), UTStar.com, Microsoft, Havoc Intel, Gmedia, Unum, Defence Forces, Age Action Ireland, NeuroSynergy Games, Deycom Computer Solutions Ltd.



Institiúid Teicneolaíochta Chorcaí  
Cork Institute of Technology

### Cork Institute of Technology

#### **Centre for Adaptive Wireless Systems (AWS):**

Established in 2008. Conducts research into the investigation and development of concepts for hardware, software and network and system design

for adaptive wireless systems. The hardware research focuses on the design of miniaturised wireless systems, particularly sensor nodes for wireless sensor applications; intelligent self-adapting radio resource and configuration management concepts for heterogeneous cellular networks and ad-hoc wireless networks. Funded mainly under HEA PRTL, SFI and Enterprise Ireland, the centre includes the Applied Research Enhancement (ARE) centre:

#### **Technologies for Embedded Computing (TEC),**

established in 2006. Key collaborators include the Tyndall National Institute, University College Cork, The Environmental Research Institute, Trinity College Dublin, University College Dublin as well as a diverse range of industrial partners from wireless technology development companies to end-users.

#### **Photonics Device Dynamics Group (PDD):**

Established in 2006. Research focus is on the dynamics of semiconductor materials and devices, in particular novel quantum dot devices and optical injection and feedback in semiconductor lasers. Funded mainly under PRTL, SFI and Enterprise Ireland, and includes the Applied Research Enhancement (ARE) centre: **Centre for Advanced Photonics & Process Analysis (CAPPA)**, established in 2008. The PDD labs are hosted by the Tyndall National Institute and key collaborators include all Irish institutions involved in photonics research, University of California Los Angeles (USA) and the Centre National de la Recherche Scientifique (France). Industrial partners include Alcon, Epi-Light, Logitech.

#### **Astronomy Instrumentation Group (AIG):**

Concentrates its activities in the areas of instrumentation research and quasar research. This includes the development and use of new instrumentation and data-analysis techniques to support astronomy research, and the study of quasar optical variability on short time-scales.



### Dundalk Institute of Technology

#### Software Technology Research Centre

**(SToRC):** Established in 2001. Research is focused on a number of strategic thematic research areas: software quality engineering; spreadsheet engineering; medical device software development. Research at the centre is mainly funded under SFI and Enterprise Ireland. The centre includes the **Regulated Software Research Group**, funded by SFI. Key collaborators include Lero – The Irish Software Engineering Research Centre, University of Ulster, University College Dublin, Dublin City University, Waterford Institute of Technology, Queen's University Belfast, IADT-Dun Laoghaire, University College Dublin. Industrial partners include Armac Systems, HBOS, Chambers Consulting, Viable Options, Kenexa, Ad Rem, Motorola, Fujitsu-ICL, Stiona Software, Digiweb, Axellis, Boston Scientific, BioBusinessNI, Vitalograph.

**Electrochemistry Research Group:** Carries out research within the field of electrochemistry, combining aspects of fundamental physical chemistry and synthetic inorganic chemistry for the development of novel materials which possess applications in molecular electronics and biologically and chemically based sensors. The group, in conjunction with its collaborators, employs a range of techniques, such as, electrochemical, spectroscopic and surface techniques to characterise molecular based systems in both solution and the solid state. Academic collaborations include Monash University (Australia), Centre d'Etudes Nucléaires (France), University of Versailles (France) and Bremen University (Germany).



### Letterkenny Institute of Technology

#### Wireless Sensor Applied Research Laboratory

**(WiSAR):** Established in 2009 under the Enterprise Ireland Applied Research Enhancement (ARE) Programme. There are two main research strands: wireless devices that can be worn on the human body (medical devices, remote health monitoring, disability assistance, entertainment) and the use of these devices in the built environment to allow large modern office and industrial buildings to be as environmentally efficient as possible through monitoring of temperature, light, humidity and people movement. Key collaborators include Athlone Institute of Technology, Cork Institute of Technology, Waterford Institute of Technology, University of Ulster, Queen's University Belfast.



### Limerick Institute of Technology

#### Information Technology/Digital

**Communications:** Established in 2009. Conducts research into the use of advanced communication technology and novel sensors to real world problems, including the integration of smart technology into the built environment. Funded by Enterprise Ireland and the EPA, the team is developing solutions in areas such as tele-medicine, efficient energy control, light management, performance monitoring and security access. Key collaborators of this research include Institute of Technology Tallaght Dublin, University of Limerick, Waterford Institute of Technology and Telecom Management, Sud-Paris (France).



### Institute of Technology Tallaght Dublin

#### Radio Frequency Technology Centre (RFTC):

Applied research in wireless technology, particularly low power wireless sensor devices. Wireless circuit design up to 6GHz; new state-of-the-art techniques being developed for Power Amplifier efficiency; Zigbee (IEEE 802.15.4) radio front end optimisation for range extension.



### Institute of Technology Tralee

#### Centre of Innovation in Distributed Systems

**(CIDS):** Established in 2008. Conducts multidisciplinary research convergence to innovate real-world solutions in multiple sectors (security, healthcare, energy), industry verticals (retail, manufacturing, pharmaceuticals, logistics) and business operations (global supply chain, risk management, track and trace). The primary research focus is in the area of Radio Frequency Identification (RFID) with a particular interest in projects that are applied and industrial in nature while other research activities include wireless sensor networks; energy monitoring; GARCH applied to forecasting in the supply chain and intelligent data analytics. Funded under Enterprise Ireland, EU Interreg programme and the EU ICT Policy Support Programme. CIDS are the Irish General Assembly representatives on the EU Thematic Network focused on RFID technology called the RACENetworkRFID which was launched in March 2009. Key collaborators include the Tyndall National Institute, University College Cork, Georgia Tech Ireland, Fraunhofer IML (Germany), University of Parma (Italy), Massachusetts Institute Technology (MIT) – Forum for Supply Chain Innovation (USA), Office Max (USA), GE Global Research (USA), MIT – Energy Initiative (USA).

#### Centre for Intelligent Mechatronic and Sensor Systems (CIMSS):

Established in 2008 and funded by Enterprise Ireland and IRCSET. Research interests include the integration of intelligent electro-mechanical systems, robotics and sensors for industrial applications (agriculture, biomedical and energy). Current research projects are focused on: mechatronics for agricultural engineering; bio-engineering (instrumentation and materials); embedded systems and FPGAs; renewable & sustainable energy; intelligent energy management. Key collaborators include University of Limerick, NUI Galway, Royal College of Surgeons in Ireland, Dairymaster, Transmission Links Ireland, Greenline Energy Assessors, Energymaster, Evolve Technology Solutions, WKSolar, ERS Contacts Ltd., Analog Devices, Intel.



Waterford Institute of Technology  
INSTITIÚID TEICNEOLAÍOCHTA PHORT LAIRGE

### Waterford Institute of Technology

#### Telecommunications Software & Systems

**Group (TSSG):** Established in 1996, researching communications software services. This encompasses emerging architectures for management of complex telecommunications and internet systems, as well as addressing next generation service development and deployment. The TSSG has expertise in the areas of distributed systems and service oriented architectures, particularly when applied to the communications and telecommunications domain. Predominantly funded by SFI, HEA PRTL, Enterprise Ireland and EU Framework Programmes 4, 5, 6 and 7. Includes the Applied Research Enhancement (ARE) centre:

**Centre for Converged IP Communications Services (3CS) and the SFI-funded Federated, Autonomic Management of End-to-end communication services (FAME)** Strategic Research Cluster (SRC). Key collaborators highlighted from over 150 active funded partnerships include

the 7 Irish Universities, Cork Institute of Technology, Institute of Technology Tralee, Athlone Institute of Technology, Letterkenny Institute of Technology, FhG FOKUS, Intel, Ericsson, IBM, Cisco, Eircom, 02 Ireland, Alcatel-Lucent, Hewlett Packard, Telefonica I&D, T-Systems, Portugal Telecom, Telcom Italia, France Telecom, NEC, Nokia, Nokia Siemens Networks.

**Optics Research Group (ORG):** Established in 1994, the research focus of the group includes many different branches of optical science. Current projects range from discrete device fabrication, characterisation and analysis, to the design and testing of novel fibre optic systems. Key research interests include: fibre optics; solid-state photonic devices; nanophotonics and biosensing; structural health monitoring; lasers and spectroscopy; applied mathematics. Predominantly funded under Enterprise Ireland and TSR Programmes. The key collaborators of this research include University College Cork; Cork Institute of Technology, Tyndall National Institute, University of Limerick, Georgia Tech Ireland, Royal Institute of Technology (Sweden), Institut non-lineaire de Nice (France), University of Bristol (UK), Universite Libre de Bruxelles (Belgium) University of Bath (UK), Clemson University (USA), VPI Systems Inc (Germany), Corning Inc (USA), Firecomms Ltd., Intune Networks Ltd., Eblana Photonics, Fibrepulse, Kigre Inc., Chiral Photonics.

# Seamless Use of Network Abstraction Technologies

**Seamless Use of Network Abstraction Technologies (SUNAT)** was established in 2007 at the **Software Research Institute (SRI)** in **Athlone IT** under Enterprise Ireland's Applied Research Enhancement programme. This applied research centre directs its focus on facilitating the rapid prototyping, creation and delivery of mobility enabled applications by developing a Service Enterprise Architecture for Adaptive Mobility (SEAAM). This is intended to provide developers with the ability to deploy mobile applications without the requirement for low level technical detail.

One research strand of **SUNAT** is to undertake research and development in the domain of IP Multimedia Subsystem (IMS) service conceptualization, creation and validation. The ultimate goal of the activity is to provide an open source foundation for the stakeholder companies within IMS ARCs to use as a platform for building consumer services in live networks and also for adding additional functionality to their network infrastructure.

In an Enterprise Ireland-funded project, **SUNAT** conducted an IMS service delivery evaluation for its Irish-based industrial partner **Solanotech Ltd**. **SolanoTech** is a software product and services company with specific expertise in converging TV, internet and communications services. Solanotech provides products and services which enable mobile and broadband service providers to expand and enable the value of their premium service offerings. During this project, **SUNAT** evaluated the Ericsson Service Development Studio (SDS) 3.1 version as a service delivery platform for the creation of IP Multimedia based added services.

The outputs of the research project include a template and mapping guidelines which enables efficient modification of **SolanoTech's** enterprise middleware platform, SolanoWare to interwork with a range of IPTV Set Top Boxes. The developed product was validated by executing an integration test with the AmiNet 130 Set Top Box. This project led to a template for rapid integration of any set top box/web browser environment with Solanoware.



# Microbial-Host Interactions – Prevention is better Than Cure!

One of the key research challenges being tackled by **The Centre of Applied Science for Health (C.A.S.H.)** at **ITT Dublin** is the study of the microbial-host interaction. This research has a particular emphasis on infections of the Cystic Fibrosis (CF) lung caused by the *Burkholderia cepacia* complex (Bcc). CF is the most common lethal hereditary disorder in Caucasians with a median age of survival of 32. Ireland has the highest incidence of CF in the world, with almost 1 in 1,400 live births being affected.

The Bcc pathogens are innately resistant to antibiotics and the development of effective therapeutic strategies to treat these infections is a major challenge. Studies at **ITT Dublin** have included the investigation of the effects of recombinant human lactoferrin (rHL) on planktonic and biofilm cultures of Bcc organisms. Lactoferrin is a multifunctional protein that exhibits antimicrobial activity. These studies established that lactoferrin alters the susceptibility of Bcc to a range of antibiotic therapies. Current research at **C.A.S.H.** includes the investigation of the expression of iron acquisition molecules (siderophores) by Bcc under various growth conditions. In particular, the siderophore response after bacterial exposure to epithelial cells will be examined. The expression of ornibactin, an important siderophore for Bcc strains, will be examined using Real-time PCR methods.

