



Evaluation of Agency Supports for R&D Performed in the Business Sector

Final Report – Part 1 – Main Report

25 October 2004



CONTENTS

Executive Summary	1
Background	1
Major Findings.....	1
Recommendations for the Future	2
<i>Getting More Companies to do R&D</i>	<i>2</i>
<i>Increasing R&D Investment by Companies</i>	<i>2</i>
<i>Raising the Quality of R&D in the Business Sector.....</i>	<i>2</i>
<i>Optimising the Operational Procedures</i>	<i>3</i>
1 Introduction	4
2 Policy Context	5
2.1 Productive Sector Operational Programme.....	5
2.2 The Irish Action Plan for Promoting Investment in R&D.....	6
2.3 The Enterprise Strategy Group.....	8
3 Evaluation Methodology.....	9
3.1 Overview	9
4 RTI Scheme.....	11
4.1 Objectives	11
4.2 Description	11
4.3 Indicators and Targets	12
4.4 Operating Procedures.....	12
4.5 Data Analysis Results.....	14
4.6 Findings from Company Interviews	15
4.7 Deadweight	18
4.8 Conclusions	18
5 Capability Scheme	20
5.1 Objectives	20
5.2 Description	20
5.3 Indicators and Targets	20
5.4 Operating Procedures.....	21
5.5 Data Analysis Results.....	22
5.6 Findings from Company Interviews	25
5.7 Deadweight	27
5.8 Conclusions	28
6 Interviews with Key Informants	29
6.1 Interviews with Stakeholders	29
6.2 Company Attitudes to R&D in General	30
6.3 Company Views on Support Mechanisms.....	32
6.4 Interviews with Non-Participant Companies	33
6.5 Interviews with Agency Staff.....	34
7 The Overall System for Supporting Business R&D.....	36



7.1	The Current Range of Initiatives	36
7.2	The Key Challenge – Increasing BERD	38
7.3	Factors Limiting the R&D Performance of Companies	38
7.4	Summary of Findings.....	44
7.5	Conclusions	45
8	The R&D Support System in Finland	46
8.1	General observations.....	46
8.2	Support Schemes	46
8.3	Interpretation of EU State Aid Rules.....	47
8.4	Funding Mechanisms.....	48
8.5	Assessment and Decision-making	48
8.6	Networking and Collaboration	50
9	Recommendations.....	52
9.1	Introduction	52
9.2	Over-arching Recommendations.....	52
9.3	RTI Scheme.....	58
9.4	Capability Scheme.....	62

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Particular thanks are due to the staff of Enterprise Ireland responsible for overseeing the operation of the two Schemes covered by this review for their patience in responding to our many requests for information, as well as for their full and frank comments on the design and operation of the Scheme during our discussions. We also gratefully acknowledge the overall guidance on the conduct of the review provided by Michael Fitzgibbon and Jacqueline Allan of the Evaluation and Indicators Department in Forfás.

Executive Summary

Background

An evaluation in 2003 of the R&D Capability Programme operated by IDA Ireland found that it was a very effective mechanism for encouraging substantial upgrades in the level and quality of R&D within firms. It recommended that the programme be continued and extended, but with minor operational changes.

This evaluation focuses on two other initiatives supporting business sector R&D:

- The Competitive RTDI Scheme (hereafter referred to as the 'RTI Scheme'), which is operated by Enterprise Ireland (EI) but is open to all firms in Ireland, both indigenous and foreign owned.
- R&D Capability scheme, operated separately in EI, Shannon Development and Údarás na Gaeltachta.

Account is also taken of three other related schemes – the R&D Awareness Initiative, the Innovation Management Initiative and the RTDI for Collaboration Programme – all of which are operated by EI.

Major Findings

In relation to the RTI the message is that it is continuing the support mechanism for individual R&D projects which has been in operation since at least 1993. It is meeting the targets set in the National Development Plan (NDP), at least those that are being monitored, and is leading to additional spending on R&D and the employment of additional R&D staff. Patenting levels are also up.

The R&D Capability scheme involves mainly EI clients, with a few from Shannon Development and none as yet from Údarás na Gaeltachta. EI uses Capability grants mostly as an element of a total financial package to support start-up companies, rather than as a targeted mechanism to achieve significant scale-up in research in existing R&D performers, thereby largely ignoring a one of the two objectives for the Scheme specified in the Productive Sector Operational Programme, namely to “*support firms to make substantial new investment beyond their current level of R&D*”, which is a key focus in IDA’s implementation of the Scheme. There is, therefore, substantial variability between IDA Ireland and EI in how Capability grants are used.

Despite both schemes having met some of their NDP targets, there remains a need for more firms to be introduced to R&D and existing R&D performers to be encouraged and helped to increase substantially their R&D investments. Action on both fronts is required if the aims of the Enterprise Strategy Group and the targets set in the recently published Action Plan for Promoting Investment in R&D to 2010 are to be attained.

Recommendations for the Future

Achievement of the Action Plan targets will require a concerted effort by the development agencies. The existing support programmes should continue to be a central plank of this effort but significant changes both in emphasis and in operations will be needed within the agencies. A summary of the recommendations from this evaluation is given below under four major objectives:

- Getting more companies to do R&D.
- Increasing R&D investment by companies.
- Raising the quality of R&D in the business sector.
- Optimising the operational procedures.

Getting More Companies to do R&D

- Make increased usage of the R&D Awareness Initiative as a mechanism for persuading companies of the business benefits of engaging in R&D.
- Provide greater assistance to companies in the preparation of applications and their first drawdown claims.
- Raise the ceiling on the total project cost for applications under the non-competitive element of the RTI Scheme, from €95.2k to €150k.
- Implement a more pro-active role by agencies, involving technical advice and placement schemes, to increase the absorptive capacity of firms.

Increasing R&D Investment by Companies

- Give increased focus on foreign owned companies in RTI Scheme.
- Give increased focus on established indigenous companies in Capability Scheme, thereby making Capability Scheme more visible as an distinct entity for such firms, rather than using it mainly as part of a package for start-ups.
- Clarify the requirements for companies to receive repeat support, namely that they have achieved a significant enhancement of their R&D activities.

Raising the Quality of R&D in the Business Sector

- Introduce a pro-active and holistic approach, involving the Development Advisors, technologists and marketing specialists from agencies having a sustained, pro-active involvement with relevant companies. This will require implementation of the Enterprise Strategy Group's recommendation for establishing a specialist group (which they called 'Technology Ireland') comprising experts in technology and innovation management. It will involve a radical change in the way technologists in EI are currently used, developing their skills to advise companies on technology strategies and interacting with them at a much earlier stage of the process.

- Actively promote inter-firm co-operation on R&D, particularly between indigenous and foreign owned firms, which is currently hindered by the existing agency structures and operating methods. The ‘*Technology Ireland*’ group will need to play the key role in identifying relevant opportunities.
- Provide greater financial incentives for firms to undertake longer-term and more risky research. EU State Aid rules allow such research to attract higher grant rates than are currently given by the agencies.
- Place more emphasis on process research and development. Most current support is for product development. This again is an area where technical expertise is needed in working with companies.

Optimising the Operational Procedures

- Consider simplifying the project approval process in EI, which is currently over-elaborate and unnecessarily bureaucratic, along the lines of the Finnish model (described in Chapter 8).
- Ensure that all Development Advisors / Project Executives in the agencies are fully aware of all relevant support initiatives and the contributions that each can make to company development.
- Introduce loans, partially provided up front, as a component of the funding mechanism in relevant cases to minimise cash flow problems. The loan component should be repayable on achievement of pre-agreed success criteria.
- Improve the scheme guidelines, particularly in regard to eligible costs, mid-project changes, record keeping requirements and eligibility for repeat support.
- Introduce procedures for the technical monitoring of projects, both while in progress and on completion, and ensure that relevant indicator data is collected
- Streamline the claims process to minimise, as far as possible, the need for double auditing by company auditors and then by agency inspectors.

1 Introduction

This report presents the key findings from an evaluation of the R&D Capability Grants Scheme ('the Capability Scheme') as operated by Enterprise Ireland and Shannon Development¹ and the RTDI Scheme ('the RTI Scheme') as operated by all four industrial development agencies. Both Schemes commenced in 2000. The evaluation focuses on the performance of the Schemes up to the end of 2003. It also, however, notes where appropriate some data that has recently come available covering the first six months of 2004.

The full terms of reference for the evaluation are presented in Part 2, but the main can be summarised as follows:

1. Review the R&D Capability Grants Scheme and the Competitive RTDI Scheme as operated by Enterprise Ireland in order to:
 - a) Examine how they contribute individually and collectively to meeting the aims of the RTDI in Industry Measure, in particular that of increasing industry expenditure on R&D; and
 - b) Determine whether or not they can be improved in terms of economy, efficiency and/or effectiveness in meeting the objectives of the RTDI in Industry Measure.
2. Examine the overall strategy of the agencies for supporting business sector R&D, drawing on the reviews of these two schemes and of other relevant schemes.

The remainder of the report is structured as follows:

Chapter 2 describes the changing policy context in which the schemes operate.

Chapter 3 outlines the methodology used in the evaluation.

Chapter 4 reviews the RTI Scheme.

Chapter 5 reviews the Capability Scheme.

Chapter 6 summarises the findings of interviews with key stakeholders.

Chapter 7 examines the overall system for supporting business R&D.

Chapter 8 describes the R&D support system in Finland.

Chapter 9 presents our conclusions and recommendations.

An accompanying document provides a series of appendices which present in more detail the various findings and analyses that are summarised in this report.

¹ IDA Ireland also operates the Capability Scheme for its client companies. This element of the Scheme was evaluated by Evaltec in 2003. Údarás na Gaeltachta has not had any client companies apply to the Scheme so far.

2 Policy Context

2.1 Productive Sector Operational Programme

The origins of the R&D Schemes for industry date back to Ireland's Industrial Development Act of 1986. This Act provides the current legal basis for the provision of publicly funded grants to companies in support of their research and development costs. Since then there has been a succession of initiatives for grant aiding industrial R&D, namely the Product and Process Development Grants Scheme, 'Measure 6', 'Measure 1' and the Research, Technology and Innovation (RTI) programme. The current initiatives of this type, supporting company R&D, are the Research, Technological Development and Innovation initiative (RTI Scheme) and the Research and Development Capability Scheme (Capability Scheme).

The RTI and Capability Schemes were introduced in 2000 as part of the Productive Sector Operational Programme under the current National Development Plan 2000-2006 (NDP). Consistent aims of R&D policy have been to increase the number of companies performing R&D and to enhance the scale and capacity of R&D performing firms to do more R&D. A key objective of the strategy outlined in the NDP is to develop Ireland into a knowledge-based economy. Investment in research, development and innovation by both the State and private sectors is seen as crucial to the achievement of this objective. As a result, the current NDP proposes a significant leap in expenditure on R&D at both institutional and corporate levels over the period 2000 to 2006. It proposed an overall allocation to RTDI of €2.47 billion for the period 2000 to 2006 of which €484 million was specifically allocated to industry initiatives.

Key objectives of the RTDI strategy for industry set out in the NDP include:

- Helping firms to develop innovative products, services and processes.
- Increasing the number of effective R&D performing firms.
- Increasing the scale of R&D within firms.
- Embedding a culture of R&D in SMEs.
- Increasing linkages with institutions.
- Encouraging firms to access and exploit technology.

The Industry Measure within the strategy has two main objectives, see Exhibit 2.1.

Exhibit 2.1 – Objectives of the RTDI for Industry Measure

- To embed an R&D culture in firms that already have a technological capability.
- To support the R&D/technology requirements of the 3,000+ companies which do not perform R&D at present and particularly to increase the number of companies doing R&D for the first time.

The RTI Scheme, like previous initiatives, is geared towards providing grant support towards the cost of individual R&D projects, for either new or existing R&D performers, in indigenous or foreign-owned companies. It is not specifically aimed at the development of new or substantially expanded R&D facilities, although this might be a desirable side benefit in some cases (particularly for companies not previously involved in R&D).

In contrast, the Capability Scheme is very much targeted at getting companies to significantly expand their R&D functions, including developing new or enhanced facilities for R&D. To this end it can grant aid substantial capital costs for buildings and equipment, unlike the initiatives mentioned above which primarily grant aid the marginal costs involved in undertaking one or more specific R&D projects. Until recently, however, Irish legislation required that the overall R&D facility development project must include at least one specific R&D project. This legislative requirement was dropped in 2003.

Other supports within the Operational Programme of relevance to businesses performing R&D include management training, the R&D Awareness Initiative and the RTDI for Collaboration Programme. Chapter 7 discusses these schemes in the context of the overall system for supporting business R&D

2.2 The Irish Action Plan for Promoting Investment in R&D

The Inter-Departmental Committee on Science, Technology and Innovation has published its report on The Irish Action Plan for Promoting Investment in R&D to 2010¹ recently. This sets out a number of key objectives and targets for increasing Gross Expenditure on R&D (GERD) and Business Expenditure on R&D (BERD) in the period up to 2010. The overall aim is that *‘Ireland by 2010 will be internationally renowned for the excellence of its research and be at the forefront in generating and using new knowledge for economic and social progress, within an innovation driven culture’*.

The two key targets of particular relevance to this study are shown in Exhibit 2.2:

Exhibit 2.2 – Key targets set by the Inter-Departmental Committee on Science, Technology and Innovation

- An increase in Irish gross expenditure on R&D from 1.4% of GNP to 2.5% of GNP in 2010.
- An increase in business expenditure on R&D from €917m in 2001 or 0.9% of GNP to €2.5b or 1.7% of GNP by 2010.

¹ Inter Departmental Committee on Science, Technology and Innovation, July 2004, ‘Building Ireland’s Knowledge Economy. The Irish Action Plan for Promoting Investment in R&D to 2010’, Government Publications. Dublin.

If these new targets are to be achieved, an upward revision will be needed in the various targets for business R&D (noted chapters 5 and 6) that were set in Productive Sector OP several years earlier.

In terms of developing business capacity to undertake R&D, the Action Plan proposes a strong focus on the following:

- Supporting the top 150 R&D performers.
- Increasing the scale of R&D carried out by companies.
- Getting more firms to become R&D performers.
- Developing a cluster-led approach to bring together companies to determine areas of common research to underpin the development of new products, processes and services.
- Attracting mobile R&D investment.
- Developing seed capital markets.
- Developing a client oriented approach with less bureaucracy to State supports for R&D.

The Action Plan calls for a significant increase in BERD. During the 1990's BERD grew significantly (by between one-third and one-quarter every two years), but showed a marked slowdown in the period 1999 to 2001 (see Exhibit 2.3), reflecting the downturn in the international and domestic economies.

Exhibit 2.3 – Trend in BERD (€m)

	1993	1995	1997	1999	2001
Current prices	343	470	612	784	917
% Growth	-	37%	30%	28%	17%
Constant prices	392	522	679	848	917
% Growth	-	33%	30%	25%	8%

(Source: Survey of Research and Development in the Business Sector, 2001, Forfás)

While growth may have been impressive in the 1990's, as a percentage of GNP, BERD has barely kept pace, see Exhibit 2.4. Ireland continues to lag behind other EU and OECD countries (averages of around 1.2% and 1.5%, respectively).

