

Evaluation of the Technology Centre Programme

EXECUTIVE SUMMARY

An evaluation has been conducted of the Technology Centre Programme through a review of the 17 centres which have operated over the past four years. The main findings and recommendations of the evaluation are as follows:

1. The Technology Centre Programme should continue, but with changes in the criteria for the establishment of centres, their mode of operation and their success criteria. There is no one model for a successful centre, but clear guidelines for success are identified in this report.
2. The main objectives of the Technology Centre Programme – to utilise the expertise and facilities of the regional colleges of technology to assist indigenous Irish industry to adopt competitive new and improved technologies – should remain. The second objective, that a centre should become financially self-sufficient in three years, is over-simplistic and unrealistic, and should be replaced by a number of criteria: job creation in local industry, provision of important technological infrastructure services and progress towards a full recovery of salaries and operational costs from earned income should be the main criteria.

Benefits to the host institution should include increased interaction with industry, placement of graduates in quality jobs and improved technical facilities.

3. Three centres, the Food Product Development Centre, the Clean Technology Centre and National Avionics Ltd are close to economic viability. National Avionics Ltd, which was initially the National Avionics Research Centre, has become a limited liability company wholly owned by the Dublin Institute of Technology. This possible route to economic viability should not be taken as a model for others to follow. The formation and ultimate financial success or failure of campus companies will be decided by financial judgements and market forces.

The Clean Technology Centre's financial performance relies on a combination of services to Irish-based industry and EU research contract income. This combination of income source and exposure to a wider range of expertise is both necessary and desirable for a number of research-based centres. However, pursuit of EU research funding to the exclusion of serving local industry should be discouraged. The Clean Technology Centre has established a good balance between service to industry and conducting EU research projects.

The Food Product Development Centre can be cited as a model for those centres which seek to survive by offering a range of services to industry, including new product development, routine testing and analysis and consultancy advice. If, as in Sweden, this centre's performance in creating jobs in the Irish consumer foods industry were to be recognised with a grant of f10,000 per job, then it would be financially secure.

4. A number of centres, eg the Furniture Test Centre, the Materials (Construction) Test Centre and the Industrial Control Centre, provide valued services to local industry and enable their host institutions to maintain closer links with industry. The financial viability of these centres will depend, in the short term at least, on continued support from the host institution in terms of provision of subsidised accommodation, administrative services, and academic staff to work in the centre to provide essential quality control on the services and the results delivered to industrial clients.

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5. Host institutions should be aware of the legal liability involved with the provision of analysis, testing and design services to industry, and should put suitable arrangements, eg in relation to insurance, in place to deal with this. However, the best insurance against liability claims is an effective quality assurance scheme. Most of the Technology Centres do not have adequate quality systems in place.
6. Before new centres are approved, there should be more stringent and accurate market research and business modelling. New centres should build on the established expertise of the host institution and existing links with Irish industry. A commitment of a majority of the relevant academic staff to participate in the centre should be made and the budget must include the salary of a full-time centre manager.
7. Centres which focused on technology demonstration through the purchase of expensive advanced production equipment have performed poorly. Any new centres, based on this principle, should demonstrate in their business plan real commitment and support from the industry they seek to serve and provide an adequate full time team to demonstrate the equipment effectively.
8. The Boards of Management of the Technology Centres are too large and are ineffective. They should not attempt to manage but provide direction, vision and advice. They should be small, (6 to 8 people), with a majority of industrial members and with just one representative each from the host institution and a government agency. The centre manager should be a member of the Board.
9. New Technology Centres should be encouraged which would assist the service industries, eg tourism and retail and distribution. The service industries are increasingly major users of new and improved technology but companies, especially small to medium enterprises in those industries, lack the resources to evaluate new technology. Technology Centres in these sectors could provide valuable and cost-effective comparative evaluation services by accessing a world-wide network of experts and early users of the new technologies.

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BACKGROUND AND INTRODUCTION

An evaluation has been conducted on the Technology Centre Programme by Quo-Tec Limited, an independent consultancy. The Programme commenced in 1991 and at the start of this evaluation, there were 17 centres in operation (two of these have recently been transferred from the programme into the private sector).