Some strains of Bcc are highly transmissible and studies at **C.A.S.H.** have shown that Bcc lipases are involved in invasion. Lipase activity was measured in eight species of the Bcc. Strains from the *B. multivorans* and *B. cenocepacia* species predominantly produced high levels of lipase. Pre-treatment of two epithelial cell lines with Bcc lipase significantly increased invasion by two *B. multivorans* strains and one *B. cenocepacia* strain, and did not affect either plasma membrane or tight junction integrity. Inhibition of Bcc lipase production by the lipase inhibitor, Orlistat, significantly decreased invasion by both strains in a concentration-dependent manner. Many Bcc species are capable of epithelial cell invasion, although the mechanism(s) involved are poorly understood. Bacterial proteins that are involved in attachment to lung cells have been identified by 2-Dimensional electrophoresis and MALDI-ToF analysis, in collaboration with NUI Maynooth. This will enable the design of vaccines or novel compounds which will prevent colonisation by Bcc.

Combined, these studies are contributing to the design, synthesis and identification of novel compounds with anti-microbial potential at **ITT Dublin** and NUIM. Translation of these research findings to clinical settings has the potential to lead to enhanced outcomes for patients with CF and other respiratory infections.

## Acknowledgement:

The Centre of Applied Science for Health is funded under the Programme for Research in Third Level Institutions (PRTL) Cycle 4.

## Theme 2 Health and Biotechnology Research

### Headline Facts:

- Within this theme there are currently:
  - **13** Established research groups
  - **57** Principal Investigators
  - **23** Postdoctoral researchers
  - **129** Postgraduate students
- Since 2004, researchers within this theme have:
  - Been awarded over **€55 million**
  - Published over **300** peer-reviewed journal and conference papers
  - Published **21** books/book chapters
  - Been granted **2** patents

### Technological Expertise:

- Biotechnology:
  - Toxicology
  - Microbiology
  - Identification and screening of antimicrobials
  - Identification of bioactive compounds
- Pharmaceutical Sciences:
  - Pharmaceutical processing and bioprocessing
  - Process analytical technologies
- Smooth muscle physiology
- Electrochemistry; inorganic chemistry; supramolecular chemistry
- Macular pigment research
- Membrane separations
- Development of high-frequency radiowave cancer therapy



**Over 150 postgraduate and postdoctoral researchers across 13 established research groups**

## IOT Centres and Groups Conducting Research in Health and Biotechnology



### Athlone Institute of Technology

**Bioscience Research Institute (BRI):** Formerly the Centre for Biopolymer and Biomolecular Research, established in 2000. Main research themes include: toxicology; sanitisation & decontamination; biomedical; microbiology, and cell & molecular biology & healthcare. Funded under the HEA PRTL cycles 1, 2 and 3, EU Framework Programme 4 and 5, SFI, Enterprise Ireland and TSR Programme Strand III. The key collaborators of this research include Dublin City University; NUI Galway; Galway-Mayo Institute of Technology, University of Strathclyde (UK), University of Brescia & University of Milan (Italy), Weizmann Institute (Israel), University of Turku (Finland), Health Service Executive, Innocoll, Isotron, Elan, Genemedic, DNA Vision (Belgium), Hormos Medical Ltd. (Finland), Cella SA (Luxembourg), Abbott Diagnostics, Irish Body Care, CeBec Group, Europharma Concepts, Mayo Healthcare, Athlone Labourites, Pharmaplaz, BioUETIKON Ltd. (Ireland), Progressive Genetics Ltd.



Institiúid Teicneolaíochta Chorcaí  
Cork Institute of Technology

### Cork Institute of Technology

**Department of Biological Science:** Research in this Department is funded predominantly by SFI, the Health Research Board, Department of Agriculture, Fisheries and Food, TSR Programme Strand III, IRCSET and EU programmes. Key research themes include virulence in mycobacteria; molecular analysis of enteric viruses; antibiotic resistance in *Salmonella*; determination of endocrine disruptors in Irish waters; virulence in *Listeria monocytogenes*; DNA profiling of MRSA isolates; molecular epidemiology of *Campylobacter*; Pneumococcal surveillance; screening cells of novel antimicrobials; purification and analysis of bioactive compounds. Key collaborators of this research include Limerick Institute of Technology, Waterford Institute of Technology, Institute of Technology Tallaght Dublin, University College Cork, Cork University Hospital, Cambridge University (UK), University College London (UK), Teagasc and numerous bio-pharma companies.

### Irish National Centre for Membrane

**Technology:** Funded under Enterprise Ireland, EPA, EU Framework Programme 4, 5 and 6, the HEA and local industries. Research focuses on the use of membrane separations (ultrafiltration, nanofiltration, reverse osmosis and pervaporation) for the recovery of valuable components from process and waste streams.



### Dundalk Institute of Technology

#### Smooth Muscle Research Centre (SMRC):

Established in 2005. Research focuses on the cellular mechanisms underlying physiological function modification in a range of prevalent disease states including urinary incontinence; erectile dysfunction; lymphodema, arthritis and uterine obstruction.

Funded under SFI, Enterprise Ireland TSR Programme Strands III & I, the Health Research Board, EU Framework Programme 7, Wellcome Trust (UK), Medical Research Council (UK), Diabetes UK, National Institutes of Health (NIDDK, USA). Includes the Applied Research Enhancement (ARE) centre:

**Ion Channel Biotechnology Centre (ICBC).** Key collaborators include University College Dublin, Dublin City University, Royal College of Surgeons in Ireland, Our Lady's Hospital for Sick Children, Crumlin, Belfast City Hospital, Queen's University Belfast, St George's Hospital Medical School (UK), Exeter University (UK), Royal Marsden & St George's Hospital (UK), University of Nevada (USA), University of Calgary (Canada), University of Nagoya (Japan), Andor Technology (UK), Servier Laboratories (France), Pharma Forschung (Germany), Pierre Fabre (France).



### Limerick Institute of Technology and Institute of Technology Tralee

#### Shannon Applied Biotechnology Centre

**(SABC):** A collaborative Enterprise Ireland-funded Applied Research Enhancement (ARE) centre, established in 2008. Combines research strengths in natural product utilisation, bioactivity screening, fermentation, mammalian cell culture and bioprocessing. Ongoing research programs are in the areas of marine biotechnology, yeast derived ingredients, prebiotics and bioprocess technology: to explore natural products for novel bioactive substances of value to healthcare, pharmaceutical/biopharmaceutical, food, cosmetics, agricultural, environmental, diagnostic and bio-energy industries; bioprocess development and optimisation. Key collaborators include NUI Galway, University College Cork, Teagasc (Moorepark, Ashtown and Kinsealy), NUI Maynooth, Waterford Institute of Technology, Dublin City University, University College Dublin, University Limerick, Dublin Institute of Technology, Avon Orthopaedic Centre (UK), CEVA Brittany, SAMS (UK), NERI (Denmark), University of Sheffield (UK), University of Bratislava (Slovakia).



### Institute of Technology Sligo

#### Mitochondrial Biology and Radiation Group

**(MiBRRG):** Established in 2008 and funded by SFI. Developing a new high-frequency radiowave cancer therapy that is free of side effects and is cheaper and more effective than those currently available in the main stream. Specific research projects include: simulated sunlight damage to human skin mitochondria; an *in vitro* evaluation of the bio-effects of RF radiation and their modification to advance skin cancer therapy; experimental study of electromagnetic fields on biological targets. Key collaborators of this research include Dublin Institute of Technology, Beaumont Hospital, Ferris State University (USA), Newcastle University (UK), Radiowave Therapy Research Institute (Australia).



### Institute of Technology Tallaght Dublin

#### Centre of Applied Science and Health (CASH):

A PRTL-funded centre, established in 2007 in partnership with the National Institute for Cellular Biotechnology (NICB), The Adelaide and Meath Hospital incorporating the National Children's Hospital (AMNCH) and NUI Maynooth. There are three interdisciplinary research strands: Strategies for combating difficult and antimicrobial resistant pathogens; biomedical devices; translational molecular cell biology research.

#### Centre for Research in Electroanalytical

**Techniques (CREATE):** Established in 1996, this Centre is part of the **C.A.S.H.** programme at ITT Dublin. It is funded predominantly under PRTL, TSR Programme Strand III, Enterprise Ireland, IRCSET, EPA Strive Programme and the EU Marie Curie programme. Research focuses on applying the tools of synthetic chemistry, electrochemistry and material science to design a range of multifunctional materials which possess applications in strategically important technological fields. Specific scientific areas of expertise include the synthetic design of redox active materials, employment of modern electrochemical and surface based techniques for the study of fundamental material properties and the micro fabrication and miniaturisation of multi-array sensors for clinical sensing. Key collaborators of this research include Dublin City University, NUI Maynooth, University of Limerick, Trinity College Dublin, Adelaide, Meath and National Children's Hospital (AMNCH), University of Arizona (USA); University of Grenoble (France), University of Monash (Australia).

#### Centre of Microbial Host Interactions (CMHI):

Established in 2001. Part of the **C.A.S.H.** programme at ITT Dublin. Exploring interactions between pathogenic bacteria and human cells in order to better understand how they contribute to disease and in order to develop better antimicrobial therapies. The current disease model is the bacterial colonisation of the cystic fibrosis (CF) lung. Research is funded under PRTL, SFI and TSR Programme Strand III. Key collaborators include **C.A.S.H.** Partners and the University of Zurich (Switzerland).

### **Centre for Pharmaceutical Research and**

**Development (CRPD):** Established in 2005. Part of the **C.A.S.H.** programme at ITT Dublin. Research focuses on the development of novel therapeutic agents with defined pharmaceutical properties and the elucidation of biochemical processes central to control of specific diseases. Areas of expertise include: drug synthesis; *in vitro* drug screening (pro-and eukaryote); *in vivo* screening (eukaryote); formulation/product development/dosage forms; analytical method development; real time sensor for detecting stage in process. The Centre is predominantly funded under PRTL, IRCSET, Enterprise Ireland and TSR Programme Strand III. Key industrial collaborators include Cross-Vet Formulation, Gerard Laboratories, Wyeth PDC.

drug delivery); pharmaceutical processing and development of novel process technologies (analytical and catalytic applications); biomedical research and biotechnology. Key collaborators of this research include Tyndall National Institute, Dublin City University, Queen's University Belfast, Kings College London (UK), Cardiff University (UK) the Chinese Academy of Science (China), University of Missouri (USA), EirGen Pharma Ltd., Merck, Sharp and Dohme (Ireland) Ltd., Bausch and Lomb, TEVA, Genzyme Ireland Ltd., Waterford Regional Hospital, Fastform Research Ltd. and GlaxoSmithKline (UK).

### **Macular Pigment Research Group (MPRG):**

Established in 2002 and predominantly funded by Fighting Blindness Ireland, Enterprise Ireland and commercial organisations such as Bausch and Lomb, Alcon and Macuvision Europe. The group conducts research into the importance of macular pigment (MP) in protecting against an age-related blindness known as age-related macular degeneration (AMD), and in enhancing overall quality of visual performance and comfort. Key collaborators of this research include Trinity College Dublin, Queen's University Belfast, Royal Victoria Hospital (Belfast), London School of Hygiene and Tropical Medicine (UK), University of Westminster (UK), University of Aberdeen (UK), University Eye Clinic (Holland), Friedrich-Alexander University (Germany), Brown University (USA), Medical College of Georgia (USA), Nutrasight Consultancy Limited, Whitfield Clinic, Nutritional Epidemiology Group, MRC Human Nutrition Research (UK), Westmead Hospital (Australia), Howard Foundation (UK), Macuvision Europe Ltd., Birmingham (UK), Alcon Laboratories (USA), Pfizer Healthcare, Ireland.