Exhibit 2.4 – Trend in BERD as a % of GNP & Ireland's OECD ranking

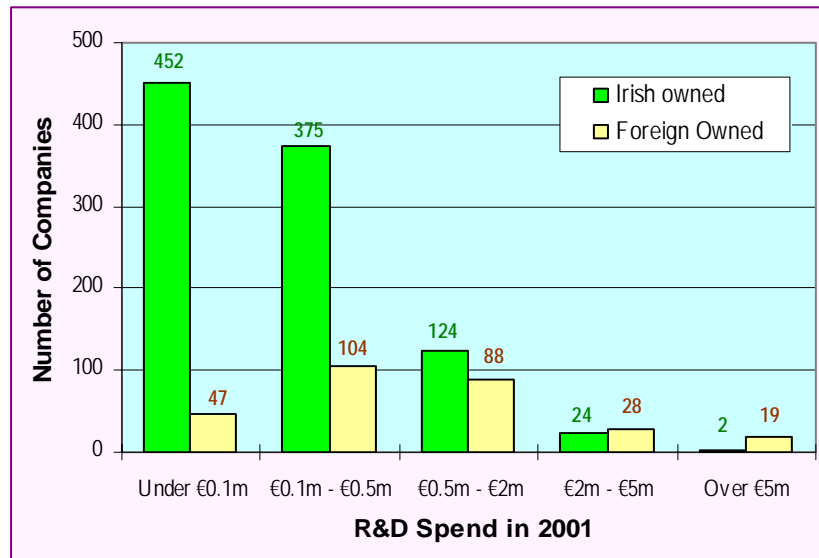
	1993	1995	1997	1999	2001
BERD as a % of GNP	0.89%	1.01%	1.04%	1.03%	0.95%
Rank amongst 26 OECD countries	15	13	13	14	15

(Source: Survey of Research and Development in the Business Sector, 2001, Forfás)

In addition, a significant proportion of BERD is carried out by foreign owned companies (approximately 65% in 2001) and is concentrated in a relatively few sectors, notably software and IT (65% of expenditure in 2001).

Detailed analysis of the data returned by companies for the 2001 BERD survey revealed that approximately 1,000 indigenous companies were performing R&D, but only 150 (15%) spent over €0.5m in the year, as can be seen in Exhibit 2.5. In contrast, almost 50 % (135 out of 287) of the foreign owned companies engaged in R&D spent over €0.5m.

Exhibit 2.5 – Distribution of R&D expenditures by companies



(Source: Forfás survey of R&D Expenditure in the business sector.)

2.3 The Enterprise Strategy Group

The Enterprise Strategy Group published its report on enterprise strategy up to 2015¹, which encompasses recommendations on science and technology policy. These include:

- The establishment of a new structure within Enterprise Ireland (to be called ‘Technology Ireland’) to develop a strategic approach to market-led applied research.
- Increased funding for applied research and R&D carried out by companies.
- Development of mechanisms to encourage greater collaboration in research, particularly between industry and academia.
- Facilitation of non-technological innovation, particularly in the services sector.

¹ Enterprise Strategy Group, 2004, ‘Ahead of the Curve: Ireland’s Place in the Global Economy’, Government Publications, Dublin.

3 Evaluation Methodology

3.1 Overview

The consultants used a combination of quantitative and qualitative methods to carry out the evaluation. These included:

- A review of literature relevant to the operation of the Schemes, including promotional brochures, web pages, Scheme descriptions and guidelines. Previous evaluations were also re-visited.
- A range of analyses on the databases used to record information on Schemes' applicants and approvals.
- Interviews with key informants in the Department of Enterprise, Trade & Employment (3), Enterprise Ireland (6), IDA Ireland (1), Údarás na Gaeltachta (1), Shannon Development (1), IBEC¹ (2 – IRDG² and Irish BioIndustry Association). Four members of the RTI Committee (three current and one past) and two private sector venture capitalists were also interviewed.
- Interviews and focus groups with Development Advisors / Project Executive³ in Enterprise Ireland (6), and Shannon Development (4), IDA Ireland (2) and Údarás na Gaeltachta (2), and with seven Technical Assessors.
- A random selection of 190 application files were reviewed by two of the evaluators, focusing on the quality of the projects, and on the commercial and technical assessments. A profile of these files is presented in Exhibit 3.1 below.
- A sub-set of 65 companies from among the 190 reviewed files were visited for detailed face-to-face interviews regarding their involvement with the Schemes. The interviews, which lasted 1 to 1½ hours, were split between three of the evaluators and made use of a structured questionnaire. This covered the processes involved in the Schemes, status of projects funded under the Schemes, impacts of Scheme participation and attitudes to R&D in general. Profiles of the interview sample are presented in Exhibit 3.2.
- A listing of the top R&D performing companies (150 Irish owned and 150 foreign owned) was used by the evaluators to select a sample of 7 companies that had not been in receipt of funding from either of the Schemes since 2000. The majority of the sample of 300 performers had in fact participated in one or other of the Schemes, mostly the RTI Scheme. Seven non-participant companies agreed to be interviewed by telephone. All of these had R&D

¹ IBEC = Irish Business and Employers Confederation.

² IRDG = Industry Research and Development Group.

³ For the remainder of this report the term 'Development Advisors' is used to encompass Project Executives from IDA Ireland and Údarás na Gaeltachta as well as Development Advisors from Enterprise Ireland and Shannon Development.

expenditure of at least €250k per annum. The interviews focused on their awareness of the Schemes and reasons for not applying.

Exhibit 3.1 – Profile of application files reviewed

	RTI Cohort	Capability Cohort	Total Sample
General			
All files	156	34	190
First time R&D performers ^A	47 (30%)	21 (62%)	68 (36%)
Campus spin-off companies	6 (4%)	10 (29%)	16 (8%)
Agency			
Enterprise Ireland	105 (67%)	25 (74%)	130 (68%)
IDA Ireland	24 (15%)	–	24 (13%)
Shannon Development	18 (12%)	9 ^B (26%)	27 (14%)
Údarás na Gaeltachta	9 (6%)	–	9 (5%)

(Sources: Scheme application files and databases.)

Notes: ^A These numbers are taken from the application forms. We believe, however, that they are unduly high. Firstly, 38% of these applications were for projects costing in excess of €500k, which we consider unlikely if the companies had not previously been involved in significant R&D. Secondly, during our subsequent company interviews it emerged that almost half of the companies classified in the database as first time R&D performers had been spending over €50k p.a. on R&D prior to their applications, and many of these had one or more full-time R&D staff.

^B Four of these were subsidiaries of multinational companies.

Exhibit 3.2 – Profile of participant companies interviewed

	RTI Cohort	Capability Cohort	Total Sample
General			
All interviews ^A	50	15	65
First time R&D performers ^B	13 (26%)	10 (67%)	23 (35%)
Campus spin-off companies	2 (4%)	4 (27%)	6 (9%)
Agency			
Enterprise Ireland	35 (70%)	11 (73%)	46 (71%)
IDA Ireland	6 (12%)	–	6 (9%)
Shannon Development	6 (12%)	4 ^C (27%)	10 (15%)
Údarás na Gaeltachta	3 (6%)	–	3 (5%)

(Sources: Scheme application files and databases.)

Notes: ^A Includes two companies that had participated in both Schemes and were interviewed separately regarding each.

^B See Note B in Exhibit 3.1 above.

^C Two of these were subsidiaries of multinational companies.

4 RTI Scheme

4.1 Objectives

The RTI Scheme was launched in 2000. It is co-funded by the European Regional Development Fund. The stated objectives¹ of the Scheme are presented in Exhibit 4.1:

Exhibit 4.1 – Objectives of the RTI Scheme

- Encourage and support high quality, high risk R&D projects.
- Encourage company participation in product and process development.

4.2 Description

Documentation on the Scheme highlights that it focuses on commercial, good quality, high risk projects, which are not necessarily linked to building strategic R&D capability, but which will result in sustainable net increases in the level of high quality R&D being carried out by companies. Projects supported under the Scheme must generally be completed within two years, with plans for commercialization within one further year. The Scheme uses an open call for tenders to which any company, indigenous or foreign owned, can apply. However, start-up companies are, in general, directed by Enterprise Ireland towards the Capability Scheme.

Support for RTI projects up to a total of €450k is in the form of grants with maximum limits in accordance with EU rules. These define three classes for R&D, see Exhibit 4.2.

Exhibit 4.2 – EU Classifications for R&D

Fundamental research: An activity designed to broaden scientific and technical knowledge not linked to industrial commercial objectives. The maximum allowable rate is 100%.

Industrial research: Research aimed at the acquisition of new knowledge that may be useful in developing new products, processes or services, or improving existing products, processes or services. The maximum allowable rate is 75%.

Pre-competitive development activity: The shaping of the results of the industrial research into a plan, arrangement or design for product, processes or services (e.g. creation of a prototype, demonstration projects, pilot projects, etc.). The maximum allowable rate is 50%.

¹ Based on the Complement Sheets for the Productive Sector Operational Programme 2000-2006.

The RTI Scheme designates all projects as ‘pre-competitive’ under EU rules. The grant maxima therefore vary between 25% for large companies in the South and East, to 45% for SMEs in the BMW region. For projects between €450k and €650k an additional repayable element can be applied for. Higher grant rates (up to 50% for SMEs) can be awarded for collaborative projects between companies and research institutions or for cross border co-operation between two independent partners, firms or research institutions. Currently, the Irish agencies apply a system of bonus points when assessing proposals if collaboration with third level colleges is involved.

4.3 Indicators and Targets

The indicators and targets set out for the Scheme in the Productive Sector OP for the period 2000-2006 are as follows:

- Total grants approved of €180m. The mid-term target (2000-2003) is €90m.
- Number of applications supported: 1,250 (650 mid-term).
- Increased spend on R&D by participating companies: €600m (€300m mid-term).
- Increase in the number of new R&D performers: 500 (250 mid-term).
- Sales from projects developed under the Scheme: €1,500m (€300m mid-term).

4.4 Operating Procedures

The RTI Scheme is split into two main elements:

- A **non-competitive** element for projects with a total cost up to €95,200. Approval decisions for these are made by in-house management groups within each of the four agencies.
- A **competitive** element for projects with a total cost exceeding €95,200. Approval decisions for these are made by the 17 member RTI Committee¹ for applications originating with any of the agencies.

Application Process

There are different application forms for each element. These are available from the web site of EI (but not from those of the other three agencies). Companies can download the relevant form, complete it and submit it directly. In most cases, however, they discuss their plans and receive additional guidance from a

¹ This Committee is chaired by EI and currently comprises:

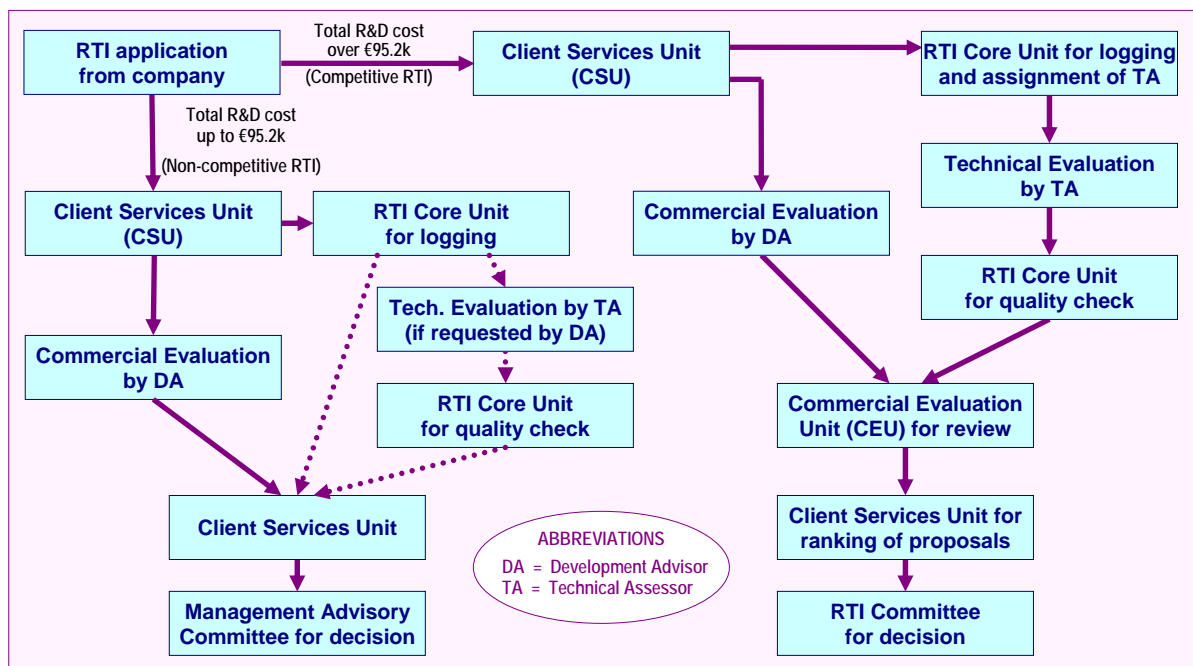
- Eight members from State agencies – EI (three including the chair), IDA, Shannon, Údarás, Bord Bia and Teagasc.
- Two from government departments (Enterprise, Trade & Employment and Agriculture & Food).
- Six from industry.
- One academic.

Development Advisor prior to submission. When such discussions do occur, proposals with a low probability of success are ‘weeded out’ at an early stage in the process¹, which contributes to the high overall approval rate of 82%.

Assessment and Approval Process

The procedures for assessment and approval differ between the two elements, as illustrated in Exhibit 4.3.

Exhibit 4.3 – Overview of EI’s approval processes for RTI applications



- Notes:**
1. This diagram presents a simplified version of the process for all competitive applications. In practice there are various feedback mechanisms if problems are encountered or more information is required.
 2. For non-competitive applications the procedures are the same in all four agencies (apart from the name of the approval committee).
 3. Regardless of the agency concerned, Technical Assessors are appointed by EI. Most are EI staff but, in a few cases, an external Technical Assessor is used.

The entire process from the time an application is submitted to final decision on approval or otherwise typically takes eight to twelve weeks.

Monitoring

There are no procedures for follow up by Technical Assessors of supported projects at any stage post approval. Although Development Advisors technically have responsibility for on-going monitoring of supported projects, this does not occur to

¹ From analysis of EI’s database on the Scheme, it is evident that revision of proposals also occurs after they have been submitted. Approximately 15% of applications are shown as withdrawn but, in many cases, these are followed a few months later by another application from the company concerned, covering the same project areas but, presumably, with considerable refinements.

any significant extent in practice. When claims for payment are submitted, a visit to the company is made by a Claims Inspector¹. These visits are, however, more focused on checking the validity of the financial aspects of the claim, rather than on project progress *per se*.

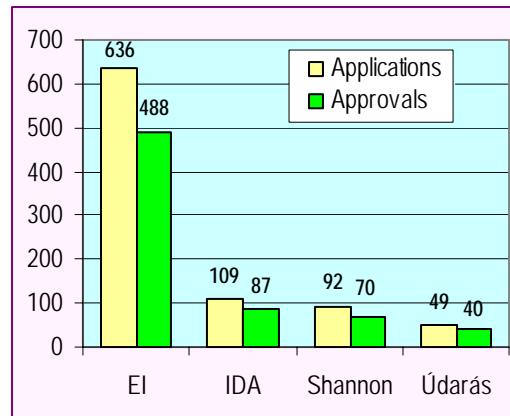
Monitoring of the overall Scheme takes place mainly at a financial level in terms of progress in achieving annual approval and draw-down targets.