The Technology Centres, most of which are based at Regional Technology Colleges, provide a mixture of analysis, testing, consultancy and training services in a particular area of technology. Their establishment has been funded by an initiative from the Office of Science and Technology (OST) at the Department of Enterprise and Employment, with support from the European Regional Development Fund (ERDF).

The methodology employed to conduct this evaluation has included:

- An in-depth review of four centres:
 - The Food Product Development Centre (DIT Dublin)
 - The Clean Technology Centre (RTC Cork)
 - The Centre for Surface & Interface Analysis (RTC Cork)
 - The Finger Jointing Centre (Forbairt Glasnevin)under a contract commissioned by Forbairt to run in parallel with the overall review of the Technology Centre Programme.
- A visit to 12 of the 17 centres and discussions with centre personnel.
- Analysis of evaluation reports by other consultants on the centres not reviewed in depth by Quo-Tec.
- Discussions with clients of the centres.
- Discussions with the Director of the Cork RTC and the President of the Dublin Institute of Technology, which between them host seven of the Centres.
- Examination of financial documents and business plans for each of the centres which have generated such documents.
- Discussions with members of the Board of Management of four of the centres.
- A workshop in Dublin to discuss the Findings and Recommendations of this evaluation.

For each of the centres reviewed in-depth, Quo-Tec employed an expert in the technology concerned to provide greater insight into the competence of the centre and the quality of the services being delivered. In addition the programme has been reviewed by an expert from Sweden, Goran Reitberger, who has extensive experience of a similar, but more extensive, Technology Centre Programme in Sweden.

This report describes the findings of the evaluation and gives recommendations for the future direction of the Technology Centre Programme.

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THE TECHNOLOGY CENTRE PROGRAMME

AIMS AND OBJECTIVES

The aims and objectives of the Technology Centre Programme can be summarised as follows:

1. To support the development of campus-based centres which will provide technology services to Irish industry.
2. To foster a closer relationship between third level institutions, in particular Regional Technology Centres (RTCs) and local industry.
3. To transfer appropriate modern technologies and techniques from RTCs to local industry and thereby improve competitiveness, generate new business and create jobs.
4. To encourage the Technology Centres providing these services to become financially self-supporting and, where appropriate, become spin-off companies.

Hence the Technology Centres have a dual remit:

- to assist Irish industry with the uptake of appropriate modern technology;
- to be, ultimately, self-supporting financially.

MODE OF OPERATION

The programme was initiated, and continues to operate, by inviting third level institutions to submit proposals for funds for the establishment of Technology Centres which focus on a particular technology of relevance to Irish industry and, in particular, local industry. The funding may be applied to the recruitment of centre staff, the purchase of necessary equipment and the provision of essential support services and facilities. Funding is normally provided for three years of operation of the proposed centre and thereafter the centre is expected to survive on the income from services rendered.

Most of the centres which have been established have a small number of staff (some have no full time staff). Each centre has a Board of Management drawn, in most cases, from the host institution, current and potential clients and representatives of Government Agencies.

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TECHNOLOGY CENTRES – THE DIFFERENT TYPES AND THE SERVICES THEY OFFER

The seventeen technology centres reviewed are listed in Table 1, together with the services they offer.

The services include:

- New Product Development
- Testing and Analysis
- Consultancy
- Information Provision
- Training
- Contract Research for Irish Based Industry
- EU Research Project Participation
- Technology Demonstration
- Relationship with other Science & Technology support activities
- Summary

NEW PRODUCT DEVELOPMENT

New product development is an important activity for at least five of the centres. The Food Product Development Centre has been particularly successful in assisting Irish companies in the consumer prepared foods sector to develop new higher added value products from locally-sourced raw materials. One development alone has created 20 extra jobs for a client company in the West of Ireland.

New product design and development is claimed to be the main activity of the Product Development Unit in Dundalk, although its activities may more accurately be described as providing consultancy services to Irish companies developing new products. Its main area of expertise is in general electronic and electromechanical product design but it has assisted local industry with the development of a very wide range of products, including a steel sub-frame for a mobile home, a personal computer-based automatic door control system, a microprocessor-based control unit and a pipe cutter.