Waterford Institute of Technology  
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### **Waterford Institute of Technology**

#### **Pharmaceutical and Molecular Biotechnology**

**Research Centre (PMBRC):** An Enterprise Ireland funded Applied Research Enhancement (ARE) centre established in 2009. Core competencies include: pre-formulation and materials characterisation; formulation and polymeric drug delivery; separation science and impurity identification; molecular biotechnology, biomedical science and nanotechnology. The major research activities include: polymeric drug delivery technologies (incorporating ophthalmic, oral and transdermal

**Centre for Health Behaviour Research (CHBR):**

Established in 2001. Current and recent research include: an evaluation of the impact of mass events on population physical activity levels; studies of drug and alcohol misuse amongst youth and Traveller groups; the development of national physical activity guidelines for Ireland, development of the national men's health policy; Carlow men's health project, evaluation of "Moving Hearts" and "Munch and Crunch" health promotion programmes, and a review of the smoking cessation services within the south east, and "Switch-Off Get Active", an evaluation of a school-based intervention to decrease sedentary behaviour and increase physical activity in primary school children; the evaluation of several programmes undertaken by the Waterford Sports Partnership; evaluation and dissemination of the Activity in Care Training programme (ACT), a physical activity programme for frail older adults, in partnership with Age and Opportunity. Funded by Irish Sports Council, Health Services Executive, Department of Health, Health Research Board, Waterford Sports Partnership, Ossory Youth. Key collaborators include University of Limerick, University of Ulster, Dublin City University and The School of Public Health, University of Sydney (Australia).

# Transforming Communities, Environments and Technologies for Ageing-in-Place.

The **Netwell Centre** is a collaborative venture in the North East of Ireland, formed between the **Dundalk Institute of Technology (DkIT)**, the Dundalk Town Council (DTC) and the Health Services Executive (HSE). It is housed within the School of Nursing, Midwifery and Applied Sciences, and is located in the **Regional Development Centre** on the **DkIT** campus. The Centre conducts multidisciplinary research at **DkIT** that aims to develop more integrated community-oriented services, more sustainable home and neighbourhood design, and more age-friendly technologies.

The **Netwell Centre** was Ireland's representative in the WHO's global Age-Friendly cities project. As one of 33 cities from 22 countries, this collaboration has enabled links with a global network of gerontology centres. The **Netwell Centre** is now leading on the measurement of age-friendliness through a large survey of community based adults. The goal is to make Co. Louth Ireland's first age-friendly county, where a community's structures and services are accessible and inclusive of the needs and abilities of diverse groups. Within this context, opportunities are maximized for older people to be healthy, active and secure in their living environments.

**Netwell** is involved in designing the physical and social environment to support and enable older people to age-in-place with quality of life. To this end a number of surveys are underway with mid-life and older adults, volunteers, and associated health and social care professionals. These data are being analyzed by multidisciplinary professionals including those with expertise in psychology, social policy, software engineering, business, accountancy and the construction environment.

**Netwell** also aims to deliver technological tools and services that enable older people to remain in their home of choice. This has led to the establishment of a new Enterprise Ireland-funded Applied Research Enhancement (ARE) Centre and a multi-tiered testbed environment that involves:

- *Home-in-the-lab*: This includes a physical home-environment in a lab setting, and the ability to simulate a home environment through CAVE technology. The Cave Automatic Virtual Environment (CAVE) is an immersive virtual reality environment. It offers a multi-person, room-sized, high-resolution 3D video and audio environment. As the user moves within the display boundaries, the correct perspective is displayed in real-time to achieve a fully immersive experience.
- *Lab-in-the-Home (Pop. 15-150)*: This provides access to a place-based evaluation framework from 16 living apartments, and the wider neighbourhood within the Barrack Street area of Dundalk, Co. Louth. This also provides state-of-the-art ambient assisted living (AAL) technologies to operate pilots for future developments and retrofits.
- *County Initiative (Pop. 500-1500)*: Participants provide a diverse testbed of matched groups for follow up surveys, interviews, trials and simulations. Surveys and interviews provide insights into adults' attitudes and behaviours towards all types of technology.

Outputs to date include the establishment of Cultáca or service brokers who work independently and directly with older people. The Centre has also been highly influential in the development of collaborative stakeholder engagements, such as the Barrack street development, Age Friendly County Initiative, plus business meetings and AAL conferences, by working closely with business leaders, clinicians, Health Service Executive personnel, policy makers, political representatives, and other academics.



# Offshore Geotechnics

The **Geotechnical Research Group (GRG)** at **IT Sligo** conducts applied research that is highly relevant to issues currently facing the geotechnical industry. The core of the research is utilisation of the **IT Sligo** geotechnical centrifuge to investigate soil-structure interaction problems and in so doing, develop innovative design concepts for complex geotechnical problems.

Geotechnical centrifuge modelling is the most powerful investigative tool for revealing the mechanisms that govern the behaviour of complex soil-structure interaction problems. In view of this, **IT Sligo** have established the first and only geotechnical centrifuge facility in Ireland, and in so doing, have greatly enhanced the group's capabilities. The research falls within two broad thematic areas; onshore geotechnics for infrastructure projects and offshore geotechnics for the renewable energy industry.

The latter area is seen as a particularly important sector for Ireland in view of our target to produce 40% of our energy requirements from renewable sources by 2020. Although offshore wind and wave energy have been identified as having the highest potential to meet this target, much of this energy resource lies in very deep water where bottom founded structures are no longer economically feasible and must be replaced with floating facilities that are anchored to the seabed. As the water depth increases the relative cost associated with the foundations (i.e. anchors for floating wind turbines or wave energy converters) increases. This is mainly due to construction durations and challenges when operating in deep water and the high cost of anchor handling vessels. Significant cost savings can therefore be made by employing anchoring systems that may be readily deployed in deep water, whilst providing equivalent or superior holding capacity over conventional anchor types (such as drag embedded anchors and suction caissons).

The **GRG** are currently investigating a range of anchoring systems that have previously been employed by the offshore oil and gas industry and revisiting these systems in view of the significantly different loading regime imparted by floating renewable energy facilities. The approach of the **GRG** is to utilise the geotechnical centrifuge to obtain experimental data that can be used:

- as a performance indicator for the various anchoring systems
- as a means of validating and developing analytical design tools that can be readily implemented by offshore industry

Research outputs from the **GRG** have been disseminated in leading international geotechnical journals and at the most influential international conferences in the offshore industry. These publications have made significant impact; for example publications emerging from preliminary research on dynamically installed anchors have been used as benchmark data for numerical and analytical studies at The University of Texas at Austin (USA). More importantly this research has formed the qualifying basis for which certifying bodies approved the geotechnical design of dynamically installed anchors for offshore oil and gas operators. This technology-transfer to industry not only exemplifies the importance of this research area to the offshore energy industry, but points to the potential for the **GRG** to produce further technology-transfers, and for development of new Institute-Industry links.

## Theme 3 Renewable, Sustainable and Environmental Technologies Research

### Headline Facts:

- Within this theme there are currently:
  - **13** Established research groups
  - **53** Principal Investigators
  - **11** Postdoctoral researchers
  - **92** Postgraduate students
- Since 2004, researchers in this theme have:
  - Been awarded over **€28 million**
  - Published **200** peer-reviewed journal and conference papers
  - Published **15** books/book chapters
  - Engaged in over **30** applied research projects with industry
  - Been granted **3** patents
  - Generated **2** spin-out companies

### Technological Expertise:

- Applied marine biotechnology
- Renewable energy technologies including wind turbine development
- Clean and sustainable energy technologies
- Energy efficiency in the built environment
- Bioenergy production; waste/biomass remediation
- Sustainable development
- Environmental monitoring instrumentation
- Environmental and resource management and consultancy
- Forestry research
- Molecular ecology
- Sustainable agriculture

# Outputs from collaborative projects with industry include patents and spin-out companies

## IOT Centres and Groups Conducting Research In Renewable, Sustainable and Environmental Technologies



### Institute of Technology Carlow

**EnviroCore:** Established in 2009, formerly the Biotechnology and Molecular Environmental Science (BMES) Centre (established in 1999). The Centre conducts research into the use of phyto and microbial technologies for waste treatment, biomass production and plant biotransformations, the discovery of biological components for environmental bioindicators/biosensors, and environmental monitoring and risk assessment. Major funders of this research include PRTL, EU Framework Programmes, SFI, Enterprise Ireland, TSR Programme Strand III, IRCSET, and the EPA. Key academic collaborators of this research include Teagasc National Crops Research Centre (Carlow), University College Cork, NUI Maynooth, NUI Galway, Queen's University Belfast, University of Cardiff (UK), University of British Columbia (Canada), University of Madrid (Spain), University of Évora (Portugal). Key industrial collaborators include Maxol, Greencore, Glanbia, Ballon Meats, Boozeberrys, DEC (Belgium), Danisco (Denmark), EnviroSurveying Ltd. (UK).



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Cork Institute of Technology

### Cork Institute of Technology

**Clean Technology Centre:** Active in pure and applied environmental research in the field of sustainable production and consumption since 1992. Areas include cleaner production, environmental management systems, environmental management, tracking and inventory of all materials and life science assessment.

### Mass Spectrometry Research Centre for Biotoxin and Proteomics Research (PROTEOBIO)

Established in 1994 and funded predominantly under PRTL, SFI, Enterprise Ireland, IRCSET and the EPA Strive Programme. The isolation and structural elucidation of new bioactive compounds from the marine environment. Key academic collaborators include Limerick Institute of Technology, Dublin City University, University College Cork, NUI Galway, Tohoku University (Japan), University of Valencia (Spain), University of Vigo (Spain), University of Santiago (Spain), Instituto Superiore di Sanita (Italy), University of Oslo (Norway), University of Nantes (France), University of Dundee (UK), Institute for Marine Research (Finland), Cawthron Institute (New Zealand).



### Dundalk Institute of Technology

#### National Centre for Freshwater Studies:

Established in 2005. Conducts research into the development of strategies and technologies to restore surface water and ground water impacted by man-made and natural processes. Includes the **Organic Resource Group**. Main funders of this research include the HEA, Enterprise Ireland, EPA Strive Programme, InterTradeIreland Fusion Programme, and EU Programmes. The Centre partners with Ballyhaise Agricultural College, University College Dublin, Trinity College Dublin, Dublin City University, NUI Maynooth, Royal College Surgeons in Ireland, Queen's University Belfast, University of Ulster, Centre for Ecology and Hydrology (UK), University of Helsinki (Finland), Uppsalla University (Sweden), GLEON network, Makerere University (Uganda), Bord Na Móna, EPA, Teagasc, Monaghan County Council, Marine Institute, ESB International, Medical Missionaries of Mary, National Federation of Group Water Schemes (NFGWS), Monaghan and Louth County Councils, Ugandan Water and Sanitation Network, New York City Department of Environmental Protection (USA).

#### Centre for Renewable Energy at Dundalk IT

**(CREDIT):** Established in 2002. Conducts research into the development of large and small/medium wind systems, bioenergy research, and development of sustainable fuels from marine biomass. Funded under the EU Interreg Programme, Enterprise Ireland and Sustainable Energy Ireland. Key collaborators of this work include Dublin City University, Queen's University Belfast, Institute of Technology Sligo, University of Ulster, Scottish Association for Marine Science (UK), University of Strathclyde (UK), Airtricity, ESB International, Eirgrid, General Electric, Irish Food Processors, Oriel Wind Farm, Atlantic Industries, ABB, Tesco Ireland, Wind Energy Direct, AirEn Services, Igen, Ferm Eng, Coolpower, Horseware, Gaeltech, Open Hydro, Vestas Celtic, Numa Engineering, HJ Heinz, Eircomposites, KMC Engineering.