4.5 Data Analysis Results

A range of analyses were conducted on the information in EI’s database for the RTI Scheme. Full results of this task are presented in Part 2 of our report. Key findings were as follows:

- Up to the end of 2003, a total of 685 applications had been approved by the RTI Committee (513 on a competitive basis). The distribution of applications and approvals between the four agencies is shown in Exhibit 4.4.
- The total value of grants approved was €116m (€5.5m on a non-competitive basis)², ahead of the mid-term target of €90m. The average grant was €215k under the competitive element and €31.9k under the non-competitive.
- Only 25% of the approved funding was for foreign-owned companies, although such companies account for 65% of BERD in Ireland.
- For the competitive element of the Scheme, approval rates for applications averaged 82% over the period mid-2000 to mid-2004 (72% on a monetary basis).
- Outright rejections averaged 3% with the remaining 15% consisting of withdrawn applications (some of which were subsequently re-submitted in a modified form, see earlier footnote).

Exhibit 4.4 – All RTI applications and approvals



(Source: EI database on the RTI Scheme.)

¹ Claims and payments are handled by each agency for its own client companies, with periodic reimbursement from the Department of Enterprise, Trade & Employment, via EI.

² New data, which became available at the time of writing, shows that for the first six months of 2004 a further €15.7m was approved in respect of 75 applications. Over this period the average number of applications being put forward each month is 12 for the competitive element of the Scheme and one for the non-competitive element.

The overall performance of the RTI Scheme in comparison to the targets set for it in relevant NDP Complement is shown in Exhibit 4.5.

Exhibit 4.5 – Performance of the RTI Scheme against NDP targets

Indicator	Mid-Term Target	Actual
Total grants approved	€90m	€116m
Number of applications supported	650	685
Increase in R&D spend by participating companies	€300m	Unknown ^A
Increase in number of new R&D performers	250	261 ^B
Sales from projects developed under the Scheme	€300m	Unknown ^A

Notes: ^A These indicators are not monitored, so there is no information on them in EI's database for the Scheme.

^B This is the number of new R&D performers supported according to EI's database on the Scheme. We consider it to be unduly high, as explained in Note B of Exhibit 3.2.

As noted, data on two of the indicators used for the Scheme, increase in R&D spend by participating companies and sales from projects developed under the Scheme, are not collected from participant companies on a regular basis. This evaluation looked at 50 RTI participants in detail. Additional R&D expenditure was over €17m, slightly above what had been forecast by the companies in their original proposals and additional sales were €270m, about what had been predicted. Based on this small sample this would suggest that the target for additional sales will be achieved, while the level of additional R&D spend will be behind target.

4.6 Findings from Company Interviews

Fifty companies that had participated in the RTI Scheme since 2000 were interviewed. The interviews covered the specifics of their RTI involvement, which are summarised below. They also covered the companies' attitudes to R&D in general and their views on funding methods, which are described in chapter 6.

- Companies appear to have selected strategically critical projects to put forward for RTI funding.
- The majority of companies have good to excellent project management procedures in place.
- Just over half of the projects supported had been completed and launched onto the market with a further 11% completed but not yet launched. Only 8% of projects had been deferred or abandoned. The balance were in progress (most as planned, some behind schedule).
- Achievement of targets for sales and R&D expenditure have been particularly impressive:

- For the RTI participants for which there is a complete data set¹, sales increased from c.€556m pre-grant to c.€826m in 2003, 99% of the projected sales figure given by companies in their RTI applications.
- R&D expenditure increased from c.€15.4m (3% of sales) to c. €32.7m (4% of sales), slightly higher than what was forecasted.

There were a number of positive comments on the Scheme from the companies interviewed:

- There was a generally high level of satisfaction with the Scheme's overall operation.
- Ninety-six percent of interviewees said they would like to participate in the Scheme again and would recommend it to another company.
- Sixty-eight percent of interviewees indicated that their RTI project fitted completely with their core business and technology. A smaller proportion (22%) indicated that the project involved a new technology but was within the core business area.
- For most companies the RTI grant enabled them to speed up the R&D process and/or to run multiple projects in parallel, rather than sequentially. This was particularly significant for smaller companies, where cash flow was a major impediment to conducting regular, on-going research.
- Over two-thirds of those interviewed carried out other R&D projects at the same time as they undertook the RTI projects.
- The technical assessment process scored particularly well in terms of satisfaction and usefulness.
- Companies were generally satisfied with their relationship with their Development Advisor, although several commented that there was little or no contact during their projects.
- Companies identified a range of specific impacts arising from their RTI projects:
 - Increased sales and profits.
 - Greater credibility with customers.
 - Improved linkages with customers and/or suppliers.
 - Improved competitiveness.
 - Improved capability to carry out R&D, including up-skilling of staff.
 - Embedding of R&D further within the company's culture.

¹ This covers 37 of the 50 RTI participant companies interviewed. For the remainder, either no sales projections had been given in the proposal or the companies declined to give specific information on current sales during the interview.

- Forty-eight percent of companies indicated that they would like to enhance their R&D capability further – quite substantially in several cases – but awareness of the Capability Scheme was extremely low.
- Patenting activity has also increased when compared with predecessor schemes, with over one-third of respondents indicating that they had taken out patents on the products arising from the RTI project.

Despite the overall high satisfaction rating, there were several negative findings regarding the Scheme:

- There was little or no research element in any of the supported projects.
- Almost all projects were aimed at product development. Although process development elements were present in some cases, these were typically only a minor part of the overall projects, aimed at adaptation of existing processes to accommodate the manufacture of the products concerned.
- Although many companies had effective procedures for managing their close-to-market development projects, there was little evidence of any procedures for developing longer term technology strategies.
- Although 48% of companies indicated that they would like to enhance their R&D capability further – quite substantially in several cases – awareness of the Capability Scheme was extremely low. Furthermore, the evaluators identified a number of RTI projects that could more suitably have been funded under the Capability Scheme.
- There was no substantial R&D collaboration in any of the projects reviewed.
- Several companies had received no pre-application assistance.
- A small number of companies employed consultants at considerable expense to prepare their proposals, finding the entire process too daunting.
- Most small first-time applicants were not aware of the R&D Awareness Initiative which, *inter alia*, could have part-funded consultancy assistance formulate their R&D needs.
- The introduction of the requirement for timesheets part-way through 2003 created concern in companies caught in the transition period.
- Many companies complained about the double-auditing involved in claims whereby the company submits a claim which must be certified by an accountant and a Claims Inspector from EI then re-audits.
- A number of companies also commented negatively on the size of grant received relative to the administrative burden involved.
- There is a perception amongst some companies that there is little or no flexibility to change projects mid-stream.

- A small number of companies commented that they had been discouraged from putting forward second RTI applications.
- Companies suggested that clearer guidelines are needed up-front on what precisely would be required to comply with the Scheme’s administrative and paper requirements, particularly for the claims process, on allowable costs and under what circumstances changes or second round applications would be allowed.

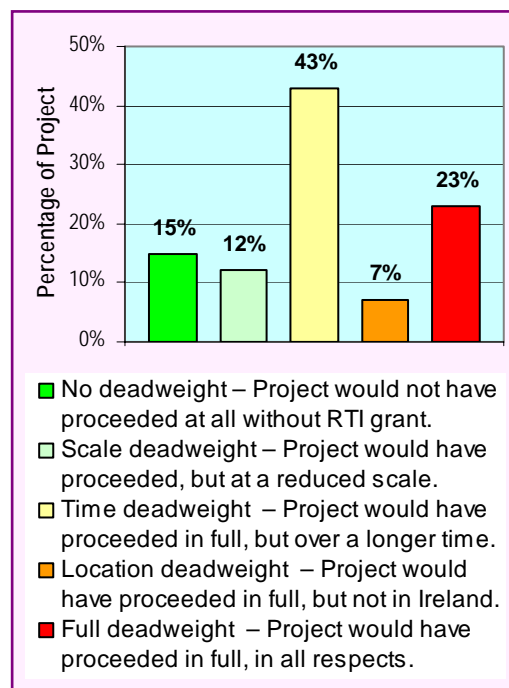
4.7 Deadweight

Most companies described their RTI project as business critical. Together with the short-term focus of the Scheme (i.e. project completion within two years and subsequent commercialisation within one year), it is not surprising that there was some element of deadweight in 85% of the projects, see Exhibit 4.6.

Only 23%, however, exhibited full deadweight (i.e. they would have proceeded in an identical manner even if no RTI grant had been received), which is within an acceptable range of 20% - 25%, and is lower than that found in previous schemes such as Measure 6 and Measure 1.

Furthermore, in many of these cases the companies commented that, although the grant had no effect on the performance of the RTI project itself, it had allowed them to work on other R&D projects that they would have otherwise postponed or not undertaken at all.

Exhibit 4.6 – Deadweight Analysis of RTI Projects



4.8 Conclusions

The RTI Scheme is highly relevant for a large number of both new and existing R&D performers. The evaluation has found several very positive outcomes. But it has also identified a number of negative features. Exhibit 4.7 summarises both the positive and negative findings.

Exhibit 4.7 – Key findings on the RTI Scheme

Positive Findings:

- The Scheme is on target to achieve full draw-down and to support the number of companies set out in the Productive Sector OP Complement Sheets (see Exhibit 4.5).
- Many of the projects supported involve the employment of additional R&D staff who were subsequently retained, thereby contributing to enhanced R&D expenditure, capability and sustainability within firms.
- Most companies have met or exceeded the sales estimates given at the time of their application to the Scheme.
- The substantially higher level of patenting activity than was evident in previous evaluations indicates that there has been an increase in the technological novelty of supported projects.
- RTI support has enabled companies to speed up their R&D programmes, thereby contributing towards increased competitiveness.

Negative Findings:

- As a result of the Scheme's design, the projects supported are short term, close to market developments with negligible research content and therefore do not fulfil the objective of being of high technical risk.
- Very little attention is being paid by companies to their longer term technology requirements and the strategies needed to meet them.
- A relatively low proportion of funding is being provided to foreign-owned firms (25%), compared to their contribution to BERD (65%).
- The Scheme has not been very successful in attracting in new R&D performers.
- There is very little collaboration with the higher education institutions or with other companies.
- There is extremely low awareness of other relevant initiatives, notably the Capability Scheme and the R&D Awareness Initiative.
- Improvements are needed in some operational aspects, notably: pre-application support, guidelines (particularly on the records that need to be kept), rules regarding repeat applications and the system for auditing claims.

5 Capability Scheme

5.1 Objectives

The Capability Scheme was launched in 2000. It is funded entirely by the Exchequer. The stated objectives¹ of the Scheme are presented in Exhibit 5.1.

Exhibit 5.1 – Objectives of the Capability Scheme

- Build the capability of firms to carry out R&D at a significant and continuous level.
- Support firms to make substantial new investment beyond their current level of R&D activity.

5.2 Description

Each agency runs its own version of the Scheme. The IDA implementation was reviewed in an earlier report². Údarás has had no applications under the Scheme. The evaluation therefore focused on the implementations by EI and Shannon, particularly the former as it accounts for 87% of the approvals by these two agencies.

The Capability Scheme was initially intended to support companies in order to enable them to significantly enhance their R&D capability and capacity. As implemented by EI and Shannon it has three main target groups:

- High Potential Start-Ups (HPSUs)³.
- Existing client company expansions.
- Significant R&D projects outside the scope of the RTI Scheme (expenditure over €3m).

In practice the main focus of both the EI and Shannon implementations has been on the first of these, i.e. HPSUs.

5.3 Indicators and Targets

The indicators and targets for the Scheme as a whole (i.e. as operated by all of these State agencies) set out in the Productive Sector OP for the period 2000-2006 are as follows:

¹ Based on the Complement Sheets for the Productive Sector Operational Programme 2000-2006.

² Hogan, B. & Bolger, B. 'Review of the IDA's Research and Development Capability Grants Scheme', Evaltec.

³ In EI's database on the Scheme, start-up companies are split into two categories – High potential Start-Ups (HPSUs) and Technology Based Start-Ups (TBSUs). In this report we classify both as HPSUs.

- Financial aid provided to firms: €91m. The mid-term target (2000-2003) is €58.5m.
- Number of projects supported: 220 (140 mid-term).
- Number of new R&D staff employed by participating firms: 800 (500 mid-term).
- Total business investment in R&D facilities: €364m (€234m mid-term).
- Number of new R&D performers: 100 (60 mid-term).
- Number of firms spending more than €1m per annum on R&D: 75 (50 mid-term).

5.4 Operating Procedures

The Scheme is operated on a non-competitive basis by each agency separately. Funding is provided via both grants and equity, the latter often in the form of convertible preference shares. In the case of existing client company expansions, preference shares can be re-designated as an R&D grant based on commercial success following the completion of the project.

For HPSUs in particular, the Scheme is usually only one component part of a broader investment package provided through the agencies, with equity the main funding mechanism used. Unlike the RTI Scheme, which is targeted at part-funding the costs of specific R&D projects, under the Capability Scheme a substantial proportion of the funding is normally used to establish new or expand existing facilities.

Application Process

In contrast to the RTI Scheme, application forms are not available online – intending applicants to the Capability Scheme must work closely with a Development Advisor when putting together their proposal. The engagement between Development Advisors and companies is more one of negotiation than is the case in the RTI Scheme – Development Advisors can spend considerable time taking the company through the commercial rationale for its project, and the financing of it, prior to submission. Applicants must provide a company development plan as part of their proposal.

Assessment and Approval Process

Decisions on approvals are made by internal committees within the relevant agency. In the case of EI, two different committees are involved, depending on the size of the project. Projects under €200k are submitted to EI's Management Advisory Committee (MAC) for a decision on approval. Projects over €200k must go to EI's Investment Committee for decision. For Shannon applications, just one committee is involved, regardless of project size.

As with RTI, applications are subjected to both commercial and technical assessments, with EI appointing the Technical Assessor (typically one of its own staff). Based on discussions with Development Advisors, however, more weight is given to the commercial assessment.

Within EI, for support packages between €200k and €600k, the Development Advisor has responsibility for undertaking the commercial assessment of proposals with a 'hand-holding' input from the Commercial Evaluation Unit (CEU). For projects of €600k or over the CEU undertakes the commercial assessment in conjunction with the Development Advisor.

With equity having become an increasingly large component of aid packages under the Capability Scheme, considerable time can elapse from the date when an application is submitted until final approval, as there can be extensive negotiations, particularly regarding company valuations. This is reflected in longer time from receipt of application to decision – averaging 8 months compared to 10 weeks for the RTI Scheme.

Monitoring

As with the RTI Scheme, there are no requirements for Technical Assessors to become involved in monitoring projects after they have been approved. The only standard procedures are for the checking of claims for grant drawdowns by a Claims Inspector from the relevant agency. Where equity is employed as a major element of the R&D funding – typically as part of a broader package of financial assistance for HPSUs – there appears to be no follow-up to confirm that it has been employed specifically to fund R&D activity.

