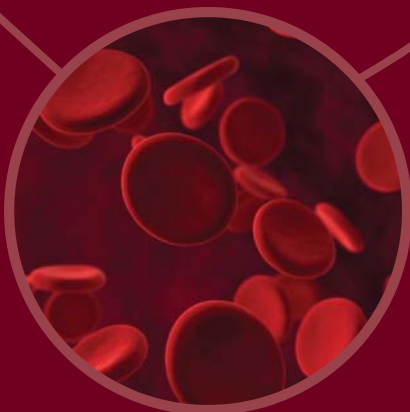


# Mapping Study of Research and Technological Development Centres on the Island of Ireland



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Department of Enterprise, Trade and Employment

Department of Enterprise, Trade and Investment

Department for Employment and Learning

InterTradelreland

Invest Northern Ireland

Enterprise Ireland

Science Foundation Ireland

## Disclaimer

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# Mapping Study of Research and Technological Development Centres on the Island of Ireland

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# Foreword

Knowledge is now identified as the driving force of economic growth, social development and job creation and the primary source of competitiveness in the world economy. InterTradelreland's vision is of a globally competitive island economy characterised by the optimal utilisation of economic resources, particularly knowledge, to drive additional wealth creation in Northern Ireland and Ireland.

Today, countries at the vanguard of the global economy are making investments in science & technology initiatives and infrastructure that are advancing knowledge creation. Michael Porter however has pointed out the paradox that "enduring competitive advantages in a global economy lie increasingly in local things - knowledge, relationships, and motivation - that distant rivals cannot match"<sup>1</sup>.

Assuming that research and technological development (RTD) capacity is a good indicator of 'knowledge' endowment, the report presents, for the first time, a picture of a 'knowledge island' that is rich and diverse with a strong degree of complementarity between North and South. The report also assesses the relationships between RTD centres. Crucially, the report concludes that collaborative activity on a cross-border basis is lower than what could be expected. The 'motivation' for cross-border collaborative activity is high: over half of the responding centres have engaged in cross-border activity over the past 5 years. The report identifies a high level of willingness to engage in further collaborative activity in areas that are both economically critical and mutually rewarding. However, this opportunity is not being realised because of a lack of awareness about potential partners and the

non-availability of a suitably targeted funding scheme.

The report makes a number of recommendations to address these issues in a manner that will optimise the use of the knowledge resources on this island, delivering additional value to Northern Ireland and Ireland and enhance the perception of the island as a hub in the global knowledge economy.

**Aidan Gough**

DIRECTOR, STRATEGY & POLICY  
InterTradelreland

<sup>1</sup> Michael Porter (1998) (Clusters and the new Economics of Competition, Harvard Business Review Nov/Dec. Boston.)

# 1. Executive Summary

## Introduction

In February 2006, the British Irish Intergovernmental Conference instituted a review of areas for potential North/South economic cooperation. The importance of innovation for future international competitiveness was recognised and the resulting report, "Comprehensive Study on the All-Island Economy", called for an all-island mapping study of research centres on the island with a view to facilitating the development of greater collaboration.

This study is designed to contribute to the North/South policy debate on science, technology and innovation by profiling the research and technological development (RTD) centres on the island, exploring the nature and extent of cross-border collaboration, exploring opportunities for collaboration and making recommendations to address those opportunities.

## Profile

Of the 96 centres who responded to the study, 41 are based in Northern Ireland and 55 in Ireland. Over half have been founded since 2000 and almost one quarter operate annual budgets of £7m/€10.5m or over.

The main disciplines covered by the RTD centres include, life & health technologies, information and communication technologies (ICT), nanosciences & nanotechnologies, aerospace technologies & advanced manufacturing, agri-food technologies and environmental technologies. Life & health technologies and information and communication

technologies are the most common areas of activity for centres and 43 per cent of centres cite activity in multiple disciplines.

Peer-reviewed publication is the main indicator of activity for centres. However, there is evidence of commercial activity with almost half of centres holding patents and almost one quarter having created spin-out companies from their work.

## Nature and Extent of Collaboration

Almost two thirds of centres have reported engagement with the private sector. Of the levels of industry collaboration reported by centres, the majority (43.5 per cent) is with local industry partners on a joint risk and reward basis. Cross-border collaborations with industry account for 6.5 per cent.

Almost 70 per cent of centres cite public sector bodies amongst their clients. The greatest proportion of joint risk and reward collaborations are with EU partners (39 per cent) and local partners (29 per cent). 9 per cent of such collaborations are on a cross-border basis. Of the levels of public sector, contractual collaboration, the majority is with EU partners (46 per cent) and local partners (36 per cent). Cross-border contractual collaborations account for 8 per cent.

In total, over half of the responding centres have engaged in cross-border collaboration over the last 5 years and cite funding opportunities, skills and experience and facilities of the partner as the main drivers for collaboration. The report points to a lack



of knowledge about opportunities in terms of incentives and potential partners as the main barriers to cross-border collaboration.

### **Opportunities for Collaboration**

The report identifies the centres' potential for cross-border collaboration by examining internal factors (such as staff and budget levels, track record for collaboration and research activity outputs) and the external environment (commerciality of research area and existence of partners in the opposite jurisdiction). A total of 36 centres were identified as having the highest potential for cross-border collaboration. These centres cover the range of disciplines referred to earlier and are split equally between Ireland (18) and Northern Ireland (18). A further 23 centres were identified (Ireland, 15; Northern Ireland, 8) as having potential for developing cross-border collaboration.

### **The Case for All-Island Collaboration**

The report demonstrates that centres collaborate, to a greater extent, with local industry and academic partners compared to cross-border partners. This can be attributed to the investments being made by each jurisdiction to support the industry-academic interface and the scale and quality of research undertaken. These investments support the common policy objectives in both jurisdictions to translate research into business and to expand the research system.

The levels of cross-border collaboration identified in the study point to a distinct border-effect which can be explained by a combination of factors including limited knowledge of potential partners and of the incentives that accommodate or encourage all-island collaboration. The availability of suitable funding has been both a driver and a barrier to collaboration. When schemes have existed, they have stimulated projects and collaborative relationships. However, the connections have tended to weaken post funding.

A further extension of industry and academic collaboration across the border will deliver enhanced mutual scientific and economic benefits by bringing together resources and excellence to achieve critical mass in areas where the island can compete internationally.

Recognising these benefits University College Dublin and Trinity College Dublin have, earlier this year, established framework agreements with Queen's University Belfast to promote, facilitate and consolidate cooperation in education and research in areas of mutual interest.

The report shows that centres demonstrate varying degrees of potential for all-island collaboration. There is no doubt that there are excellent centres in both jurisdictions in some key and rapidly developing technologies and it is these that offer the greatest prospects of delivering mutual benefit if their scale can be developed through enduring cross-border collaboration.

## Recommendations

These are based on the 2 main issues identified as barriers to cross-border collaboration; awareness and funding.

1. Improve levels of awareness and communication on a cross-border basis through measures such as:

- Facilitation of improved graduate education linkages to enhance formal post-graduate training;
- Additional support for networking across research disciplines and between the academic and policy community on the island;
- Promotional tools, for example an all-island monthly Science, Technology & Innovation (STI) Digest; and
- An all-island Science Award (perhaps by extension of those operated by the Royal Irish Academy).

2. Develop support programmes to facilitate the following types of collaborative activity:

- All-Island Research Clusters: a small number of world-class multi-location centres based on the best available resources on the island and beyond;
- Bilateral Projects: centre-to-centre or institution-to-institution collaboration on a project-by-project basis; and

- Smaller Scale Collaborative Projects: short term technology transfer projects and knowledge exchange projects, particularly with industry. This could also allow researchers to use facilities in the other jurisdiction.

3. Examine appropriate funding models to support enduring cross-border collaboration. These could include the following:

- Dedicated all-island funding mechanism;
- Alignment of existing funding mechanisms to facilitate all-island participation; and
- Adaptation of existing funding supports.

## 2. Introduction

In Ireland, the National Development Plan (2007-2013) provides the impetus for a significant expansion of scientific research which is dealt with more specifically in the Strategy for Science, Technology and Innovation (2006-2013). Building on the success of the Programme for Research in Third Level Institutions (PRTLII) and Science Foundation Ireland (SFI), this strategy sets targets for increased participation in the sciences, a step change in the quality and quantity of research and the strengthening of local and international synergistic linkages.

In Northern Ireland, the Government has identified innovation through increased investment in research and development as a key driver towards the achievement of its economic vision. A key part of that drive has been the identification of 5 key technology areas and the subsequent establishment of RTD centres of excellence.

In broad terms both regimes are targeting the same growth technologies - ICT, life sciences, nanotechnology, agri-food and aerospace. Both have the same problem of lack of scale and as a consequence are encouraging an increased emphasis on internationalisation which provides an increased impetus for cross-border collaboration.

In February 2006, the British Irish Intergovernmental Conference instituted a review of areas for potential North/South economic cooperation. The importance of innovation for future international competitiveness was recognised and the resulting report, "Comprehensive Study on the All-Island Economy", called for an all-island

mapping study of research centres on the island with a view to facilitating the development of greater collaboration.

The study has been produced by InterTradeIreland with input from a Steering Group made up of representatives from:

- Department of Enterprise, Trade and Employment
- Department of Enterprise, Trade and Investment
- Department for Employment and Learning
- Invest Northern Ireland
- Enterprise Ireland
- Science Foundation Ireland

It is designed to contribute to the North/South policy debate on science, technology and innovation by identifying the opportunities for collaboration and the actions needed to maximise those opportunities going forward.

This report uses the following definition of a Research and Technological Development Centre:-

*"A physical or virtual centre of research and/or technological development that concentrates existing capacity and resources to enable researchers to perform industry-academic collaborative RTD or industrial applied RTD. This RTD activity should have an impact on the economy in the short to medium term."*

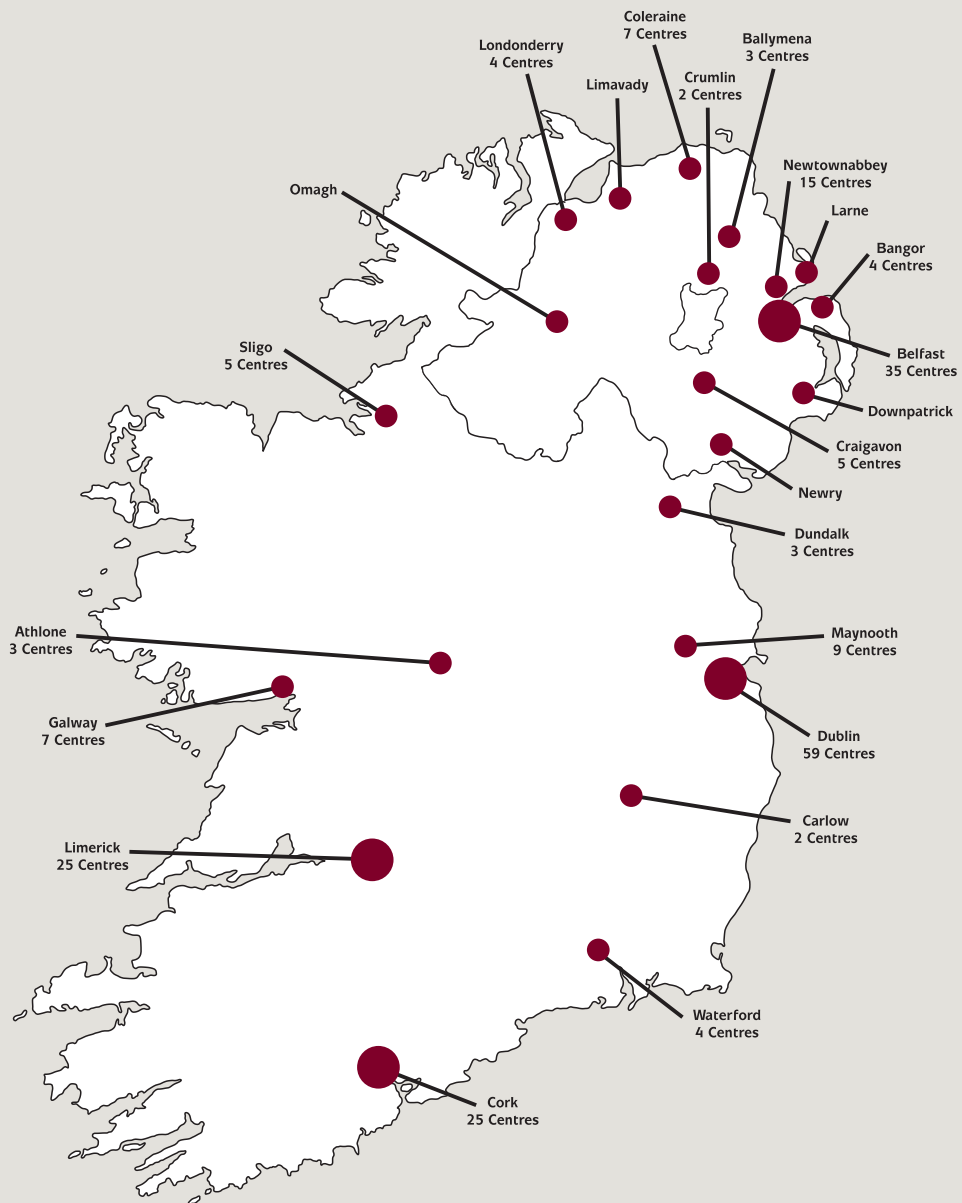
This definition was used to identify 222 centres (listed in Appendix 1) who were invited

to complete an online survey<sup>2</sup>. A total of 96 centres completed the survey, as listed in Appendix 2. The survey was followed up by in-depth interviews with a selection of centres and in-depth interviews with senior representatives from stakeholder organisations.

A number of private sector specialist centres in Northern Ireland were included in the listing due to their status and the nature of the support provided to them by Invest NI. Equivalent private sector participation in Ireland was captured through the inclusion of the CSETs (Centres for Science, Engineering and Technology) and their industry partners, as listed in Appendix 3.

<sup>2</sup> The 222 centres identified constitute a comprehensive list of RTD centres on the island. However it should be noted that any new centres established during the course of the study are not included in this report, e.g. The Glen Dimplex Energy Centre, launched in July 2007.

Figure 1 Centres Approached



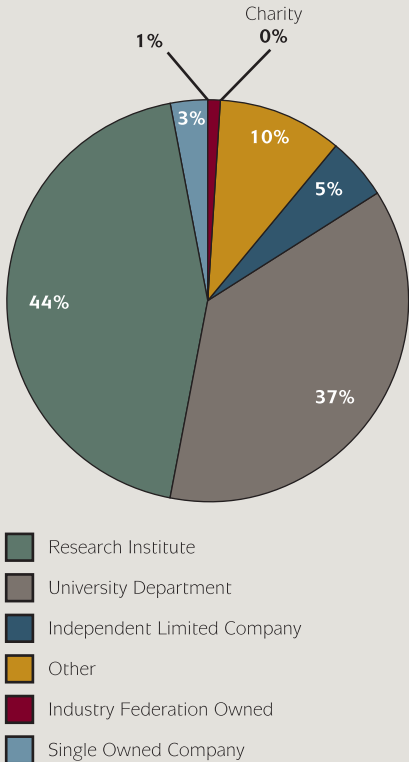
### 3. Overview of Research and Technological Development Centres on the Island

This section of the report outlines the findings from the online survey and interviews with leading research centres on the island. The list of centres who responded to the survey is shown in Appendix 2.

**TYPE**

The majority of centres surveyed are located in academic institutions. 81 per cent of responding centres are academia-based and 8 per cent are controlled by private companies. Those categorised as “Other” are predominantly teaching units with some element of research carried out.

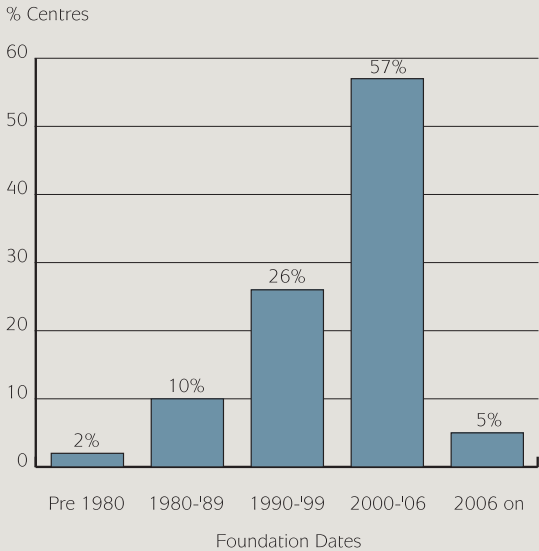
*Figure 2 Organisation Types among RTD Centres*



**FOUNDATION**

The majority of centres are of recent origin; 62 per cent have been founded since 2000 highlighting the success of investments and initiatives North and South in this period. Examples of such initiatives in Ireland include the National Development Plan which places emphasis on research as an instrument of economic growth and established Centres for Science, Engineering and Technology (CSETs) and Programme for Research in Third-Level Institutions (PRTLl) funding. In Northern Ireland, the Northern Ireland Economic Council - Best Report placed initial emphasis on the identification of key technology areas which are now the priority areas for Invest NI. These are set out in the Regional Innovation Strategy Action Plan 04 - 06. This is an evolving landscape with significant change where centres are closing, amalgamating, and reforming. The drivers of these changes are predominantly funding related as centres respond and adapt to new initiatives and programmes. Within this environment, centres are outward looking and open to change and new opportunities.

*Figure 3 Foundation Dates of RTD Centres*





### BUSINESS MODEL

Governance structures amongst the centres vary widely and no single “business model” holds as standard. The scientific direction and the management of the operations tend to be centralised on-site. They are run with a high degree of autonomy. In particular, the high profile centres tend to demonstrate an entrepreneurial atmosphere where opportunities are maximised.

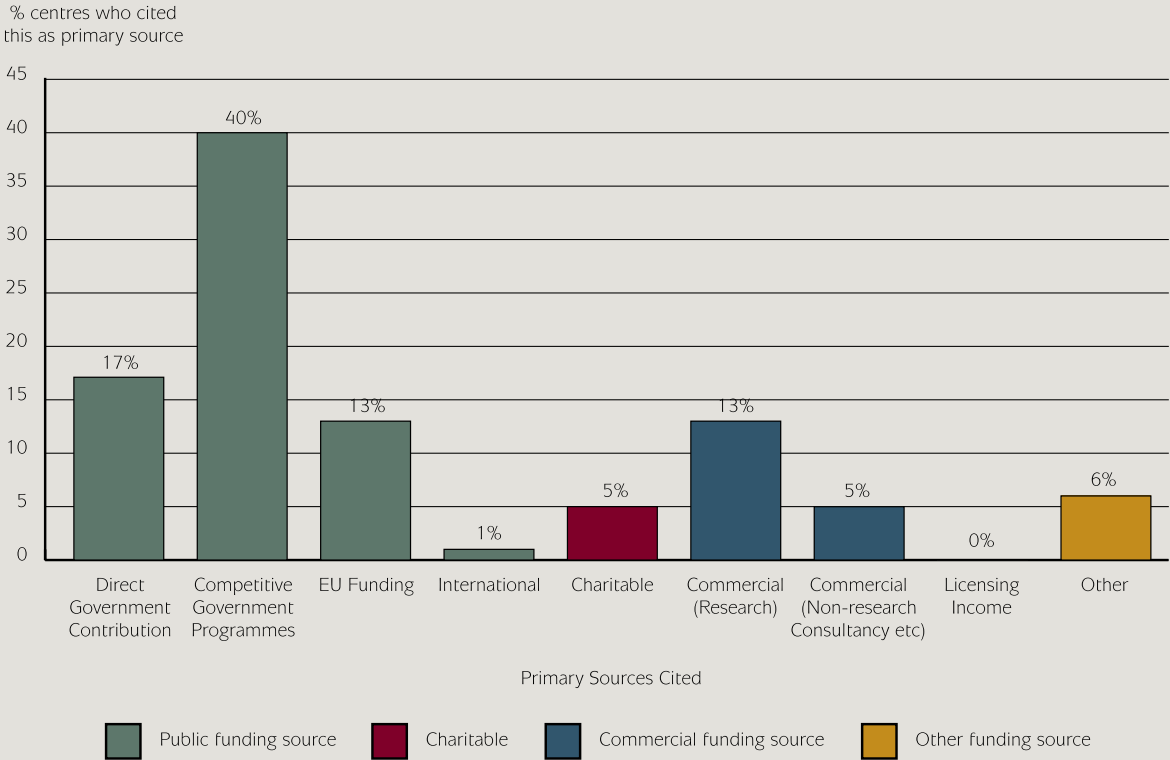
### FUNDING SOURCES

In general, centres rely on funding from multiple sources. Only 18 per cent of them rely on a single funding source whereas the

other 82 per cent of centres derive funding from multiple sources. Some receive money from a wide range of funders with 3 per cent of centres getting less than 40 per cent of their funding from their main source. Funding is a major concern for many research centres and much energy and time is devoted to this activity and any new sources and relationships which can assist in this task are attractive.