### Galway-Mayo Institute of Technology

#### **Centre for Applied Marine and Freshwater**

**Research:** Established in 2001. Research focuses on the sustainable management and conservation of aquatic resources and marine ecosystems. Funded by EU Framework Programme 6, Marine Institute, Bord Iascaigh Mhara, TSR Programme and Enterprise Ireland. Key academic collaborators include NUI Galway, University College Cork, University College Dublin, University of Athens (Greece), University of Vigo (Spain), Centre for Environment, Fisheries and Aquaculture Science (UK), Danish Institute for Fisheries Research, European Commission Joint Research Centre, Department of Primary Industries and Fisheries (Australia), Environment Canada, University of Stockholm (Sweden), University of Exeter (UK), University of St Andrews (UK), University of Plymouth (UK), Greenland Institute of Natural Resources, Université de Liège (Belgium), University of Namur, (Belgium), Nancy Université (France), Universidade de Aveiro (Portugal).

#### **Centre for the Integration of Sustainable Energy Technologies (CiSET):**

Established in 2007. Explores sustainable technologies that encompass energy demand and supply for a range of applications that include the built environment (domestic and commercial) and other industrial applications such as agriculture and aquaculture. Funded by the EU Framework Programme 6, Sustainable Energy Ireland, and Enterprise Ireland. Key collaborators include Cork Institute of Technology, Limerick Institute of Technology, University College Dublin, University of Edinburgh (UK), Thermo King (Galway), Roadstone Irl. Ltd., ProAir Ltd., Dunstar Ltd., A&M Renewables, Shamrock Solar Ltd., Aquaculture Industry, EcoOla Ltd., Oyster Homes Ltd., Energy Matters Ltd., Galway Energy Agency, Mayo Energy Agency, Údarás na Gaeltachta, Inis Oirr Fishermans Co-op, Trancat (Germany), Jaguar, BMW, Ford Motor Company.



### Letterkenny Institute of Technology

#### Centre for Applied Marine Biotechnology

**(CAMBio):** An Applied Research Enhancement (ARE) centre, established in 2005. Conducts research in collaboration with industry in aquaculture and fisheries, marine biodiversity, biomedical marine research leading to the discovery of new drugs from marine organisms, marine food processing and waste remediation. Funded by Enterprise Ireland, TSR Programme Strand III, IRCSET, Bord Iascaigh Mhara, Marine Institute. Key collaborators include University of Ulster, University College Dublin, University College Cork, Dublin City University, University of Limerick, NUI Galway, Galway-Mayo Institute of Technology, Queen's University Belfast, University of Newcastle (UK), University of Prince Edward Island (Canada), University of Wales (UK), University of London (UK), Heriot-Watt University (UK), Florida Atlantic University (USA), Woods Hole Oceanographic Institute (USA), University of Vienna (Austria), Cartron Point Shellfish Ltd., Teagasc, Deegaagh Point Shellfish Ltd., Taighde Mhara Teo, Errigal Eisc Teo, Mulroy Bay Aquaculture Producers Group, Atlanfish Ltd., Bantry Bay Seafoods Ltd., Iasc Sligeach Uisce-Leathan Teo, Marine Harvest Ireland Ltd., Mclwaine Shellfish Ltd., Mulroy Mussels Ltd., United Fish Industries.



### Limerick Institute of Technology

#### Renewable Energy Management, Environmental Monitoring and Built Environment Research

**Centre (REMEMBER):** Conducts research into the development of embedded control systems for applications in environmental monitoring, energy management and integrated renewable energy systems. Predominantly funded by Enterprise Ireland. Key collaborators include Charles Parsons Institute, University of Limerick, University of Ulster, Solar Energy Research Center (USA), Höskolan Dalarna, Borlänge (Sweden), Tampere University of Technology (Finland), University of Oulu (Finland), University of Graz (Austria), University of Sienna (Italy), Intelligent Data Systems, Prime Energy Solutions, Element Six (De Beers), Olympus Life Science Research Europa GMBH, F4 Energy, Calimax Energietechnik GmbH (Austria), HT Enerco Oy (Finland), Säättötuli Oy (Finland).

#### The Centre at Limerick for Environmental and Analytical Research (CLEAR):

Established in 2005 and funded by the EPA. Research themes include the environmental monitoring of air, water and soil ecosystems; the development of quality management systems for waste water treatment plants and other waste water systems and the use of wireless sensor technologies for water quality. Key collaborators include University College Dublin, University College Cork, Memorial University (Canada), EpiSensor, Central Solutions, Smart Bay, Irish Fisheries Board, Roche Ireland Ltd.



### Institute of Technology Sligo

**Centre for Sustainability:** A PRTL-funded centre, established in 1999. Conducts research into environmental monitoring and analysis, advanced environmental analysis, wastewater treatment, remediation of contamination, sustainable development, sustainable tourism, environmental economics and public attitudes to the environment. Key collaborators include Limerick Institute of Technology, Cork Institute of Technology, Letterkenny Institute of Technology, Galway-Mayo Institute of Technology, Institute of Technology Tralee, Dundalk Institute of Technology, Trinity College Dublin, University College Dublin, NUI Galway, University College Cork, University Limerick, NUI Maynooth, University of Ulster, Queen's University Belfast, Scottish Association for Marine Science (UK), University of Melbourne (Australia), South West College (NI), Kerry County Council, Sligo County Council, United Utilities (UK), Welsh Water (UK).

### Centre for BioEnvironmental and Public

**Health (BEPH):** Established in 2007. Funded predominantly by the EPA and HEA. Conducts research into environmental and public health issues such as human pathogen dispersal via wastewater discharges and the spreading of sewage sludges and farm waste on agricultural land. Key collaborators include University College Dublin, NUI Galway, John Hopkins Bloomberg School of Public Health (USA) and local authorities in Counties Sligo, Mayo, Roscommon and Donegal.



Waterford Institute of Technology

INSTITIÚID TEICNEOLAÍOCHTA PHORT LAIRGE

### Waterford Institute of Technology

**Eco Innovation Research Centre (EIRC):** The cross-disciplinary development of new products, technologies, services and processes that contribute to sustainable development. Thematic areas of research within the EIRC include Estuarine, Forestry, Molecular Ecology and Sustainable Agriculture. Predominately funded by Enterprise Ireland, EPA, Marine Institute, the HEA, TSR Programme and the EU. Key collaborators include NUI Galway, University College Cork, Trinity College Dublin, Queen's University Belfast, Memorial University (Canada), Teagasc, EPA, Coillte, Forest Service, British Forestry Commission (UK), Commonwealth Agricultural Bureau International (CABI), Agri-Food & Biosciences Institute (NI), National Biodiversity Data Centre (NBDC), and Swift Ecology Ltd. (UK).

# Teaching in the Multilingual Classroom

Language teachers increasingly find themselves preparing to face the realities of the multilingual rather than the monolingual classroom. The multilingual classroom, however, presents opportunities for effective language learning that frequently are not met because its complexities are not always understood and its potential not exploited. Confronted with the daily contingencies and challenges of administration, assessment and curriculum, educators tend to approach the teaching and learning of languages as if monolingualism were the norm; and overlook the fact that bilingual or multilingual learners of any target language are not the same as monolingual learners.

To address this issue, **Dr Muiris O'Laoire** of the **Centre for Language Acquisition Research** at **IT Tralee** in collaboration with **Professor Christine Hélot** of the **IUFM** and the **University of Strasbourg France** conducted qualitative-type ethnographic research deploying interviews, TAPs observation and linguistic analysis to determine the following:

1. How languages are positioned within the home and school – including teachers' and whole school policies and ideologies of additive or subtractive bilingualism have a considerable bearing on multilingual learners' educational and linguistic development.
2. How the imbalance in power relations, the utilisation of resources and linguistic models and standards as well as the positioning of 'authoritative' texts and the overt or covert reluctance to draw on community funds of cultural knowledge all play a part in undervaluing the valuable ecologies of the multilingual classroom.

International collaborators invited to contribute to this work included academics from University of Birmingham, UK; Universidad de los Andes, Bogotá, Colombia; University of Hamburg, Germany; City University of New York, USA; Heriot-Watt University, UK; Massey University, New Zealand; University of Melbourne/Monash University, Australia; Hebrew University Jerusalem, Israel. The challenge was to establish a common approach in a range of different cultural contexts and educational settings, which was overcome by agreeing on using the Creese and Martin framework of ecology and agency.

Findings from this work included:

- Certain pedagogical practices like "translanguaging" must be legitimated and accepted by all participants in multilingual classrooms.
- An ecological perspective works in that it requires us to question the pedagogic validity of what teachers do in multilingual classrooms.

The research will be published in a co-edited volume Hélot, C & Ó Laoire, M (2010) ***Teaching in the Multilingual Classroom: Policies for Pedagogy. Clevedon, Buffalo, Toronto, Sydney Multilingual Matters***



## DViz – The Online Platform for Data Visualisation

The **Dviz** project at **IADT, Dun Laoghaire** is a collaborative two-year digital technology research project funded by the National Digital Research Centre (NDRC). The NDRC specialises in funding innovative translational research in the digital media sector. The project brings together a diverse skill set including commercial partner **Twelve Horses** and academic research teams at **IADT** and **UCD** to realise an innovative visualisation platform with strong commercial potential.

**Hilary Kenna**, a Lecturer in Design and Digital Media, from the **School of Creative Arts, IADT, Dun Laoghaire** co-authored the project with Gabrielle Stafford from **Twelve Horses**. She is one of the project's two Principal Investigators (the other being Dr. Aaron Quigley, UCD) and is **Dviz's** Design Research Lead.

**Dviz** itself is an online platform to facilitate the contextualisation of statistical data in real-time using dynamic visualisation technology. The ultimate objective of this project is to unlock the value of data by creating a platform that will enable users to visualise, manipulate and track data in a way that is meaningful for them. The resultant dynamic visualisations will facilitate immediate understanding of real-time data, will enable the user to drill-down to investigate causal relationships and will lead to more effective decision and policy making.

The scope of the project's application is for a wide range of data visualisation contexts in any situation where non-database literate users need to view and interrogate complex (multivariate, dynamically changing) data sources in real-time in an online environment.

The research value of **Dviz** lies in the combination of data analysis and information visualisation – a relatively new space called 'visual-analytics'. By replacing the existing lengthy, labour-intensive and technically and semantically challenging query construction and evaluation phases, non-database experts have immediate access to data and its meaning. The technical challenge of the project lies in building four elements of the platform (data layer, graphic production, visualisation toolkit and architecture model) to interact together in real-time. In addition, visualisation technology, often more pictorially artistic than useful, is applied to represent data in a way that is meaningful for the user, essentially turning raw data into useful information.

The project started in February 2009 and will run for two years after which it will be launched commercially.