Monitoring of the overall Scheme is on the same basis as for the RTI Scheme, i.e. at the level of checking claims and overall financial targets, with periodic reports being provided to the RTI Committee for information purposes.

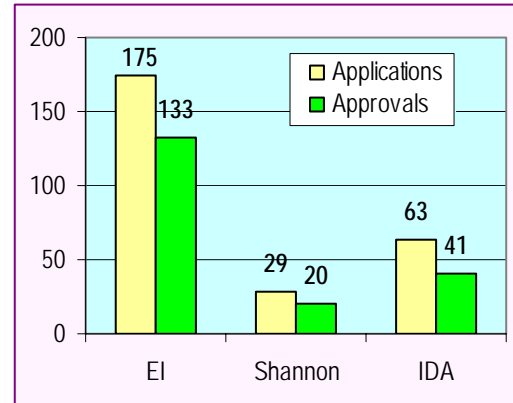
5.5 Data Analysis Results

As can be seen from the preceding section, EI has no formal role in administering the Scheme as implemented by the other agencies, other than providing Technical Assessors. Nevertheless, one of their executives does maintain a database containing information on applications coming in through all agencies. A variety of analyses were carried out on this information. Key findings were:

- From the commencement of the Scheme in 2000 up to the end of 2003, 267 applications had been received, including 63 under the IDA element of the Scheme (included here and in subsequent Exhibits in order to give a complete picture and provide a basis for comparisons between the different agencies' implementations).

- Of these 267 applications, 194 had been approved, 11 were cancelled and just one was listed in the database as rejected. This is ahead of the mid-term target for approvals for the Capability Scheme as a whole of 140. The distribution of applications and approvals between the three agencies involved is shown in Exhibit 5.2.

Exhibit 5.2 – Capability applications and approvals



(Source: EI database on the Capability Scheme.)

- The majority of the remainder were part way through the approval process, reflecting the more protracted procedures (compared to the RTI Scheme) due to the high proportion involving equity investments¹.

- By the end of 2003, total funding of €106.6m had been approved – €75.8m by way of grants (two thirds of this by IDA) and €30.8m as equity. This is substantially ahead of the mid-term target of €58.5m. The average funding approved per application by each of the agencies is shown in Exhibit 5.3.

Exhibit 5.3 – Average Capability funding approved

Agency	Amount
EI	€360k
Shannon	€446k
IDA	€1,215k
All	€549k

(Source: EI database on Capability Scheme.)

- Approximately 70% of the funding approved by EI and Shannon was awarded to companies classified as start-ups, see Exhibit 5.4.

- An analysis of the equity to grant ratios shows that the use of equity by both EI and Shannon has increased substantially each year since commencement of the Scheme, reaching 70% and 46% respectively in 2003, see Exhibit 5.5.

The overall performance of the Capability Scheme against the mid-term targets set for it in the relevant NDP Complement is shown in Exhibit 5.6.

¹ The Scheme's database lists a wide variety of other reasons for other applications that had not been approved at the end of 2003. These include 'lapsed' (3), 'deferred' (2), 're-directed to RTI' (3), funding approved under another scheme' (2) and six cases where no explanation is present.

**Exhibit 5.4 – Capability Scheme – Approval numbers and funding (€000)
by type of company**

Agency	EI		Shannon		IDA		Total	
	No.	Grant + Equity	No.	Grant + Equity	No.	Grant + Equity	No.	Grant + Equity
Large companies	4	3,286	2	4,176	36	47,168	42	54,630
SMEs ^A	14	6,218	4	1,735	1	236	19	8,189
HPSUs ^B	91	30,390	10	1,846	1	222	102	32,458
TBSUs ^C	22	6,989	2	534	0	0	24	7,523
Unclassified	2	945	2	634	3	2,202	7	3,781
Total	133	47,828	20	8,925	41	49,828	194	106,581
HPSU + TBSU percent of classified firms	86%	80%	67%	29%	3%	0.5%	67%	39%

(Source: Analysis of EI's databases on the Capability Scheme.)

- Notes: ^A SME = Small or Medium size Enterprise.
^B HPSU = High Potential Start-Up company.
^C TBSU = Technology Based Start-Up company.

Exhibit 5.5 – Capability Scheme – Extent of equity funding (€000)

Agency	EI		Shannon		IDA		Total	
	Total	% Equity	Total	% Equity	Total	% Equity	Total	% Equity
2000	6,314	39%	0	0%	0	0%	6,314	39%
2001	10,218	44%	1,492	13%	13,738	0%	25,448	18%
2002	12,764	64%	4,840	23%	28,632	0%	46,236	20%
2003	18,532	70%	2,593	46%	7,458	3%	28,583	51%
Total	47,828	59%	8,925	28%	49,828	0.5%	106,581	29%

(Source: Analysis of EI's databases on the Capability Scheme.)

Exhibit 5.6 – Performance of the Capability Scheme against NDP targets

Indicator	Mid-Term Target	Actual
Financial aid	€58.5m	€106.6m ^A
Number of projects supported	140	194 ^B
Number of new R&D staff employed	500	Unknown ^C
Total business investment in R&D facilities	€234m	Unknown ^D
Number of new R&D performers	60	Unknown ^C
Number of firms spending over €1m p.a.	50	Unknown ^C

Notes: ^A €75.8m in grants and €30.8 in equity

^B This is the number of **applications** supported. These encompasses 232 individual **projects**.

^C These indicators are not monitored, so there no information on them is present in EI's database for the Scheme. This evaluation looked at 15 Capability participants in detail. Additional R&D staff was 59 and the number spending over €1m in 2003 was seven.

^D The EI databases for the Capability Scheme include data on the proposed company investments in projects, but this is not broken down into expenditures on facilities and other revenue costs, nor are these subsequently monitored other than for claims verification.

5.6 Findings from Company Interviews

Face to face interviews were conducted with 15 Capability grant recipient companies (11 EI, 4 Shannon, the latter including two foreign owned firms). Key findings from this process were:

- The Capability support constituted a much higher proportion of total R&D budgets than was the case for companies receiving RTI grants.
- The majority of the Capability cohort employed four or more research staff. This is not surprising given that research was the core business of many of the companies interviewed. Eleven of the 15 companies interviewed had hired additional staff to carry out their Capability projects (a total of 59 new staff).
- Sixty percent of companies also carried out other R&D in parallel with their Capability project.
- Most of those interviewed plan to increase their R&D expenditure and nearly all of the staff taken on as a result of the Capability projects have been retained, indicating that the increased levels of expenditure will be sustained.
- Just over one-third of the projects supported had been completed and launched onto the market with a further 18% completed but not yet launched. No projects had been deferred or abandoned. The balance was in progress (most as planned, some behind schedule).

- Eight of the 15 companies interviewed were in the start-up phase or not even in business in 2000/2001 so it was not possible to examine the trend in projected sales as with the RTI participants.
- Eleven of the Capability companies provided data on their R&D expenditure in 2003. All were spending upwards of €0.25m annually on R&D. Prior to the Capability support their combined R&D spend was c.€8.2m. By 2003 it was c.€16m.

Positive comments on the Scheme included the following:

- Companies were generally satisfied with the overall operation of the Scheme, with all respondents indicating that they would recommend the Scheme to other companies.
- For HPSUs, particularly those in an early stage of development, the presence of EI equity acted as an incentive for other venture capitalists to invest in the company.
- The level of pre-application assistance and the commercial assessment process were highly rated.
- Specific benefits arising from participation in the Scheme include:
 - Increased sales and profits.
 - Greater credibility with customers.
 - Improved competitiveness.
 - Improved capability to carry out R&D in terms of both skills and equipment.
- Capability Scheme support has enabled many companies either to speed up their R&D programmes or to ramp up the scale of R&D.
- For the two multinationals interviewed, the Capability grant was an important factor in getting new R&D functions assigned to the Irish operation rather than elsewhere in the company. (This had also been Identified as a key benefit in the earlier evaluation of IDA's operation of the Capability Scheme.)

As with the RTI Scheme, there were also some negative findings:

- With the exception of two projects in biotechnology HPSUs, the research content of supported projects was low.
- With the exception of the same two biotechnology HPSUs, there was no evidence of the companies engaging in medium or long term planning of a technology strategy.
- The extent of collaboration (mostly with colleges), although higher than among RTI participants, was still low, and generally on a contracting basis rather than

true research collaboration. Concerns over intellectual property issues was a significant barrier to greater collaboration.

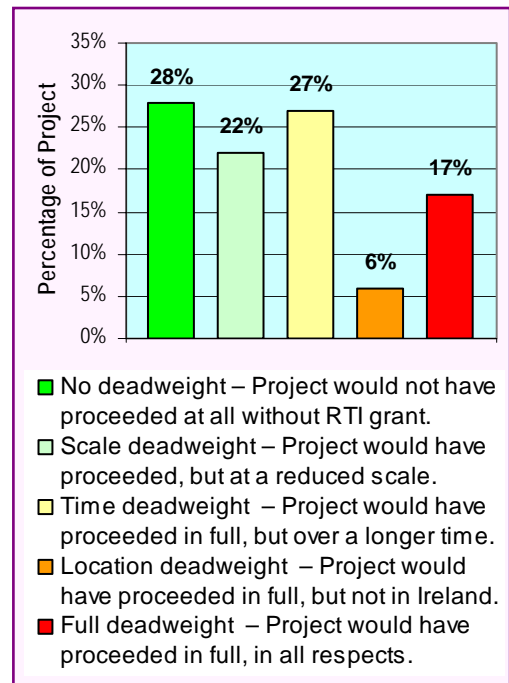
- Dissatisfaction was expressed on three aspects of the agencies' equity investments:
 - The valuations placed by EI on the companies.
 - The terms under which EI came in (the same as other investors).
 - The lack of support from EI to assist companies to negotiate with other investors.
- There was considerable dissatisfaction regarding the time from claim to payment.
- Most interviewees found the level of paperwork and detail required quite onerous.
- Several companies considered that substantially improved guidelines are needed, particularly in the information they are expected to collect and on eligible costs.

5.7 Deadweight

Most companies described their Capability project as business critical or as the core business. The proportion of projects exhibiting some degree of dead weight, namely 72% (see Exhibit 5.7), while lower than the RTI cohort, is still surprisingly high given the start-up nature of many of those interviewed.

Seventeen percent of the projects exhibited full deadweight, which is somewhat lower than was the case for RTI projects (23%). So again this is an acceptable proportion. Furthermore, in many of these cases the companies commented that, although the receipt of funding support had no effect on the performance of the Capability project itself, it had allowed them to work on other R&D projects that they would otherwise have postponed or not undertaken at all.

Exhibit 5.7 – Deadweight analysis of Capability Projects



5.8 Conclusions

The key findings from our examination of the Capability Scheme are summarised in Exhibit 5.8.

Exhibit 5.8 – Key findings on the Capability Scheme

Positive Findings:

- The Scheme is ahead of its NDP mid-term targets in respect of the number of companies supported and amount of funding approved (see Exhibit 5.6).
- The Capability funding has allowed companies to take on an average of four additional researchers.
- Equity investments by the agencies in HPSUs at an early stage has enhanced their ability to obtain further investment from private sector sources.
- Capability Scheme funding support has enabled companies to enhance their research facilities, speed up their R&D and take on additional projects.

Negative Findings:

- The Scheme, as implemented by EI particularly, and Shannon to a lesser extent, is far too strongly focussed on supporting HPSUs. From our interviews with RTI grant recipients there is a significant market for the Scheme among existing R&D performers in the indigenous sector which needs to be addressed and further developed. This would be in line with the original intentions for the Scheme.
- The high usage of equity for supporting HPSUs does not seem justified, other than at the earliest start-up phase. Companies that have developed beyond that stage are not encountering major difficulties in obtaining further funding from private sector venture capitalists.
- With a few exceptions the projects supported are developmental, with a very low research content.
- There is very little genuine research collaboration.
- Only a minority of companies are paying any attention to their longer term technology needs.
- Where equity constitutes a significant part of the R&D funding provided there are no procedures for verifying that it has been used solely for the intended purpose.

6 Interviews with Key Informants

6.1 Interviews with Stakeholders

Interviews with policy makers, representatives of industry and the venture capital community and senior management within the State agencies, revealed that there are differences in emphases in terms of the expectations for the Schemes. While nearly all describe the type of research funded under the RTI Scheme as ‘close to market’ and the EI web site describes the Scheme in terms of ‘high risk’ projects, there was a wide range of expectations for the Scheme’s outcomes including:

- Getting companies to do more R&D.
- Getting more companies involved in R&D.
- Increasing R&D capability.
- Increasing competitiveness.
- Commercialisation of research.
- Changing attitudes and behaviours.
- Getting Irish companies to produce intellectual property.

The Capability Scheme was described in terms of filling a gap in the venture capital market for high technology start-up companies (despite the fact the Scheme requires companies to find other sources of finance).

While most respondents expressed satisfaction with the Schemes, a number of challenges and suggestions for improvements were identified. The challenges identified included:

- Getting companies to do more sophisticated, innovative, longer-term research.
- Getting companies to become involved in collaborative research.
- Bridging the gap between the needs of industry and the needs of academia.
- Provision of long term funding for bioscience companies.

Suggested improvements to the Schemes included:

- Providing more money for technologically risky and expensive projects.
- Providing advice, not just funding.
- Simplifying the whole application, approvals and claims process.
- Including market research and training in R&D as eligible costs.
- Increasing awareness of the Schemes and information on them.

6.2 Company Attitudes to R&D in General

While interviewing companies about their involvement with the RTI or Capability Schemes, we also explored their approach and attitudes to R&D in general. The main findings were:

- Decisions on R&D were generally made by the managing director in consultation with the R&D manager where such a position existed in the company.
- Twelve percent of companies have adopted a team based approach to R&D planning and budgeting, involving other key functions such as production and marketing.
- R&D was already considered to be 'critical' to the future of companies in 64% of cases and 'very important' in 31%.
- Two thirds of companies already had formal R&D/product development plans, with R&D as part of the overall corporate strategy and with some formalised methods for managing R&D projects.
- The majority (72%) also had manned R&D functions. These ranged from a half time person up to 100 people.
- Sixty percent of companies hired additional staff to carry out their supported projects (a total of 113.5 new staff).
- All of the staff taken on as a result of the supported projects have been retained indicating that the increased levels of expenditure will be sustained.
- The number of RTI participant companies with four or more R&D staff grew from 33% of the cohort in 2000/2001 to 53% in 2003. (No corresponding data are available for Capability Scheme participants.)
- Most of those interviewed plan to increase their R&D expenditure.
- The capability to do all of the R&D in-house has improved when compared with participants in previous schemes such as Measures 6 and 1, with only a small proportion of companies sub-contracting any aspect of the R&D.

Based on our experience of evaluating the predecessors to the RTI Scheme, it is very evident that there has been a significant change in attitudes and behaviours towards R&D in the last ten years. Companies now view R&D as much more central to the core activities of their businesses and a critical component of future success. How R&D is conducted has also become more planned and sophisticated. Factors driving increased R&D expenditure, in order of frequency of responses, include:

- Demands made by customers or market opportunities.
- Competition.
- Development of new products or technology.
- The need to meet changing regulations, legislation or standards.