The Nautical Enterprise Centre has been successful in developing products in the form of software packages for traffic control and for freight scheduling for the marine and shipping sectors of Irish industry. The Industrial Control Centre has undertaken the development of prototype control systems for the chemical and food process industries.

National Avionics Ltd, in addition to developing products for clients under research contracts, is also intending to develop its own product range utilising its expertise in radio frequency data linking.

The role of the Tool Industry Research and Advisory Centre, (TIRAC), in product development is to offer advisory services and prototype toolmaking services to clients who are developing new products.

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Table 1: The Technology Centres and the services they offer

Services Provided								
Technology Centre	New Product Development	Testing & Analysis	Consultancy	Information Provision	Training	Contract Research for Irish industry	EU Research Projects	Technology Demonstration
National Avionics Ltd DIT*	●	●				●	●	
Tool Industry Research & Advisory Centre (TIRAC), Sligo RTC	●				●			●
Finger Jointing Centre, Forbairt					●			●
Food Product Development Centre, DIT	●	●	●	●	●			
Product Development Unit, Dundalk RTC	●		●					
Clean Technology Centre, Cork RTC		●	●	●			●	
Knitwear CAD/CAM Centre, Limerick RTC					●			●
Quality Assurance Laboratory, Letterkenny RTC**		●						
Medisolve Ltd (formerly bioengineering Research Centre) UCD/TCD***	●		●	●				
Materials (Construction) Test Centre, Letterkenny RTC		●						
Centre for Surface and Interface Analysis (CSIA), Cork RTC		●					●	
Nautical Enterprise Centre, Cork RTC	●		●					
Centre for Advanced Manufacturing & Management Systems (CAMMS), Cork RTC					●			
Irish National Centre for Bioinformatics, TCD			●	●				
Industrial Control Centre, DIT	●				●			
Wood Technology Centre, University of Limerick					●			●
Furniture Test Centre, University of Limerick		●						

Key:

- *** = Intended services – centre only recently set up.
- ** = Now operated by a private sector
- * = Recently converted to a limited liability company

RTC = Regional Technical Centre

DIT = Dublin Institute of Technology

MediSolve Ltd (formerly the Bioengineering Research Centre) which has been established as a joint venture company owned by University College Dublin and Trinity College Dublin, is intending to develop products and to offer product development advisory services.

In summary, it can be said that the provision of assistance to Irish manufacturing companies to create new products should be one of the most effective ways in which the Technology Centres can fulfil their remit and generate new manufacturing jobs in Ireland.

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TESTING AND ANALYSIS

Technical Colleges and Universities in many countries are offering testing and analysis services on an ad-hoc basis to local industry. The Technology Centres specialising in such services are an attempt to establish the relationship on a more commercial footing.

The Food Product Development Centre now has an established business in food taste testing panels.

The Clean Technology Centre conducts mass balance and solvent emission analyses for its clients in the pharmaceutical industry, but does not regard the activity as core business.

Testing is the core business of the Furniture Test Centre, the Materials (Construction) Test Centre and the Quality Assurance Laboratory' (fish testing).

CONSULTANCY

A number of centres attempted to earn income from consultancy, but in practice it has proved very difficult to persuade Irish industry to pay for advice. The Clean Technology Centre is one of the more successful in this area. Their consultancy service is closely linked to the supply of high quality information.

INFORMATION PROVISION

Information provision is the raison d'etre of the Irish National Centre for Bioinformatics (INCBI). The INCBI is the Irish node of the European Molecular Biology Network (EMBnet) which consists of 25 linked information providers in 19 European countries. The centre offers Irish companies and research organisations access to databases of biological sequences of proteins and nucleic acids. This information, which is increasing in volume every rapidly, is a vital input to successful research in the pharmaceutical, biotechnological and medical sectors. To date the main clients for this service have been the universities.

The Clean Technology Centre established its reputation by producing high quality multiclient reports on topics of interest to its members who pay an annual subscription fee which has been raised progressively from f7,000 to f10,000 during its three years of operation. These reports have recently been discontinued in favour of more client-specific services. Information provision is still an important part of its services to members, including access to the important databases.