## Theme 4 Medical Devices, Engineering and Materials Research

### Headline Facts:

- Within this theme there are currently:
  - **12** Established research groups
  - **30** Principal Investigators
  - **7** Postdoctoral researchers
  - **47** Postgraduate students
- Since 2004, researchers within this theme have:
  - Been awarded over **€14 million**
  - Published over **184** peer-reviewed journal and conference papers
  - Been granted **3** patents
  - Engaged in over **40** applied research projects with industry

### Technological Expertise:

- Medical Device Technologies:
  - Smart medical devices for assistive rehabilitation
  - Development of vascular, urinary and digestive simulation systems
- Materials research:
  - Development of novel polymeric drug delivery systems
  - Novel polymer recycling technologies
  - Biodegradable polymer synthesis and characterisation
  - Development of novel nano-particulate polymeric composite systems
  - Development of techniques for cutting sharpness of materials
  - 3D examination of materials and products
  - Mathematical modelling of magnetically targeted nanoparticles in biomedicine
  - Microwave processing and waste remediation
- Design technologies:
  - Sustainable product design and processing
  - Design innovation
- Engineering research:
  - Bioengineering
  - Biomedical imaging
  - Geotechnical engineering
  - Materials, mechanics and modelling



# Over 40 applied projects with industry

## IOT Centres and Groups Conducting Research in Medical Devices, Engineering and Materials



### Athlone Institute of Technology

**Materials Research Institute (MRI):** Established in 2000 and funded by Enterprise Ireland and TSR programme. Current research includes the development of novel polymeric drug delivery systems; novel polymer recycling technologies and biodegradable polymer synthesis and characterisation; development of novel nano particulate polymeric composite systems. New and emerging areas of research include computational analysis & rapid prototyping/tooling/manufacture. Key collaborators include Dublin Institute of Technology, University College Dublin, Queen's University Belfast, NUI Galway, Trinity College Dublin, University of Limerick, Dublin City University, Georgia Tech, Galway-Mayo Institute of Technology, Boston Scientific, Medtronic AVE, Pharmaplaz, Clearstream, Transitions Optical, Altay, Elan, Applied Intellectual Capital (USA), Mallinkrodt, PPG (USA), Patterson Protective Coatings (UK), Cameron, Mergon, USCI (Japan), Lotus Engineering.



### Dundalk Institute of Technology

**Regulated Software Research Group:** Established in 2009 as part of the Software Technology Research Centre. Funded by SFI, FP7 programmes and the internal research masters funding programme within DKIT. Current research includes the development of a global software development framework for the medical device industry and the development of an ideal software development environment for medical device software. Key collaborators include Lero – the Irish Software Engineering Research Centre, Dublin City University, University of Ulster, University College Cork, Vitalograph, Axellis Ltd., Boston Scientific, Spice User Group (UK), VTT (Finland), Griffith University (Australia).



Institiúid Teicneolaíochta Chorcaí  
Cork Institute of Technology

### Cork Institute of Technology

#### Medical Engineering Design and Innovation

**Centre (MEDIC):** Established in 2008, under the Enterprise Ireland-Applied Research Enhancement (ARE) programme. The Centre aims to generate a stimulus for innovation, new ideas and technology transfer in the research themes of smart medical devices for assistive rehabilitation. There are 3 applied research strands: smart surgical devices; assistive rehabilitation devices; therapeutic and regenerative medicine.



### Galway-Mayo Institute of Technology

#### Galway Medical Technologies Centre

**(GMedTech):** Established in 2005, this Applied Research Enhancement (ARE) centre is actively progressing simulation systems that mimic the peripheral vasculature; the cardiovascular system; the venous system and the urinary and digestive systems. Current research is focused on the cardiovascular area and has four major topics: abdominal aortic aneurisms; cranial aneurisms; coronary artery disease; venous systems. The Centre is mainly funded by Enterprise Ireland, the HEA and TSR Programme Strand III. The key collaborators include Cork Institute of Technology, Waterford Institute of Technology, Royal College of Surgeons in Ireland, NUI Galway, University College Hospital Galway, University Limerick, McGowan Institute for Regenerative Medicine (USA).



### Institute of Technology Sligo

**Centre for Design Innovation:** An Applied Research Enhancement (ARE) centre, established in 2006. The primary aim is the understanding and promotion of effective use of design within business and the public sector in Ireland. Mainly funded by Enterprise Ireland, InterTradeIreland, EU Interreg Programme and the BMW Regional Assembly. Key collaborators include Cork Institute of Technology, University of Cardiff (UK) and Masonite.

**Geotechnical Research Group:** Established in 2005 and funded by Enterprise Ireland and TSR Programme Strand III. Conducts research into the use of full-flow penetrometers for measuring the undrained shear strength and consolidation characteristics of soft soil; geotechnical performance of offshore anchoring systems for floating facilities; predicting the settlement of embankments constructed on soft ground; physical modelling of soil-structure interaction problems using a geotechnical centrifuge. Key collaborators include Trinity College Dublin, University College Dublin, Virginia Tech (USA), University of Western Australia, Maccaferri GP, In SITU (UK), AGECE, Geoprobings (Norway).

#### Mechanical and Electronic Engineering:

Funded by Enterprise Ireland and TSR Programme Strand III. Current research themes include the development of a standardised technique for the measurement of cutting sharpness for biomaterial and biocomposites; acoustic emission modelling of fracture events in bone using neural network analysis; to predict the crack propagation in bone. Key collaborators include Dublin Institute of Technology and NUI Galway.



### Institute of Technology Tallaght Dublin

#### Microsensors for Clinical Research and Analysis

**(MiCRA):** Established under the Enterprise Ireland Applied Research Enhancement (ARE) programme in 2006. Research includes micro and nano fabrication of high quality designed structures using cheap, non-labour intensive methodologies and the subsequent characterisation via SEM and AFM; synthesis of novel organic compounds including metallo-organics; development of bio-components for bio-sensors; electrochemical characterisation of nanostructures, bio-sensors and other novel materials; surface modifications via organic, metallic or inorganic materials. Key collaborators include Waterford Institute of Technology, Tyndall National Institute, University College Dublin, Trinity College Dublin, Dublin City University, University of Monash (Australia), University of Sheffield (UK).

#### Bioengineering Technology Centre (BTC):

Established in 2007. Multidisciplinary group (materials, mechanics, finite element analysis & computational fluid dynamics modeling, bioengineering, control and sensors). Current research is mainly in the area of orthopaedics, biomechanics, FEA and CFD analysis, rapid prototyping and design, working closely with orthopaedic surgeons and other medical professionals and consultants from AMNCH, Galway, Clare, Blackrock, Crumlin and Coombe Hospitals.



### Institute of Technology Tralee

**Geometric Optics:** Established in 2006 and funded by SFI, IRCSET, Enterprise Ireland and Wellcome Trust (UK). Activities within this group revolve around basic research in mathematics, includes mathematical physics, computer graphics and biomedical imaging. Key collaborators include University College Dublin, Dublin City University, University of Limerick, Royal College Surgeons in Ireland, University of Durham (UK), University of Edinburgh (UK), University of Glasgow (UK), Humboldt University (Germany), Université de Paris-Est Marne-la-Vallée (France).



Waterford Institute of Technology  
INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE

### Waterford Institute of Technology

#### South Eastern Applied Materials (SEAM)

**Research Centre:** Established in 2008, under the Enterprise Ireland Applied Research Enhancement (ARE) programme. Conducts research relevant to orthopaedics, medical devices and pharmaceutical sectors. Current research focuses: novel implant materials for orthopaedic joints; application of finite element analysis in the development of biomedical devices; development of non-destructive methodologies for 3D examination of product components using X-ray tomography; microwave processing of materials & mathematical modelling of magnetically targeted nanoparticles in biomedicine. Key collaborators include University of Limerick, Cork Institute of Technology, Dublin Institute of Technology, Galway-Mayo Institute of Technology, Abbott Ireland, Boston Scientific, Bausch and Lomb, Genzyme Ireland Ltd., Stryker Orthopaedics and Sigmoid Pharma Ltd.

# Global Warming and Our Fresh Water Reserve in the Antarctic

Increases in pollution have led to stresses on the purity of and demand on accessible fresh water globally. Less than 1% of the world's fresh water which is accessible for direct human use is found in rivers, lakes, reservoirs and underground aquifers. The remaining 1.5% of the world's fresh water is frozen in glaciers and icebergs such as those found in the Antarctic. To date, there has been a lack of available and efficient technologies to harvest this resource of fresh water and there is the threat that global warming will cause it to melt into the oceans. As temperature increase is the major factor of global warming that is causing these freshwater reserves to melt, it is important that it is monitored regularly in the Antarctic environment.

In 2008, **The Centre at Limerick for Environmental Analytical Research (CLEAR)** at **Limerick IT**, led by **Dr Josephine Treacy**, was involved in a project for the Beyond Endurance Antarctic Expedition 2008 "Antarctic Challenge Team 2008." The **CLEAR** research group is involved in environmental monitoring, management and control. Both sensor design and bio-monitoring and the application of wireless sensor technology for environmental control are a key aspect of CLEAR research. The object of the **CLEAR** Antarctic Research Project was:

- To educate secondary school transition year students (from Salesian College, Pallaskenry, Limerick; Terence McSweeney Community College, Knockabreeny, Cork; St Nesses's Community College, Limerick) on issues related to global warming;
- To conduct temperature measurements using wireless sensors;
- To use analytical measurements to locate the fresh water reserve in the Antarctic with the use of conductivity measurements;
- To monitor pH and nitrate levels in the water in the vicinity of the Antarctic;
- To study waste management practices in the Antarctic through the use of questionnaires.

This project educated transition year students on issues related to global warming and provided the opportunity to investigate temperature profiling in the Antarctic using wireless sensor technology. The students were supervised by Carol Meager, an EPA-Strive postgraduate student from **CLEAR**. The measurement of temperature involved the use of Zigbee Wireless Sensor Technology manufactured by **Episensor**, an SME company located in the **Enterprise Acceleration Centre** at **Limerick IT**. The wireless sensors were positioned for air temperature measurement at timed intervals throughout the Antarctic voyage. These measurements were collected and will be used to monitor temperature change in the Antarctic.

The future deployment opportunities of wireless sensor technologies are presently being researched by the **CLEAR** research group at **Limerick Institute of Technology**.

# Ion Channel Biotechnology

The **Ion Channel Biotechnology Centre (ICBC)** at **Dundalk IT** is the commercial arm of the **Smooth Muscle Research Centre**, a research team comprised of about 20 researchers, including 4 Principal Investigators, a visiting Professor and Senior Research Fellow.

The focus of the research is on ion channels, and includes expertise in electrophysiology, imaging technology and studies investigating the mechanisms of excitation-contraction coupling in smooth muscle. Of particular interest is the role of calcium in smooth muscle function, and the influence that ion channels have in controlling mechanisms of contraction in healthy and diseased tissue. The primary areas of interest are in urinary incontinence and urethral physiology, erectile dysfunction, arthritis and diseases of the vascular system.

**ICBC** is engaged with industry through the development of tools for measuring and analysing biological function in smooth muscle. These industrial collaborations include approaches to adapt imaging tools, microscopes and cameras for medical use, as evidenced by long time collaborations with companies such as **Andor Technology** in Belfast. More recently the Centre has initiated a program to develop drug candidates for treatment of urinary incontinence, and has established two additional capabilities in molecular biology and organic chemistry to assist in this development plan. Urinary incontinence is due in part to the spastic contraction of smooth muscle lining the bladder, the result of overactive contractile machinery and an imbalance in the open and closed states of specific ion channels. Current therapies to treat this condition focus on the nervous control of the smooth muscle. The approach taken at the Centre is to reduce the activity of the smooth muscle directly through opening ion channels that are known to relax the smooth muscle. The effect is seen in isolated cells, and in whole tissue strips and while at the early stages of development, this approach holds considerable promise. Through the use of patent applications the Centre will protect a portfolio of high value compounds for commercialization, with a goal to develop treatments for debilitating diseases that severely affect people's lives.