From the discussions with companies it is evident that these changes in attitudes and behaviours cannot be solely attributed to participation in the current schemes. In fact, many respondents appear to have introduced changes in their R&D strategies and methodologies during the late 1990's. A number of factors are at play. These include the following:

- The cumulative impact of participation in previous R&D schemes, including training courses in R&D management.
- Interaction with international customers and suppliers.
- Increased globalisation and dissemination of 'good practice' methodologies.

The importance of cumulative impacts over time should not be under-estimated. Companies were asked what had been the impact of participating in R&D initiatives in general. The top five impacts, in order of frequency, were:

- Enabling companies to engage in R&D beyond immediate short-term business needs.
- Improved competitiveness.
- Locating R&D facilities in Ireland or particular parts of Ireland.
- Supporting staff to develop their R&D skills.
- Enabling companies to employ more highly skilled research staff.

While there have been very positive behavioural changes for most companies, there remain some areas of concern:

- Those companies that have a more unplanned, ad hoc approach to R&D have no plans to change their approach. This might not be such an issue if all of these companies were small, but a number (eight) were SMEs with sales over €3m spending reasonable sums of money on R&D on an on-going basis.
- Attitudes towards collaboration, particularly with other companies, continue to be either negative or indifferent. Those companies (approximately one-quarter) that have positive attitudes to collaborating with either the third level sector or other companies, or of acquiring technology as part of their innovation strategy, generally already have experience of doing so. It should be noted, however, that in most cases this 'collaboration' really equates to sub-contracting.
- Attitudes towards participation in international R&D initiatives were those of indifference or negative, because of perceived irrelevance or difficulty for small companies to participate.

6.3 Company Views on Support Mechanisms

Companies interviewed for this evaluation were asked for their views on financial support mechanisms and non-financial supports for R&D. The findings were as follows:

- The preferred method of funding support by far continues to be straightforward grants. Reasons for this preference included familiarity, cash flow considerations, a lower impact on the Balance Sheet than other financing (e.g. loans), providing credibility with other investors, banks or headquarters, etc.
- There was considerable support for the concept of low interest loans, repayable on commercial success, as part of an overall package of support for R&D, particularly if it meant that the overall level of financial assistance could be increased.
- Repayable grants were seen by most to be no different from loans. Concerns expressed included the impact on the Balance Sheet of getting a loan and how project success would be determined.
- Awareness and understanding of tax credits was generally low. Many companies cited the need for profits as a major draw-back. Other negative perceptions of tax credits included the lack of immediate cash flow provided by tax credits, lack of funds provided by tax credits for specific R&D projects, the level of spend required (incremental element) and the impact of an already low corporate tax rate. Tax credits were also unlikely to benefit a start-up company.
- Equity was the least preferred mechanism for supporting R&D. Issues raised included valuation of the company, concerns regarding control, and the impact on attracting other investors (both positive and negative).

Suggestions for non-financial supports included:

- Marketing related supports, notably networking.
- Assistance with the development of R&D strategies/plans.
- Provision of specific technical support (many of these respondents referred to the type of support that had been provided in the past by Eolas).

With regard to grant rates, a variety of opinions were expressed:

- Approximately one third of respondents supported higher grant rates for collaborative activity between companies and their customers and suppliers in R&D (although a number did comment that this would be funding what companies have to do anyway to stay in business).

- Around one-quarter would support higher grants for collaboration in R&D between large and small companies, providing they were not directly competing against each other.
- One fifth supported higher grants for collaborative activity between firms irrespective of size.
- Just under one-quarter supported higher grants for collaboration with colleges.
- Smaller numbers of companies suggested that merit should always determine the grant rate or that higher grants should be given to projects involving technologies of strategic importance to Ireland.

6.4 Interviews with Non-Participant Companies

Seven companies that are known to perform R&D at a significant level (€0.25m or more annually) were interviewed by telephone by the evaluators to determine their awareness of the two Schemes and reasons for non-participation to date. Five of the seven companies were aware that the development agencies could provide financial support for R&D. The other two were not.

- Two companies had received support under predecessor schemes (e.g. Measure 1).
 - One of these companies expressed the view that the process was too bureaucratic and time consuming and this has deterred them from applying to the current Schemes, although the company is at present reviewing its position given the growth in its R&D spend. The company called for radical simplification of the grants process and reduced bureaucracy.
 - The other company had found the support to be very useful. However, the company believed that it was not entitled to apply to R&D schemes again, having being supported once, and that the nature of its development work may mean it is ineligible. The company now plans to address these matters with EI. It called for more proactive promotion of R&D Schemes by EI and clarification of eligibility criteria.
- Two of the other companies had past poor experiences with other non-R&D grant schemes (feasibility, equity and employment grants were named) in terms of bureaucracy, the management time and timescales involved. This had acted as a deterrent to applying for further grant aid, including to the R&D Schemes.
 - One of these companies was aware of the RTI and Capability Schemes and suggested the need for simplification of the application process.
 - The other company was not aware of either Scheme, stating that in discussions with EI the existence and possible relevance of the RTI or

Capability Schemes was never raised. This company now plans to discuss these Schemes with EI.

- One company that was not aware of either scheme now plans to follow up with Shannon.
- One company that was aware of both Schemes had commenced the process of applying to the RTI Scheme but withdrew its application because of the level of sensitive commercial data sought in the application process. No compromise could be reached in discussions with EI.
- One company that was aware of both Schemes was not interested in either because the increased costs of manufacturing and conducting R&D in Ireland meant that they were seriously considering moving their business abroad.

6.5 Interviews with Agency Staff

As part of this evaluation we interviewed 24 agency staff directly involved with the schemes in various ways. The interviewees consisted of Development Advisers from EI (6), Shannon (4), IDA (2) and Údarás (2), plus seven Technical Assessors and three managers. The interviews covered a range of topics such as the types of companies and projects supported, the operation of the schemes and ideas on how these might be improved in the future. The main findings were as follows:

- The technical quality of most projects is good to excellent and has been improving slowly but steadily over recent years. They are also highly relevant to the companies concerned. Very few, however, involve any significant research content – they tend to be short term, close-to-market development work – except for a few Capability Scheme projects from biotechnology HPSUs.
- Currently there are a limited, but growing, number of companies with the technological capability to undertake longer term projects with a significant research element, but most of these remain focussed on short-term needs and appear to do little or no longer term planning of their technology strategies. Supporting such projects under the RTI Scheme would require some changes in its design, particularly the time limits on projects and their commercialisation and, to a lesser extent, the associated assessment criteria.
- The Technical Assessors considered that, given the opportunity, they could assist relevant companies to develop business relevant technology strategies, but the level of involvement needed, in addition to their existing assessment functions, would put a severe or impossible strain on their available time.
- Technical Assessors would like to be involved earlier in the application process than usually occurs, thereby providing an opportunity to give companies some advice on preparing the technical aspects of their proposals. In some cases it would also be beneficial for allowing discussion with companies of other options

that might be relevant (e.g. collaboration or technology acquisition). This earlier involvement does occur with a limited (but slowly growing) number of Development Advisors, particularly from EI and IDA.

- Some Development Advisors are not comfortable with the whole area of research and are not very familiar with one or both of the schemes.
- There is little or no technical monitoring of the progress of projects. The verification process for grant claims is strongly focussed on financial aspects. Where equity funding has been provided, there are no procedures for checking that it has been used specifically to fund R&D, rather than being used as a contribution to the overall costs of the recipient companies.
- Development Advisors from EI expressed serious reservations about the roles of the Commercial Evaluation and Client Services Units in the assessment process, particularly given that these bodies have no direct contact with companies. They considered that assessments should be the sole responsibility of themselves and the Technical Assessors.
- Simplification of the claims process is needed, e.g. auditing the first claim in great detail but doing spot checks for subsequent claims.
- Improved company guidelines are required, giving detailed information on:
 - The assessment and approval process, including the criteria employed.
 - The financial and time recording data, and any other paper trails, that will be sought as the project progresses.
 - Allowable and non-allowable expenditure.
 - The requirements for the consideration of second round applications.

7 The Overall System for Supporting Business R&D

This chapter draws together the evaluation findings and discusses the challenges that these present. It is necessary, however, not to consider these topics solely in the context of the two funding schemes that we have reviewed in detail, but to recognise that they form part of a wider system of initiatives for supporting and strengthening the R&D performance of companies. The chapter therefore starts with a brief review of the main components of this system.

7.1 The Current Range of Initiatives

There is a range of schemes in place to address various aspects of R&D performed by the business sector. These include the RTI and Capability Schemes that are the subject of this evaluation. Among the companies that we interviewed, participation in, or even awareness of, any of the other schemes described below was extremely limited.

RTI Scheme

The findings from this evaluation show that projects supported under the RTI Scheme, while producing positive impacts, are too small and short-term in nature to contribute significantly to the objective of substantial growth in BERD to 1.7% of GNP by 2010¹. More companies need to be attracted into the Scheme, doing larger scale projects and projects with a longer term 'industrial' research focus. The Scheme also needs to focus more strongly on the foreign-owned companies that are already performing R&D here, which account for 65% of BERD but receive only 25% of the RTI funding.

Capability Scheme

The operation of the Capability Scheme by IDA was reviewed in 2003², which provides grants to established foreign-owned companies towards the costs of setting up major R&D operations in Ireland or of substantially expanding existing R&D functions. That review noted the key role of the Scheme in achieving corporate decisions in favour of locating substantial R&D projects in Ireland in the face of competition from other company sites, thereby ensuring that these companies became more strongly embedded here.

From the current review it is evident that the operation of the Capability Scheme by EI, and to a less extent by Shannon, has focused strongly on supporting start-up

¹ Target set in the Report of the Inter-Departmental Committee on Science, Technology and Innovation, 'Building Ireland's Knowledge Economy. The Irish Action Plan for Promoting Investment in R&D to 2010'.

² Hogan, B. & Bolger, B., 'Review of the IDA's Research and Development Capability Grants Scheme', Evaltec, May 2003,

companies. While these may be in technically challenging areas such as biotechnology, they are small in scale and many will take considerable time to yield any potential significant impacts or benefits in terms of sales, exports and employment. Applications from existing, large-scale R&D performers have been on the rise in 2004, but the numbers involved are extremely small. Considerable more effort will be required to market and attract indigenous R&D performers into the Scheme in order to achieve substantial growth in R&D expenditure and capability.

Innovation Management Initiative

The Innovation Management Initiative is open to all manufacturing and internationally traded services companies including companies doing R&D for the first time as well as existing R&D performers. It covers 50% of the fees associated with designated courses. These include Masters in Technology Management (two courses of which one is by distance learning), Diploma in Technology Management, Building New Products and R&D Capability, Introduction to R&D Management (two courses of which is a pilot using web based delivery), and Certificate in Innovation and R&D Management for the Food & Drinks Industry.

R&D Awareness Initiative

The R&D Awareness Initiative operates on a regional basis and includes seminars for companies to make them aware of the importance of R&D and the supports that are available. It also provides support towards the costs of up to three days technical consultancy provided by consultants selected by the companies from a named panel. This consultancy can cover understanding the R&D process, establishing the right strategy, identifying the right projects, developing a project plan and applying for funding.

The Initiative is aimed at companies spending less than €65k annually on R&D or less than €130k in the preceding three-year period. It is a potentially important route to attracting companies into the RTI Scheme and supporting companies to carry out R&D in a structured and strategic manner for the first time.

RTDI for Collaboration Programme

The recent evaluation of the RTDI for Collaboration Programme by Technopolis¹ found that the wide range of individual schemes involved had achieved only very limited success in developing collaborative research networks and in building partnerships between industry and the higher education sector that enhance company capability

¹ Arnold, E., Bussillet, S., Sowden, P., Stroyan, J., Whitehouse, S., Zaman, R., 'An Evaluation of the RTDI for Collaboration Programme', Technopolis, June 2004.

and competitiveness. Key factors affecting the development of such collaboration include technological capability within industry and the capacity and the culture within the third level sector to form links.

7.2 The Key Challenge – Increasing BERD

Increasing business expenditure on R&D is a key plank of both EU and Irish innovation policy. Ireland has had considerable success in its economic development in the 1990s, surpassing the growth rates of all the other EU countries. At the same time, business expenditure on R&D also grew strongly, albeit from a low base. Growth rates slowed down towards the end of the decade, particularly during the period 1999 to 2001. Because of the rapid growth in GDP and the low starting point, in 2001 BERD as a percentage of GDP was 0.80% (0.95% as a percentage of GNP) while the EU average was 1.21% (GDP). As noted earlier, the Inter-Departmental Committee on Science, Technology and Innovation has now set ambitious targets of almost trebling BERD, and achieving a BERD/GNP ratio to 1.7%, by the year 2010.

It should be noted that the current NDP targets for the RTI and Capability Schemes, which were established several years earlier, need upward revision to reflect this new policy.

Factors that will enhance increased BERD include positive government policies articulated in the NDP, the Action Plan for Promoting Investment in R&D to 2010 and the White Paper on Science and Technology, and support for these policies by the business sector. The internationalisation of business is also a major driving factor in getting more companies to do more and/or better R&D.

7.3 Factors Limiting the R&D Performance of Companies

There are a number of limitations in the current R&D activities of companies that must be overcome if the increased BERD targets are to be achieved. A brief discussion of these is presented in the following sections.

The Research Content of Projects

Increasing the sophistication of the technological base of R&D performing companies, both indigenous and foreign-owned, requires the provision of support for, and active encouragement of, more ambitious and longer term research (i.e. 'industrial' research in EU parlance). This kind of research would enhance the ability of firms to upgrade their knowledge base and to develop more sophisticated and higher value-added products, and increase the embeddedness here of MNEs.

The focus of the two schemes on which this evaluation focuses, particularly RTI, is too short term to meet the recently set BERD targets. Supporting companies to do

more of the same, while necessary, will not be sufficient. Supports need to be put in place to encourage companies to take quantum leaps and to carry out higher potential R&D.

More ambitious and longer-term research entails greater risks than the short-term development activities currently funded and, therefore, it can be presumed that left to themselves, companies will under-invest in such an activity. Public intervention is therefore justified. A further argument to support the funding of more ambitious, 'industrial' research is the fact that there is a lower probability of deadweight.

The RTI and Capability Schemes are currently based on a narrow interpretation of EU State aid rules that effectively constrain support (and maximum support levels) to 'pre-competitive', near market development. This limits the financial incentives they can provide for companies to push the boundaries of their research beyond immediate short term business needs.

Another shortcoming of the current Schemes is that, although they allow for support for process development, the guidelines for the Schemes emphasise product development. Their failure to actively encourage process R&D indicates an insufficient understanding of the importance of the latter, not only for better productivity but also to scaling up the technological intensity of industrial production.

Company Technology Strategies

It is important that a company's research activities are put in the context of its overall development strategy and not treated as isolated events, i.e. that they have a well defined technology strategy. From our extensive interviews, however, it is clear that this situation currently exists in only a small minority of companies. The industrial development agencies need to introduce a highly pro-active approach to remedy this shortcoming.

We consider, however, that there is a significant issue relating to the range of skills and experience available currently in the agencies to assist companies with developing technology strategies. Some of the Technical Assessors have some of the necessary skills, but most will need training. Although EI has provisions for its technologists to undertake Technology Management Reviews of companies, which includes assisting in technology strategy development, it is evident from our interviews with companies and with Technical Assessors that this has not been occurring to any significant extent in practice. Currently the main focus of technologists' interactions with companies is carrying out technical assessments of project proposals. – they are not being brought in by Development Advisors as part of a broader approach to company development.