TRAINING

Provision of training was the sole activity of the Centre for Advanced Manufacturing and Management Systems (CAMMS). The Industrial Control Centre envisaged that training would provide a significant proportion of their income, but in practice this has not materialised due to competition from hardware suppliers who include the cost of training in the price of the system.

The Tool Industry Research and Advisory Centre (TIRAC) and the Knitwear CAD/CAM Centre have provided courses in the use of the advanced equipment owned by these centres. The level of income is very small.

The Food Product Development Centre, in addition to running food product tasting panels, also provides training in the setting up and operation of these panels.

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CONTRACT RESEARCH FOR IRISH BASED INDUSTRY

Contract research for Irish industry is regarded as a principal activity of the PATs (Programmes in Advanced Technology). Three centres have conducted research in the form of new product identification and development.

EU RESEARCH PROJECT PARTICIPATION

The participation of a number of centres in EU research activity has been undertaken to generate income and to thereby achieve economic viability.

Participation in EU projects does have a number of other benefits, namely:

- The ability to retain high quality staff who can then be available to work with Irish based industry on other projects.
- The recognition and enriching contacts with other countries enjoyed by the host institution.

EU contracts also provide very large sources of money for much less management time when compared to attempting to generate a similar income from a large number of small jobs for local industry.

EU-funded research contracts are probably essential for the survival of some centres (eg Centre for Surface and Interface Analysis, the newly-formed National Avionics Ltd and the Clean Technology Centre). This activity should not be permitted to dominate a centre's activities, but it would not be reasonable to ask the centres to become economically viable and at the same time stop them pursuing a valuable source of funding, even if there is not always a direct benefit from these research projects for Irish industry. The involvement of some centres in EU-funded contracts is a reflection of the pressures on them to become self-financing over a short timescale.

One centre, the Food Product Development Centre, has almost achieved economic viability without EU project funding.

TECHNOLOGY DEMONSTRATION

Five centres have chosen to devote a substantial proportion of their funding to the purchase of plant and equipment which is technologically in advance of that possessed by Irish industry. These are:

- Tool Industry Research and Advisory Centre
- Finger Jointing Centre
- Knitwear CAD/CAM Centre
- Centre for Surface and Interface Analysis (CSIA)
- Wood Technology Centre

The purpose of the investment is to be able to demonstrate the manufacturing equipment and allow Irish industry to assess the benefits before committing to similar investments.

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RELATIONSHIP WITH OTHER SCIENCE & TECHNOLOGY SUPPORT ACTIVITIES

The Technology Centre Programme is just one of a number of programmes designed to assist industry in Ireland to be more competitive through the exploitation of new and improved technology. Other programmes include:

- The Programmes in Advanced Technology (PATs).
- Technical services offered by Forbairt, eg from the Industrial Materials Programme.
- Feasibility Study Grants for the Evaluation of New Manufacturing Processes.
- The Technology Audit Scheme.
- The Techstart Scheme which allows smaller companies who employ technical graduates to obtain a contribution to the salary costs in the first year.

While contract research for industry is included in the possible services which Technology Centres could provide, it is not one of their primary functions. This is the remit of the PATs, although there is, as yet, no PAT which addresses Clean Technology, Avionics, Toolmaking, Wood Technology, Surface Engineering or Bioengineering. Hence some of the Technology Centres could, in theory, have applied to become PATs.

The technical services offered by the Forbairt Industrial Materials Programme in the areas of metallurgy, corrosion, ceramics, coatings technology and non-destructive testing (NDT), should make the formation of Technology Centres focusing on these technologies unnecessary unless a very strong case can be made for a local service in an area remote from Dublin.

The feasibility study grants for the evaluation of new manufacturing processes, etc. should provide the Technology Centres with a mechanism for helping local industry, ie the centres could assist industry to conduct these studies. The same could be said of the Technology Audit Scheme.

In comparison with the Techstart Scheme, the Technology Centres should be able to provide companies with much wider and deeper access to new and improved technology. However, the value, particularly in terms of technology transfer, of having a well-qualified technical graduate full-time within a company, and thereby with a better opportunity of assessing that company's need for new technology, should not be underestimated.