71 per cent of respondents cite the public sector as the primary source of funding to the system. Within this sector, local funding is the strongest contributor - only 14 per cent of centres cite international providers as their primary source. 40 per cent of centres list competitive government programmes as their major funding source.

Figure 4 Primary Sources of Funding



23 per cent of centres (some of which are in the private sector) list commercial and charitable income as their primary source of funding. No centres describe licensing income as a major funding source.

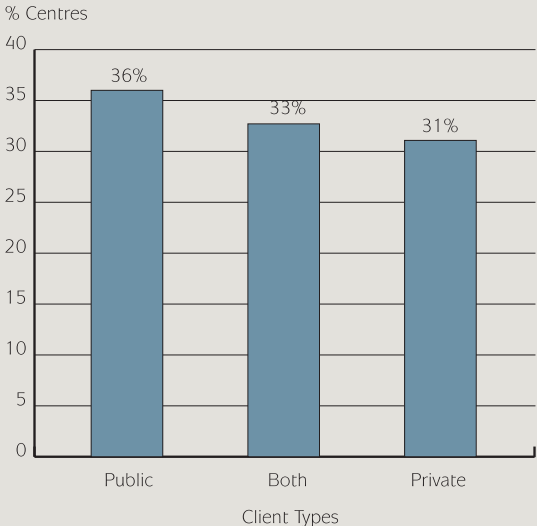
**INDUSTRY ENGAGEMENT**

Many centres have a significant level of engagement with the private sector. 31 per cent of centres cater primarily or only to private sector clients. A further 33 per cent cater to both public and private sector clients and 36 per cent cater primarily/only to public sector clients.

The list of commercial clients is impressive and extensive covering ICT, Agri-Food, Medical and Biotech, Pharmaceuticals, Chemicals and Aerospace and include multinationals at home and abroad and SMEs. (A full list of commercial clients and public agencies with which centres engage is included as Appendix 3).

This level of private sector engagement is unsurprising as the CSETs and the Centres of Excellence in Northern Ireland have all been established on the basis of strong industry engagement and in sectors of strategic importance. A listing of CSETs and their industry partners is included in Appendix 3.

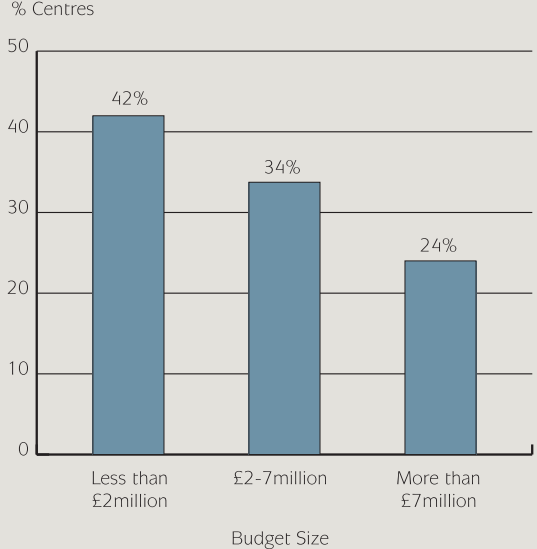
**Figure 5 Client Base  
Public & Private Sector**



**SCALE**

The scale of centre budgets vary widely across the island. 42 per cent of responding centres operate on annual budgets of £2 million / €3 million or less. Over one third of centres operate a budget of £2 - 7 million (€3-10.5 million). Almost one quarter of centres have budgets over £7 million / €10.5 million.

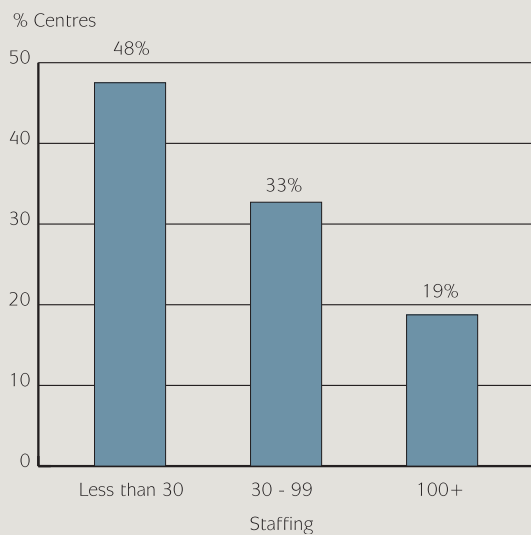
**Figure 6 Centre Annual Budgets**



## STAFF

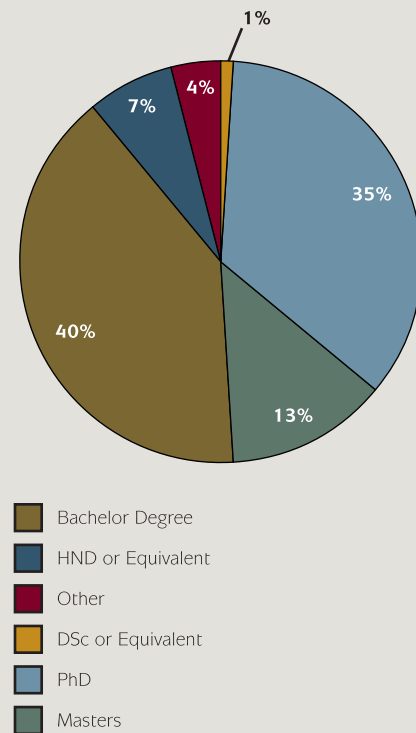
Almost half of all centres employ 29 or fewer staff. However, 19 per cent have in excess of 100 staff. The highest staffing levels are at the National Centre for Biomedical Engineering Science (NCBES) at NUI Galway with 395 staff and the Tyndall National Institute at UCC with 353 staff. Over one third of centres employ between 30 - 99 staff.

**Figure 7** Centre Staffing Levels



Centres attract highly qualified staff. 49 per cent of all staff at responding centres hold Masters or higher qualifications. 97 per cent of centres include at least one staff member with a PhD qualification. Just over a quarter of centres include at least one staff member with a DSc or equivalent qualification.

**Figure 8** Qualifications of Centre Staff



## ACTIVITY

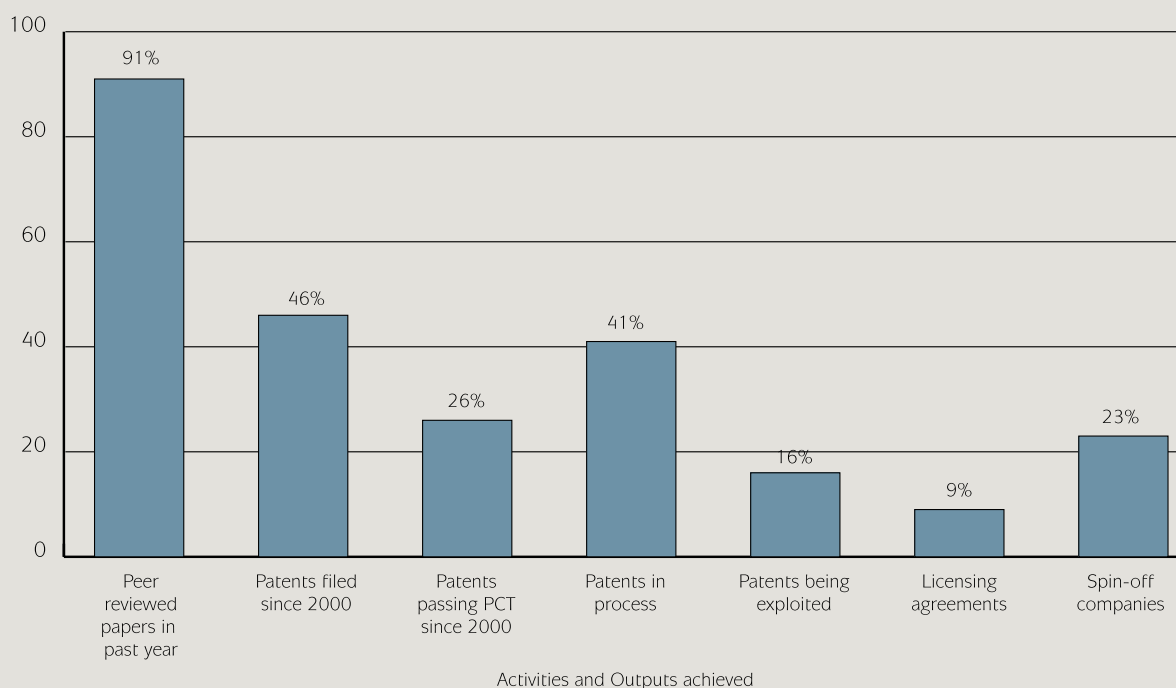
Publication in peer reviewed journals has emerged as the leading indicator of activity amongst responding centres. 91 per cent have published in peer reviewed publications in the past year. The volume reported ranged from 3 to 265 papers.

Evidence of commercial exploitation of the outputs of research is lower with less emphasis on patents, licences and spin-off companies. While 46 per cent of responding centres have registered patents, only 16 per cent are currently exploiting patents. Typically, centres

are exploiting 1 or 2 patents however the study identified 1 centre which is exploiting 11 patents. 9 per cent of centres have achieved licensing agreements and 23 per cent of centres have created spin out companies from their work.

**Figure 9 - Activity Indicators among RTD Centres<sup>3</sup>**

% centres who have engaged in this activity



<sup>3</sup> Note - this graph may include an element of double-counting where a patent is being exploited in a spin-off company or under a licensing agreement for example.

### DISCIPLINES

Many centres operate on an inter-disciplinary basis in their work. Leading disciplines on the island are:

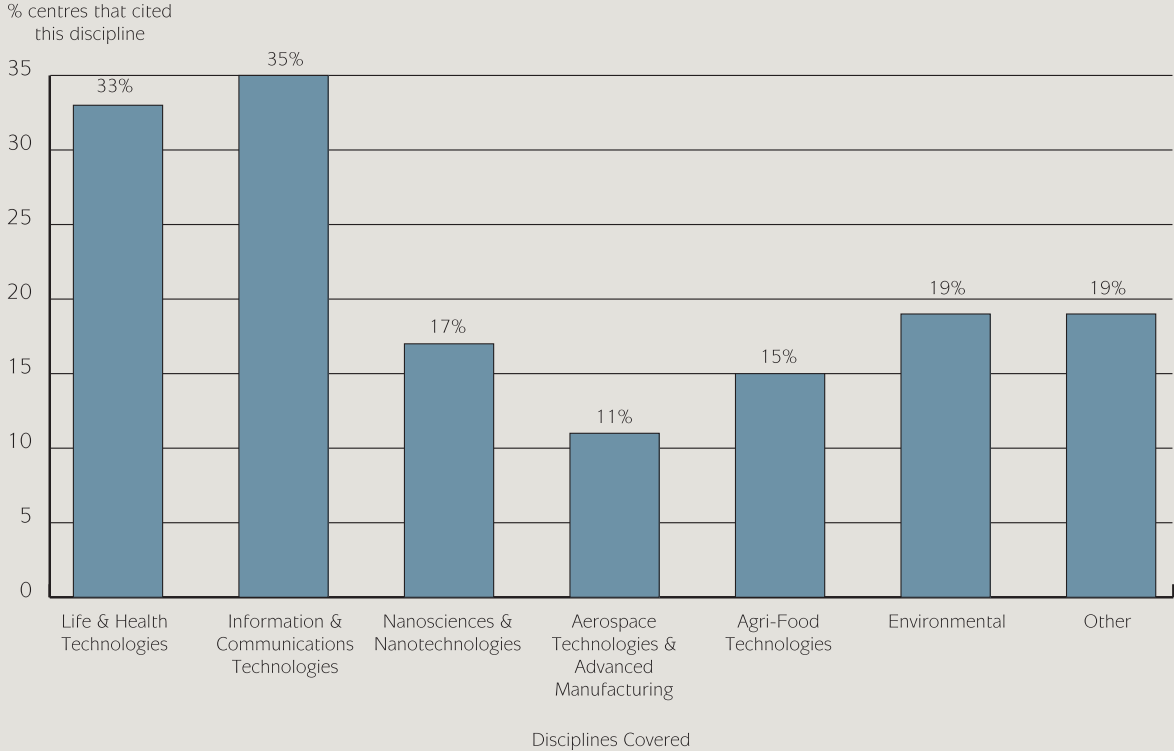
- Information & Communications Technologies - 35 per cent;
- Life and Health Technologies - 33 per cent; &
- Environmental Technologies - 19 per cent.

43 per cent of centres gave multiple answers to this question indicating a multi-disciplinary approach:

- 17 per cent of centres cited 2 disciplines;
- 19 per cent of centres cited 3 disciplines; and
- 7 per cent of centres cited 4 disciplines.

Maps geographically showing the centres involved in each discipline are shown in Section 6 - Identifying Areas for Growth in All-Island Collaboration.

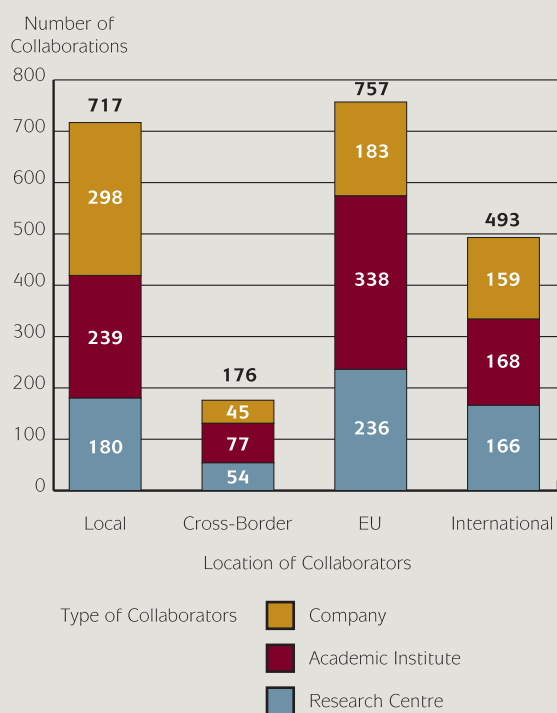
Figure 10 Disciplines Covered by RTD Centres



## 4. The All-Island Collaborative Environment

Joint risk collaborations<sup>4</sup> are widespread. Of the total, 35 per cent are with EU partners, 33 per cent with local, 23 per cent with international but only 8 per cent are across the border. Centres in Ireland have a higher preponderance for EU and international linkages whereas Northern Ireland centres have more with Great Britain.

**Figure 11 Collaborations with Joint Risk and Reward**



Of the levels of industry collaboration reported by centres, the majority (43.5 per cent) is with local industry partners on a joint risk and reward basis. Cross-border collaborations with industry account for 6.5 per cent.

Of the levels of public sector collaboration (with both academic institutes and research centres), the greatest proportion is with EU partners (39 per cent) and local partners (29 per cent). 9 per cent of such collaborations are on a cross-border basis.

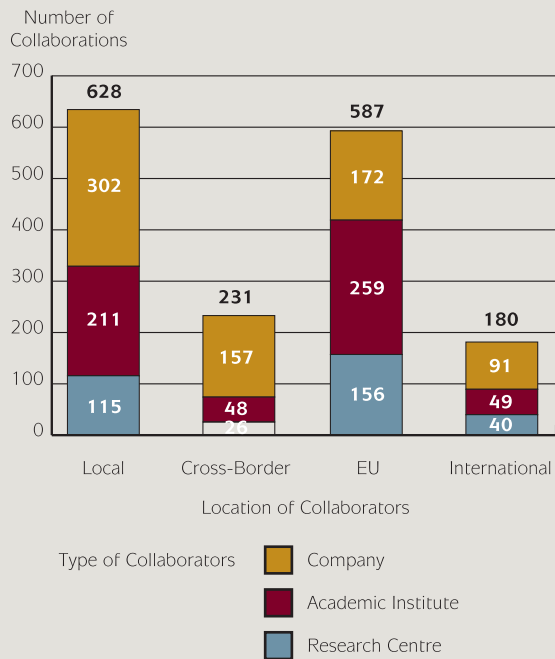
Contractual collaborations<sup>5</sup> are less common and exist mainly among local partners. For centres in Ireland these relationships are predominantly with local partners, followed by EU and international partners and finally cross-border partners.

Centres in Northern Ireland create contractual relationships with local partners followed by cross-border partners. Relationships with EU and international partners are less in evidence.

<sup>4</sup> A joint working arrangement with joint risk and reward

<sup>5</sup> A collaboration based on the supply of services, research, consulting etc. on a fee basis

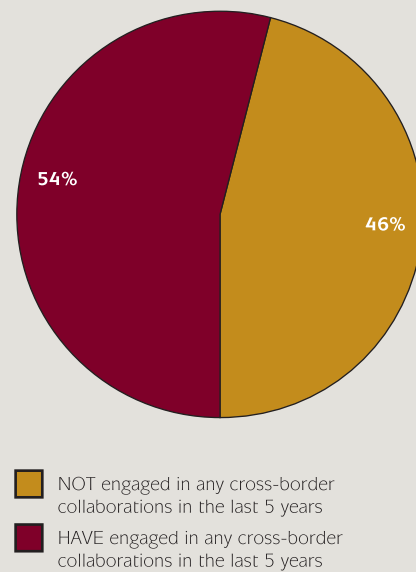
**Figure 12 Collaborations on a Contractual Basis**



The levels of industry collaboration reported by centres on a contractual basis are broadly similar to those reported on a joint risk and reward basis, with the exception of cross-border collaboration which is three times higher. The profile of public sector, contractual collaboration also mirrors that of collaborations on a joint risk and reward basis.

Over half of all centres have participated in cross-border collaborations.

**Figure 13 Participation in Cross-Border Collaborations to Date**



The research demonstrates that Northern Ireland based centres are more likely to have collaborated on a cross-border basis than centres based in Ireland. 66 per cent of Northern Ireland respondents have collaborated at least once with a centre in Ireland (compared to 46 per cent of those based in Ireland).



In general the research found that the levels of familiarity about potential partners in the other jurisdiction is not as good compared to that of local partners and networks.

Reasons given for non-participation in cross-border collaboration include:

- Have not identified any mechanism which would allow such collaborations; (35 per cent)
- Have not investigated opportunities to date; (32 per cent) and
- Have examined opportunities and have not proceeded. (27 per cent)

Centres gave various explanations as to why they have not (yet) explored this option:

- *“We have not found complementary skills and experience”.*
- *“We are now investigating these options”.*
- *“No relevant expertise identified in the other jurisdiction”.*
- *“Not a deliberate policy - our needs are met by others not on the island of Ireland”.*
- *“We see opportunity but see EU funded projects as the only mechanism - this seems like overkill”.*
- *“To date there has been very few and small funding opportunities.”*

On the other hand where there has been collaboration, a wide variety of drivers are nominated as contributing to a centre’s decision to collaborate on a cross-border basis:

- 71 per cent of centres cite funding programmes that act as a driver of collaboration on an all-island basis;
- 71 per cent of centres cite situations where the need for skills and experience outside their own centre resulted in all-island collaborations; and
- 44 per cent cite situations where they sought out a partner in the other jurisdiction because of the equipment, facilities or infrastructure that was available in the other jurisdiction.