R&D Collaboration with Colleges

Innovation policies at both national and international level emphasise the importance of R&D networking and collaboration, recognizing that these provide a range of benefits. Since collaborative R&D entails significant transaction costs for the participants and generates knowledge spillovers¹, support by government R&D funding schemes is justified. Indeed many governments, as part of their innovation strategies, include funding support for collaborative R&D activities.

Ireland's innovation policy includes a range of initiatives to promote university-industry knowledge transfer and collaboration. These kinds of schemes, when operated effectively, can be very useful, particularly in Ireland where there is little tradition in collaboration in R&D across institutions and the institutional base aimed at technology transfer is weak. The recent evaluation by Technopolis of the RTDI for Collaboration Programme has shown, however, that little actual collaboration was happening. This concurs with our findings.

It is evident from our interviews with companies that concerns regarding intellectual property are a significant factor hindering R&D collaboration with colleges. It seems that Irish universities regard their intellectual property as a source of income in a way which, in the light of US examples, seems unrealistic. In the USA extremely few patents have been able to provide substantial income for universities².

The Irish authorities should ensure that the rules on intellectual property be regarded as fair by companies and that these rules encourage university-industry R&D collaboration in order to guarantee that inventions are utilised commercially and benefit the Irish economy. The current development of various codes of practice by the Irish Council for Science, Technology and Innovation (ICSTI) can help to facilitate this. It must also be noted, however, that many of the R&D projects that companies currently engage in are too short term and close to market to be of interest to colleges.

Inter-company R&D Collaboration

In addition to university-industry collaboration, company-to-company R&D collaboration is an important means to advance the joint knowledge base and to develop products through supplier-subcontractor (value chain) relations, or

¹ From the general welfare point of view, knowledge spillovers are a positive thing; however, from the point of view of the individual firm that carries out the research, it means that the firm will not capture all the returns from the R&D. Public support is meant to generate spillover effects and to induce the firm to embark on collaboration.

² Research on US universities indicates that licensing revenues are highly skewed and concentrated among a small number of inventions, dominated by biomedical inventions. Furthermore, universities have great differences in their license revenue distributions. (Reference: Mowery, David. C. and Arvids A. Ziedonis, "Numbers, Quality, and Entry: How Has the Bayh-Dole Act Affected U.S. University Patenting and Licensing?" NBER Innovation Policy & the Economy, Vol. 1 Issue 1, p. 187-220.)

horizontally. The latter often means the creation of more or less generic information that can be shared by the partners. Collaborative endeavours in R&D amongst companies can also include partners from universities or other research institutions. Collaboration typically involves high entry costs in, for example, the creation of trust and the norms for co-operation needed amongst the partners. Knowledge spillovers and loss of intellectual property can also be a concern.

The Irish university-industry oriented schemes, referred to above, do not promote collaboration in R&D amongst companies and are set up for individual university-company co-operation. The RTI Scheme, therefore, needs to pay particular attention to encouraging this activity.

With regard to a lack of support for collaborative projects between companies in general, the Irish R&D support system has a further complication in the division of labour between the four industrial development agencies, particularly EI and IDA. EI caters to the needs of indigenous firms and IDA to those of multinationals. While the policies of both EI and IDA have been highly successful in many respects, the separation of indigenous and foreign-owned firms in innovation policy may impede the possibilities for promoting R&D projects that cut across this divide. In the present-day world, the distinction based on ownership is no longer as clear as it was in the past. Through trade sales, such as those in biotechnology, successful high-tech indigenous start-ups often end up being owned by foreign companies. There have also been cases of Irish management buy-outs of foreign owned operations based here.

Promoting further embeddedness of multinationals in the Irish economy through value-chain related R&D developments and subcontracting, or the promotion of cluster developments in a given industrial area, will require the agencies to collaborate more effectively in promoting R&D schemes for this purpose.

The recommendations made by the Enterprise Strategy Group on the establishment of two separate entities within EI, Export Ireland and Technology Ireland, could potentially address the issue, but only if there are clear structures in place to ensure an integrated approach to technology development across all sectors of the Irish economy.

Links between R&D and Marketing

Marketing by companies is as key to success as specific research or development activities. Companies interviewed for this evaluation, as well as agency executives, identified commercialisation and marketing as areas needing further support if the fruits of R&D are to yield value added products that customers need and value, and resultant additional sales. There is a need to promote the importance of grounding

R&D in market/customer needs and including sales or marketing in the research process.

Fragmentation of the R&D Support Initiatives

The current range of initiatives for supporting company R&D activities, described briefly at the start of this chapter, is potentially a very useful ‘tool kit’. It currently functions, however, as discrete, isolated programmes that are not integrated into a cohesive system of supports and progression for companies doing R&D. They lack consistent and comprehensive promotion by agency executives to their clients. The division of labour between different state agencies based on either location or ownership further fragments the system of support. It is important that any further developments, such as the proposed Technology Ireland and Export Ireland initiatives, do not fragment the system further.

Even the promotion of individual initiatives, including the RTI and Capability Schemes, is inconsistent. It is very dependent on individual Development Advisors in each agency. If they are not fully familiar with the initiatives and/or are not comfortable with discussing R&D needs and potential solutions, then the schemes may not be promoted to a particular client. A more committed, consistent, dynamic approach is necessary.

Agency Interactions with Companies

Based on company interviews, there is insufficient interaction between EI and most of its client companies overall. The Business Development Model, whereby companies are supported with advice, as well as aid, in an integrated manner makes sense, but it is not operating effectively, at least in relation to R&D. There is insufficient on-going contact with companies prior to, during and after submission of proposals, and as those proposals progress into real activity and conclusive outcomes, for this to happen.

We acknowledge that some Development Advisors effectively work as a ‘team’ with certain Technical Assessors on R&D projects. This needs to become the norm and not just happen in the case of assessing a specific application for support under the RTI or Capability Scheme. It needs to be applied as part of an on-going interaction with companies on their development needs.

Low Participation by Foreign Owned Companies

MNEs account for two-thirds of BERD. This is not reflected in the uptake of the RTI Scheme. A contributing factor is that, since the Scheme commenced in 2000, it appears to have been viewed as primarily an EI scheme by the other agencies, particularly IDA. This impression was reinforced by the fact that EI administers the

Scheme, chairs the RTI Committee and has two other representatives on it. There are now some indications that this view may be beginning to change, but only slowly.

Support for Indigenous Company R&D Expansions

From the evidence of our interviews, it is clear that many well established indigenous companies hope to enhance substantially their current R&D activities in terms of scale and/or technological capability. Indeed some have already done so in recent years. Supporting such enhancements was the core aim of the Capability Scheme when it was introduced, but most of these companies have never been informed of its existence. We accept that supporting the R&D activities of HPSUs, which has been the main focus of the Scheme by EI and Shannon, is a legitimate use of the Scheme (although we have serious reservations, expressed elsewhere in this report, regarding the extent of equity usage for this purpose). We consider, however, that established R&D-performing companies, not HPSUs, should be the main target group for the Scheme.

Support for New R&D Performers

Not enough of the existing companies that are not currently engaged in significant R&D activities are being attracted into the system. The base of companies performing R&D continues to be quite narrow with approximately 1,300 companies classified as R&D performers¹. The R&D Awareness Initiative should have a key role in increasing the numbers seeking to become involved, with the non-competitive element of the RTI Scheme providing the main source of project funding.

Unfortunately, however, there appears to have been only weak commitment to the former activity by EI, and none by the other three agencies. In addition, the amount of funding provided by non-competitive RTI grants is so low that it barely compensates participants for the time and costs involved preparing an application, maintaining the required records and dealing with the 'double audit' claims process.

Cash Flow

Cash flow was identified by many of the companies interviewed as an impediment to consistent and sustained R&D activity. Currently the RTI Scheme does not allow up-front payment of grants. The Capability Scheme, through the use of equity, can support up-front cash requirements. In contrast many countries, such as Sweden, Austria and Finland, use a combination of R&D loans and grants. Loans have the advantage over a grant in that they are paid up-front. The principle of not granting loans or providing guarantees for loans should be reconsidered.

¹ The Irish Action Plan for Promoting Investment in R&D to 2010.

7.4 Summary of Findings

This evaluation has identified a number of strengths that can be built upon. It also identified weaknesses that need to be addressed.

Strengths

Strengths identified by this evaluation centre on positive cumulative impacts on corporate R&D behaviour and expenditure, arising in part from the various grant schemes to support R&D activity put in place over the years:

- More companies are doing R&D and more of these are doing it in a sophisticated, structured way.
- Expenditure levels as well as staff numbers have increased and these increases are being sustained.
- Increased sales and competitiveness, as well as patenting and licensing activity, have resulted, reflecting the focus of much R&D activity on responding to customer demand or market needs.
- Companies also have positive attitudes towards R&D and recognise its importance to their future. This is not just a hi-tech phenomenon, but one that was expressed by companies in many different sectors including those that might be categorised as ‘traditional’.

Weaknesses

There are, however, a number of significant inhibitors and weaknesses in company attitudes to R&D, as discussed in the previous section, that will need to be overcome if the BERD targets are to be achieved:

- Most R&D performing companies continue to have a culture of low risk taking and this is reflected in the focus of most corporate R&D activity on business critical, short-term projects arising from immediate customer demand with minimal research content.
- Only a small minority of companies make any attempt to develop a technology strategy which would allow them strike an appropriate balance in their R&D activities between short-term and longer-term needs.
- For some companies cash flow concerns inhibit increased expenditure on R&D.
- There is a low level of collaboration between companies. Factors cited by companies interviewed for this evaluation included secrecy (commercial as well as technical) and competition, plus a lack of industry norms for collaboration.
- The extent of R&D collaboration with colleges is also low. Reasons for this include:
 - Negative perceptions about colleges’ abilities to meet commercial time scales and deadlines.
 - Lack of awareness of what colleges have to offer.

- Secrecy versus publication of research results.
- Concerns regarding the treatment of intellectual property.
- The R&D activity of some companies is poorly connected to the marketplace – only a minority of the companies interviewed have a multi-disciplinary team-based approach to R&D that includes the sales or marketing people.

7.5 Conclusions

The findings of this evaluation reveal that there are significant deficiencies in the current supports for business sector R&D and in the way in which these are delivered to companies. If no action is taken to remedy these, the current BERD targets will not be achieved. More importantly, the full R&D potential of companies in Ireland will not be realised, constraining future economic growth. The key shortcomings that need to be addresses are presented in Exhibit 7.1.

Exhibit 7.1 – Shortcomings to be addressed

- The range of initiatives, although individually appropriate, are highly fragmented – there is no attempt by the agencies to use them in a holistic approach to enhance the R&D capabilities in their client companies.
- There are no systems for identifying and then assisting relevant companies to develop technology strategies.
- Aspects of the RTI Scheme design (time limits on project duration and commercialisation of results, maximum grant percentage) militate against supporting longer term projects with a significant research element.
- The extent of funding support given under the RTI Scheme to foreign-owned firms, at 26% of the total, is far too low in the context of their 65% contribution to BERD.
- Insufficient numbers of first-time R&D performers are receiving support under the RTI Scheme.
- The Capability Scheme is paying far too little attention to enhancing the R&D performance of existing companies in the indigenous sector.

8 The R&D Support System in Finland

8.1 General observations

In Finland only 5.6 percent of the R&D expenditures in enterprises is funded from public sources (2002). However, a major part of this support, 85 percent, comes from one organisation, Tekes (National Technology Agency), which thus has a central place in the Finnish R&D support system in the business sector. Tekes also finances R&D activities in public research organisations (third level, research institutes etc.), though other organisations, too, especially the Academy of Finland, are important for R&D funding in these organisations.

In addition, there are a variety of organisations, ranging from public and semi-public to private ones, aimed at helping companies to develop and especially at advancing the commercialisation of inventions and research findings. These organisations are often regionally based. Even though many of these organisations are private, the activities are often funded with public money.

The Ministry of Trade and Industry maintains an internet-based portal to provide and disseminate information on the various services available for companies in different stages of development.

8.2 Support Schemes

Tekes operates many different kinds of support schemes for R&D including more general support schemes as well as specific technology programmes where R&D support is given to projects within a specific technological area. Forty-six percent of Tekes' funding is channeled through technology programmes (over 50% of money granted to public research institutions and 44% of monies granted to companies). The largest technology programmes are in ICT (€53m in 2003) and biotechnology (€40m in 2003).

Programmes intended for different groups of R&D performers are designed differently, often in close interaction with potential beneficiaries, to answer to their particular needs. For example, for start-ups there are schemes to support the costs of establishing the firm (grants, loans and capital loans¹), while for start-ups and SMEs there are schemes to develop business plans, for feasibility studies, for long-term research projects, and for product development; in addition, there are schemes to promote transfer of knowledge from universities (so-called Technology Clinics). Large companies can benefit from R&D support either through individual projects or through projects that are part of technology programmes.

¹ Tekes never becomes an owner or a co-owner of the companies to which it grants capital loans.

In recent years, Tekes has improved its collaboration with other funding agencies such as the Academy of Finland (a system of Research Councils) and Sitra (The Finnish National Fund for Research and Development), which is an independent public foundation and awards funding to research and training, innovation and business development, as well as making venture capital investments. For example, Tekes and Sitra have a joint pre-seed funding scheme for developing technology and other knowledge-oriented business ideas.

Tekes promotes its support schemes actively, e.g., through workshops or other meetings or visits to companies. In case of a new potential customer, a Tekes expert visits the company to acquaint her/himself with the business and technology strategy of the company, to advise the company of potential support schemes, and to discuss their possible role in the company strategy. Tekes officials pay regular visits to large company customers to keep informed of the developments in their R&D strategies. During such visits, the suitability of Tekes schemes for the various R&D projects of the company is discussed. These contacts provide a pre-screening of the suitability of companies' R&D project ideas with the support schemes that Tekes offers.

8.3 Interpretation of EU State Aid Rules

Finland applies two kinds of EU rules for R&D aid, first, the *de minimis* rule for SMEs for certain schemes (maximum €100k of aid in three years)¹, and second, EU R&D rules for the majority of the schemes. Finland's notification to the EU Commission is fairly general and describes the way Finland applies the rules. Finland, for example, lumps the categories of 'fundamental' and 'industrial' research together and applies the same rule for the former as for the latter (maximum support percentage 50% in the absence of supplements, see section C.3) even though, in principle, fundamental research could be supported up to a maximum of 100% of the costs. As a consequence, in practice Finland only uses the categories of 'industrial' and 'pre-competitive' research under the EU rules for State R&D aid.

Specific R&D programmes do not have a predefinition into 'industrial' or 'pre-competitive', but in each decision, the team of experts handling the proposal estimates a percentage of each (e.g. a specific project is 45% industrial and 55% pre-competitive research), and the overall support percentage is an adjusted average. This method is described in the Finnish notification and accepted by the EU Commission.