## Theme 5 Creative Arts and Technologies, Social Sciences and Humanities Research


### Headline Facts:

- Within this theme there are currently:
  - **18** Established research groups
  - **198** Principal Investigators
  - **26** Postdoctoral researchers
  - **165** Postgraduate students
- Since 2004, researchers within this theme have:
  - Been awarded over **€17 million**
  - Published **215** peer-reviewed publications
  - Held over **60** group and solo artist exhibitions
  - Published **54** books/book chapters
  - Been granted **6** patents

### Technological Expertise:

- Assistive technologies and ambient assisted living
- Men's health research
- Rehabilitative therapy research
- Development of national physical activity guidelines for Ireland
- Tourism
- Marketing
- Women in management
- Human resource management
- Accounting and finance
- Franco - Irish Studies
- Language Acquisition
- Art history and design history
- Creative industries
- Creative arts and media
- Design and visual communications
- Broadcast and digital media
- Visual and material cultures





# 54 books and book chapters and over 60 solo and group exhibitions

## IOT Centres and Groups Conducting Research in Creative Arts and Technologies, Social Sciences and Humanities



### Institute of Technology Blanchardstown

**Language, Language Education, Cultural Studies and Educational Data Mining:** Conducts research into areas of language, language education and literacy development, cultural studies, intercultural studies and diversity. Also looks at the impact of teaching and learning projects on the students learning experience using data mining techniques. Funded by IRCHSS, TSR Programme Strand I, the NDLR, the HEA Strategic Innovation Fund and the AIB innovation Fund with ITB. Key collaborators include Trinity College Dublin, Dublin Institute of Technology, Institute of Technology Tallaght, Institute of Technology Carlow, Rapid-I, Blanchardstown Area Partnership and the National Adult Literacy Agency (NALA).



### Institute of Technology Carlow

**Industrial Design and Product Innovation (DesignCORE):** An applied design research centre, established in 2004. Focuses on industrial design and product innovation. Key themes include: sustainable product design & innovation; 3D visualisation and rapid prototyping in design; user interface and user centred design. Funded under the EU Interreg Programme and Enterprise Ireland. Key academic partners include Athlone Institute of Technology, Galway-Mayo Institute of Technology, University of Alabama (USA), TU Delft (Netherlands), University of Limerick, KAOS Pilots (Denmark), PDR University of Wales Institute, Fundacion Prodiintec (Spain), University Oviedo (Spain). Client companies include Allsop Europe Ltd., Haptica, FastForm Research Ltd., Oglesby & Butler Ltd., Broderick Engineering Ltd., Open Window, Keenan Systems Ltd., Kelsey Manufacturing Ltd., NIPAK, Lencraft Boats Ltd., Consort Case Ltd., Ace Compaction Ltd., EPAS, Distag Ltd., Informed Choice, Supercare 2000, Kings River, Netwatch Security, VVVisions.

### **National Centre for Men's Health (NCMH):**

Established in 2008. Dedicated to men's health research. Partners with the Health Services Executive, Department of Health and Children, Men's Health Forum in Ireland, European Men's Health Forum, Institute of Public Health in Ireland, Irish College of General Practitioners and the National Office for Suicide Prevention.

### **Rehabilitative Sciences Research Centre (RSRC):**

Established in 2007. Primarily concerned with the critical evaluation of therapeutic practices and procedures employed by therapists in clinical practice, but also other areas such as strength and conditioning, exercise rehabilitation, gait analysis and sports rehabilitation. Developed links with Dublin City University, University College Dublin, University of Limerick, Universidad Rey Juan Carlos (Spain), the British Association of Sports Rehabilitators and Trainers (BASRAT) and the US National Strength and Conditioning Association (NSCA).



Institiúid Teicneolaíochta Chorcaí  
Cork Institute of Technology

### **Cork Institute of Technology**

**Creative Arts Research:** Research interests include design for interaction; critical approaches to art and technology; communication through new media; internet-based and networked art; art history; design history; cultural and media studies.

**Business and Humanities Research:** Research interests include tourism; marketing; women in management; human resource management; accounting; finance; ICT; social services; community care; health policy; health education; social economics; family and relationship psychology; childcare; physical activity and child and adolescent wellness and health.



### **Dundalk Institute of Technology**

**NETWELL Centre:** Established in 2006 and predominantly funded by Atlantic Philanthropies, EU Interreg Programme and Enterprise Ireland. Promotes social **Networks**, **Environments** and **Technologies** for **Wellness** and ageing-in-place. Aims to provide a regional centre of excellence for the applied research, development and application of innovative service models and technologies to support older people to age-in place in their homes. Includes the Applied Research Enhancement (ARE) centre: **Centre for Affective Software for Ambient Living Awareness (CASALA)**. The Centre partners with SToRC at Dundalk Institute of Technology, University of Ulster, NUI Galway, NUI Maynooth, Trinity College Dublin, Dublin City University, Royal College of Surgeons in Ireland, Simon Fraser University (Canada), the Health Services Executive and the local authorities.

**Creative Media Research Group:** Areas of research include work practices for stimulating and managing the creative process; e-learning; new media narrative forms; transformative impact of media on society. Additional research areas include; social networking; gaming; identity and place; drivers of business growth (innovation in creative industries); new-content creation; tangible interface design; new media narrative structures.

**Music Research Group:** Established in 2009 and located within the Department of Music and Creative Media, the Music Research Centre provides teaching, research and scholarship, and involvement with community, all of which are interlinked and mutually supportive. The research conducted within the Centre is carried out within a number of specialist areas, such as; performance practice, music technology, composition and analysis, music education and pedagogy, music and community,

ethnomusicology and musicology, and traditional and folk music. The Centre is a member of the HEA PRTL Cycle 4 Funded initiative, An Foras Feasa: the Institute for Research in Irish Historical and Cultural Traditions which is a consortium of four partner institutions: NUI Maynooth, St Patrick's College Drumcondra, Dundalk Institute of Technology and Dublin City University. The Centre also collaborates with the Contemporary Music Centre – through a collaborative project between the Music Departments of Dundalk Institute of Technology, St. Patrick's College Drumcondra, NUI Maynooth and the Contemporary Music Centre, Dublin (Ireland's national archive of contemporary music) under the auspices of An Foras Feasa.



**Institute of Art, Design and Technology,  
Dun Laoghaire**

**Creative Arts and Media Research:** Research interests include creative arts and media, theory and practice; broadcast and digital media; design and visual communications; visual and material cultures; photography; moving images. Funded by the National Digital Research Centre (NDRC), TSR Programme Strand I, EU Programmes and IRCHSS. Member of the International body of film schools (CILECT), partner in the EU Media funded ENGAGE workshops, member of the European League of Institutes of Art (ELIA), member of the Graduate School of Creative Arts and Media (GradCam) funded under PRTL and is a founding partner of the National Digital Research Centre (NDRC).

### **Centre for Creative Technologies and**

**Applications (CCTA):** Established in 2001.

Explores the interaction between people and technology. This finds expression in a range of existing disciplines such as audio/visual technologies; gaming; multimedia; psychology; eLearning; assistive technologies and emerging disciplines such as cyber-psychology. Mainly funded by EU programmes, TSR Programme and Enterprise Ireland. Key collaborators include Dundalk Institute of Technology, TSSG at Waterford Institute of Technology, Trinity College Dublin, University College Dublin, Corvenius University (Hungary), Ericsson Ireland, Dept. of Education, Websplash, Oniva.

**Centre for Public Cultures Studies:** Research interests include: entrepreneurship and public cultures; public cultures as related to labour law; comparative industrial relations; work identities and patterns; contemporary British and European cinema; globalisation; cultural tourism and heritage; radical and alternative media practices; arts, culture and citizenship. Funded by TSR Programme Strand I and Dun Laoghaire Rathdown County Council. Key collaborators include Loras College (Iowa, USA), Memorial University (Canada), Sir Wilfred Grenfell College (Canada) and a wide range of local and regional industry partners.



### Letterkenny Institute of Technology

**Business Research Group:** Established in 2008. Focused on several key research themes: innovation & enterprise; new media (including social media); strategic planning in the public sector; dispute resolution; research/teaching interface.



### Institute of Technology Tallaght Dublin

#### National Centre for Franco-Irish Studies

**(NCFIS):** Established to act as a conduit for research into the historical, literary, spiritual, cultural and other links between France and Ireland. Aims to contribute to the public debate by putting into perspective general issues such as infrastructure development (transport, health and education), immigration, flexibility, entrepreneurship, and by comparing the French and Irish approaches to these issues and what could one country learn from the other on ways to tackle these issues.



### Institute of Technology Tralee

#### Centre for Language Acquisition Research:

Established in 2009. Funded by Chomhairle um Oideachas Gaeltachta & Gaelscolaíochta (COGG); IRCHSS; Údarás na Gaeltachta; TSR Programme Strand I. Research interests include the study of bilingualism and multilingualism and the development of knowledge of second language and third acquisition in naturalistic and instructional contexts. Aims to advance the quality of language teaching and learning by: conducting research and action projects; sharing research-based and other forms of knowledge across disciplines and education systems locally, nationally and internationally; engaging with practicing teachers; supporting learners in language immersion/ bilingual/multilingual situations. Key collaborators include Trinity College Dublin, University College Dublin, NUI Maynooth, University of Waikato (New Zealand), University of Haifa (Israel).



Waterford Institute of Technology  
INSTITIÚID TEICNEOLAÍOCHTA PHORT LAIRGE

## Waterford Institute of Technology

### **Waterford Crystal Centre for Marketing**

**Studies:** Established in 2003. Committed to the creation and diffusion of new marketing knowledge by promoting three interacting activities: teaching, research and industry interaction. Key research interests include marketing strategy and the development of capabilities, innovation and knowledge transfer, brand and reputation management and sports marketing. Centre research activity is funded by Fáilte Ireland, IRCHSS, Health Services Executive, Enterprise Ireland and TSR Programme. Key academic collaborators include Manchester Business School (UK), Oklahoma State University (USA) and Stony Brook University (USA). The Centre's research is applied in collaboration with the Health Services Executive, Marketing Institute of Ireland and Waterford Crystal.

### **Centre for Social and Family Research:**

Established in 2003. Conducts applied social research which will critically address current debates in Irish social policy and make a contribution to the development of policy. Brings together the teaching and research strengths of a strong multi-disciplinary team and benefits from a range of disciplines including: sociology, social policy, theology, social work, early childhood studies and psychology. Key areas of strategic research interests include racism and ethnicity, changing nature of Irish families, child-centred research, religion, fathering, men

and masculinities, parenting and fostering. Strong links have been developed with key commissioning bodies and funding has been secured from the TSR programme, IRCHSS and The Department of Health and Children. Key collaborators include University College Cork, University College Dublin, Bradford University (UK), FochlochSchule Gelsenkirchen (Germany), the Department of Social and Family Affairs and the Department of Justice, Equality and Law Reform.

### **The Centre for Management Research in Healthcare and Healthcare Economics**

**(CMRHHC):** A regional partnership, which brings together leading healthcare executives and representatives in the field of management and organisation of healthcare. Key areas of strategic interest include; quality implementation frameworks in healthcare, healthcare accreditation, performance measurement in healthcare, patient and public involvement in healthcare decision-making, human resource development in the health services, reputation management, healthcare economics and GP management practices. Funding has been secured under the TSR Programme Strand III and the Ireland Newfoundland Partnership Programme. Key collaborators include organisations such as the Health Services Executive South East (HSESE), the Irish College of General Practitioners, Memorial University (Canada), University of Nottingham (UK) and Dublin City University.

# Cultivating Entrepreneurship through Collaboration

## The Right Environment

Turning innovative ideas into successful businesses requires a powerful blend of people, place, culture and imagination. Developing an enterprise culture is about providing the right environment for new ideas to grow alongside existing flourishing enterprises. The shared vision of the **Institute of Technology, Tralee** and Shannon Development for the seamless integration of the business and learning communities has resulted in the development of one of Ireland's most successful business environments – Kerry Technology Park. The shared campus has become a national role model and the interchange of ideas, skills, knowledge and energy between the Institute of Technology, Tralee and Park based enterprises involving students, researchers, lecturers and entrepreneurs, underpins the success of the campus as a whole.