State research organisations are focused on world class research in, for example, agriculture, food and health care. The Technology Centres operating in or on the fringes of these subject areas, eg the Food Product Development Centre and MediSolve Ltd (formerly the Bioengineering Research Centre) have good links with these state research organisations, and do not attempt to duplicate their activities.

SUMMARY

It can be seen that most of the 17 centres have engaged in a range of activities and different combinations of activities in an attempt to fulfil their dual remit of assisting Irish industry with new and improved technology and achieving economic viability. Their performance, the successes and failures are analysed in the next section. There does not appear to be any significant duplication of effort or intended function between the Technology Centre Programme and other S&T support activities.

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ANALYSIS OF THE PERFORMANCE OF THE TECHNOLOGY CENTRES

OVERVIEW

The analysis of the performance of the 17 centres has been carried out with reference to:

1. recent in-depth evaluation reports conducted by consultants (including the four carried out by the authors of this report);
2. discussions with clients of the centres;
3. a review of financial statements of income and expenditure (where available).

The performance of the centres is very varied. While no centre has yet proved its economic viability, three are very close to doing so, including payment for accommodation and administrative services. These are:

- The Food Product Development Centre
- The Clean Technology Centre, and
- National Avionics Ltd

An important factor in the success of these three centres was the employment of very able full-time centre managers who have first hand experience of the industry sectors they seek to serve.

Centres which have been run on a part-time basis by staff members of the host institutions have had little or no success.

Centres which employed their grants to buy advanced equipment have struggled to attract significant interest from Irish industry. This calls into question the quality of the market research which preceded the grant applications. Too many of the centres appear to rely on questionnaires and mail shots rather than face-to-face market research interviews which are much more accurate and informative, especially when carried out by people who understand the technology which is on offer.

The Board of Management (The Board of Directors would be more appropriate) of most of the centres is too large. There are too many nominees or representatives (particularly of the host institution and governmental bodies) and too few industrialists, who could give direction to the centre, but not management. This should be the responsibility of a full-time Centre Manager. Steps have already been taken to ensure that industry-driven advisory boards are put in place. Guidelines on the functions, membership and operations of advisory boards are now part of the contract for all new centres.

The two remits of the centres to help Irish industry adopt new and improved technology and to become economically viable can be in conflict and success should be judged against several criteria, of which financial viability is one, but not the only one. The others are job creation in Irish industry and the provision of essential infrastructure services.

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THE SUCCESSES

The Food Product Development Centre is a model performer in that it has served Irish industry, created new jobs in the industry and is close to economic viability. A major factor in the success of the centre is the clever combination of the creative skills of the chefs who work in the college (and in restaurants in Dublin) with the underpinning food science of the centre staff to create high quality, consumer prepared foods.

The centre has an impressive record of repeat business from satisfied clients for a range of services. 15 customers have placed at least three contracts each – 12 of those have used the FPDC for more than one year. The customer statistics indicate that every second new customer will come back within a two year period. A small increase in the product development business, which has considerable scope for attracting new clients, would permit the centre break even financially.

To grow and trade profitably, the centre needs to employ more staff but this would increase costs ahead of increased income. This dilemma is faced by all small businesses which attempt to grow without the benefit of external financial backing.

It should be noted that if the Food Product Development Centre were to be operating in Sweden it would have received f10,000 for each of the jobs it has created in industry. Hence, for one of its projects, it would have received f200,000. This would have provided the necessary capital reserves from which to grow.

The Clean Technology Centre is also a success story. It has provided valuable services to the locally-based pharmaceutical production and chemical process companies and established an international reputation which has helped with EU research contracts.

Operation of the Erasmus Scheme (mature students from Continental Europe who are attached to the centre and seconded to local industry to conduct specific investigations) has been particularly successful and much appreciated by the industrial companies.

The centre is very close to economic viability and the mix of service to industry and EU research income should provide the basis for growth and stability.

National Avionics Ltd has successfully transformed itself into a limited liability company (wholly owned by the Dublin Institute of Technology) which employs 17 people.