Figure 14 Impetus for All-Island Collaboration

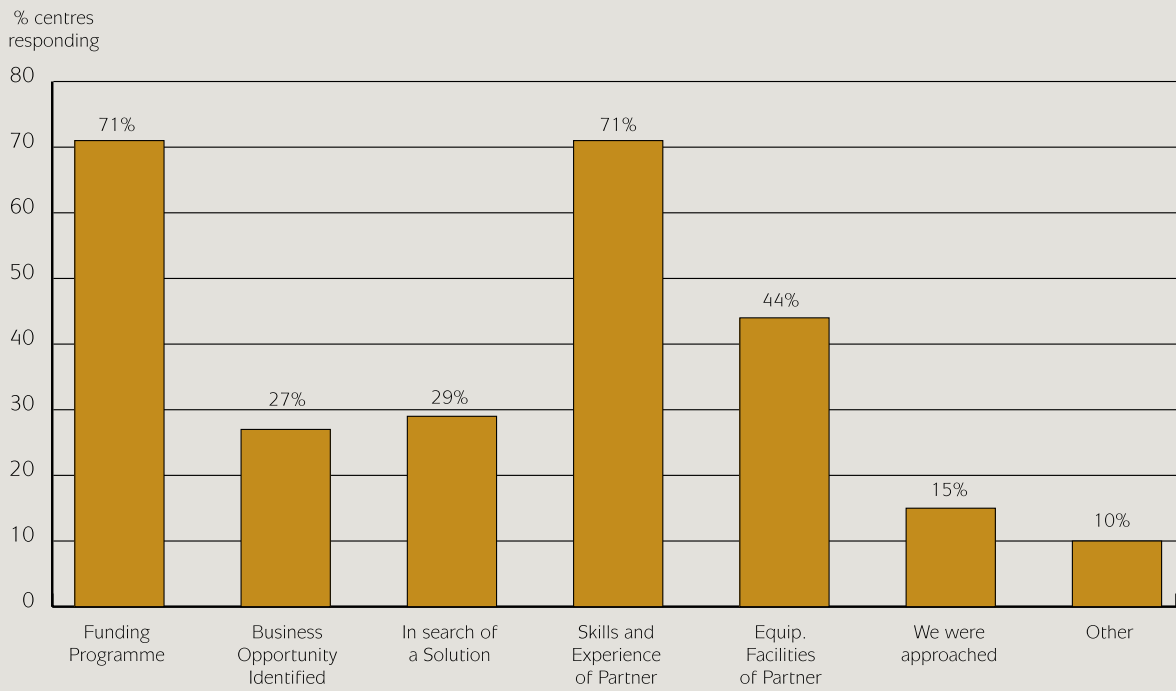
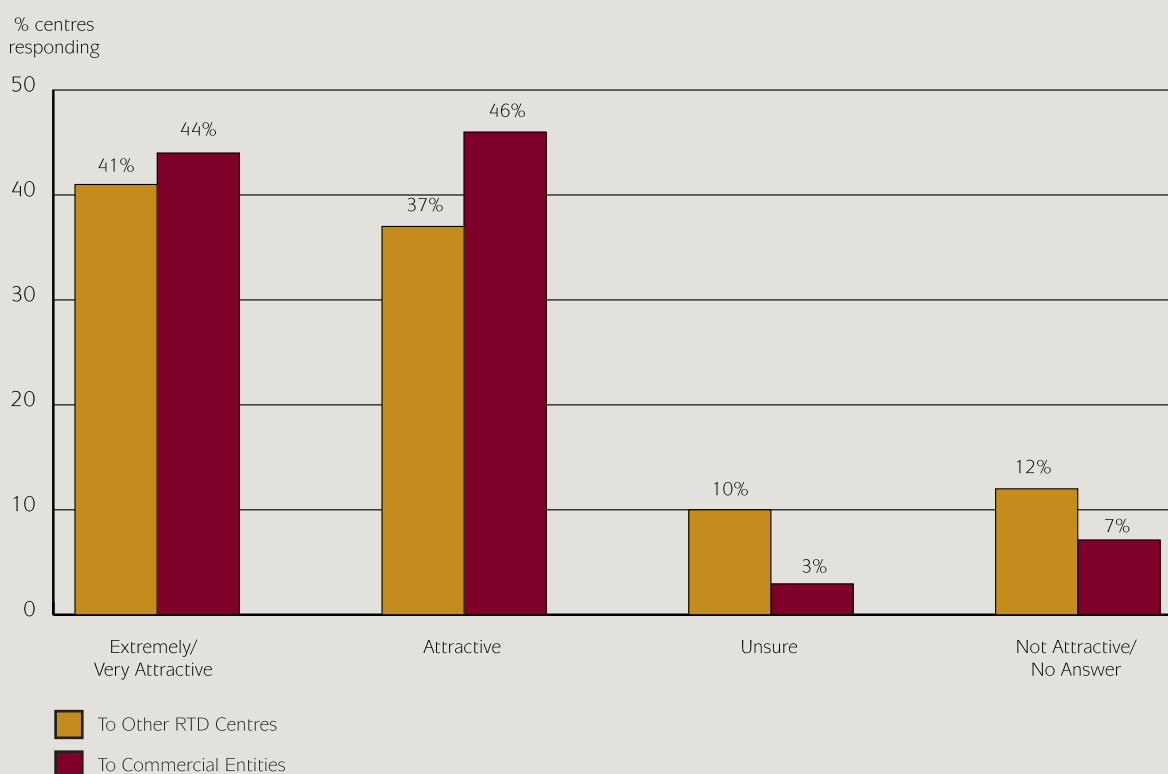


Figure 15 Rating of Attractiveness to Potential Partners



78 per cent consider their centre an attractive or very attractive proposition to potential RTD partners in the other jurisdiction. Centres are even more confident of their attractiveness to commercial entities in the other jurisdiction - 90 per cent claimed to be attractive or very attractive to that potential audience.

- *“Extremely attractive given our unique skillsets”.*
- *“Attractive. We have a wide variety of expertise....”.*
- *“Quite attractive for specific projects....”.*

Commentary included

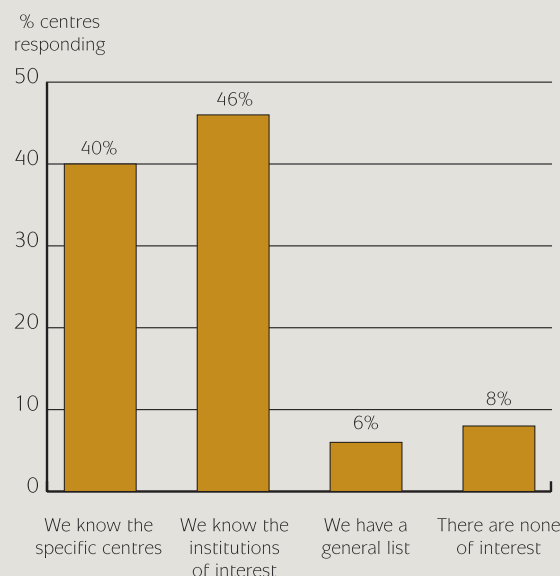
- *“Very attractive, given synergies in research and experience.....”.*
- *“Strong links at a professional and personal level”.*
- *“Very attractive....because of complementarity, critical mass and common vision”.*

Despite this confidence however, responding centres have only a general idea of where opportunities lie among academic organisations in the other jurisdiction. Only 40 per cent of centres can name counterparts of interest in the other jurisdiction. Almost half (46 per cent) can identify the institution of interest but not give the specific centre or facility name. 6 per cent have a long list or a general list of centres of interest to them. Only 8 per cent claim that there are no centres of interest to them in the other jurisdiction.

In interviews, some centres however, described the specific relationships they would like to create and how they worked around the system to make a cross-border collaboration work:

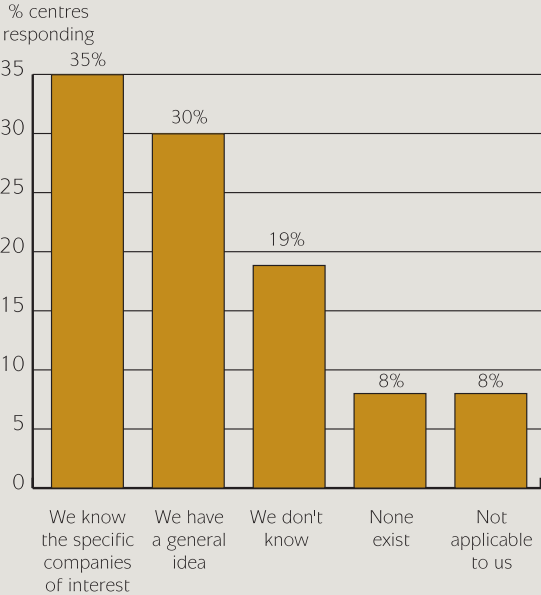
- *“There are definite opportunities in the nano-bio space and there is a great potential for success. We are in contact with colleagues in pharmacology in the Eastern Health Board in the North”*  
Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)
- *“There was a collaboration between Queen’s University Belfast, Tyndall, and Trinity which was funded by IFI to the extent of £1.5m. It was a healthy collaboration although the funding ran out after 3½ years but the collaboration continued for a while. We are trying to rekindle in part with the ECIT / Tyndall Framework 7 project. It will be large scale!”*  
The Institute of Electronics, Communications and Information Technology (ECIT)

**Figure 16 Ability to Identify Prospective Academic Partners**



Centres identify even fewer specific opportunities in the area of collaboration with commercial organisations. Only 35 per cent of respondents were able to nominate any specific companies. A further 30 per cent have a general idea of the sectors and types of companies that are of interest but cannot specifically identify their target market. This contrasts with the fact that 90 per cent of centres consider themselves attractive to this market.

**Figure 17 Ability to Identify Prospective Commercial Partners / Clients**



The survey asked centres to identify any internal issues that could limit their ability to collaborate on an all-island basis. Many centres claim to have no limitations affecting their ability to create collaborative relationships in the other jurisdiction. 34 per cent of centres are open to relationships with commercial entities and 38 per cent are open to relationships with RTD centres.

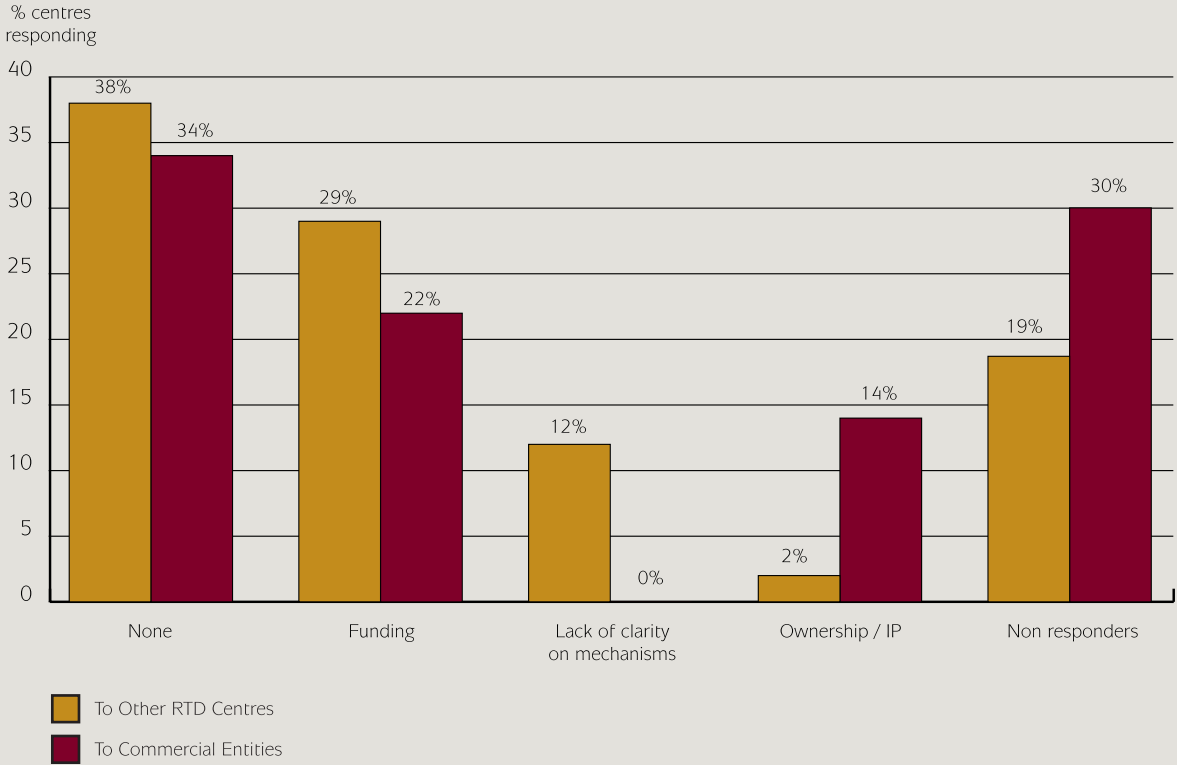
Among the limitations identified, funding is the top consideration - 29 per cent of centres consider this to be a barrier in creating relationships with RTD centres. 22 per cent consider it to be a barrier to creating relationships with commercial entities.

12 per cent of centres cite complex and differing funding mechanisms as a barrier to collaboration.

Some centres acknowledge that the limitations they described were the same limitations that exist in collaborating with any other external partners and were not specific to cross-border work. These common barriers included:

- Resources;
- Ownership;
- IP Protection; and
- Logistics.

**Figure 18 Barriers Identified to All-Island Collaboration**



Centres are strongly of the opinion that programmes restricting the movement of funds, e.g. those operated by the UK Research Councils are inhibiting collaboration. There is a recognition amongst centres that only EU funding can facilitate North/South collaboration. Centres are strongly of the opinion that programmes restricting the movement of funds, e.g. Biotechnology and Biological Sciences Research Council (BBSRC) are inhibiting collaboration.

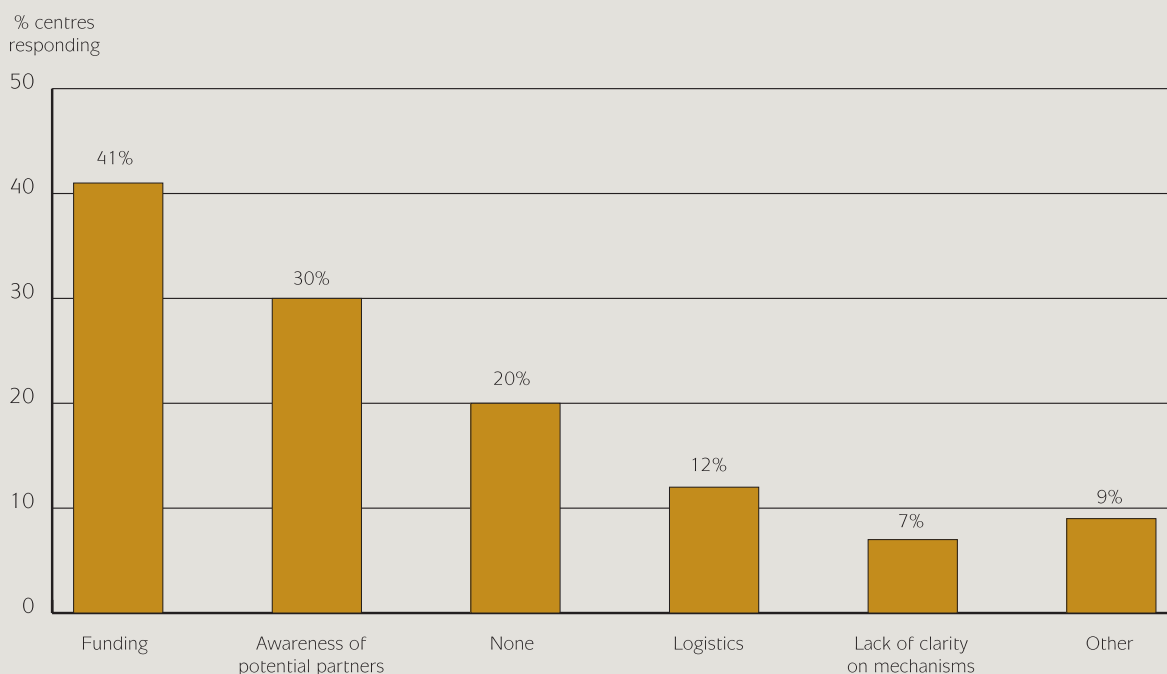
A lack of awareness of potential partners is also listed as a perceived barrier by 30 per cent of centres:

- *“Lack of information and forums in which to interact”.*

- *“Lack of common communication networks”.*
- *“Little opportunity to meet colleagues in the other jurisdiction.”*

On the other hand, 20 per cent of centres cite no limitations to prevent them from collaborating in the other jurisdiction. 55 per cent of this group have experienced cross-border collaborations in the past. The other 45 per cent have not but cite a lack of opportunities and mechanisms as the reason for this, not a lack of funding.

**Figure 19 Perceived Barriers to All-Island Collaboration**

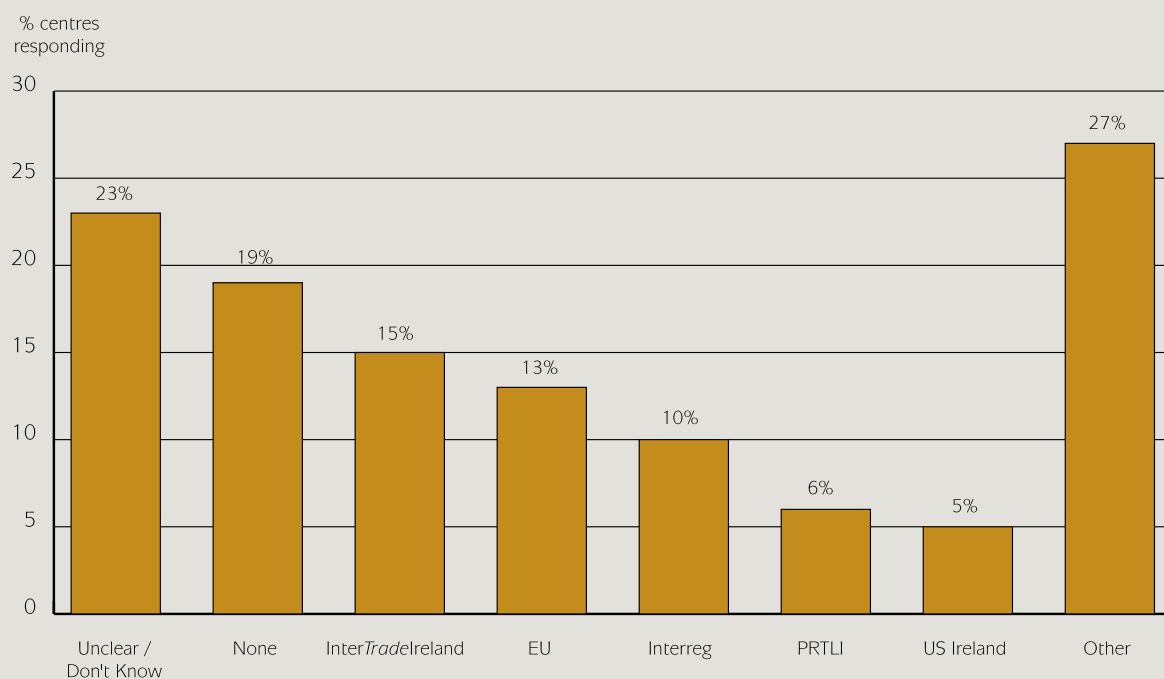


Throughout the research, centres have demonstrated enthusiasm for the concept of all-island research collaboration. They are clear on the potential benefits.

- *“Increased technology base for the whole island. Cross fertilization of ideas.”*
- *“Improved depth in academic research community. Enhanced funding opportunities.”*
- *Greater critical mass to compete internationally.”*
- *“Huge in terms of bringing together complementary expertise, shared human and physical resources. marketing and branding the island of Ireland as a biomedical science and engineering research hub, critical mass of expertise to compete globally.”*
- *“Access to laboratory resources not available in house.”*
- *“World-class expertise in a wide range of engineering.”*
- *“Both jurisdictions are too small to be insular.”*
- *“New opportunities in research as well as commercialisation of ideas to enhance future financial sustainability.”*



**Figure 20 Incentives Identified by RTD Centres**



Centres have identified some of the incentives offered by agencies and funding bodies that accommodate or encourage all-island collaboration. However, 23 per cent of respondents are unclear or unaware of what is available and another 19 per cent claim that none exist.

The centres list a wide range of incentives of which they are aware. 27 per cent list “Other” - a diverse range of small programmes and initiatives. 15 per cent are familiar with InterTradeIreland specific programmes.

Some quotes from centres

- *“No incentives that are of immediate relevance to our centre. We would not engage in a contrived collaboration for any incentive - the arrangement must be meaningful and provide opportunity to both sides.”*
- *“Unclear on the full scope of interaction possibilities.”*

## **The Collaborative Environment - Summary**

### **All-Island Collaborative Experience by Centres**

Centres are actively involved in collaborative relationships demonstrating successes in joint risk and contractual arrangements. Relationships are predominantly with local partners and with EU partners.

Over half of all responding centres have engaged in some form of cross-border collaboration.

The drivers of these collaborations are widespread but funding opportunities and the skills, experience and infrastructure at the partner's centre have been the main impetus.

Centres are highly confident that they offer a very attractive proposition to potential partner organisations in the other jurisdiction but in many cases have only a general idea as to who those partners might be.