## Learning through Excellence

Entrepreneurship forms a central focus of the **Institute of Technology, Tralee** strategically led by the **Centre for Entrepreneurship** located in the **Tom Crean Business Incubation Centre**. We practise and promote real-time engagement between entrepreneurs, academics and students together with offering strategic support and intervention with their business ideas.

Entrepreneurship is promoted inclusively at key inflection points in the education system by designing and tailoring programmes to suit the different learning needs of second level, third level, post graduate and post doctoral level students. Creativity and innovation is encouraged in our model of Interactive Action Learning and Applied Delivery.



YEP [www.youngentrepreneur.ie](http://www.youngentrepreneur.ie) has received international recognition for its innovative approach to entrepreneurship education and the high level of interaction between students and entrepreneurs. Students learn transferable life skills on the programme as they learn how to research, present, peer critique, network, seek mentor support and apply financial business sanity tests to their business ideas. The programme offers a full curriculum, application of multiple pedagogies in its delivery, business plan templates, mentoring from local entrepreneurs, educator training, a customised resource book with a fully resourced web site, two-day seminars, workshops, end-of-year examination and an awards programme which includes an opportunity for work placement with local entrepreneurs for the finalists.



The Endeavour Programme [www.endeavour.biz](http://www.endeavour.biz) is about giving potential entrepreneurs the opportunity to fast-track their dreams by learning from the best in a proven environment totally focused on bringing businesses all the way from concept to reality. Participants are immersed in a business and academic environment for seven months, learning to engage and network with their peers, other business start-ups, global entrepreneurs located in Kerry Technology Park and the staff and students of the **Institute of Technology, Tralee**. They receive one-to-one support from Ireland's top entrepreneurs and learn from some of Ireland's leading professionals, with their businesses being challenged through business stress panels.

## Future Planning

We will continue to work in collaboration with our academic and entrepreneur partners as we develop the Junior Entrepreneurship Programme targeted at primary level students, international summer camps in entrepreneurship, executive education and postgraduate programmes.

# Fame Strategic Research Cluster: Creating a National Telecommunications Innovation Hub

The awarding of a €5.86m Science Foundation Ireland (SFI) Strategic Research Cluster (SRC) grant to **Waterford Institute of Technology's Telecommunications Software Systems Group (TSSG)** and its academic and industrial partners is an important step towards the establishment of a national innovation cluster in the communications services area. The **FAME (Federated, Autonomic, Management of End-to-end Communication Services)** Cluster is led by the **TSSG** and brings together leading academic research groups from TCD, UCD, NUIM, and UCC and industrial players including Telefonica I&D, Cisco, Ericsson, HP and IBM. This research programme which aims to develop leading edge communications management solutions for next generation networks, is the first SFI Strategic Research Cluster to be led by an institute of technology.

The research programme provides a research and development eco-system, integrating long-term strategic oriented research, postgraduate student training and innovative technical solutions for industry. This is achieved through direct involvement of industry in the development and implementation of the **FAME** programme. Scenarios provide a common platform for the exchange of knowledge and requirements between the academic and industrial players thus ensuring that scientific solutions developed within the project can be more easily integrated into the industry partners' product portfolios. The project plans to extend the model over time to create a national communications services innovation hub, supporting the needs of both multinational corporations (MNCs) and small to medium sized enterprises (SMEs.)

The track record of the **TSSG** since 1996 has established a model for the creation of an innovation environment, funded from diverse Irish and European research funding sources. The innovation model has been achieved through the creative use of its funding portfolio, achieving a balanced mass of basic, applied and pre-product research and by pushing the boundaries of expectations beyond the traditional view of the scope of academic research to incorporate metrics for industry impact. These impacts include standardisation, transfer of technology and know-how to industry, new product development and industry start-ups. Establishing strong academic/industry partnerships is fundamental to the creation of a research and innovation environment.

The **TSSG** is connected to the international business and research community through the European Framework Programmes (FP5, FP6 and FP7). Furthermore international research collaborations are supported by Higher Education Authority (HEA) and SFI research programmes and awards. An example of how support to the broader ICT community (particularly SMEs) is provided is the Enterprise Ireland sponsored Industry-Led Research Programme (ILRP). The **TSSG** has more than 20 companies (80% SME) in its ILRP IMS-ARCS ([www.ims-arcs.com](http://www.ims-arcs.com)). The role of the **TSSG** is to support these companies in the development of next generation mobile and telecommunications solutions for the global market.



## Theme 6 Entrepreneurship Research, Entrepreneur Support and Business Incubation

### Headline Facts

#### Entrepreneurship Research:

- Within this theme there are currently:
  - **5** Established research groups
  - **19** Full-time faculty members
  - **53** Postgraduate students
- Since 2004, researchers within this theme have
  - Been awarded over **€7 million**
  - Published **120** peer-reviewed journal and conference papers
  - Published **38** books/book chapters

#### Entrepreneur Support:

- Within the sector there are currently:
  - Over **€14 million** in investment in Enterprise Platform Programmes
  - Currently almost **180** entrepreneurs on Enterprise Platform Programmes
  - Over **850** entrepreneurs supported to date

#### Business Incubation:

- Approximately **€38 million** has been invested by Enterprise Ireland's Campus Incubation Programme
- Within the sector there are currently:
  - **14** Incubation Centres, offering almost 18,000m<sup>2</sup> of incubation space
  - **249** Client companies, of which 52 have reached HPSU status, as defined by Enterprise Ireland
  - **695** People employed by these client companies, of these 62 are graduates of the IOT sector
- Since the establishment of Incubation Centres in the IOT sector there have been:
  - **338** Collaborative research projects with academic research groups
  - **345** Projects involving IOT students
  - **48** Patents granted to client companies
  - **15** Campus spin-out companies

### Expertise

#### Entrepreneurship Research:

- Female entrepreneurship
- Entrepreneurship education and training
- Entrepreneurship in the creative industries
- Social entrepreneurship
- Entrepreneurship in emerging economies

#### Enterprise Support and Business Incubation:

- Enterprise development
- Business Incubation
- Technology innovation and commercialisation
- Innovation and knowledge transfer
- Marketing
- Development of networks
- Training and development





# State investment in the Institutes of Technology has supported 850 entrepreneurs

## Entrepreneurship Research

### IOT Centres and Groups Conducting Research In Entrepreneurship



#### Dundalk Institute of Technology

**Centre for Entrepreneurship (CER):** Established in 2001. Research expertise includes entrepreneurship, women's entrepreneurship, entrepreneurship education and training, enterprise and innovation; entrepreneurship in the creative industries; social enterprise and social entrepreneurship; business incubation; entrepreneurship in emerging economies; entrepreneurship and social inclusion/ social policy. Mainly funded under the EU Interreg, EQUAL and Leonardo da Vinci Programmes. A key collaborator is the Babson College (Boston, USA).



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Institiúid Teicneolaíochta  
Leitir Ceannairde  
Letterkenny Institute  
of Technology

#### Letterkenny Institute of Technology

##### Electronics Production & Innovation Centre

**(EpiCentre):** Established in 2005 under the EU Interreg Programme. A technology and innovation centre for the North West cross border region solving practical industrial problems in partnership between local companies and the three further/ higher education institutions in the region: The Intelligent Systems Research Centre (ISRC), University of Ulster (Magee, NI); North West Institute of Further and Higher Education (NWIFHE) and Letterkenny Institute of Technology.



### Institute of Technology Tralee

#### Centre for Entrepreneurship and Enterprise Development (CEED):

Established in 2008. Key research areas are focused on: correlation between entrepreneurship education and business set-ups; entrepreneurship and games theory; mentor intervention; leaving the MNC for entrepreneurship; cross curricular opportunities for entrepreneurship; entrepreneurship external to the Business School; creativity environs – a necessity; seamless integration between education and enterprise; funding blocks – a myth?; succession planning and entrepreneurship; social entrepreneurship. The group has been funded by Strategic Innovation Fund, Enterprise Ireland, TSR Programme Strands I & II, PRTL, Údarás na Gaeltachta, Kerry Enterprise Board and Private Investment. Key collaborators include University of Limerick, Department of Education, Dublin City University, NUI Galway, Stanford University (USA), European Forum for Entrepreneurship Education (EFEE), Mary Immaculate College, Irish Network of Teachers and Researchers in Entrepreneurship (INTRE), International Educators in Entrepreneurship Programme (IEEP), National Council for Graduates in Entrepreneurship (NCGE), Shannon Development, Kerry Technology Park, Enterprise Ireland, Ernst & Young, Kerry County Enterprise Board, South West Regional Authority, Kerry Women in Enterprises.



Waterford Institute of Technology  
INSTITIÚID TEICNEOLAÍOCHTA PHORT LAIRGE

### Waterford Institute of Technology

#### Centre for Enterprise Development and Regional Economy (CEDRE):

Supports, promotes and develops entrepreneurship in the region. Current research themes include: entrepreneurs and entrepreneurship (male and female); owner managers; enterprise creation, development, growth and internationalisation; enterprise policy; entrepreneurial regions; technology and knowledge transfer (knowledge exchange); and family enterprises. The Centre also manages the South East Enterprise Platform Programme (SEEP), and runs two postgraduate diplomas in Enterprise Development (one for entrepreneurs, the other for enterprise centre managers). Staff and associated staff of the Centre are also deeply involved in setting and supporting strategic direction of the Spirit of Enterprise Forum, Chambers of Commerce, and local/regional enterprise support agencies. Mentoring of entrepreneurs on SEEP, tenants of ArcLabs (WIT's Research and Innovation Centre), and knowledge based enterprises across the South East is a key feature of the Centre. The Centre is seamlessly integrated into the fabric of academic and economic development in the South East. Funded by EU Framework Programme 6 and Interreg Programme and Enterprise Ireland. Key collaborators include University of Aberystwyth (UK), Oxford University (UK), Cumbria University (UK), University of the West of Scotland (UK), University of Middlesex (UK), Enterprise Ireland, enterprise support agencies and local/regional government.

**Research in: Innovation, Knowledge, &**

**Organisational Networks (RIKON):** Established in 2007. Research projects include 'realising a business advantage through enhancing managerial capabilities in innovation and knowledge'; 'establishing and managing collaborative business networks'; 'investigating the knowledge and innovation needs of micro and small enterprises, and promoting/establishing a network approach to meeting these needs'; 'examining the learning and knowledge transfer activities of micro and small enterprises'; 'investigating the transfer of knowledge between Waterford Institute of Technology and stakeholders'. RIKON has a particular interest in rural tourism development. Funded by TSR Programme Strand I, Fáilte Ireland, IRCHSS, Enterprise Ireland. Key collaborators include Fáilte Ireland, Enterprise Ireland, South East Chambers of Commerce, local government agencies, and firms located in the South East of Ireland.

**Entrepreneur Support****Enterprise Start Programmes in the IOT Sector:**

- Part-time programmes, aimed at people with innovative ideas

**Enterprise Platform Programmes in the IOT Sector**

**CÉIM (Commercialising Entrepreneurial Ideas and Management Development):** A full time innovative business start up programme at **Letterkenny IT** and **IT Sligo**, delivered over 12 months. Designed to bring relevant, tangible support to people with innovative ideas that have high commercial and export potential. It assists entrepreneurs to establish and manage their own business. Successful applicants avail of training, financial and other business supports, networking opportunities and incubation space. Funded under the HEA TSR Programme Strand II.

**Create Training:** A 12 month initiative based at **IADT** that trains entrepreneurs in starting new media companies. Funded under the TSR Programme Strand II.