The avionics sector in which it operates is an intensely competitive one, dominated by multinationals. However, National Avionics Ltd. identified a niche in the market for radio frequency data-linking expertise and has attracted collaborative EU contracts with major players such as Aerospatiale.

Market forces and profitable growth will be the ultimate determinants of success. National Avionics Ltd. will need commercial freedom of action, highly motivated promoters and the scope, in time, to attract outside capital in order to achieve success. The company should now be moved on to the same basis as other campus companies which generally involves the promoters holding the majority shareholding and the college having a stake amounting to about 15%.

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THE PROBLEMS

The problems faced by the Technology Centres will be analysed and discussed under the following headings:

- Markets, market research and marketing
- Management and boards of management
- Involvement of the host institutions
- Sales, income generation and finance

Markets, Market Research and Marketing

A failure to identify and capture an economically viable market for their services is the largest and most frequent problem encountered by the Technology Centres. There are many reasons for this failure:

- Some of the centre managers claim to be too busy running the centre to go out and develop the market.
- The local market may well be very small.
- Marketing has been passive and ineffective, being based largely on questionnaires and mail-shots.
- Low or zero cost competition for similar services especially the provision of training included in the cost of hardware or software purchase.
- Services dependent on advanced equipment which failed to stimulate the interest of the local market.

To attempt to remedy the problems some of the centres have been awarded additional grants to recruit staff to undertake marketing or to allow the centre managers to spend more time on marketing. Forbairt has also allocated funding for the employment of consultants to conduct market research.

While these additional resources may prove successful, it is worth recalling the ingredients for success of small start-up businesses:

- Most small businesses are started by entrepreneurial individuals who already have an instinctive knowledge of their markets.
- This knowledge has usually been acquired by working for an organisation already in the business.
- The founder of the business is often the best salesperson for the services offered and very few small businesses can afford the overhead cost of a full-time sales/marketing person.

Some of the centres have these ingredients for success. Some of the centre managers were previously employed in the industries to which they now seek to provide services and understand the market very well. For some other centres, which do not have this advantage, it is improbable that additional funding for market research or marketing provided by a third party will compensate and make the difference between success or failure.

Better market research, based on face-to-face interviews with prospective clients, should be a prerequisite for the establishment of new Technology Centres.

Management and Boards of Management

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The quantity and quality of the management of the Technology Centres are the next most important factors (after the market) which have determined success or failure of a centre. Those centres which in their original budget applications did not include provision for the salary of a full-time manager have not achieved the income or growth in income which had been forecast. This is hardly surprising as it is well known that all successful start-up businesses rely on a very intensive time commitment (much more than normal working hours) by the founders.

It is therefore recommended that no new centres are approved unless there is provision in the budget for the employment of a full-time centre manager.

Ideally, the centre manager should be recruited from the industry the centre seeks to serve. Alternatively, if a member of the host institution takes on the role, then previous experience of the industry, either through employment or a proven track record of working successfully with the industry, is recommended. An example of the latter approach is the Clean Technology Centre where the Manager, who was employed in the chemical process industry before becoming a full-time member of the Department of Chemical Engineering at Cork RTC, seconded himself to the centre and then employed the income to the centre to fund the salary of staff to cover his lecturing responsibilities.

The Centre Manager must perform the following functions:

- Interface with the clients
- Interface with the host institutions
- Provide financial management and planning
- Be responsible for quality control
- Manage personnel
- Market the centre

In addition to all of these functions, the Manager must also be directly involved in the provision of income-earning services, ie they must earn their keep directly. Clearly only very able and dedicated individuals can perform all of these functions. Centre Managers should be offered performance-related, two-year renewable contracts.

The so-called Boards of Management of the Technology Centres have, for the most part, been too large and ineffective.

Boards of Management should be formed following the guidelines recently agreed by the Forbairt Science and Technology Development Committee, ie a maximum of 10 board members; the chairperson should be from industry, preferably from the main sector served by the centre, and representation ideally should be a minimum of three industry nominees, a maximum of three college nominees and a maximum of two Forbairt representatives. It should be noted that these are only guidelines and most boards should be smaller.