Centres identify some level of internal limitation to collaborate on an all-island basis. These include:

- Funding;
- A lack of awareness of the mechanisms available; and
- A lack of awareness of who's who in the other jurisdiction.

In the main, centres do recognise the benefits of all-island collaboration. However, the level of awareness of the incentives offered by agencies and funding bodies is mixed with 42 per cent claiming that none exist or are unclear about what is available.

## 5. Analysis of the Barriers to Collaboration

From the research involving both the survey and interviews, real barriers have been identified that inhibit cross-border collaboration.

## **Awareness and Familiarity**

Historically the 2 scientific communities on the island have operated independently within different structures, in different jurisdictions and have been oriented in different geographical directions.

Northern Ireland's Higher Education sector was traditionally relatively well and securely funded within the UK structure. Research was about pursuit of excellence and more recently local economic benefit has become an objective within the sector. On the other hand, in Ireland funding has risen from much lower (than Northern Ireland) to higher levels and has for longer had a strong focus on economic development.

There is a significant variance between centres and individuals in the level of knowledge and awareness of the relevant research activities in the other jurisdiction. This can be explained, in part, by the effect of the border. Even today there is a relatively low level of mobility among students and staff and in many disciplines no effective channels of communications exist on an all-island basis.

In discussion centres freely admit that there is a general lack of awareness of what was going on in the other jurisdiction. Some have suggested the term "institutional ignorance" and a lack of willingness to seek solutions except in cases of definite business need.

Cultural and competitive forces are still in existence and will need a longer term "human approach" rather than a purely financial solution.

Some quotes from centres: -

- *"Establishing relationships and building trust and confidence is the first step towards genuine collaborations."*
- *"I don't know how to advertise our capabilities to these potential partners, or for us to learn of their needs."*

## **Funding and Funding Rules**

Availability of funding is a major issue for almost all respondents. When funding is available collaborative projects are undertaken - as one respondent commented: "Research follows funding."

Centres comment that to incentivise cross-border collaboration specifically, an injection of "new money" into the system is required. Centres were not in favour of using existing money to fund cross-border initiatives.

A clear understanding of funding mechanisms is another challenge to success. In some cases the centres are not aware of opportunities that are coming into being (CSET's operating on an all-island basis, availability of PRTLTI funds for extra-jurisdictional spend, etc.) An overview of the current funding situation on the island, North and South is given in Appendix 4.

Centres also comment that the lack of clarity surrounding how funding structures can (or cannot) accommodate an all-island project

are frustrating. Comments included:

- *“The primary obstacle is the alignment of mechanisms - either there should be an all-island contingency fund or bodies should align their calls.”*
- *“Need for relevant cross-border financial arrangements capable of supporting major research initiatives with large critical mass.”*
- *“Both the Competence Centre (Enterprise Ireland) and Graduate Research Education Programmes (IRCSET) are Irish schemes. We need parallel schemes or matching funds in Northern Ireland to enable these to become cross-border. The benefits for both projects of being cross-border would be enormous. “*

## **Other Barriers**

Logistics and infrastructure are noted as barriers to forging and developing collaboration:

- *“The big barrier at this point is the lack of any decent transport link. There was an air connection in the past but none now. That had allowed the previous links but makes anything now well nigh impossible. Even the improving roads leave the journey long and tortuous.”*
- *“I can be in Boston almost as quickly as I can get to Coleraine.”*

In general it was agreed that access was improving and is not as significant a problem as previously.

## 6. Identifying Areas for Growth in All-Island Collaboration

In this section the potential for each centre to participate in cross-border collaborative relationships is examined by plotting the positioning of each on the matrix in Figure 21. It looks at the internal qualities of each organisation and the nature of the opportunity which exists for collaboration in the relevant sector on the other side of the border.

**It is not primarily a judgement on the research capability of any organisation and indeed some outstanding centres are not in the top quadrant either because there are very limited opportunities on the other side of the border or because the nature of the centre’s ownership precludes most types of collaboration.**

Furthermore because the positioning of an individual centre on this matrix is based on the information provided in the survey, it is indicative not absolute. The matrix should be viewed as a way of thinking about the different centres and where cross-border collaboration might fit into their agendas and priorities.

An examination of centres shows varying degrees of capability and potential for cross-border collaboration. The survey examines the centres’ internal ability to collaborate (the x-axis) on a cross-border basis using criteria such as:

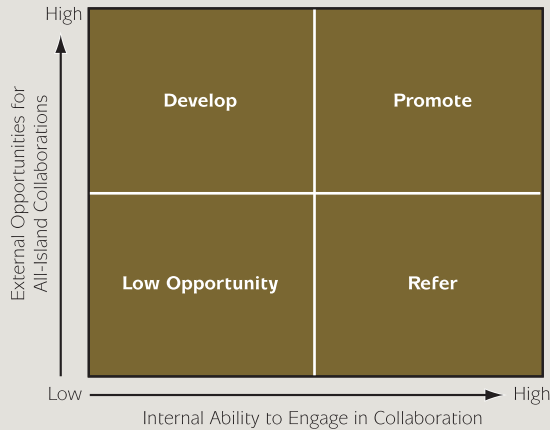
- Staffing levels;
- Budget levels;
- Propensity to collaborate in the past; and
- Success factors such as papers, patents, licences, spin out companies.

The survey also examines the centres’ external opportunities in cross-border collaboration (the y-axis) using criteria such as:

- Commerciality of the sector of operation;
- Existence of opportunities and partners on the island; and
- Breadth and applicability of technology areas.

These factors are calculated into scores that position the centres onto a grid indicating the potential for cross-border collaboration. The grid comprises 4 quadrants as detailed below.

**Figure 21 Matrix to Assess Potential for All-Island Collaboration**



- Quadrant 1 - (Top Right Quadrant) PROMOTE
  - o Centres with a high degree of internal ability to collaborate and who operate in a sector with a high potential for all-island collaboration appear in the top right quadrant and will tend to be the strongest candidates for further all-island collaboration;

- Quadrant 2 - (Top Left Quadrant)  
DEVELOP

- o Centres with a lower degree of internal ability to collaborate but who operate in a sector with a high potential for all-island collaboration appear in the top left quadrant and with encouragement will be candidates which may be suitable for development for all-island collaboration;

- Quadrant 3 - (Lower Right Quadrant)  
REFER

- o Centres in this quadrant (lower right) demonstrate the ability to engage in collaborations but do not seem to have the same level of opportunity to engage on an all-island basis. Their opportunities may lie elsewhere and they should probably target other more promising territories; and

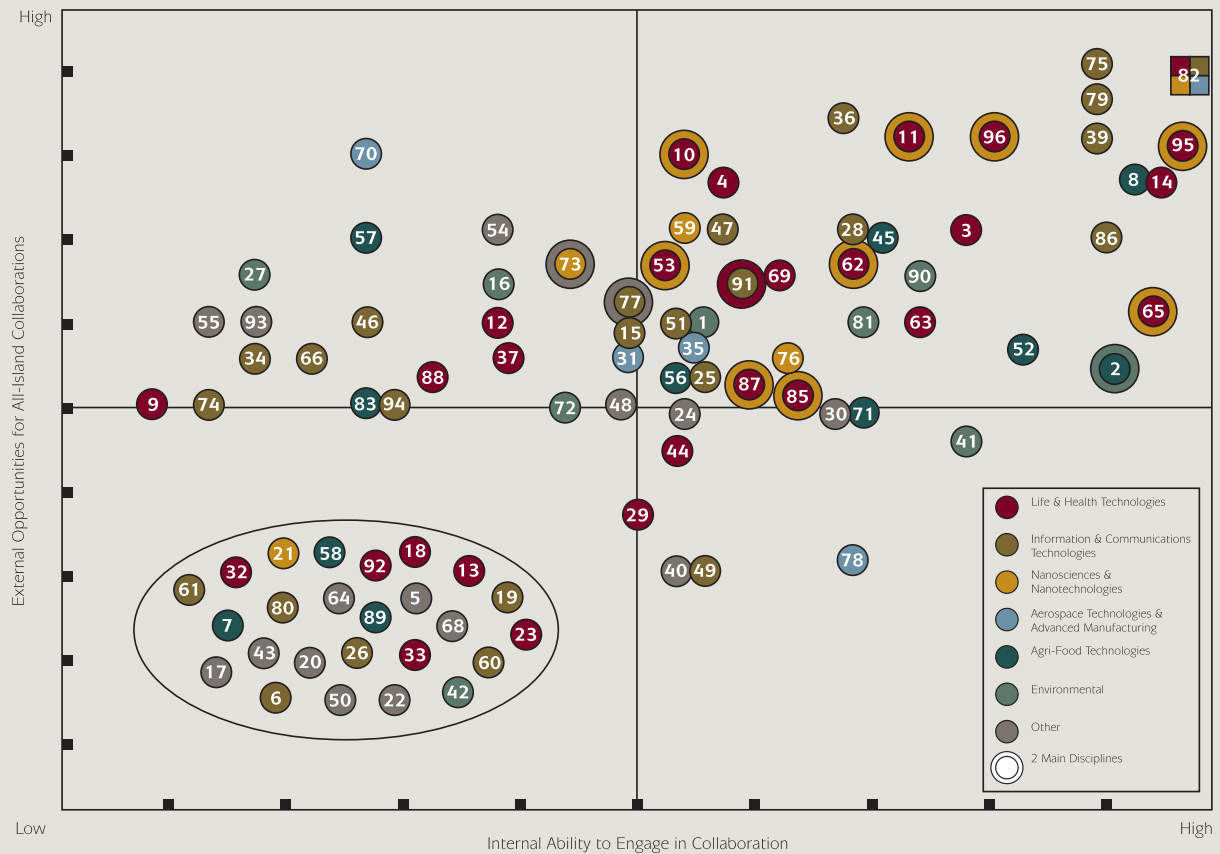
- Quadrant 4 - (Lower Left Quadrant)  
LOW OPPORTUNITY

- o The centres in this quadrant (lower left) are assessed as not having demonstrated the ability to collaborate. They also operate in sectors where there appears to be limited potential for collaboration with the other jurisdiction. These centres would tend to be of the lowest priority for the initiatives discussed here.

The collaboration grid seeks to identify centres that offer the best potential for unlocking all-island collaboration opportunities. Responding centres are plotted overleaf according to the information they provided.



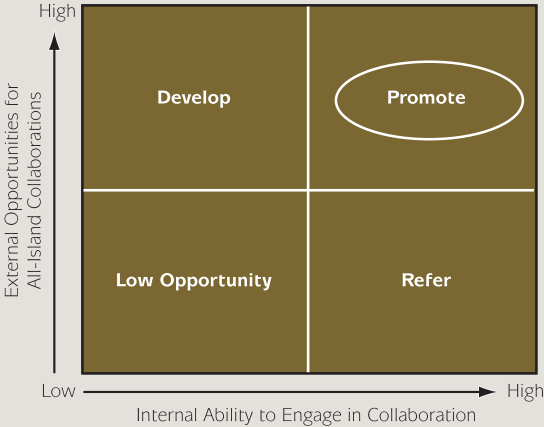
Figure 22 Rating of Centres' Potential for All-Island Collaboration



Placement of a centre on this grid is not primarily a judgement on the research capability of any organisation and indeed some outstanding centres are not in the top quadrants either because there are very limited opportunities on the other side of the border or because the nature of the centre's ownership precludes most types of collaboration.

See key of centre names in Appendix 2 of this document.

### Quadrant 1 - Targets to Promote

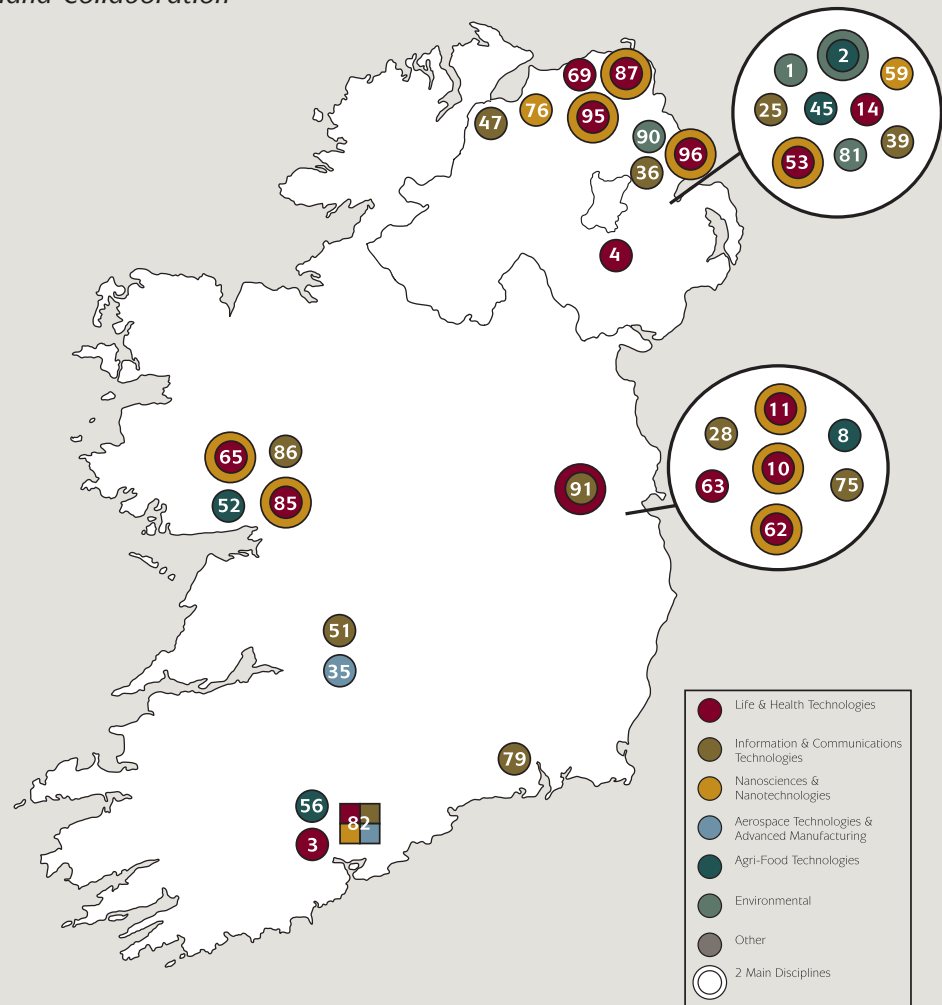


The potential for all-island collaborative relationship building amongst these 36 centres is very high. It is likely that they are currently seeking out opportunities and many are already finding ways around the barriers that exist. These centres tend to be aware of their counterparts and the “matches” that may be beneficial. This group includes the centres that will tend to be most positively pre-disposed towards engaging in all-island projects.

Centres in this quadrant typically show the following characteristics:

- Internal Ability to Collaborate:
  - o Currently active in collaborations;
  - o Have the staff and funding to engage with external parties;
  - o Are outward looking in their approach; and
  - o Have demonstrated success in commercial ventures in the past.
- External Potential for Collaboration:
  - o Operating in sectors that are highly commercial; and
  - o Operating in sectors where there are opportunities and partners in the opposite jurisdiction.

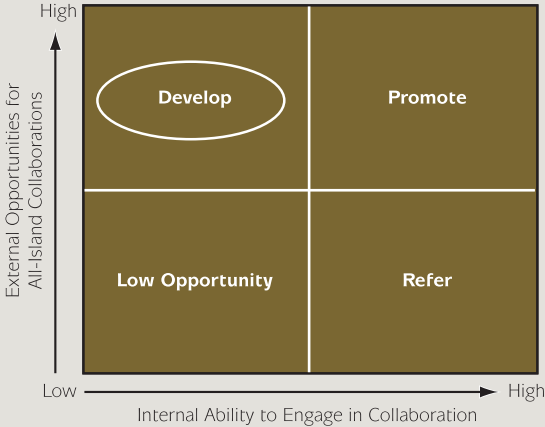
Figure 23 Centres with Greatest Potential for All-Island Collaboration



Centres that appear in this quadrant include -

- 1 Centre for Climate, the Environment and Chronology QUB
- 2 Agri-Food & Biosciences Institute DARD
- 3 Alimentary Pharmabiotic Centre UCC
- 4 Almac Group Craigavon
- 8 Ashtown Food Research Centre Teagasc Dublin
- 10 Bio-medical Diagnostics Institute DCU
- 11 Centre for Research on Adaptive Nanostructures and Nanodevices TCD
- 14 Centre for Cancer Research and Cell Biology QUB
- 25 Centre for Research on System on Chip and Advanced Microwireless Integration QUB
- 28 Centre for Telecommunications Value-Chain Research TCD
- 35 Composites Research Centre UL
- 36 Computer Science Research Institute UU
- 39 Electronic Communications and Information Technology QUB
- 45 Institute of Agri-Food and Land Use QUB
- 47 Intelligent Systems (Wireless Technology) UU
- 51 Lero - The Irish Software Engineering Research Centre UL
- 52 Marine Institute Galway
- 53 Medical Polymers Research Institute QUB
- 56 Moorepark Food Research Centre Teagasc Cork
- 59 Nanotech NI Belfast
- 62 National Centre for Sensor Research DCU
- 63 National Institute for Cellular Biotechnology DCU
- 65 National Centre for Biomedical Engineering Science NUIG
- 69 Northern Ireland Centre for Food and Health UU
- 75 Research Institute for Networks and Communications Engineering DCU
- 76 Seagate Technology, Limavady
- 79 Telecommunications Software and Systems Group WIT
- 81 The QUESTOR Centre QUB
- 82 Tyndall National Institute UCC
- 85 Regenerative Medicine Institute NUIG
- 86 Digital Enterprise Research Institute NUIG
- 87 Functional Genomics Centre UU
- 90 Built Environment Research Institute UU
- 91 Hamilton Institute NUIM
- 95 Biomedical Sciences Research Institute UU
- 96 Nanotechnology and Integrated BioEngineering Centre UU

### Quadrant 2 -Targets to Develop

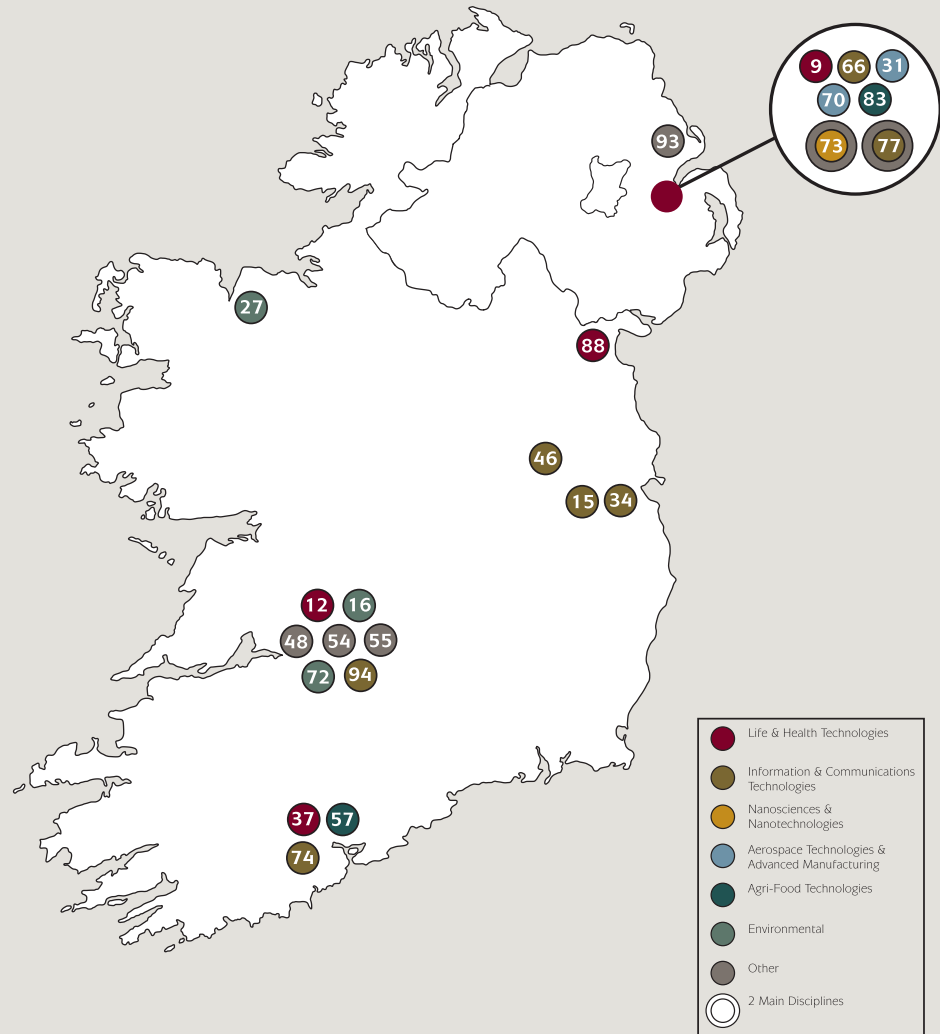


The potential for all-island collaborative relationship building among this group of 23 centres exists. It is envisaged that, with support, they would find opportunities in the other jurisdiction. This group tends to include smaller, less developed, less prolific centres. They tend to be centres that are less aware of their counterparts and the “matches” that may be beneficial.