As a rule, Finland does not use the allowed maximum percentages in R&D support to companies except in particular cases. Nevertheless, overall, the support percentages can be higher than those in the Irish schemes, reflecting the fact that many projects and schemes are truly for longer-term R&D rather than just 'pre-competitive' research as defined by the EU State aid rules. If part of the support consists of a loan, it

¹ For example, since 2003, support to feasibility projects is given applying the rule of *de minimis*.

decreases the support intensity and can increase the overall sum that can be allocated to a company. The notification to the EU Commission states clearly the maximum proportion of loans in project support and the maximum intensity of capital loans.

In a recent new notification to the EU Commission, Finland obtained acceptance of a procedure in which a loan can be fully converted into a grant (that is, its reimbursement is not required) in cases where the project has failed and thus has not led to any commercial utilisation.

8.4 Funding Mechanisms

Finland (in practice often Tekes) uses a combination of loans, capital loans and grants. Grants are usually used for longer-term and more risky projects. Shorter-term development projects are supported by way of loans but capital loans may also be used if the capital needs of the company are such that it would benefit from this option. In practice this means that larger companies, which tend to carry out 'industrial' research, often get grants (though they also obtain loans for shorter term developmental projects), while SMEs, which tend to be doing development work, get loans or capital loans. Combinations of loans and grants are also used. In exceptional cases part of a grant can be paid in advance, for example, when the entire project could not commence without an advance sum. However, there have been only a few cases during the past 10 years. As a general rule, up to 30% of loans and 50% of start-up loans can be paid in advance.

Tekes' loans have lower interest rates than commercial loans and Tekes, unlike commercial lenders, does not require guarantees. Loan contracts include a repayment plan. There is, however, considerable flexibility on a case by case basis on final repayment plans. If there is commercial or technological failure of project companies can have repayment prolonged, or deferred, or converted into equity, or converted into a grant, depending on individual circumstances and subject to aid intensities.

8.5 Assessment and Decision-making

Tekes does not use committees or external people in its assessment and decision-making on R&D projects, except for decisions exceeding €1.7m when a project has to be submitted to the Board of Tekes¹.

When the funding of a project is under €250k, the decision is taken by a technology manager based on the proposal of the experts handling the case. If the funding exceeds €250k but is lower than €500k, the decision is made at a higher level by an

¹ The Board has representatives from government (such as Ministries of Trade and Industry and Education), companies, industrial organisations and the trade unions.

executive director responsible for project funding. When the sum is over 500k but lower than €1.7m, the decision is taken by the Director General, and above €1.7m it is taken by the Board. Larger projects have to go through each of the above stages, and a proposal is thus subject to consideration at each level.

Tekes maintains a matrix organisation which separates the assessment and handling of proposals from their monitoring and overall management and planning, as a rule with different people responsible for the two tasks (an exception is the dual role of technology teams to be involved in both assessment and monitoring; see below). A project team is responsible for the assessment and handling of a proposal. The team consists of from two to four persons, one of whom is an expert in business administration while 1-2 (sometimes 3) are technology experts and one a support person. One expert is assigned primary responsibility for preparing the proposal for decision, with others to help. An expert keeping an overall understanding of a particular company (responsible for the 'client' relationship) is generally a member of the project team for a proposal coming from that company, usually, however, not as the one having primary responsibility for the project handling. Usually there is a visit to the company prior to a decision. After their internal preparation the project team presents the proposal to a larger, so-called technology team (see below) for an internal "peer review".

The assessment criteria include the extent to which the project fits into Tekes project portfolio, the technology to be used and developed, and the utilisation possibilities. The assessment is qualitative. The distance of a proposal from the market stage is also assessed in a qualitative manner. The nature of the project is evaluated within the continuum of 'industrial' versus 'pre-competitive' research and the support percentage is allotted accordingly (plus other factors that influence the maximum allowed state aid intensity).

The technology teams, mentioned above, are responsible for monitoring the project portfolio in a specific technology area, and as described, also assess project proposals before decisions are taken. The technology team is larger than a project team consisting of from 5 to 10 people. The technology team is also responsible for strategic planning in their technology area and for activation measures intended to increase customer interest in Tekes' 'products', the various schemes.

The fact that Tekes does not use committees of external people in the assessment and decision-making process has drawn attention from some external evaluation panels that have reviewed specific technology programmes. Tekes' justification is to maintain the confidentiality of the proposals and to prevent a leakage of information to outsiders, taking into account the potential sensitiveness of the plans of particular companies. As a result, companies are willing to divulge their quite confidential future plans, and this information enhances understanding by Tekes of their R&D needs and possibilities. The information improves the formulation of new initiatives,

the promotion of networking, and the development of overall technology strategies of Tekes.

Formal rejection rates vary by type of recipient, with company projects having lower rejection rates than projects proposed by universities or research institutes. In 2003, the rejection rate of company projects was a little above 20% in terms of proposal numbers and nearly 40% in terms of money applied for. However, it is emphasised by Tekes that usually an applicant is in contact with Tekes in advance of submitting a proposal and about half of these contacts will lead to a proposal not being submitted. The 'pre-screening' will weed out the proposals that do not fit into Tekes funding schemes. However, formally these contacts do not entail any decisions, but firms can very well submit a proposal. The aim is to reach a joint understanding of how best to progress the plans of the companies. The contacts with companies through visits, as described above, often provide with a mechanism for this 'pre-screening' process.

8.6 Networking and Collaboration

There is a strong emphasis on collaboration and networking within the Finnish system. In 2003, 71% of all Tekes-funded company projects (90% of projects of large companies) had subcontracting from or collaboration with universities or research institutes, and 66% of the projects of large companies had subcontracting from SMEs. In terms of money, the percentages are smaller, particularly for large companies, with only thirteen per cent of Tekes funding in the projects of large companies going to research institutions (universities or research institutes) and 9% going to SMEs. However, the above figures do not reveal the overall extent of collaboration and networking. Tekes often makes decisions on parallel projects and requires that the partners in each, for example a company and a university, collaborate and exchange information with each other. This kind of collaboration and networking is not revealed by the figures on money flows.

The assessment of applications from large companies includes consideration of the project against five criteria, of which three are related to collaboration. In principle, one of these criteria, although in practice two, have to be fulfilled for large companies to get funding:

- Collaboration with SMEs.
- Collaboration with a university or a research institute.
- Being part of a technology programme.
- International collaboration.
- The research results can be utilised by others or the project is an 'industrial' research project.

For universities or research institutes to get funding from Tekes, these have to attract to the project at least two companies as co-financiers and potential users of research results. In practice, companies are members of the steering groups of such projects

and can get in with a small sum of money. This is typically the case, when the project is longer-term or research in nature and the number of participating firms is larger than the minimum required. Nevertheless, attracting firms into the project presupposes that the research to be conducted has to be of industrial relevance, at least in the long run. Evaluations have found that this kind of project provides companies with a sort of 'technology watch', an opportunity to have a peek at the research frontier and can lead to further collaboration in other projects. There are, however, also projects that are more application-oriented and typically, the companies (at least two) are more committed to the project, fund it with larger sums, and have their own parallel projects in-house to develop the application possibilities further.

Technology programmes, that is, specific funding for a clearly-defined technology or application area, have collaboration and networking as an important principle and thus aim at creating externalities and spillovers in the S&T system. Consequently, there are a lot of above-mentioned parallel, collaborating projects. The majority of application-oriented technology programmes are built around economic clusters bringing in central partners involved in innovation activities in the sector. In addition, these programmes promote collaboration and networking among programme participants through seminars and meetings and exchange of research plans and results on such occasions. Technology programmes have a higher degree of publicity than other Tekes funded projects and the projects often are longer-term than those funded outside such programmes.

Technology programmes are planned involving the key stakeholders in the technology sector, such as companies, research institutes and universities. For a technology programme to be launched, the stakeholders have to be willing to be both committed to the programme and willing to collaborate with each other. Tekes thus does not plan the programmes without an active interest by potential participants. For the system to work well there has to be trust in the system not being discriminatory towards any potential partner. So far, this trust seems to be forthcoming.

9 Recommendations

9.1 Introduction

Developing the current RTI and Capability Schemes further and engaging more with companies, and on a more planned basis, are two necessary steps to improve business sector R&D performance. These alone, however, will not be sufficient. The environment within which the schemes operate also needs to be right and a change in the institutional framework and organisational culture within agencies is required. Other reports have proposed changes to the institutional framework, but detailed discussion of these is beyond the scope of this evaluation.

We consider, however, that it is important to highlight the need for developing an integrated support system and an integrated institutional framework if R&D activity by the business sector is to be supported effectively. Growing sophistication by companies in their R&D must be matched by increased sophistication in the support structures and a belief that Irish companies can use R&D to be competitive on the world stage.

A previous report on the IDA's operation of the Capability Scheme recommended that it should be continued and promoted more aggressively with the aim of expanding considerably the number of firms involved. It made a number of recommendations, mainly of an operational nature. We do not revisit those recommendations in this report, concentrating instead on those emerging from our current review. These are set out below and fall into three broad categories. The first relates to over-arching recommendations covering organisational culture and support mechanisms. The second category relates specifically to the operation of the RTI Scheme, while the third relates to the specific operation of the Capability Scheme.

9.2 Over-arching Recommendations

Currently, the business system of R&D in Ireland might be described as an Egyptian pyramid with a large number of small or non-performers at the base; approximately 1,000 companies performing R&D of various degrees of scale and sophistication, but nearly all close to market development work in the middle; and a small number doing research at the top. The objective of any support by the State to the business sector in R&D should be to try over time, e.g. 10-15 years, to change the shape of this pyramid to that of an Aztec pyramid with more companies doing more R&D and more of these doing more sophisticated R&D by introducing an **integrated system of supported progression**. State support should aim to:

- a) Encourage more non R&D-performing firms to engage in R&D (both indigenous and foreign-owned).

- b) Encourage existing R&D performers to take on more substantial, strategic projects with potentially higher risks and rewards (both indigenous and foreign-owned).

To this end we see a need for five major types of initiatives to support R&D in the business sector, aimed at:

1. Raising awareness of the benefits of technological development, particularly in companies not currently engaged in R&D.
 2. Developing enhanced innovation strategy capabilities for existing R&D-performing firms.
 3. Providing financial support for R&D projects.
 4. Providing financial support for establishing or expanding R&D facilities.
 5. Encouraging a greater degree of R&D collaboration, both between firms and with third level institutions.
1. For companies not currently engaged in any significant R&D, action is needed to promote a greater awareness of the importance of R&D to their future growth and to encourage them to become R&D performers. The key requirement is for **the agencies to take on a much more pro-active role** in this area, with a substantial involvement of technologists and marketing experts working closely with the Development Advisors. A scheme similar to the **R&D Awareness** initiative is required. This scheme, however, needs to be more strongly promoted to non-R&D performers so that more companies are exposed to it and more participants in the initiative feed up into the main R&D programmes. In addition, a variation of the previous **TechStart** scheme, involving the placement of a graduate in a company for a minimum of one year with the salary heavily subsidised, should be re-introduced to support non-performers in order to introduce a capacity to absorb technology into these companies and a recognition of the benefits that can be derived from innovation.
 2. In order to encourage existing R&D performers to take a longer-term view of their technology requirements, and thus supplement their current focus on near-to-market development with R&D that is more 'industrial' research, support for a substantial **strengthening of company innovation strategy capabilities** is required. Again this will require Development Advisors, technologists and marketing specialists from the agencies having a sustained pro-active involvement with relevant companies. This aspect is considered in greater detail below.
 3. For R&D performers a scheme similar to the RTI Scheme, which focuses on specific R&D projects, continues to have relevance. Within this Scheme, however, there should be **various progression options** available to companies. The specific recommendations in relation to RTI are set out in section 9.3.

4. A Capability type scheme is also required to support activity such as **significant enhancement in facilities, equipment and research staff**. We believe that the current operation of the Capability Scheme by EI, with its strong focus on HPSUs, needs revision – it should be re-focused to provide much more support to existing companies, as occurs under the IDA implementation. Specific recommendations in relation to the Capability Scheme are set out in section 9.4.
5. Complementary schemes such as the **RTDI for Collaboration Innovation Partnerships** are also required. While there may be difficulties with these schemes as currently operated, there is still a need for support mechanisms of this nature. We support the current use of **bonus points** (i.e. the grant rate can be raised) for company R&D projects that include an element of collaboration with the third level sector. These bonus points should also apply to projects involving collaboration with other companies – an aspect needing increased focus – and should be applied to projects irrespective of which grant Scheme they are supported under.

All of the schemes require more pro-active promotion by the State Agencies and on-going provision of support to participants if R&D activity is to be enhanced over time. Support should include:

- Access to schemes on more than one occasion but with higher hurdles each time.
- Provision of pre-application and post application assistance.
- Greater input by Technical Assessors.
- More on-going monitoring of projects in terms of performance over time.
- Active engagement with firms over plans for the future and which support schemes might be relevant.
- Assistance with commercialisation where necessary.

In order to encourage this, web site and promotional material for any of the R&D support schemes should provide an **'expression of interest' form** and should not include full application forms. Companies expressing interest would then be assigned a Development Advisor and a technology expert to work with them, not only on their application but also on their overall development plans, with a strong focus on innovation strategies, including associated market analyses and commercialization plans. **The removal of direct access to application forms** would overcome some of the current difficulties that can arise in the RTI Scheme from non-client as well as existing client companies submitting proposals without pre-application support. More importantly, it would provide a key gateway to achieving the broader agency interaction with companies that we consider to be vital.

To this end, we support the recommendation of the Enterprise Strategy Group for the establishment of 'Technology Ireland', although we would prefer to call it a **Technology Strategy Group**, comprising of experts in technology and innovation management. It would, however, need to have within it (or readily accessible from outside) expertise in marketing, since this is an integral element in the planning of a technology strategy. A core function would be to support the activities of Development Advisors in all of the agencies on an equal basis, but would probably need to spend more time with indigenous companies since the development of longer term strategies is generally weaker in this sector. The Group would also be responsible for technical assessment of proposals.

We have no strong views regarding where this Group should be based. The key requirement is that its expertise is equally available to (and regularly used by) all of the industrial development agencies, i.e. the Group should not be seen as 'belonging' to, and primarily serving, any one of them.

Members of the Group would aim to establish on-going, long-term relationships with companies carrying out R&D. The focus of their work would be on the medium to long term innovation strategies and technological development of companies, not just short-term product development needs. There is also a small number of private sector consultants with established competence in this area whose expertise should be made use of in particular cases. In addition to innovation strategy skills, Group members will also need to be fully aware of the **full range** of innovation, R&D and marketing supports available to companies. They will also require a good feel for the research activities of colleges by, for example, regular interaction with Industry Liaison Officers in the third level sector.

From our interviews with Technical Assessors during this evaluation and previous reviews, we consider that some already have the broad range of skills needed to fulfil this role. But many of the others, although having considerable expertise in their various technologies and in the assessment of R&D proposals, are likely to require **training in the much broader area of innovation strategies and management**. We are not in a position to comment on the extent, if any, to which those from a marketing background may also require training.

In view of the longer term focus of the Technology Strategy Group, **this approach will need to be pursued for several years** for major benefits to be achieved.