The term 'Board of Management' is in fact a misnomer. The centre has to be managed by the Centre Manager. A board which meets quarterly or even monthly cannot manage. The board can give direction, vision, help define future strategies and give advice on investment decisions, marketing campaigns, new services, etc. To perform these roles effectively, the members of the board must understand the technologies on which the centre is based and the industries they seek to serve. In this respect board members from industry are more likely to be effective than full-time academics or government employees. If representatives or nominees from these backgrounds dominate the board membership the influence of the industrialists will be diluted.

The industrialists may or may not be customers for the services provided by the centre. They should certainly not feel any obligation to provide custom for the centre, nor should they be denied the services of the centre.

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It is therefore recommended that the boards of existing centres are reconstituted to include no more than one representative of the host institution, one representative from government agencies and the remainder to be drawn from industry. The Centre Manager should also be a member of the board. The boards should be renamed Boards of Directors.

Relationship with Host Institution

The ideal relationship between the host institution and the Technology Centres may be defined as follows:

1. The centre should be a natural extension of activities already being conducted by the host institution.
2. The centre should build on the established expertise of the college and an established relationship with local industry.
3. The centre should benefit from the expertise and support of the host institution for administration, personnel and financial services.
4. Teaching staff at the college should provide support to local industry more effectively through the centre than dealing directly on an ad-hoc basis.

In practice, this ideal relationship has almost never been achieved. Even the successful centres have found difficulty in involving the academic staff in their activities. The reasons given for this lack of involvement include:

- Distrust of, or lack of interest in, 'commercial activities'
- Lack of available time
- Preference for dealing directly with established industrial contacts
- Jealousy of the success of the centre in establishing a good relationship with industry

Another major problem which has afflicted some centres is the clash of cultures. Small businesses, which is essentially what some of the centres are trying to be, must be entrepreneurial and take quick decisions. Third level academic institutions are, quite properly, stable organisations with established procedures which are necessarily more bureaucratic than would be suitable for a small business. Accordingly, the centres which seek to develop into small businesses should be transferred into the ownership of their founder promoters with the colleges retaining about a 15% shareholding along the lines of normal campus company activity in Ireland. Many of the day-to-day problems in other centres could be solved if the centres were granted the following freedom and identity:

1. A separate bank account, albeit with a spending limit, to cover items such as courier charges, book purchase, caterers for small in-house meetings, etc.
2. A clear identity; ideally a separate dedicated building, but failing that, a front office where visitors could be received, without becoming entangled in the RTC Campus.

Some centres, which have an office in a separate location, have a clear identity and a very professional image.

At the Cork RTC, three of the centres have dedicated space on the campus.

It is recommended that for all future centres the host institution is required to demonstrate a proven track record of service to industry in the technology of the proposed centre. In addition, at least 50% of the staff working in that technological area should indicate, in writing, a positive commitment to the centre in terms of participation in consultancy and marketing.

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In addition, the host institution should indicate how it will assist the centre to have a clear identity and a measure of operational independence.

The benefits to the third level institution of hosting a technical centre should be:

- Enhanced prestige for the college
- More effective interaction with local industry
- Enrichment of the professional life of the college staff
- In some cases, access to modern equipment

If the centre is successful, the relationship with the host institution is normally harmonious and of mutual benefit. Problems arise when the centre becomes a drain on the financial resources of the college, or the clash of cultures becomes too great for either side to accommodate.

Finally, a most important issue, that of legal liability for the services offered by the Technology Centres, needs to be addressed. Most RTCs and other host institutions will carry liability insurance to cover injury to staff and students, for example for accidents in laboratories, but it is unlikely that these insurance policies cover liability for error or negligence in the provision of services through the Technology Centres.

Probably the most at risk are those providing testing and analysis services. In commercial laboratories, errors and subsequent legal action have caused the closure of some laboratories. Legal liability insurance covering these and other services such as technical consultancy can be expensive (eg £3,000 per year for coverage of up to £1 million), but is required by some clients before contracts can be placed.

The best insurance against liability claims is an effective quality assurance scheme. This means that all reports must be checked by at least two qualified personnel. Not all centres adopt this policy at present.