Centres in this quadrant show the following characteristics:

- Internal Ability to Collaborate:
  - o Less active in collaborations;
  - o Smaller in size and staffing levels thus limiting external engagement;
  - o A smaller or shorter track record of commercial successes;
  - \* Note - Centres in this quadrant may be early stage centres who have future potential but currently demonstrate little experience or track record of collaboration.
- External Potential for Collaboration:
  - o Operating in sectors where there is opportunity in the opposite jurisdiction; and
  - o Operating in sectors that are commercial.

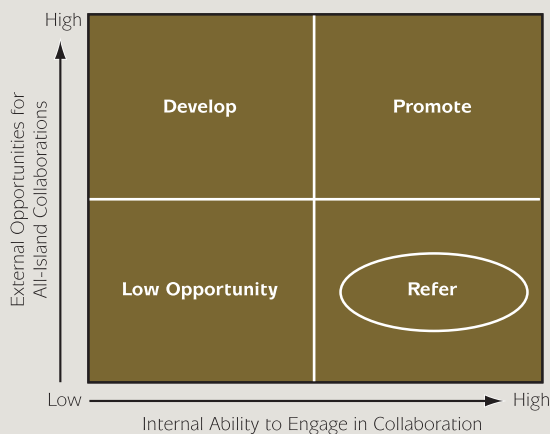
Figure 24 Centres with Potential to Develop All-Island Collaboration



Centres that appear in this quadrant include -

- 9 Bioimaging Core Technology Unit QUB
- 12 Centre for Applied Biomedical Engineering Research UL
- 15 Centre for Digital Video Processing DCU
- 16 Centre for Environmental Research UL
- 27 Centre for Sustainability IT Sligo
- 31 Centre of Excellence for Integrated Aircraft Technologies QUB
- 34 Communications Network Research Institute DIT
- 37 Centre for Research in Vascular Biology UCC
- 46 Institute of Microelectronics and Wireless Systems NUIM
- 48 Interaction Design Centre UL
- 54 Microelectronics and Semiconductors Research Centre UL
- 55 Mobile & Marine Robotics Research Centre UL
- 57 Moorepark Technology Ltd Teagasc Cork
- 66 NI Semiconductor Research Centre QUB
- 70 Northern Ireland Technology Centre QUB
- 72 Optical Fibres Research Centre UL
- 73 Polymer Processing Research Centre QUB
- 74 Power Electronics Research Laboratory UCC
- 77 Sonic Arts Research Centre QUB
- 83 United Dairy Farmers Ltd Group Technical Centre Belfast
- 88 Smooth Muscle Research Centre DKIT
- 93 FG Wilson Centre of Excellence Larne
- 94 Automation Research Centre UL

### Quadrant 3 -Targets to Refer



Centres in this quadrant show the following characteristics:

- Internal Ability to Collaborate:
  - o Currently active in collaborations;
  - o Have the staff and funding to engage with external parties; and
  - o Have demonstrated some successful outputs in the past.
- External Potential for Collaboration:
  - o Operating in sectors where there is less opportunity in the opposite jurisdiction; and
  - o Operating in sectors that are less commercial.

The potential for all-island collaborative relationship building amongst these 9 centres is limited. These centres would tend to find fewer opportunities in the other jurisdiction but may well be successful in other geographies. They tend to be centres that are less aware of

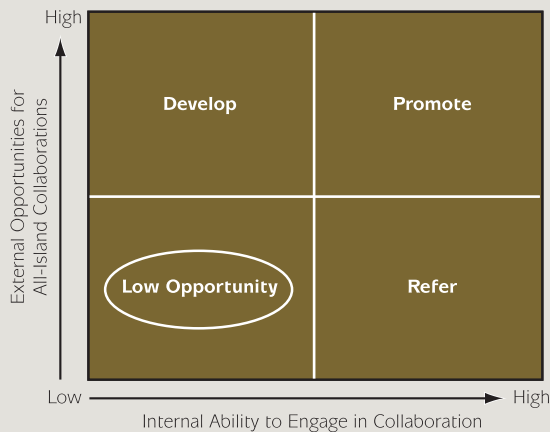
their counterparts and the “matches” that may be beneficial or perhaps are aware and know that those opportunities do not exist to any great extent. These centres may not benefit from collaborations with the other part of the island but would certainly be capable of collaborating with other geographies.

Centres that appear in this quadrant include:

- 24 Centre for Plasma Physics QUB
- 29 Centre for the Dynamics of Global Business Systems TCD
- 30 Centre for Theory & Application of Catalysis QUB
- 40 Enterprise Research Centre UL
- 41 Environmental Sciences Research Institute UU
- 44 Health & Rehabilitation Sciences Research Institute UU
- 49 Irish National IPv6 Centre WIT
- 71 Oak Park Crops Research Centre Teagasc Carlow
- 78 System Integration & Test Centre Thales Belfast



## Quadrant 4 - Low Opportunity Targets



The other centres who participated in this study either fell into this quadrant or failed to provide enough evidence to plot their positioning with any degree of accuracy.

Centres in this quadrant show the following characteristics:

- Internal Ability to Collaborate:
  - o Lack the capacity or inclination to collaborate; and
  - \* Note - this may be due to ownership structures that limit interest in external engagement.
  - o Have not demonstrated successful outputs in the past.

- External Potential for Collaboration:
  - o Operating in sectors where there is less opportunity in the opposite jurisdiction; and
  - o Operating in sectors that offer less commercial opportunity.

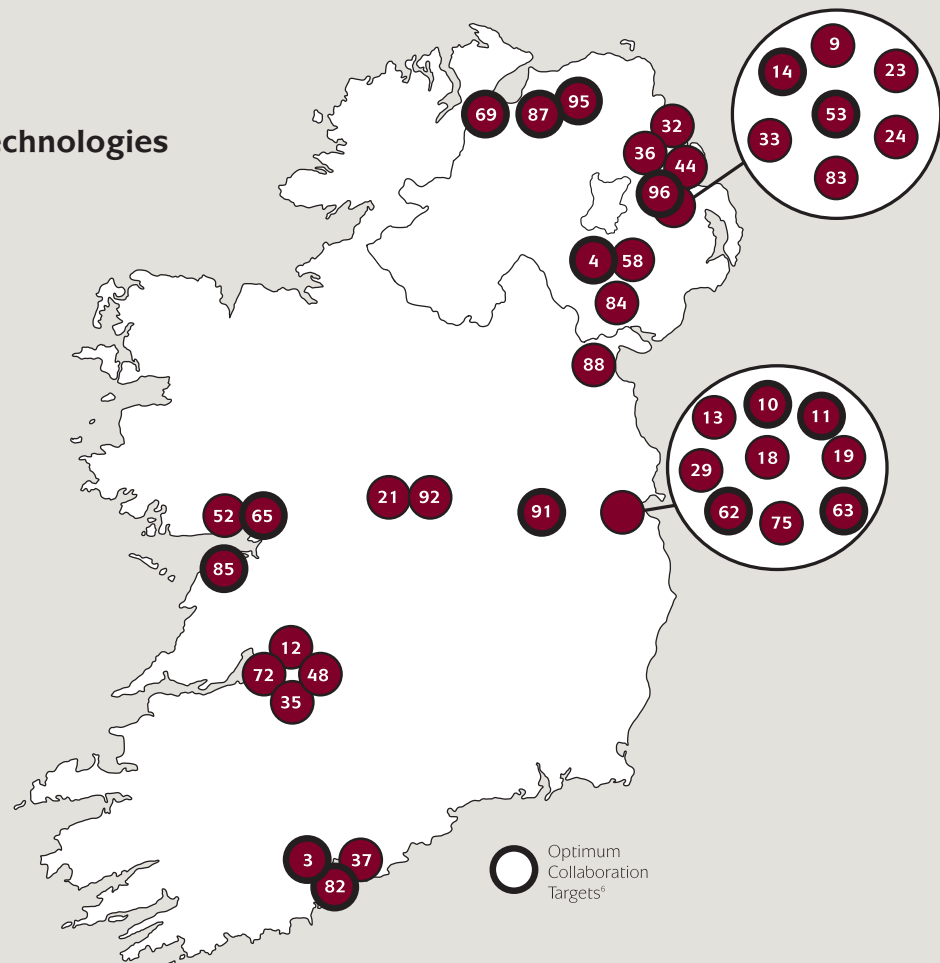
The potential for all-island collaborative relationship building amongst these centres is low. They would tend to find fewer opportunities in the other jurisdiction and have shown little tendency to collaborate in general. Many of these centres will certainly be smaller and less productive in research terms and are generally centres that will not be prime targets for the types of initiatives currently under review.

## Identifying Disciplines and Centres

There follows a series of maps by technology area plotting the locations of the centres active in each discipline. Many centres have indicated activity in a number of technology areas and hence appear on more than one map.

Those centres which have been found to be Quadrant 1 (Promote - the optimum collaboration targets) in the previous section and are mainly or significantly active in that sector are identified with dark edges to the coloured number discs on the map. Each map is followed by a commentary identifying the level of opportunity for collaboration.

## Life & Health Technologies



### Opportunity Areas for Collaboration - Life Science & Health Technology

This is a relatively large sector and some 40 centres claiming to be active in this area completed the survey. There are high profile centres on both sides of the border and there are significant opportunities for leading edge collaboration some of which would have shorter term, and much of which would have longer term, commercial potential:

- The leading centres in Northern Ireland are: the Centre for Cancer Research and Cell Biology, the Medical Polymers Research

Institute, the NI Centre for Food and Health, the Functional Genomics Centre, the Biomedical Sciences Research Institute and the Nanotechnology and Integrated BioEngineering Centre;

- The leading centres in Ireland are: the National Institute for Biomedical Engineering Science, the National Centre for Cellular Biotechnology, the Alimentary Pharmabiotic Centre, the Regenerative Medicine Institute, Tyndall National Institute, the National Centre for Sensor Research, the Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN), and the Hamilton Institute.

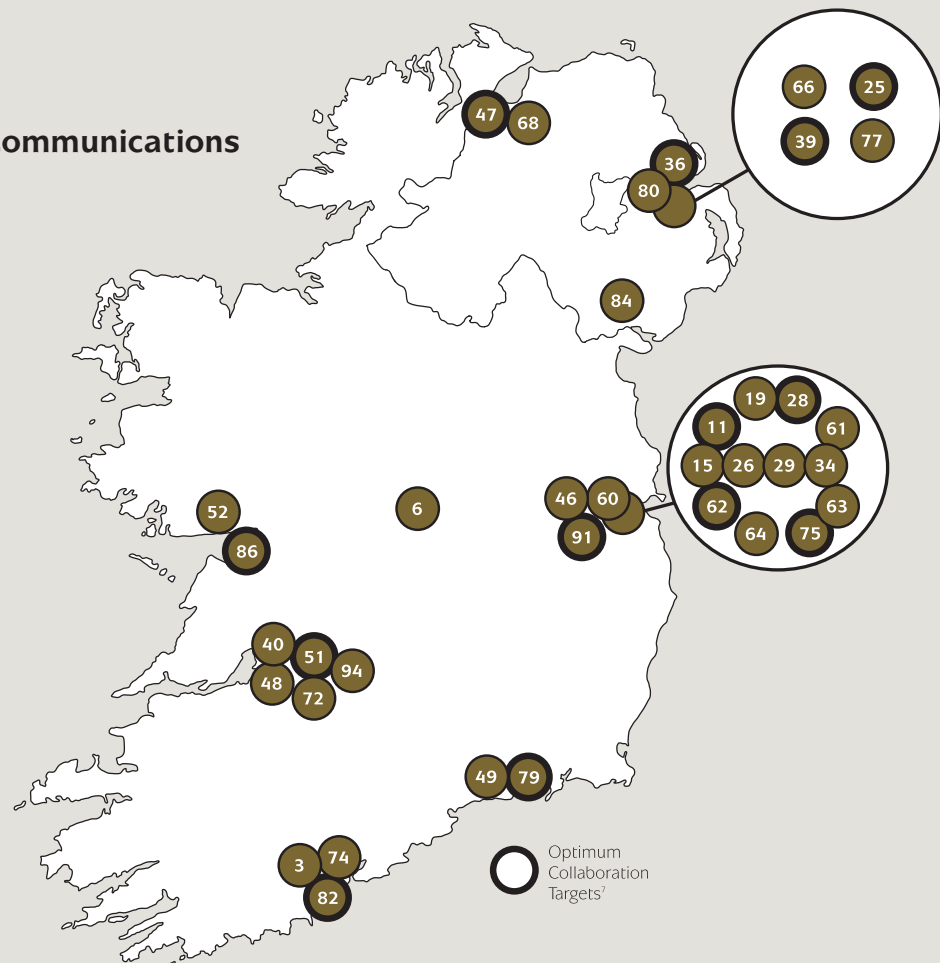
\* Centres with highest rating of potential for all-island collaboration

## Life & Health Technologies - Key

<b>3</b>	<b>Alimentary Pharmabiotic Centre</b>	<b>UCC</b>	<b>Cork</b>
<b>4</b>	<b>Almac Group</b>	<b>Corporate</b>	<b>Craigavon</b>
9	Bioimaging Core Technology Unit	QUB	Belfast
<b>10</b>	<b>Biomedical Diagnostics Institutes</b>	<b>DCU</b>	<b>Dublin</b>
<b>11</b>	<b>Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)</b>	<b>TCD</b>	<b>Dublin</b>
12	Centre for Applied Biomedical Engineering Research	UL	Limerick
13	Centre for Bioanalytical Sciences	DCU	Dublin
<b>14</b>	<b>Centre for Cancer Research and Cell Biology</b>	<b>OUB</b>	<b>Belfast</b>
18	Centre for Global Health	TCD	Dublin
19	Centre for Industrial and Engineering Optics	DIT	Dublin
21	Centre for Nanotechnology and Materials Research	AIT	Athlone
23	Centre for Organic Synthesis and Medicinally Orientated Science (COSMOS)	QUB	Belfast
24	Centre for Plasma Physics	QUB	Belfast
29	Centre for the Dynamics of Global Business Systems	TCD	Dublin
32	Centre of Excellence in Controlled Drug Delivery	Corporate	Larne
33	Centre for Scientific Cameras	Corporate	Belfast
35	Composites Research Centre	UL	Limerick
36	Computer Science Research Institute	UU	Newtownabbey
37	Centre for Research in Vascular Biology (CRVB)	UCC	Cork
44	Health & Rehabilitation Sciences Research Institute	UU	Newtownabbey
48	Interaction Design Centre (IDC)	UL	Limerick

52	Marine Institute		Galway
<b>53</b>	<b>Medical Polymers Research Institute</b>	<b>QUB</b>	<b>Belfast</b>
58	Moy Park	Corporate	Craigavon
<b>62</b>	<b>National Centre for Sensor Research</b>	<b>DCU</b>	<b>Dublin</b>
<b>63</b>	<b>National Institute for Cellular Biotechnology</b>	<b>DCU</b>	<b>Dublin</b>
<b>65</b>	<b>National Centre for Biomedical Engineering Science (NCBES)</b>	<b>NUIG</b>	<b>Galway</b>
<b>69</b>	<b>Northern Ireland Centre for Food and Health (NICHE)</b>	<b>UU</b>	<b>Londonderry</b>
72	Optical Fibres Research Centre	UL	Limerick
75	Research Institute for Networks and Communications Engineering	DCU	Dublin
<b>82</b>	<b>Tyndall National Institute</b>	<b>UCC</b>	<b>Cork</b>
83	United Dairy Farmers Ltd Group Technical Centre	Corporate	Belfast
84	Upper Bann Institute	FE	South East
<b>85</b>	<b>Regenerative Medicine Institute</b>	<b>NUIG</b>	<b>Galway</b>
<b>87</b>	<b>Functional Genomics Centre</b>	<b>UU</b>	<b>Coleraine</b>
88	Smooth Muscle Research Centre	DKIT	Dundalk
<b>91</b>	<b>Hamilton Institute</b>	<b>NUIM</b>	<b>Maynooth</b>
92	Centre for Biomaterials and Biomolecular Research (CBBR)	AIT	Athlone
<b>95</b>	<b>Biomedical Sciences Research Institute</b>	<b>UU</b>	<b>Coleraine</b>
<b>96</b>	<b>Nanotechnology and Integrated BioEngineering Centre</b>	<b>UU</b>	<b>Newtownabbey</b>

## Information & Communications Technologies



### Opportunity Areas for Collaboration - Information & Communications Technologies

This is also a relatively large sector and 37 centres claiming to be active in this area completed the survey. There are 2 particularly high profile centres, one on each side of the border - Tyndall Institute in Cork and the Institute of Electronics, Communications and Information Technology in Belfast. There are also other major research centres and there are thus significant opportunities for leading edge collaboration which would have a significant level of commercial potential:

- The other leading centres in Northern Ireland are: Centre for Research on System on Chip and Advanced Microwave Integration (SoCam), Computer Science Research Institute and Intelligent Systems;
- The other leading centres in Ireland are: Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN), Centre for Telecommunications Value-Chain Research (CTVR), LERO, National Centre for Sensor Research, Research Institute for Networks and Communications Engineering, Telecommunications Software and Systems Group (TSSG), the Digital Enterprise Research Institute and the Hamilton Institute.