The Group would also be the source of Technical Assessors for R&D project proposals. In order to provide a degree of independence, there is a strong argument for the assessments not being carried out by an individual who has been working in an on-going advisory role to the company concerned. But separating the functions has disadvantages. From the company's perspective it introduces a discontinuity – they would need to re-explain to a 'new' agency person both the specifics of the

project and its context in relation to their existing technology and development strategy. In our interviews with Technical Assessors, we found that most (but not all), foresaw no problems with fulfilling both roles with the same company. Indeed, Development Advisors already operate in a ‘dual role’ manner in the context of advising companies on proposals and their subsequent commercial assessments. On balance we favour separating the two roles, i.e. with a different technologist undertaking the advice and assessment functions.

Although implementation of the Technology Strategy Group approach is the fundamental requirement for achieving, over time, a sustained increase in the amount, quality and relevance of business R&D, there is also a need for some adjustments to the RTI and Capability Schemes. **Improved guidelines are needed**, particularly regarding eligible costs, mid-project changes, record keeping requirements and eligibility for repeat support. The funding mechanisms should be revised in order to **raise the maximum grant limit**, within EU State aid rules, for high quality, longer-term projects with a significant research component. This will involve **re-classifying elements of the current RTI and Capability Schemes as supporting ‘industrial’ research**, which will necessitate additional notification to the EU. However, such a re-classification would provide for higher aid intensities than is currently available for such projects.

The use of equity to support Capability projects by EI is based on a policy introduced many years ago of substituting equity for grants. Without a clear venture capital market failure, however, the use of equity is not justified as a funding mechanism. A strong case for market failure can be made for HPSUs at the first round of financing. Currently, venture capitalists are very wary of investing in these types of companies at the early stages of development. Provision of equity by the State fills a gap in the market and also provides such start-ups with much needed cash flow up-front. Revision of the length of time for which a company is considered to be in the start-up phase needs to take place be revised in the case of biotechnology companies, which can have extremely long development cycles and can effectively be in the start-up phase for many years.

There is only a weak rationale for State equity in second and third round financing for HPSUs beyond the immediate start-up phase. Most of the HPSUs interviewed for this evaluation appeared to have been able to source external funding from third party investors at this stage¹. Although the first-round equity from EI, and the associated due diligence checks, has a key role in attracting other investors, these

¹ This finding is supported by recent information from the Irish Venture Capital Association (IVCA), that support for the Irish technology sector by Irish VCs remains very strong with over 96% (€240m) of investment being made in such firms in 2003. According to IVCA chairman Shay Garvey, this is the highest weighting of investment in the tech sector by any European country. He added that the recently completed IVCA Review showed a consistent pattern of investment in start ups. VCs invested €33 million in 106 start ups in 2003 versus €27 million in 62 start ups in 2002. (Reference: IVCA Press Release, 21 June 2004.)

companies considered that, in the absence of further equity investment from EI in subsequent funding rounds, they would still have been able to attract other investors and proceed with their company's development.

There is no valid rationale for the use of equity to support projects by large established companies, other than providing some up-front funding (which, in any case, might be better accomplished by the use of repayable loans, discussed below). In fact, the use of equity could be seen as a deterrent to such companies applying to the Capability Scheme.

Where equity is used as a funding mechanism, on-going ***monitoring*** of its use, particularly when a portion has been attributed to the Capability Scheme, is required. ***Equity should be offered as an option to companies*** but should not form the sole basis on which Capability support is offered.

There was considerable support for the use of repayable loans by companies as a support mechanism for R&D to complement grant aid (but not to substitute completely for it). We recommend that ***repayable loans should be introduced as an option*** for companies. They are used as part of the R&D funding mechanisms in several EU countries, including Austria, Finland and Sweden.

The use of loans could increase the levels of aid that can be offered for suitable projects and is consistent with the principle of the State sharing risk with companies. They also provide up-front cash to companies. To prevent a loan from being used for routine activities and in order not to take over the function of banks, the loans should only be granted to more ambitious, risky projects and be repayable in the case of future commercial success. The EU State aid rules do not identify general principles for calculating aid intensity for loans. This needs to be negotiated with the EU Commission. Loans are regarded by the EU as having a lower aid intensity and, together with direct grants, can provide higher aid totals. Preference shares and other equity based arrangements do not fulfill quite the same function as repayable loans.

The current system of auditing of grant claims was identified by companies as a major administrative burden. ***The claims process needs to be simplified***, mindful of the need to account adequately for tax-payers' monies. A possible solution that might be considered would involve no external auditing of claims by company auditors. Claims would be prepared by companies using a standard format with full guidelines provided by the relevant State agency. A Claims Inspector would then check the claim and attendant paperwork to the level it considered appropriate on a case by case basis. Where R&D funding is provided by way of equity, a mechanism needs to be introduced to check that it is being used solely for this purpose.

The claims inspection process is focused on financial aspects of projects. There are no procedures in place for checking technical aspects, or for collecting data on the outputs and impacts of supported projects, as is needed to check progress against NDP targets. **A system for monitoring the technical progress of supported projects against pre-agreed milestones should be introduced.** This should include **a review on completion of the project**, as part of which **data relevant to the output and impact targets established for the schemes should be collected.** This should also be used as an opportunity to discuss the company’s future R&D plans and the relevant supports for these that the agency might be able to provide.

9.3 RTI Scheme

We recommend continuance of the RTI Scheme but with a number of modifications. There is scope for streamlining the approval process applications, with delegation of decisions on smaller projects to the relevant manager or director within the agency, as is done in Finland (see Chapter 8). This would free up some Development Advisor and Technical Assessor time which could be more constructively used interacting with companies.

In order to reflect the system of progression outlined above, as well as to address concerns raised by stakeholders during the evaluation fieldwork, the RTI Scheme should be split into three levels of support based on increased project risk and research intensity as summarised in Exhibit 9.1 and described in more detail below.

Exhibit 9.1 – Main characteristics of the proposed three RTI levels

Features	RTI Level 1	RTI Level 2	RTI Level 3
Target companies	First time R&D performers	Existing R&D performer	Existing R&D performer
Current R&D spend p.a.	Maximum €50k	No upper or lower limit	Minimum €500k ^B
Competitive?	No	Yes	Yes
Maximum project cost	€150k	No limit	No limit
Max. project duration	2 years	2 years	5 years
Research element needed?	No	No	Yes
Technical risk	Low	Low to medium	Medium to high
Maximum grant rate ^A	25% / 45%	25% / 45%	50% / 70%
Repeat funding at this level allowed?	No	Yes, if R&D capability has improved significantly	Yes

Notes: ^A Minima are for large firms in the South and East regions. Maxima are for SMEs in the BMW region. Both figures assume that no international collaboration is involved.

^B The minimum would apply for the first two years, in order to focus on the most likely candidate companies. Thereafter it should be reviewed.

RTI Level 1 – New R&D Performers

The objective of Level 1 would be to encourage more companies to participate in product and process development and to become R&D performers. It would be aimed at companies performing R&D for the first time or those who spend under €50k per annum, and would be non-competitive. In these respects it is effectively a continuation of the current non-competitive element of the RTI Scheme.

Companies would be offered a straight 35% grant (45% in the BMW region), the objective being to provide as much of an incentive as possible in the least complicated manner in order to encourage them to become involved. The maximum project size should be €150k with a duration of up to two years.

Pre-application support would be mandatory and would be provided to every applicant by a team comprising a Development Advisor and Technical Assessor. The Technical Assessor would play a key role in talking the company through its proposed project(s) and in signing off on the quality of the project and the capacity of the firm to carry it through. Similarly the Development Advisor would discuss with the company the appropriateness of the project in the context of its overall development and the commercialisation plans for the project once completed. Decisions on approvals would be made by the relevant department manager.

Monitoring of project progress by the Technical Assessor would provide an opportunity to advise on any technical difficulties that might arise and, on completion, to explore with the company the possibilities for further R&D activities.

A simplified claims process would apply involving only auditing of claims by the relevant agency. The Development Advisor would provide assistance to the company in preparing its first claim. Clear guidelines would be provided to companies, Development Advisors, Technical Assessors, local management and internal decision-making committees.

Companies should be given support once only under Level 1. Thereafter any further applications would be to other levels in the Scheme, where more rigorous procedures and requirements would apply.

Each agency would provide a summary of approvals made by it to the RTI Committee, which would continue to have an over-seeing role for the RTI Scheme as a whole.

RTI Level 2 – Existing R&D Performers (Development Activity)

The objective of Level 2 would be to encourage and support high quality R&D projects and to sustain R&D performance by companies. It would be for companies that are already doing R&D and would effectively be similar to the current competitive element of the RTI Scheme, with a focus on near market projects up to two years in duration.

Approval decisions for smaller projects would be delegated to managers or directors in each agency, as in Finland, with summaries provided to the RTI Committee¹. Larger projects would go to the RTI Committee for approval on a competitive basis (as currently applies). Consideration should be given to reducing the size of the Committee (e.g. to 12), with just one representative from each agency and a non-agency chair-person. Introducing more efficient methods for operating the Committee and its consideration of project assessments should also be explored, for example the use of tele-conferencing to confer with Development Advisors and Technical Assessors on smaller projects.

All applicants would be offered pre-application support. Every project would undergo a technical and commercial assessment along the lines of the current system. Projects would be required to include review milestones that would form part of an on-going performance monitoring process carried out by the Technical Assessors.

Companies would receive clear guidelines on recording requirements and eligible expenditure prior to commencing a project. As with the current RTI Scheme, a variable grant rate would apply, based on the merit of the project, with bonus points awarded for collaborative activity.

In the context of increasing inter-company R&D collaboration, a key area of focus would be companies that already have supply chain links, particularly where this involves MNEs and indigenous firms. Unfortunately the current situation, whereby the four industrial development agencies operate independently of one another, is a substantial barrier to achieving this. But the proposed Technology Strategy Group can provide a solution, as long as it is allowed to develop pro-active involvement with client companies of all four agencies on an equal basis.

The current ceiling on the amount of funding provided would be removed. In all cases, however, the amount approved should be closely linked to proposed increases in the R&D spend by companies from their own resources.

There would be no limit on the number of times a company could apply to Level 2. On each occasion, however, the Technical Assessor would assess the company against a capability enhancement checklist. This would address such issues as increased research staff, increased R&D expenditure, increased non-grant aided R&D expenditure, track record on previous projects and the degree of progression subsequent projects would make to the company's R&D capabilities and capacity. To be eligible for second and subsequent supports under Level 2, the company would

¹ This would require the RTI Committee to allocate part of the overall funding to each agency and to review periodically the size of these allocations. Approval decisions in each would continue to be on a competitive basis within its allocated budget.

have to achieve a significantly higher score on this checklist than they had at the time of the previously approved application.

RTI Level 3 – Existing R&D Performers (High Risk Development Activity)

The objectives of Level 3 would be to encourage more companies to carry out higher risk, longer term R&D projects and to encourage more companies to undertake projects involving a substantial element of research¹. It would cater for existing R&D performers with reasonable levels of existing R&D spend, focusing initially on the c.300 firms with an annual R&D spend of over €500k. It would only support projects involving significant technical risk, in technologies either current or new to the company. Project duration would be up to five years. As with RTI Level 2, there would be strong encouragement for collaborative projects, particularly between MNEs and Irish owned companies.

Pre-application assistance would be offered to all applicants. Technical and commercial assessments would be carried out. There would be a significant milestone review process to monitor progress over time. Milestone reviews would form a key part of on-going project monitoring and of the claims payments process. ‘Go/no go’ decisions would form part of the review process, with claims being made and paid based on these decisions. Milestone reviews would be carried out by the Technical Assessor, who would include in the technical assessment of the proposal submitted to the RTI Committee, a proposal on the milestone review process for each project. Projects would be approved by the RTI Committee on a competitive basis.

Companies would receive clear guidelines on recording requirements and eligible expenditure prior to commencing a project, as well as requirements for the milestone reviews.

Once projects have commenced, flexibility to alter their scope, content, timing or direction would be at the discretion of the Technical Assessor in consultation with the Development Advisor and line management up to 20% of the total costs of the project, subject to a maximum of €50k. Above this amount, any proposed changes would require RTI Committee approval.

Projects supported under Level 3 would be required to have a significant element of ‘industrial’ research. We recommend that a significant incentive should be offered in the form of funding aid of up to 50% for large companies outside the BMW regions and 70% for SMEs in the BMW region for the ‘industrial’ element of the research. The Technical Assessor would determine the breakdown of the project between ‘pre-competitive’ and ‘industrial’ research. Projects with only an ‘industrial’ component

¹ Where such projects involve substantial expansions of R&D resources (i.e. facilities and personnel), they should be considered under the Capability Scheme.

would also be eligible for Level 3 funding as would projects involving ‘fundamental’ research. Projects involving only ‘pre-competitive’ research would not be eligible (such projects would be funded under Level 2). There would be no upper limit on the size of project that could be approved but projects would have to involve a minimum expenditure of €250k, and the amount of funding provided would be linked to planned increases in companies’ own spend on R&D.

9.4 Capability Scheme

As noted earlier, the IDA implementation of the Scheme is not covered by this evaluation. These recommendations, therefore, pertain to the operation of the Scheme by the other agencies.

We agree with the current stated objectives of the Scheme and believe they have continuing relevance to the future, namely to build the capability of companies to carry out R&D at a significant and continuous level and to support companies to carry out substantial new investment beyond their current level of R&D activity. The component parts of these objectives can be described as follows:

- Establishing new R&D functions.
- Establishing new facilities and purchasing R&D equipment.
- Enlarging R&D functions.
- Enlarging facilities and equipment.
- Acquiring higher levels of skills than current capability.
- All supported activity must be at a significant and continuous level.

The Capability projects that have been supported to date by EI, and to a lesser extent by Shannon, have concentrated mainly on the first two of these, with a strong resultant focus on HPSUs. The other elements outlined above are equally important and need to receive greater attention in the operation of the Scheme. We suggest that by the end of the current NDP, at least two-thirds of Capability funding by EI and Shannon would be targeted at existing R&D performers. As outlined above, HPSUs would continue to be eligible for the Scheme, but they should not be its primary focus.

Risk would not be a determining factor in the approval process, but the incremental increase in the scale of activity arising from the proposed investment would be. All applications would have to submit a sound R&D plan/strategy as part of their application for support. Assessments would be carried out by the Development Advisor and Technical Assessor to ensure that the proposed enhancement and the R&D plan make technical and commercial sense in the context of the overall development of the company. Full use would be made of the support and advice that would be provided by the proposed Technology Strategy Group (see section 9.2),

which would also be responsible for monitoring of the project while in progress and on completion. Where appropriate assistance with commercialisation should be provided by extending the availability of the existing Commercialisation Fund to companies, as recommended in the recent Technopolis report¹.

The Capability Scheme would continue to operate on the current system for approvals, aid limits and payment mechanisms, but with the introduction of procedures for checking that any equity funding provided for R&D is being used for its intended purpose.

Support would be in the form of grants up to the maximum permissible rate under EU State aid rules, with additional funding over and above these limits provided by way of repayable loan or equity, depending on the company's preference and circumstances, and subject to current agency guidelines on the maximum permissible equity stake. There would be an option to convert some or all of any loan element into equity, again up to agency guidelines on their maximum stake. The Scheme would be proactively promoted to R&D performers by the Development Advisors.

¹ Arnold, E., Bussillet, S., Sowden, P., Stroyan, J., Whitehouse, S., Zaman, R., 'An Evaluation of the RTDI for Collaboration Programme', Technopolis, June 2004.



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