**Endeavour:** Hosted at **IT Tralee**. Targeted at ambitious, high achievers who are totally focused on changing the business space they are about to enter. The Ultimate Fast-Track Experience. Endeavour participants experience working in the right environment with open door access to globally focused successful Irish entrepreneurs. Funded under the HEA TSR Programme Strand II.

**Enterprise Development Programmes:** A range of research and consultancy programmes at **IT Carlow** that can be individually tailored or generic in nature including a 12 month full-time professional training and enterprise support programme aimed at entrepreneurs and innovators who wish to establish high potential business and technology start-ups. This work is supported through National and European Programmes and industrial and commercial sectors.

**Genesis Enterprise Programme (GEP):** A 12 month rapid incubation programme at **Cork IT** designed to provide support and management skills development for entrepreneurs leading knowledge based start-up companies in Cork and Kerry. Funded under the HEA TSR Programme Strand II.

**Limerick Enterprise Acceleration Platform (LEAP):** A 12 month programme at **Limerick IT** dedicated to translating ideas into viable business concept and the development of an investor ready business plan. Funded under the HEA TSR Programme Strand II.

**M50 Enterprise Platform Programme (M50 EPP):** This 12 month programme at the LINC at **IT Blanchardstown** targets those looking to make the leap from employment to start their own knowledge-intensive businesses with a high success rate. The programme provides supports including

access to entrepreneurs as mentors, incubation space, workshops and clinics focused on what needs to be done to make the business successful. The mentors and facilitators on the programme behave as a virtual management team for the business. Funded under the HEA TSR Programme Strand II.

#### **Midlands & West Enterprise Programme**

**(MWEP):** A 12 month programme that provides high potential entrepreneurs and innovative start-ups with the business skills, networks, facilities and supports necessary to navigate the business start-up process from concept to successful commercialisation. The MWEP is run jointly with **Athlone IT** and **Galway-Mayo IT** and in partnership with Enterprise Ireland. Funded under the HEA TSR Programme Strand II.

#### **Novation Enterprise Platform Programme**

**(NEPP):** The Novation Enterprise Platform Programme (NEPP), based at the Regional Development Centre at **Dundalk IT**, is a 12 month intensive enterprise programme for graduate entrepreneurs with an innovative business idea in the knowledge based, high-tech sectors. The programme provides a wide range of training, mentoring and consultancy supports aimed at developing the commercial and job creation potential of the proposed ideas. Funded under the HEA TSR Programme Strand II.

#### **South East Enterprise Platform Programme**

**(SEEP):** Delivered by the Centre for Enterprise Development and Regional Economy at **Waterford IT**. Supports entrepreneurs in knowledge based start-ups and is funded under the HEA TSR Programme Strand II.

#### **Synergy Enterprise Platform Programme**

**(Synergy EPP, formerly M50 EPP):** A highly innovative and intensive support programme based in the Synergy Centre in **ITT Dublin** which has dramatically improved outcomes for participating knowledge-based enterprises throughout the M50

economic corridor since 2001. Funded under the HEA TSR Programme Strand II.

## **Specialised Entrepreneurship Programmes in the IOT Sector**

### **Accelerating Campus Entrepreneurship**

**(ACE) Initiative:** A joint collaboration of **IT Blanchardstown, Cork IT, IT Sligo** and **NUI Galway** and is being led by **Dundalk IT** and supported by the HEA Strategic Innovation Fund (SIF). The project aims to provide innovative approaches to entrepreneurship education to ensure students from non-business programmes take enterprise related modules to gain experience of what it is like to run and operate real businesses. The programme promotes self-employment as a real, attractive and viable career option.

**Border Innovation Gateway:** A cross-border pre-incubation programme at **Dundalk IT** aimed at helping budding entrepreneurs to research and assess if their idea is sound and if they are the right people to take the idea forward.

**Business Mentoring for Winners:** A programme at **IT Sligo** through which businesses can access independent expert advice. Established under the **Lionra** initiative.

### **Innovation for Competitive Enterprises**

**(ICE):** Led by **Dundalk IT**, aimed at building the innovative capacity and capability of existing SMEs. Supported by the EU INTERREG IVA programme managed by the Special EU Programmes Body and is a joint collaboration with University of Ulster, University of Glasgow and Glasgow Caledonian University. Delivered across Northern Ireland, the six southern Border Counties in Ireland and Western Scotland.

**Success Through Succession:** Aimed at assisting family owned and family related SMEs to manage the challenges of succession. Supported by the EU INTERREG IVA programme managed by the Special EU Programmes Body and is a joint collaboration

with University of Ulster and Glasgow Caledonian University. Delivered across Northern Ireland, the six southern Border Counties in Ireland and Western Scotland.

**Young Entrepreneur Programme:** Hosted by **IT Tralee**. Provides a unique opportunity to explore and develop the talents of all participants. It complements traditional learning by layering workshops, case studies and interaction with key business leaders on top of participants own ideas.

## Business Incubation

### Incubation Centres in the IOT Sector

**Midlands Innovation & Research Centre (MIRC); Athlone Institute of Technology:** Provides incubation facilities for innovative and knowledge-based enterprises. Provides support for innovation, technology transfer and continuing professional development. Leverages off strong AIT institutional support for entrepreneurship and flexible approach to facilitating potential collaborations.

**Learning and Innovation Centre (LINC); Institute of Technology Blanchardstown:** The LINC is ITB's tangible link between the Institute and industry. Its primary objective is to help create wealth locally by enabling the creation or expansion of business ventures which will increase trade and employment in the region. The LINC provides a range of business development supports including access to research and development activities, consultancy and mentoring, access to ITB facilities, access to the network of academics and graduates at ITB.

**Enterprise and Innovation Campus; Institute of Technology Carlow:** Enterprise Development Programmes at the Institute of Technology Carlow is operated through the following Centres: Enterprise & Research Incubation Centre (ERIC), Campus Innovation Centre, CIM Centre and Business & Technology Centre with a mission

to develop knowledge-based enterprises and technology companies in the region by providing an environment that supports creativity and innovation to maintain sustainability. The Centres provide self-contained units suitable for e-business, technology and biopharma based enterprises in addition to access to appropriate support personnel.

**Rubicon Centre; Cork Institute of Technology:** Assists in the creation of new technology based companies. Provides start-up companies with the facilities and services required to develop. Provides an interface between Cork IT and industry, ensuring the further development of a commercial focus within the Institute. The NEMBES, Ireland's first dedicated network embedded systems building will be physically connected to the Rubicon Centre, facilitating the transfer of knowledge between the Institute and client companies at the centre.

**Regional Development Centre:** Established in 1989 by Dundalk Institute of Technology, the Regional Development Centre acts as the Institute's Innovation Support and Technology Transfer organisation. The Centre acts as a commercially oriented interface between DKIT and the industrial, commercial and business life of the region, and makes available the expertise, facilities and resources of the Institute for the wider benefit of the regional economy. The Centre achieves this through a range of programmes and activities.

**Innovation in Business Centres; Galway-Mayo Institute of Technology:** Established to support and facilitate the emergence of new market-led and knowledge-based companies in the region and to forge strategic links between the college and the world of industry and commerce. The two Innovation in Business Centres, located in Galway and Castlebar, are perfectly positioned to leverage off the expertise in medical device technologies both regionally and within GMIT. The client companies regularly work with GMedTech, the applied research enhancement centre based within the Institute which offers design support and access to medical imaging equipment

as well as the opportunity to participate in funded collaborative research projects. The Centres offer broad regional support as two Incubation Centres in different locations.

**Media Cube; IADT Dun Laoghaire:** Provides an environment for growth and development of new ideas and businesses in digital media. Provides a full range of value-added services specific to the needs of digital media companies. The centre provides access to specialised digital media facilities within the Institute including studios, 3D workshops, computer labs, a usability lab and a language lab.

**CoLab; Letterkenny Institute of Technology:** To stimulate innovation and nurture the growth of knowledge based business in the region. Currently supporting innovative product design such as computer games, flight navigation technologies; digital publishing technologies; internet applications; and direct marketing solutions.

**Enterprise Acceleration Centre (EAC); Limerick Institute of Technology:** The EAC supports the development of High Potential Start-Up (HPSU) businesses in the region; enhances the research commercialisation capability of the 3rd Level sector by providing a focal point for activity and support; facilitates potential linkages between EAC clients and LIT which could include student placement, graduate recruitment and/or collaborative R&D and research commercialisation.

**Innovation Centre; Institute of Technology Sligo:** The Centre represents a hub for regional development in the North West and a stimulating environment to nurture entrepreneurs. It focuses on developing high technology and knowledge intensive enterprises and offers workshop/industrial space for high tech manufacturing operations, laboratory space of the development of campus company operations and access to resources at IT Sligo. Several of IT Sligo's research centres and groups, including the Centre for Design Innovation, are located within the Innovation Centre.

### **Synergy Centre; Institute of Technology**

**Tallaght Dublin:** Aims to enable industry and academia to interact to create viable high growth enterprises for South Dublin County. Synergy's incubation and innovation laboratory space are in huge demand, having facilitated the development of numerous high potential start-ups. Client companies are selected with a view to optimising the "synergy" between the Institute's world class research and its partner enterprises, creating a vibrant innovation community and culture on campus, and a "hotspot" of innovation at the centre of the M50 economic corridor.

### **Tom Crean Business Centre; Institute of Technology Tralee:**

Offers a supportive environment and incubation facilities to assist innovators and entrepreneurs in taking their ideas from proof of principle to full commercial success. The Centre offers business training, consultancy and mentoring support, established support networks and an entrepreneurial environment. The Centre is located on campus with Kerry Technology Park and houses the Centre for Entrepreneurship, a unique collaboration between the Institute of Technology Tralee, Shannon Development, Kerry Technology Park and Enterprise Ireland.

### **ArcLabs Research and Innovation Centre;**

**Waterford Institute of Technology:** ArcLabs provides a unique structure that interlinks research, innovation and entrepreneurial ventures. It combines business incubation, research & development and entrepreneurship training and serves as a catalyst for innovation in the region. The Centre leverages the research and innovation capabilities from Waterford IT to help ambitious entrepreneurs and early stage ventures to achieve success in national and international markets.

## Appendices



# Acknowledgments

The IOT Research Coordination and Support Office would like to thank the Presidents and research staff of the Institutes of Technology for their support and encouragement of this project.





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# Methodological Approach

This yearbook was prepared by the IOT Research Coordination and Support Office, with the support of the HEA Strategic Innovation Fund (SIF). It provides a comprehensive overview of research in the Institutes of Technology between 2004 and 2009. The yearbook focuses on research activities that have achieved a critical mass or are currently emerging as areas of strength within the IOT sector, as identified by the IOTs.

- Athlone Institute of Technology
- Institute of Technology, Blanchardstown
- Institute of Technology, Carlow
- Cork Institute of Technology
- Dundalk Institute of Technology
- Institute of Art, Design and Technology, Dun Laoghaire
- Galway-Mayo Institute of Technology
- Letterkenny Institute of Technology
- Limerick Institute of Technology
- Institute of Technology, Sligo
- Institute of Technology, Tallaght, Dublin
- Institute of Technology, Tralee
- Waterford Institute of Technology

The data were gathered from the research groups and centres across the sector using a combination of a pro forma questionnaire and discussion. Additional data were collected from the IOT research offices. Upon collection and analysis of this data, the IOT Research Coordination and Support Office identified six strategic interdisciplinary research and innovation themes that reflect current national and EU research and innovation priorities. This yearbook describes the research successes in each of these themes and provides details of the principal groups conducting research or innovation projects within these areas. For additional information, the main research contact details are provided for each IOT.

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