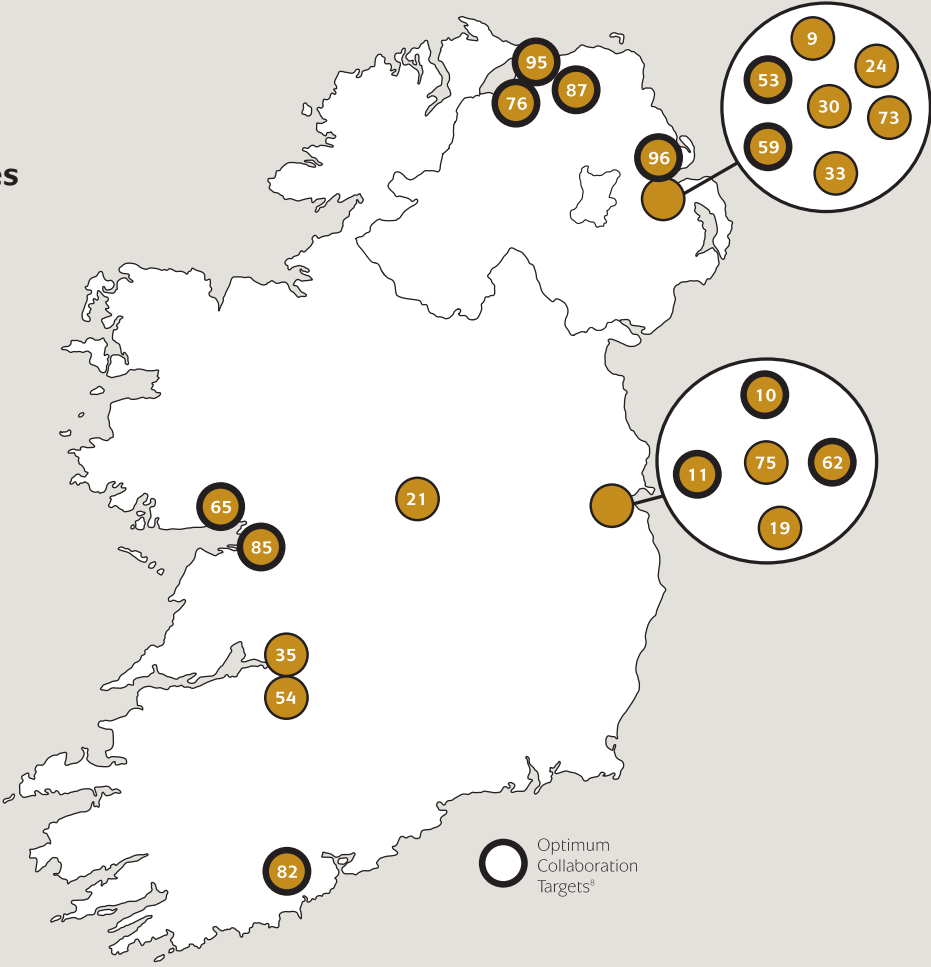
<sup>7</sup> Centres with highest rating of potential for all-island collaboration

## Information & Communications Technologies - Key

3	Alimentary Pharmabiotic Centre	UCC	Cork
6	Applied Software Research Centre	AIT	Athlone
<b>11</b>	<b>Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)</b>	<b>TCD</b>	<b>Dublin</b>
15	Centre for Digital Video Processing	DCU	Dublin
19	Centre for Industrial and Engineering Optics	DIT	Dublin
<b>25</b>	<b>Centre for Research on System on Chip and Advanced Microwireless Integration (SoCam)</b>	<b>QUB</b>	<b>Belfast</b>
26	Centre for Society Information and Media	DCU	Dublin
<b>28</b>	<b>Centre for Telecommunications Value-Chain Research (CTVR)</b>	<b>TCD</b>	<b>Dublin</b>
29	Centre for the Dynamics of Global Business Systems	TCD	Dublin
34	Communications Network Research Institute	DIT	Dublin
<b>36</b>	<b>Computer Science Research Institute</b>	<b>UU</b>	<b>Newtownabbey</b>
<b>39</b>	<b>Electronic Communications and Information Technology (ECIT)</b>	<b>QUB</b>	<b>Belfast</b>
40	Enterprise Research Centre	UL	Limerick
46	Institute of Microelectronics and Wireless Systems	NUIM	Maynooth
<b>47</b>	<b>Intelligent Systems (Wireless Technology)</b>	<b>UU</b>	<b>Londonderry</b>
48	Interaction Design Centre (IDC)	UL	Limerick
49	Irish National IPv6 Centre	WIT	Waterford
<b>51</b>	<b>Lero - The Irish Software Engineering Research Centre</b>	<b>UL</b>	<b>Limerick</b>
52	Marine Institute		Galway
60	National Centre for Geocomputation	NUIM	Maynooth

61	National Centre for Language Technology (NCLT)	DCU	Dublin
<b>62</b>	<b>National Centre for Sensor Research</b>	<b>DCU</b>	<b>Dublin</b>
63	National Institute for Cellular Biotechnology	DCU	Dublin
64	National Maintenance Centre	DIT	Dublin
66	NI Semiconductor Research Centre	QUB	Belfast
68	North West Institute of Further & Higher Education	FE	Londonderry
72	Optical Fibres Research Centre	UL	Limerick
74	Power Electronics Research Laboratory	UCC	Cork
<b>75</b>	<b>Research Institute for Networks and Communications Engineering</b>	<b>DCU</b>	<b>Dublin</b>
77	Sonic Arts Research Centre	QUB	Belfast
<b>79</b>	<b>Telecommunications Software and Systems Group (TSSG)</b>	<b>WIT</b>	<b>Waterford</b>
80	The Centre for Software Process Technologies	UU	Newtownabbey
<b>82</b>	<b>Tyndall National Institute</b>	<b>UCC</b>	<b>Cork</b>
84	Upper Bann Institute	FE	South East
<b>86</b>	<b>Digital Enterprise Research Institute</b>	<b>NUIG</b>	<b>Galway</b>
<b>91</b>	<b>Hamilton Institute</b>	<b>NUIM</b>	<b>Maynooth</b>
94	Automation Research Centre	UL	Limerick

## Nanosciences & Nanotechnologies



### Opportunity Areas for Collaboration - Nanosciences & Nanotechnologies

Although not considered a sector in its own right, Nanosciences & Nanotechnologies are included as a significant enabling technology that can impact across a wide range of sectors. A total of 22 centres, claiming to be active in this area, completed the survey. There are high profile centres on both sides of the border and there are opportunities for collaboration much of which has significant commercial potential.

- The leading centres in Northern Ireland are: the Medical Polymers Research Institute, Nanotec NI, Seagate Technology Ireland, the Functional Genomics Centre, the Biomedical Sciences Research Institute and the Nanotechnology and Integrated BioEngineering Centre;
- The leading centres in Ireland are: the Biomedical Diagnostics Institute, the Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN), Lero - the Irish Software Engineering Research Centre, the National Centre for Sensor Research, the National Centre for Biomedical Engineering Science (NCBES), Tyndall National Institute and the Regenerative Medicine Institute.

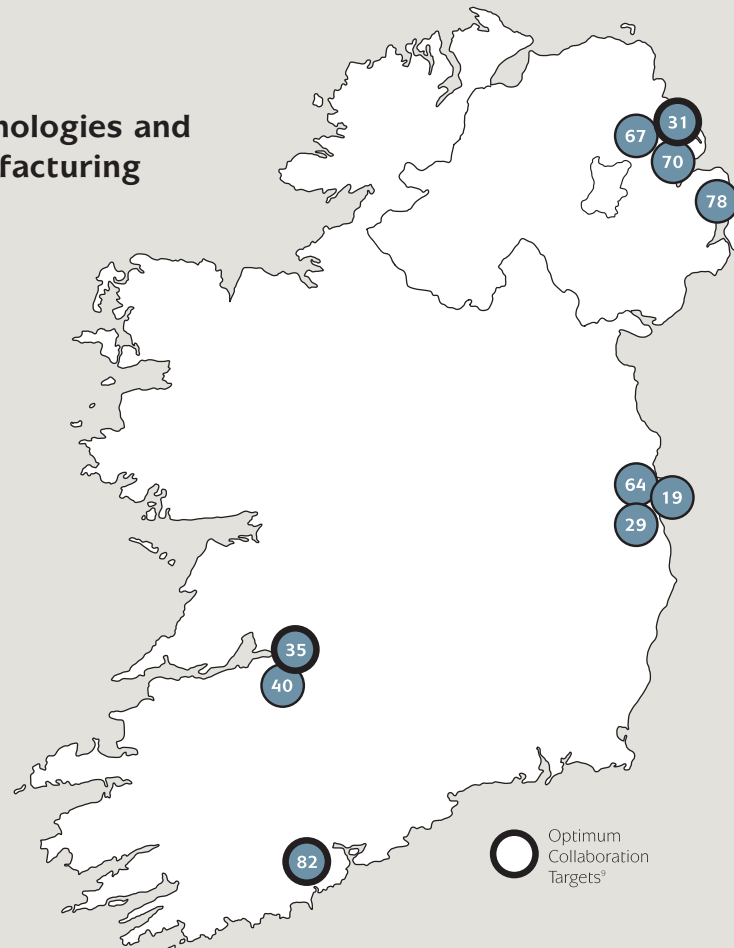
<sup>8</sup> Centres with highest rating of potential for all-island collaboration



## Nanosciences & Nanotechnologies - Key

9	Bioimaging Core Technology Unit	QUB	Belfast
<b>10</b>	<b>Biomedical Diagnostics Institute</b>	<b>DCU</b>	<b>Dublin</b>
<b>11</b>	<b>Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)</b>	<b>TCD</b>	<b>Dublin</b>
19	Centre for Industrial and Engineering Optics	DIT	Dublin
21	Centre for Nanotechnology and Materials Research	AIT	Athlone
24	Centre for Plasma Physics	QUB	Belfast
30	Centre for Theory & Application of Catalysis (CentACat)	QUB	Belfast
33	Centre for Scientific Cameras	Corporate	Belfast
35	Composites Research Centre	UL	Limerick
<b>53</b>	<b>Medical Polymers Research Institute</b>	<b>QUB</b>	<b>Belfast</b>
54	Microelectronics and Semiconductors Research Centre	UL	Limerick
<b>59</b>	<b>Nanotec NI</b>	<b>QUB</b>	<b>Belfast</b>
<b>62</b>	<b>National Centre for Sensor Research</b>	<b>DCU</b>	<b>Dublin</b>
<b>65</b>	<b>National Centre for Biomedical Engineering Science (NCBES)</b>	<b>NUIG</b>	<b>Galway</b>
<b>73</b>	<b>Polymer Processing Research Centre</b>	<b>QUB</b>	<b>Belfast</b>
<b>75</b>	<b>Research Institute for Networks and Communications Engineering</b>	<b>DCU</b>	<b>Dublin</b>
<b>76</b>	<b>Seagate Technology (Ireland)</b>	<b>Corporate</b>	<b>Limavady</b>
<b>82</b>	<b>Tyndall National Institute</b>	<b>UCC</b>	<b>Cork</b>
<b>85</b>	<b>Regenerative Medicine Institute</b>	<b>NUIG</b>	<b>Galway</b>
<b>87</b>	<b>Functional Genomics Centre</b>	<b>UU</b>	<b>Coleraine</b>
<b>95</b>	<b>Biomedical Sciences Research Institute</b>	<b>UU</b>	<b>Coleraine</b>
<b>96</b>	<b>Nanotechnology and Integrated BioEngineering Centre</b>	<b>UU</b>	<b>Newtownabbey</b>

## Aerospace Technologies and Advanced Manufacturing



### Opportunity Areas for Collaboration - Aerospace Technologies & Advanced Manufacturing

This is a small sector with 10 centres claiming to be active in this area completing the survey. Of these, only 3 can claim to be specialised in aerospace. The opportunities for collaboration are thus relatively few.

In Northern Ireland the Centre of Excellence for Integrated Aircraft Technologies (CEIAT) (a recent formed joint activity between the Department of Aeronautical Engineering and the Department of Mechanical Engineering) is a leading centre together with the major manufacturers Bombardier and Thales.

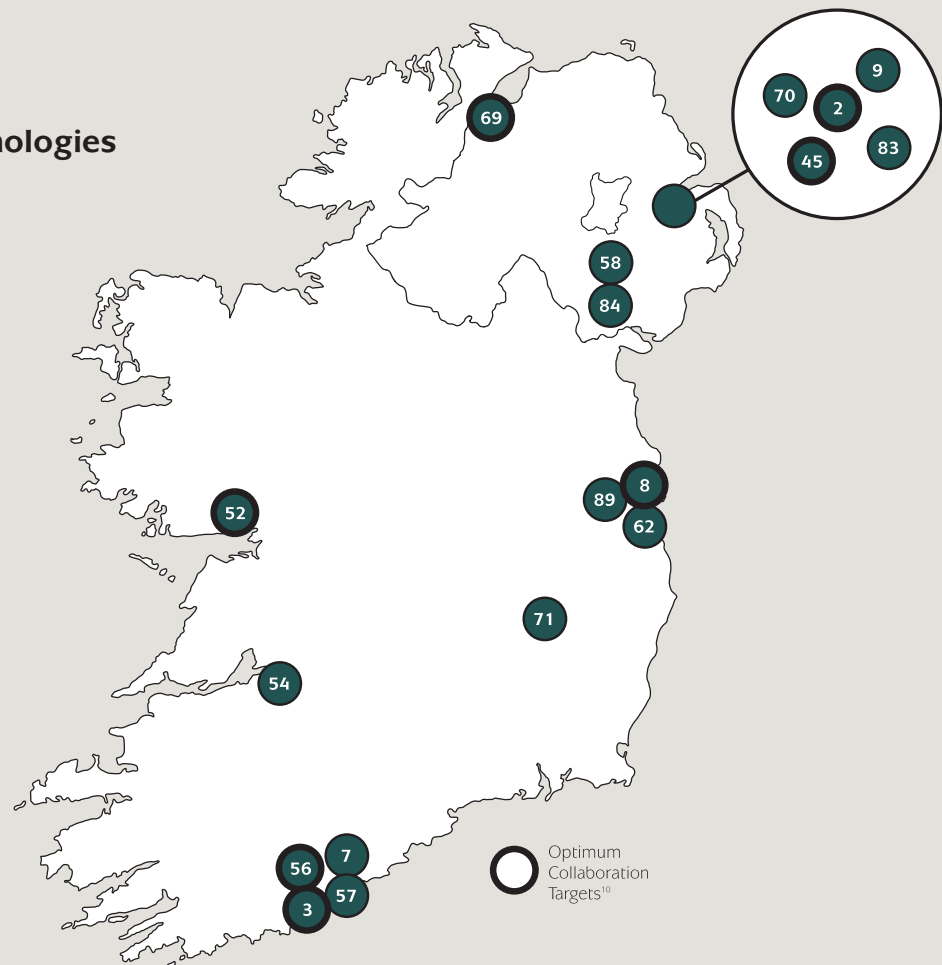
The leading centres in Ireland are: the Composites Research Centre and Tyndall National Institute.

<sup>9</sup> Centres with highest rating of potential for all-island collaboration

## **Aerospace Technologies and Advanced Manufacturing - Key**

19	Centre for Industrial and Engineering Optics	DIT	Dublin
29	Centre for the Dynamics of Global Business Systems	TCD	Dublin
<b>31</b>	<b>Centre of Excellence for Integrated Aircraft Technologies</b>	<b>QUB</b>	<b>Belfast</b>
<b>35</b>	<b>Composites Research Centre</b>	<b>UL</b>	<b>Limerick</b>
40	Enterprise Research Centre	UL	Limerick
64	National Maintenance Centre	DIT	Dublin
67	North East Institute of Further & Higher Education	FE	North East
70	Northern Ireland Technology Centre	QUB	Belfast
78	System Integration & Test Centre	Corporate	Belfast
<b>82</b>	<b>Tyndall National Institute</b>	<b>UCC</b>	<b>Cork</b>

## Agri-Food Technologies



### Opportunity Areas for Collaboration - Agri-Food Technologies

This is a very important sector for the whole island because of its double impact on the economies - agriculture and food processing. Some 18 centres claiming to be active in this area completed the survey. Overall Ireland has a more developed food industry but both jurisdictions would benefit from the increased scale facilitated by cross-border collaboration. In the marine sector Ireland's capability is unmatched in Northern Ireland.

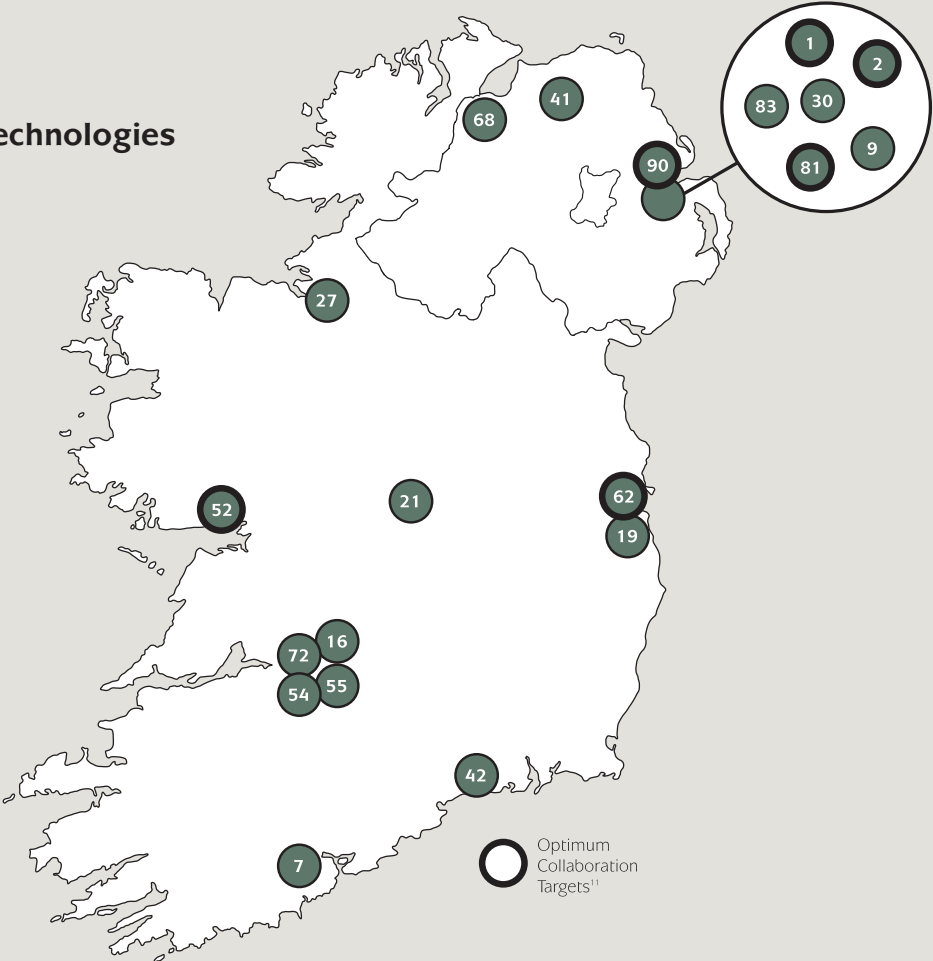
- The leading centres in Northern Ireland are: the Agri-Food and Biosciences Institute, the NI Centre for Food and Health and the Institute of Agri Food and Land Use;
- The leading centres in Ireland are: Moorepark Food Research Centre, the Marine Institute, the Alimentary Pharmabiotic Centre and Ashtown Food Research Centre.

<sup>10</sup> Centres with highest rating of potential for all-island collaboration

## Agri-Food Technologies - Key

<b>2</b>	<b>Agri-Food &amp; Biosciences Institute</b>	<b>DARD</b>	<b>Belfast</b>
<b>3</b>	<b>Alimentary Pharmabiotic Centre</b>	<b>UCC</b>	<b>Cork</b>
7	Aquaculture and Fisheries Development Centre (AFDC)	UCC	Cork
<b>8</b>	<b>Ashtown Food Research Centre</b>	<b>Teagasc</b>	<b>Dublin</b>
9	Bioimaging Core Technology Unit	QUB	Belfast
<b>45</b>	<b>Institute of Agri-Food &amp; Land Use</b>	<b>QUB</b>	<b>Belfast</b>
<b>52</b>	<b>Marine Institute</b>		<b>Galway</b>
54	Microelectronics and Semiconductors Research Centre	UL	Limerick
<b>56</b>	<b>Moorepark Food Research Centre</b>	<b>Teagasc</b>	<b>Cork</b>
57	Moorepark Technology Ltd	Teagasc	Cork
58	Moy Park	Corporate	Craigavon
62	National Centre for Sensor Research	DCU	Dublin
<b>69</b>	<b>Northern Ireland Centre For Food &amp; Health (NICHE)</b>	<b>UU</b>	<b>Londonderry</b>
70	Northern Ireland Technology Centre	QUB	Belfast
71	Oak Park Crops Research Centre	Teagasc	Carlow
83	United Dairy Farmers Ltd Group Technical Centre	Corporate	Belfast
84	Upper Bann Institute	FE	South East
89	Food Product Development Centre	DIT	Dublin

## Environmental Technologies



### Opportunity Areas for Collaboration - Environmental Technologies

The environment is an area of increasing significance, both in its own right and as a source of new economic opportunities.

For both jurisdictions this is an area where the issues will be common and in many cases the solutions will of necessity be similar. The opportunities for collaborative research may be considered to be significant from a top-down policy viewpoint.

Some 20 centres indicated that they were active in this sector. However, from a bottom-up perspective, there is less evidence of world-class leadership in this discipline on the island:

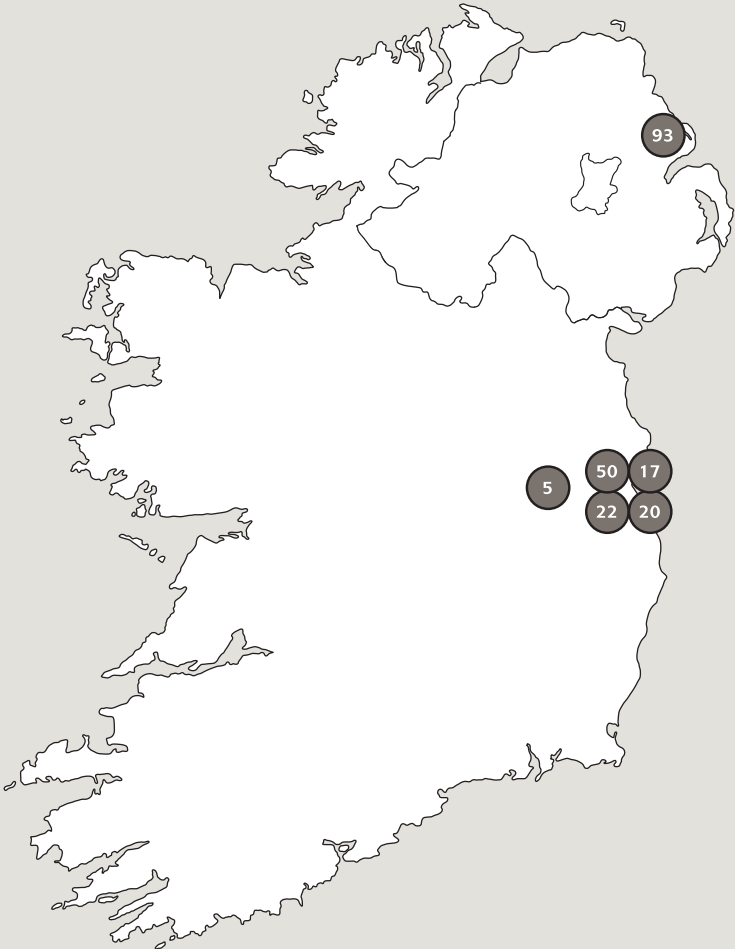
- The leading centres in Northern Ireland are: the Centre for Climate, the Environment and Chronology, the Agri-Food and Biosciences Institute, the Questor Centre and the Built Environment Research Institute;
- The leading centres in Ireland are: the Marine Institute and the National Centre for Sensor Research.

<sup>11</sup> Centres with highest rating of potential for all-island collaboration

## Environmental Technologies - Key

<b>1</b>	<b>Centre for Climate, the Environment and Chronology</b>	<b>QUB</b>	<b>Belfast</b>
<b>2</b>	<b>Agri-Food &amp; Biosciences Institute</b>	<b>DARD</b>	<b>Belfast</b>
7	Aquaculture and Fisheries Development Centre (AFDC)	UCC	Cork
9	Bioimaging Core Technology Unit	QUB	Belfast
16	Centre for Environmental Research	UL	Limerick
19	Centre for Industrial and Engineering Optics	DIT	Dublin
21	Centre for Nanotechnology and Materials Research	AIT	Athlone
27	Centre for Sustainability	ITS	Sligo
30	Centre for Theory & Application of Catalysis (CentACat)	QUB	Belfast
41	Environmental Sciences Research Institute	UU	Coleraine
42	Estuarine Research Group (ERG)	WIT	Waterford
<b>52</b>	<b>Marine Institute</b>		<b>Galway</b>
54	Microelectronics and Semiconductors Research Centre	UL	Limerick
55	Mobile & Marine Robotics Research Centre	UL	Limerick
<b>62</b>	<b>National Centre for Sensor Research</b>	<b>DCU</b>	<b>Dublin</b>
68	North West Institute of Further & Higher Education	FE	Londonderry
72	Optical Fibres Research Centre	UL	Limerick
<b>81</b>	<b>The Questor Centre</b>	<b>QUB</b>	<b>Belfast</b>
83	United Dairy Farmers Ltd Group Technical Centre	Corporate	Belfast
<b>90</b>	<b>Built Environment Research Institute</b>	<b>UU</b>	<b>Newtownabbey</b>

**Other**



**Opportunity Areas for Collaboration - Other**

This represents a disparate group and there are no sufficiently large clusters to identify significant collaboration opportunities.

5	An Foras Feasa: the Institute for Research in Irish Historical and Cultural Traditions	NUIM	Maynooth
17	Centre for Gender and Women's Studies	TCD	Dublin
20	Centre for Medieval and Renaissance Studies	TCD	Dublin
22	Centre for Nonprofit Management, School of Business	TCD	Dublin
50	Learning, Innovation and Knowledge Research Centre	DCU	Dublin
93	FG Wilson Centre of Excellence	Corporate	Larne



# 7. Conclusions and Recommendations

## RTD Centres

Research and Technological Development Centres have a key role to play in creating a critical research and technology mass to support the development of a knowledge-based economy. Both parts of the island have relatively small research communities by international standards, and lack critical scale in many areas. However, there are first-rate centres in both jurisdictions in some key and rapidly developing technologies. It is these that offer the prospects of delivering the greatest mutual economic and scientific benefit if their scale can be developed through cross-border collaboration.

## The Collaborative Environment

Collaborations on the basis of joint risk and reward are widespread with local, EU and international partners. However, those with cross-border partners account for only 8 per cent. In terms of centre-industry collaborations, the majority of these are with local partners (43.5 per cent), with cross-border partners accounting for 6.5 per cent. Contractual collaborations are less common and exist mainly with local partners. 14 per cent of contractual collaborations are on a cross-border basis.

## Barriers to Collaboration

The low levels of cross-border collaboration point to a distinct border effect. A number of issues that present challenges to the creation of a more collaborative environment have been identified.

These include:

- a low level of awareness of relevant research activities in the other jurisdiction;
- lack of effective channels of communications on an all-island basis;
- lack of support programmes to facilitate collaborative activity; and
- lack of clarity surrounding how funding structures can (or cannot) accommodate all-island projects.

It is worth noting that a number of schemes previously provided support for collaborative research and development between higher education institutions in Ireland and Northern Ireland. These spanned the areas of energy, environment, health and agri-food. For example, the Higher Education Authority (HEA) administered two North/South Research Programmes, which were initiated in 2003. Strand 1, the North/South Programme for Collaborative Research, which was administered on behalf of the Department of Education and Science and funded under the National Development Plan (2000 - 2006), allocated €5.5m to 21 cross-border inter-institutional projects across 9 institutions. These 2 - 3 year projects covered a wide range of disciplines such as Irish history, Irish film, economics, encoding of scholarly texts, research evaluation, biosciences, biomedicine, conservation, nanotechnology and ICT. Under strand 2, the Cross-Border Programme for Research and Education contributing to Peace and Reconciliation, which was administered on behalf of the Department of Education and Science and the Department for Employment

and Learning and funded under the PEACE II programme, €3.2m was allocated to 5 projects, over a 2.5 year period.

The HEA administered programmes were established with a particular focus on enhancing the research capabilities on the island by:

- strengthening research in the higher education institutions through the reward of excellence;
- enhancing the research, teaching and learning continuum and thus the quality and relevance of graduate output and skills;
- promoting networks of excellence in research and innovation; and
- contributing to policy development in a variety of areas.

The projects funded broadly met these objectives. These programmes also served to increase the level of awareness and communication between researchers North and South operating in similar fields. The lessons learned from these programmes could usefully inform the development of future North/South schemes.

## Potential for Collaboration

The report identifies 36 centres (18 in Ireland and 18 in Northern Ireland) as having high potential for all-island collaboration, and a further 23 centres (15 in Ireland and 8 in Northern Ireland) as targets for developing all-island collaboration.

In addition to the data provided by this report, the number and range of projects funded under previous HEA North/South research schemes points to the wider demand for and potential from North/South collaboration. Under Strand 1 of the programme, the HEA received 139 applications of which 21 were funded. Under Strand 2, 45 applications were received and 5 were funded. The number of projects supported was limited by the levels of funding available at the time.

The following section proposes a number of recommendations to address the identified barriers to collaboration and so better exploit the opportunities presented through increased collaboration.

## Recommendations Overview

Based on the findings of the study, recommendations are made in the following broad areas to address identified barriers to increased cross-border collaboration:

- Improved awareness levels;
- Targeted cross-border support programmes; and
- New funding models.

## Improved Levels of Awareness

In order to enhance the level of awareness of research activities in the other jurisdiction and to increase the level of personal networking the following measures are recommended. These are based around enhanced researcher mobility, improved communications and recognition of success.

### Enhancement of researcher mobility

There is an increased requirement for formal post graduate education and the opportunity exists to enhance the level of excellence of the teaching by including the best from across the island in taught post-graduate courses. At this point in time there are developments in this area in Ireland which would, according to the promoters, be considerably improved by the involvement of a Northern Ireland institution. Currently there is no means of funding such a programme.

**Recommendation 1:** The possibilities for cooperation in this area should be reviewed and possible funding mechanisms investigated.

### Improved communications

The report has found that in many scientific disciplines no effective channels of communication exist on an all-island basis. A lack of knowledge about potential partners has been identified as a real barrier to cross-border collaboration.

**Recommendation 2:** A programme to facilitate and encourage networking and innovation activity across research disciplines and between the academic and policy community on the island should be developed with appropriate bodies.

**Recommendation 3:** A monthly e-journal should circulate information about all-island research activity, funding opportunities, people and other information of interest to the science and technology community. This could be an off-shoot of [www.expertiseireland.com](http://www.expertiseireland.com), the existing sign-posting mechanism targeting this audience, as this site contains potential material for such communications.

### Recognition of success

A key part of the broadening of the cross-border awareness of research activity in the other jurisdiction is to highlight the leading edge research which is taking place across the island.

**Recommendation 4:** An All-Island Science Award should be initiated. Initially there might be separate sections for each jurisdiction as well as overall winners in order to ensure equal participation. The possible extension of an existing award (e.g. those operated by the Royal Irish Academy) should be investigated in order to benefit from the momentum of an established contest.

## Targeted Cross-Border Support Programmes

The report has identified a lack of clarity on how funding structures can or cannot accommodate all-island participation. It is important that there is recognition that science and its application is dynamic and rapidly changing and that any support structures are tailored accordingly. In order to facilitate cross-border research at a number of different levels, the report recommends the development of three support programmes to facilitate various scales of collaborative activity, as detailed below.

### All-Island Research Clusters

The report outlines the potential for the development of a small number of world-class all-island research clusters based on the best available resources on the island. The inclusion of partners outside the 2 jurisdictions should also be examined. The test for any given proposition should be that bringing the existing and complementary capabilities from either side of the border together will lead to significant enhancement of research activity and excellence. This should in turn lead to a significant level of increased mutual scientific and economic benefit to both economies.

The technology areas which will meet these criteria will be those key areas already identified by the 2 governments and where there are already strong players and scale of activity on both sides of the border. These include Biotechnology, Nanotechnology and ICT.

**Recommendation 5:** A support programme should be developed to support the establishment of a small number of world-

class all-island research clusters, based on the best available resources on the island.

### Bilateral Projects

In other areas, such as Environmental, Agri-Food, Aerospace & Advanced Manufacturing, there are strong players in both jurisdictions, but not necessarily a critical scale of complementary activity. A major issue for research groups in these areas is accessing adequate funding for collaborative projects. This is despite the fact that in many instances the project as a whole would have won support from both jurisdictions. Support for these projects will enhance the island's research capabilities and contribute to developing a critical mass in these economically important areas.

**Recommendation 6:** A support programme should be developed to facilitate collaboration on a project-by-project basis across a wide range of disciplines, as per the previous HEA programmes. It is envisaged that this would be a substantial programme (up to 3 years duration) involving full time researchers on either side of the border. The scheme should allow broadly equal participation and funding, with proposals subject to a rigorous competitive process.

### Smaller Scale Collaborative Projects

There is benefit in facilitating groups from the broader research community to undertake shorter term, smaller scale collaborative projects, particularly with industry. Such collaboration would provide strategic advantage to both the research base and industry arising from shared access to facilities, expertise or knowledge.

Of equal importance is the requirement to facilitate technology transfer, particularly to SMEs and the rural economy. InterTradeIreland's Fusion programme is an example of a scheme that facilitates technology transfer between academia and industry using a graduate as the link.

**Recommendation 7:** A support mechanism should be developed to facilitate shorter term, small scale collaboration, both centre to centre and centre to industry, on an all-island basis.

**Recommendation 8:** The development of a technology transfer scheme without the requirement for a graduate should be investigated, for example the extension of the Innovation Voucher scheme on an all-island basis as recommended by the British Irish Intergovernmental Conference report on the development of an island economy.

### Funding Models

Availability of funding has been identified as a major barrier to collaboration. Respondents believe that new funding is required to incentivise and support enduring cross-border collaboration specifically. The National Development Plan 2007 - 2013 refers to proposals for Irish Government investment in North/South projects and initiatives for mutual benefit. These include initiatives in the area of Science, Technology and Innovation. Furthermore, the financial package to help underpin the restoration of the devolved administration in Northern Ireland referenced an Innovation fund. Given these new funding sources for cross-border R&D collaborative activities, a number of funding models are

recommended for consideration.

#### All-Island Funding Mechanism

Research groups wishing to undertake joint projects would have access to a dedicated funding source which would be subject to a rigorous competitive process that would allow broadly equal participation and funding. The HEA administered North/South Research Programmes were a good example of a dedicated funding resource administered on a North/South basis.

**Recommendation 9:** The establishment of a dedicated all-island funding mechanism should be investigated.

#### Alignment of Existing Funding Supports

This would involve the recognition of collaborative projects by relevant funding agencies in both jurisdictions and incorporate a flexible mechanism to allow each agency support the research conducted in its jurisdiction.

A current example of this is the bi-lateral agreement between the UK Economic and Social Research Council (ESRC) and the Irish Research Council for the Humanities and Social Sciences (IRCHSS) which facilitates collaboration between social science researchers in Ireland and the UK. Applicants provide both councils with the Irish and UK partner proposals and these are assessed through a collaborative process by both IRCHSS and the ESRC, with funding awarded separately through the 2 councils.

The US-Ireland R&D Partnership is another example where funding mechanisms within a number of different jurisdictions are

co-ordinated to facilitate a single proposal-single peer-review system and enable joint decision making.

**Recommendation 10:** The alignment of existing funding supports to facilitate all-island participation should be investigated.

#### Adaptation of Existing Funding Supports

Existing funding supports could be adapted to allow more flexible use of funds where a business case exists for a collaborative project. In Ireland, there are a number of examples of moves in this direction. The Science Foundation Ireland (SFI) North/South Research Partnership Supplement will fund collaborations with researchers in higher education institutions in Northern Ireland in order to enhance existing SFI funded research programmes.

The Programme for Research in Third-Level Institutions Cycle 4 facilitates collaboration with international partners. Collaboration with Queen's University Belfast and the University of Ulster (and its constituent colleges) is particularly welcome. 7 of the current 16 programmes funded under PRTL Cycle 4 involve Northern Ireland participation. These programmes span biosciences, the environment, humanities and ICT.

Similarly, the adaptation of funding supports in Northern Ireland should be considered. There are 2 main kinds of higher education research funding in Northern Ireland; that provided by the Department for Employment and Learning (DEL) for essential infrastructure costs and the funds made available for specific projects by the UK Research Councils. It is acknowledged that adaptation of UK Research Council funding could be potentially challenging to implement.

**Recommendation 11:** The adaptation of existing funding supports to facilitate all-island participation should be investigated.





# APPENDIX 1

## *List and Location of Identified Centres*

### DUBLIN

Centre for Medieval and Renaissance Studies	TCD
Centre for Nonprofit Management	TCD
Centre for Telecommunications Value-Chain Research	TCD
Centre for The Dynamics of Global Business Systems	TCD
Biomedical Diagnostics Institute	DCU
Communications Network Research Institute	DIT
Centre for Research on Adaptive Nanostructures and Nanodevices	TCD
Centre for Bioanalytical Science	DCU
Centre for Digital Video Processing	DCU
Centre for Gender and Women's Studies	TCD
Centre for Global Health	TCD
Centre for Industrial & Engineering Optics	DIT
Food Product Development Centre	DIT
LinK: The Learning, Innovation and Knowledge Research Centre	DCU
National Centre for Language Technology	DCU
Research Institute for Networks and Communications Engineering	DCU
National Centre for Sensor Research	DCU
National Institute for Cellular Biotechnology	DCU
National Maintenance Centre	DIT
Ashtown Food Research Centre	Teagasc
Centre for Society, Information and Media	DCU
Centre for Research in Engineering Surface Technology	DIT
Centre for Research in Infectious Diseases	UCD
Centre for Translation and Textual Studies	DCU
Centre for Transportation Research	TCD
Centre for Urban and Regional Studies	TCD
Centre for Women in Science and Engineering Research (WiSER)	TCD
Children's Research Centre	TCD
Centre for Social & Educational Research	DIT
Conway Institute of Biomolecular & Biomedical Research	UCD
Digital Media Centre (DMC)	DIT
Distance Learning Unit	DIT
Centre for Software Engineering	DCU
Institute for Information Technology and Advanced Computing (IITAC)	TCD

Institute for International Integration Studies (IIIS)	TCD
Institute of Molecular Medicine	TCD
International Centre for Neurotherapeutics	DCU
Centre for International Studies	DCU
Materials Processing Research Centre	DCU
Microbiology Research Unit	TCD
Geary Institute	UCD
Centre for International Services Innovation	TCD
National Centre for Plasma Science and Technology	DCU
CASTeL: Center for the Advancement of Science Teaching and Learning	DCU
Non-Linear Materials Research Group	DIT
Nova UCD	UCD
Policy Institute	TCD
Project Development Centre	DIT
Radiation and Environmental Science Centre	DIT
Applied Optoelectronics	DIT
Sustainability Research Development Group	DIT
The Futures Academy	DIT
Tourism Research Centre	DIT
Trinity College Institute of Neuroscience (TCIN)	TCD
Urban Institute	UCD
Vascular Health Research Centre	DCU
Ageing Consortium	TCD
National Digital Research Centre	Dublin
RCSI Research Institute	RCSI

## **BELFAST**

Centre for Climate, the Environment and Chronology	QUB
Centre for Cancer Research and Cell Biology	QUB
Centre for Organic Synthesis and Medicinally Orientated Science	QUB
Bio-imaging Unit	QUB
Centre for Plasma Physics	QUB
Centre for Research on System-on-Chip and Advanced Microwireless Integration	QUB
Centre for Theory and Application of Catalysis	QUB
Centre of Excellence for Integrated Aircraft Technologies	QUB

Electronics, Communications & Information Technology	QUB
Institute for Agri-Food and Land Use	QUB
Medical Polymers Research Institute	QUB
Nanotec NI	QUB & UU
NI Semiconductor Research Centre	QUB
Northern Ireland Technology Centre	QUB
Polymer Processing Research Centre	QUB
Sonic Arts Research Centre	QUB
The Questor Centre	QUB
Agri-Food & Biosciences Institute	DARD
Centre for Scientific Cameras	Corporate
Systems Integration & Test Centre	Corporate
United Dairy Farmers Group Technical Centre	Corporate
NI Centre for Advanced Materials	QUB & UU
EMC Pre-Compliance Test Centre	QUB
Environmental Engineering Research Centre	QUB
Infrastructure for E-Science (incl Belfast E-Science Centre)	QUB
Software Engineering	BIFHE
DSiP Laboratories	QUB
Electronics Centre	CIFHE
Virtual Engineering Centre	QUB
Virtual Plant for Industrial Process Control	QUB
Aeronautical Engineering	QUB
Environmental Engineering and Bioremediation (within Environmental Engineering Research Centre)	QUB
BioMedical Laboratory	QUB
Centre for Advanced Materials and Processing	QUB
Next Generation Mobile Infrastructure Centre of Excellence	Corporate

## **NEWTOWNABBEY**

Built Environment Research Institute	UU
Computer Science Research Institute	UU
Health & Rehabilitation Sciences Research Institute	UU
Intelligence Systems Wireless Technology	UU
Nanotechnology and Advanced Materials Research Institute	UU

The Centre for Software Process Technology (CSPT)	UU
Informatics Research Centre	UU
INTERFACE	UU
Nanoscale Device Fabrication Facility for BioMedical Applications	UU
Centre of Advanced Cardiology Research	UU
NI Centre for Energy Research & Technology	UU
Energy and Nanotechnology Engineering Research Facility	UU
Sustainable Built Urban Environment	UU
Technology & Engineering Innovation Centre	UU
Engineering Composites Research Centre	UU

## **CORK**

Moorepark Food Research	Teagasc
Moorepark Technology Ltd	Teagasc
Alimentary Pharmabiotic Centre	UCC
Aquaculture & Fisheries Development Centre	UCC
Power Electronics Research Laboratory	UCC
Tyndall National Institute	UCC
Centre for Research in Vascular Biology (CRVB)	UCC
Centre for Unified Computing	UCC
Clean Technology Centre	CIT
Cleaner Production Promotion Unit	UCC
Cork Cancer Research Centre	UCC
Boole Centre for Research in Informatics	UCC
Environmental Research Institute	UCC
European Centre for Clinical Trials in Rare Diseases	UCC
Hydraulics & Maritime Research Centre	UCC
Informatics Research Unit in Sustainable Engineering (IRUSE)	UCC
Medical Engineering Design and Innovation Centre	CIT
Photonic Systems Group	UCC
BioSciences Institute	UCC
BioTransfer Unit	UCC
Adaptive Wireless Systems Group	CIT
Technologies for Embedded Computing Centre	CIT
The Rubicon Innovation Centre	CIT
Advanced Manufacturing Technology (AMT-Ireland)	UCC
BioMerit Institute	UCC

## LIMERICK

Automation Research Centre	UL
Enterprise Research Centre	UL
Composites Research Centre	UL
Interaction Design Centre	UL
Lero - The Irish Software Engineering Research Centre	UL
Microelectronics and Semiconductor Research Centre	UL
Mobile and Marine Robotics Research Centre	UL
Optical Fibre Sensors Research Centre	UL
Centre for Applied Biomedical Engineering Research	UL
Centre for Environmental Research	UL
Circuit and Systems Research Centre	UL
Localisation Research Centre (LRC)	UL
Materials & Surface Science Institute	UL
Materials Ireland	UL
IT Department	LIT
John Holland Research Centre	UL
Data Communications Security Laboratory	UL
Product Design	LIT
Science Department	LIT
Stokes Research Institute	UL
Telecommunications Research Centre	UL
Wireless Access Research Centre	UL
Biomedical Electronics Research Centre	UL
Electrical and Electronic Dept	LIT
Food Science Research Centre	UL

## GALWAY

National Centre for Biomedical Engineering Science (NCBES)	NUIG
Digital Enterprise Research Institute	NUIG
The Regenerative Medicine Institute	NUIG
Marine Institute	Galway
Centre for Innovation & Structural Change	NUIG
Environmental Change Institute	NUIG
Martin Ryan Institute	NUIG

## **MAYNOOTH**

An Foras Feasa: the Institute for Research in Irish Historical and Cultural Traditions	NUIM
Hamilton Institute	NUIM
Institute for Microelectronics and Wireless Systems	NUIM
National Centre for Geocomputation	NUIM
Institute of Bioengineering and Agroecology	NUIM
National Institute for Cellular Biotechnology	NUIM
National Institute for Regional & Spatial Analysis	NUIM
The Innovation Value Institute (IVI)	NUIM
The Institute of Immunology	NUIM

## **ATHLONE**

Applied Software Research Centre (ASRC)	AIT
Centre for Biomaterials and Biomolecular Research	AIT
Centre for Nantechonology and Materials Research (CNMR)	AIT

## **WATERFORD**

Esturine Research Centre	WIT
Irish National IPv6 Centre	WIT
Telecommunications Software and Systems Group (TSSG)	WIT
Centre for Converged Communications Services	WIT

## **SLIGO**

Centre for Sustainability	ITS
Apprentice Education	ITS
Energy Research	ITS
National Institute for Bioprocessing Research and Training	UCD, TCD, DCU and ITS
Robotics Project	ITS

## **CRAIGAVON**

Evron Foods Ltd	Corporate
Centre of Excellence for R&D in Controlled Drug Delivery	Corporate
Moy Park R&D Centre	Corporate
Almac Speciality Pharmaceuticals Centre	Corporate
Upper Bann Institute of Further & Higher Education	UBIFHE

## **CARLOW**

Oak Park Crops Research Centre	Teagasc
Research Programme in Environmental Sciences	Carlow IT

## **CRUMLIN**

Centre of Excellence in Proteomics	Corporate
Biochip Array Technologies	Corporate

## **BANGOR**

ICT and Computing	NDAIFHE
Manufacturing Engineering	NDAIFHE
Software Engineering	NDAIFHE
Electronics	NDAIFHE

## **BALLYMENA**

Construction and the Built Environment	NEIFHE
North East Institute of Further & Higher Education	NEIFHE
Automotive Centre of Excellence	Corporate

## **DOWNPATRICK**

East Down Institute of Further & Higher Education	EDIFHE
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## **NEWRY**

Hospitality and Tourism	NKIFHE
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## **OMAGH**

Omagh Meats R&D Centre

Corporate

## **LONDONDERRY**

North West Institute of Further & Higher Education

NWIFHE

Software Engineering

NWIFHE

RADICEL

Corporate

Intelligence Systems

UU Magee

## **LARNE**

Research & Technology Centre

Corporate

## **LIMAVADY**

Seagate Recording Media Substrate Centre of Excellence

Corporate

## **DUNDALK**

Regional Development Centre

DKIT

Software Technology Research Centre

DKIT

Smooth Muscle Research Centre

DKIT

## **COLERAINE**

Biomedical Sciences Research Institute

UU

Environmental Science Research Institute

UU

Functional Genomics Centre

UU

Northern Ireland Centre for Food & Health

UU

Centre for Media Research

UU

FEI Philips Centre for Advanced Bio Imaging

UU

Centre for Metabolomics

UU



## APPENDIX 2

### *List of Participating Centres*

1	Centre for Climate, the Environment and Chronology (CHRONO)	QUB
2	Agri-Food & Biosciences Institute	DARD
3	Alimentary Pharmabiotic Centre	UCC
4	Almac Group	Corporate
5	An Foras Feasa: the Institute for Research in Irish Historical and Cultural Traditions	NUIM
6	Applied Software Research Centre	AIT
7	Aquaculture and Fisheries Development Centre (AFDC)	UCC
8	Ashtown Food Research Centre	Teagasc
9	Bioimaging Core Technology Unit	QUB
10	Biomedical Diagnostics Institute	DCU
11	Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)	TCD
12	Centre for Applied Biomedical Engineering Research	UL
13	Centre for Bioanalytical Sciences	DCU
14	Centre for Cancer Research and Cell Biology	QUB
15	Centre for Digital Video Processing	DCU
16	Centre for Environmental Research	UL
17	Centre for Gender and Women's Studies	TCD
18	Centre for Global Health	TCD
19	Centre for Industrial and Engineering Optics	DIT
20	Centre for Medieval and Renaissance Studies	TCD
21	Centre for Nanotechnology and Materials Research	AIT
22	Centre for Nonprofit Management, School of Business	TCD
23	Centre for Organic Synthesis and Medicinally Orientated Science (COSMOS)	QUB
24	Centre for Plasma Physics	QUB
25	Centre for Research on System on Chip and Advanced Microwireless Integration (SoCam)	QUB
26	Centre for Society Information and Media	DCU
27	Centre for Sustainability	ITS
28	Centre for Telecommunications Value-Chain Research (CTVR)	TCD
29	Centre for the Dynamics of Global Business Systems	TCD
30	Centre for Theory & Application of Catalysis (CentACat)	QUB
31	Centre of Excellence for Integrated Aircraft Technologies	QUB
32	Centre of Excellence in Controlled Drug Delivery - Warner Chilcott	Corporate
33	Centre for Scientific Cameras - Andor Technologies	Corporate
34	Communications Network Research Institute	DIT
35	Composites Research Centre	UL

36	Computer Science Research Institute	UU
37	Centre for Research in Vascular Biology (CRVB)	UCC
38	East Down Institute of Further & Higher Education	EDIFHE
39	Electronic Communications and Information Technology (ECIT)	QUB
40	Enterprise Research Centre	UL
41	Environmental Sciences Research Institute	UU
42	Estuarine Research Group (ERG)	WIT
44	Health & Rehabilitation Sciences Research Institute	UU
45	Institute of Agri-Food & Land Use	QUB
46	Institute of Microelectronics and Wireless Systems	NUIM
47	Intelligent Systems (Wireless Technology)	UU
48	Interaction Design Centre (IDC)	UL
49	Irish National IPv6 Centre	WIT
50	Learning, Innovation and Knowledge Research Centre	DCU
51	Lero - The Irish Software Engineering Research Centre	UL
52	Marine Institute	
53	Medical Polymers Research Institute	QUB
54	Microelectronics and Semiconductors Research Centre	UL
55	Mobile & Marine Robotics Research Centre	UL
56	Moorepark Food Research Centre	Teagasc
57	Moorepark Technology Ltd	Teagasc
58	Moy Park	Corporate
59	Nanotec NI	QUB & UU
60	National Centre for Geocomputation	NUIM
61	National Centre for Language Technology (NCLT)	DCU
62	National Centre for Sensor Research	DCU
63	National Institute for Cellular Biotechnology	DCU
64	National Maintenance Centre	DIT
65	National Centre for Biomedical Engineering Science (NCBES)	NUIG
66	NI Semiconductor Research Centre	QUB
67	North East Institute of Further & Higher Education	NEIFHE
68	North West Institute of Further & Higher Education	NWIFHE
69	Northern Ireland Centre For Food & Health (NICHE)	UU
70	Northern Ireland Technology Centre	QUB
71	Oak Park Crops Research Centre	Teagasc
72	Optical Fibres Research Centre	UL

73	Polymer Processing Research Centre	QUB
74	Power Electronics Research Laboratory	UCC
75	Research Institute for Networks and Communications Engineering	DCU
76	Seagate Technology (Ireland)	Corporate
77	Sonic Arts Research Centre	QUB
78	System Integration & Test Centre - Thales Group	Corporate
79	Telecommunications Software and Systems Group (TSSG)	WIT
80	The Centre for Software Process Technologies	UU
81	The Questor Centre	QUB
82	Tyndall National Institute	UCC
83	United Dairy Farmers Ltd Group Technical Centre	Corporate
84	Upper Bann Institute of Further & Higher Education	UBIFHE
85	Regenerative Medicine Institute	NUIG
86	Digital Enterprise Research Institute	NUIG
87	Functional Genomics Centre	UU
88	Smooth Muscle Research Centre	DKIT
89	Food Product Development Centre	DIT
90	Built Environment Research Institute	UU
91	Hamilton Institute	NUIM
92	Centre for Biomaterials and Biomolecular Research	AIT
93	FG Wilson Centre of Excellence	Corporate
94	Automation Research Centre	UL
95	Biomedical Sciences Research Institute	UU
96	Nanotechnology and Integrated BioEngineering Centre	UU

# APPENDIX 3

## *Engagement with Industry*

Centres listed a wide variety of companies and organisations with which they have relationships. The descriptions were requested in the form of open ended questions to facilitate the wide range expected. Answers therefore ranged from detailed lists of companies to broad statements. In general, the responses give an overview that portrays centres actively engaged with industry and funding bodies.

The list of private sector companies is impressive at local and international level and includes multi-national household names, SMEs and up and coming companies that are operating at the cutting edge of their fields with the support and input of leading research centres. As well as specific answers centres listed comments such as “Large MNCs in our sector”, “Irish SMEs in our sector” etc.

### **Specific Private Sector Bodies**

3Touch	E2V Technologies Plc (UK)	Motorola Ireland
5T Process Solutions	EADS-CASA	National Semiconductor
ABB	Eblana Photonics	Nokia
Airbus	Eircom	North Cork Creameries
Alcatel	EMC	Odin
Alenia	Enfer Technologies	Original Solutions
Analog Devices	Ericsson	Piercom
Andor Technology Plc	Evolve	Portomedia
Appletree Press	France Telecom	QAD
Arrabawn Co-op	Fraudhalt	Rovsing
Ashling Microsystems	Glanbia plc	S3 Silicon & Software Systems
Bausch and Lomb	Hewlett Packard	SAAB Aerospace
Becton Dickson	Hospira	Seagate Technology
Bittware	IBM Ireland	Sensor Technologies
Biznet Solutions	IceMOS Technology	Siemens
Bosch	Intel	Snap-On
Brightwork	Intelliden	Sortex Ltd
BT	Inverness Medical Interventions Inc.	Stryker
Carberg Group	IONA	Teagasc- Food Research Division
CEL	Irish Dairy Board	Telecom Italia
Cellix Ltd	Jackman Food Solutions Ltd	Telefonica/02
Commergy	Kerry Group	Telenor
Connacht Gold Co-op	KMC	Telia
Curam Software	Leverhulme	Texas Instruments (Japan)
DaimlerChrysler	Lucent	Tipperary Co-Op
Dairygold Co-op	Magnetic Solutions	Toyota
Dale Farm Group of companies	Mailbrand	T-Systems
Dassault	Martin Dawes Systems	Vitalograph
Deerac Fluidics	Meridio	Vodafone
Dell	Microsoft Dublin	Warner Chilcott group
Dell, Ehrke & Partner	Milron	Wavin Ireland Ltd
DHL	Mobile Cohesion	Wyeth

In Ireland, the CSET programme is a powerful agent for linking the researchers in higher education institutions with indigenous and multinational companies. Specifically, CSETs must include industry partners that invest

funds or valuable intellectual capital in the centre.

The CSETs included in this report are strategically connected to industry, as listed below:

<b>CSET</b>	<b>Industry Partners</b>
CRANN: Centre for Research on Adaptive Nanostructures and Nanodevices	Intel, Hewlett Packard
CTVR: Centre for Telecommunications Value-chain Research	Alcatel/ Lucent, Xilinx
Lero: Irish Software Engineering Research Consortium	Robert Bosch AG, Iona
DERI: Digital Enterprise Research Institute	Hewlett Packard
BDI -Biomedical Diagnostics Institutes	BD Technologies, Analog Devices, Hospira Inc. Inverness Medical Innovations, Enfer Scientific, Amic AB
REMEDI - Regenerative Medicine Institute	Medtronic Inc Charles River Laboratories
APC - Alimentary Pharmabiotic Centre	GlaxoSmithKline, Alimentary Health

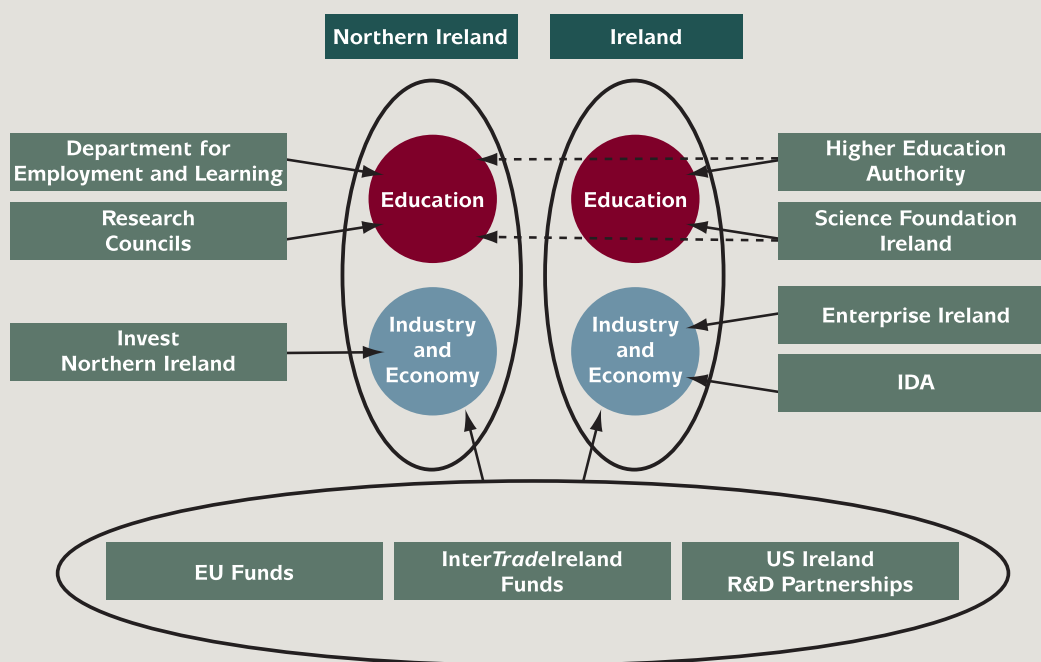
Centres also listed public sector bodies as their clients including:

AHRC	Geological Survey of Ireland
British Academy	Health Research Board
Concern	Higher Education Authority
Department of Community, Rural and Gaeltacht Affairs	HSE
Department of Agriculture and Food	IDA
Department of Agriculture and Rural Development	InterTradeIreland
Department of Communications, Marine & Natural Resources	Invest NI
Department of Enterprise, Trade and Employment	Irish Aid
Department of the Environment	Irish Aviation Authority
Department of Education	Marine Institute
Department of Health	Ministry of Defence UK
DfID	NERC
DTI	Office of Public Works
Enterprise Ireland	Pasteur Institute (France)
Environmental Protection Agency	PPARC
EPSRC	Queens University
ESRC	Regional Waste Management
EU DG-INFSO	Science Foundation Ireland
European Commission	SEUPB
European Space Agency	Trinity College Dublin
Fáilte Ireland	Údarás na Gaeltacha
FSA	Ulster of University
FSPB	University College Cork

# APPENDIX 4

## Current Funding Overview

### Funding Access Outlined



### Overview of the Status Quo -

#### Funding Access in Northern Ireland

It is understood that none of the UK government schemes currently permit the funding of research in Ireland and in most cases it would be difficult within the current structure to effect change in this regard. The Northern Ireland science community receives funding from the UK Research Councils.

Higher Education research for the benefit of mankind and for education is funded by:

- Dept. Employment & Learning (DEL) - Capital, Recurrent, Science Research

Investment Fund, Strategic Priority Fund, Spur, etc.

- Research Councils - Biotechnology & Biological Sciences (BBSRC), Engineering & Physical Sciences (EPSRC), Medical (MRC) and Science & Technology Facilities (STFC).

Research for the benefit of industry and the economy is funded by:

- Invest NI - R & D Centres of Excellence, Start, Compete, Higher Education Innovation Fund (jointly with DEL), etc.
- EU funds research only in multi-jurisdiction partnerships through Framework Programmes, Interreg, etc.

- US-style club funding trialled for some time (Questor) but only recently reconsidered more generally.

## Funding Access in Ireland

The Irish science community has a history of collaboration outside the state. Historically funded at a lower level, external collaboration was a means of enhancing the overall research activity but the benefit is that the Irish funding system suits EU and industry funding.

Research is funded by:

- Higher Education Authority - PRTLII.
  - o Cycle 4 of PRTLII facilitates collaboration with international partners
- SFI - CSETs, National Access Programme, etc.

Industry Research is funded by:

- EI/IDA - R & D Funding/Management/Tailored Funding, Competence Centres, Innovation Vouchers/Partnerships, etc.
  - o There is some flexibility in Competence Centre and Innovation Voucher funding that allows some expenditure outside the jurisdiction
- EU funds research through Framework Programmes, Interreg, etc.
- Enterprise Ireland funding can be spent in Northern Ireland to the benefit of an Irish company and this is explicit in relation to the Innovation Vouchers.

## Funding Access specifically designed for All-Island Collaboration

Science funding with cross-border options include:

- InterTradelreland's Fusion and Innova programmes;
- Interreg, which is reported as only poorly understood and unused for mainstream research funding;
- The US-Ireland R&D Partnership, a tri-jurisdictional initiative aimed at increasing the level of collaborative R&D across the 3 jurisdictions. Funding agencies and bodies from each jurisdiction (National Institutes of Health, National Science Foundation, Science Foundation Ireland, Invest NI, Dept. for Employment & Learning, Department of Health, Social Services and Public Safety (DHSSPS) and R&D Office) will consider collaborative research proposals in the research areas identified by the Partnership and will support the agreed costs of the research to be carried out locally. This serves as an example of where funding mechanisms within 3 jurisdictions are being coordinated to facilitate a single proposal-single peer-review system and enable joint decision-making;
- In line with recent policy to maximise the potential for cross-border collaboration, particularly in the area of Framework Programme 7 (FP7), InterTradelreland is currently working with Invest Northern Ireland and Enterprise Ireland to explore ways to support increased engagement in FP7 on an all-island basis. Many centres see



FP funding as the only option to support all-island collaboration but consider it an onerous option due to the regulations requiring multiple EU project partners; and

- IRCSET is working to encourage a more collaborative approach (North and South) in addressing the opportunities for graduate formation at PhD and Masters level. Already, a number of collaborations look extremely promising and IRCSET would wish to see more of this.
- The Marine Institute has recently launched a call for proposals on an all-island basis.

# APPENDIX 5

## *Glossary of Terms*

BBSRC	Biotechnology and Biological Sciences Research Council (UK)
CSETs	Centres for Science, Engineering and Technology (Ireland)
DARD	Department of Agriculture and Rural Development (Northern Ireland)
DCU	Dublin City University
DEL	Department for Employment and Learning (Northern Ireland)
EPSRC	Engineering and Physical Sciences Research Council (UK)
ESRC	Economic and Social Research Council (UK)
FE Colleges	Further Education Colleges
HE	Higher Education
HEA	Higher Education Authority
HEIF	Higher Education Innovation Fund (UK)
HRB	Health Research Board
ICT	Information & Communications Technologies
IDA	Industrial Development Authority - Ireland
IFI	International Fund for Ireland
INI Start	Invest Northern Ireland Start Programme
IP	Intellectual Property
IRCHSS	Irish Research Council for the Humanities and Social Sciences
IRCSET	Irish Research Council for Science, Engineering and Technology
ITS	Institute of Technology Sligo
MRC	Medical Research Council (UK)
NUIG	National University of Ireland Galway
NUIM	National University of Ireland Maynooth
PI	Principal Investigator
PRTL	Programme for Research in Third-Level Institutions (Ireland)
QUB	Queen's University Belfast
RIA	Royal Irish Academy
RTD Centre	Research and Technological Development Centre
SFI	Science Foundation Ireland
SME	Small & Medium Enterprise
SRIF	Science Research Investment Fund (UK)
STFC	Science & Technology Facilities Council (UK)
TCD	Trinity College Dublin
UCC	University College Cork
UCD	University College Dublin
UL	University of Limerick
UU	University of Ulster
WIT	Waterford Institute of Technology

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