The formation of a limited liability company is another route to limiting the liability of the host institution, but this is not a substitute for inadequate quality systems.

Sales, Income Generation and Finance

None of the Technology Centres have so far generated sales/income from services provided to cover their running costs. The main reason for this shortfall between income and expenditure is a failure to achieve projected sales income. The underlying reasons are:

1. over-estimate of the likely sales;
2. undercharging for the services provided.

The over-estimate of the likely sales has been largely covered under Section 4.3.1 (Markets, Market Research and Marketing). Undercharging for services is evident at a number of centres. Consultancy rates as low as £150 a day were quoted by one centre. Several believe that £250/day is the upper limit which industry will pay. At the same time nearly all of the feedback from clients for the centres' services indicate, not surprisingly, a high level of satisfaction with the value for money.

A charge-out rate of between £400 and £500/day, which is at the lower end of the scale of commercial consultancy rates, should be the target recovery figure for the Technology Centres.

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In addition, daily charge rates should not be the determining factor in securing sales. The work to be done for the available budget should be the deciding factor.

The practice of charging a low price for the first job for a client, in the hope that the quality of the service will allow higher charges for subsequent jobs, which was advocated by several centre managers, should be actively discouraged. The 'sprat-to-catch-a-mackerel' method of securing sales is wholly discredited in the commercial world. Customers will expect the same value for money the second time and, if they do not receive it, will believe that they have been deceived and misled. A much better approach, if there is a low initial budget, is to lay out a menu of work, with extra tasks to be done on successful completion of the initial work, which is charged at the fully overheaded rate from the beginning of the contract.

Finance

The grants for each centre were intended as priming finance to allow the centres to acquire resources in the form of staff and/or equipment and to meet their early working capital needs. The objectives of the Technology Centres Programme – to utilise the expertise and facilities of the third level sector (notably the Regional Technical Colleges and DIT) to assist Irish industry to adopt competitive new and improved technologies – are not commercially motivated, and centres working to these objectives will not usually succeed as stand-alone, spin-off companies. There may be a small number of exceptions, referred to elsewhere, and these should be moved into the normal campus company category. It is worth noting that the small business experience in Ireland and elsewhere is that a high proportion of start-up small businesses fail while others struggle in their early years.

It is unrealistic to expect the Technology Centres, with a small number of exceptions, which should, in any event, be moved into the campus companies arena, to succeed as stand-alone, spin-off companies.

Centres, supported by their host institutions, should be required to achieve a break-even on marginal costs, ie salaries, promotional costs, travel, etc, and to make provision for future capital replacement. This implies ongoing support from the host institution in terms of overheads such as support services (computing, finance, etc) and accommodation.

It is unrealistic to expect the Technology Centres to succeed as stand-alone spin-off companies.

IMPACT ON CLIENT COMPANIES

There are a number of measures of the impact of the services of the Technology Centres on their client companies. These include:

- The creation of jobs as the result of new product generation

The Food Product Development Centre has been successful in creating jobs in client companies in this way. National Avionics Ltd, has created 17 jobs in its own company.

- The improvement of sales, profitability and/or increase in market share

In practice, it is very difficult to prove a direct correlation between the adoption of new or improved technology and an increase in turnover, profitability and/or market share,

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as so many other factors influence these measures of success. The only examples which were identified in this evaluation relate again to new product development for clients by the Food Product Development Centre.

- Reduction in Operating Costs

The Clean Technology Centre, the Industrial Control Centre, and the Nautical Enterprise Centre could claim to have made an impact on reducing their clients' operating costs.

- Transfer of Technology

The Clean Technology Centre has seen one of its key people move to a client company. This should be seen as an indicator of success.

It would be unfair to judge the impact of Technology Centres on their clients over too short a timescale. Many of the seeds sown by the work of the Technology Centres will take time to germinate and produce fruits in the form of the increased profitability or competitiveness of their clients. This would apply in particular to those centres which have provided training courses for their industrial clients, eg the Centre for Advanced Manufacturing and Management Systems.

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FINDINGS

- The main objective of the Technology Centre Programme, which is to utilise the expertise in the Regional Technical Colleges to assist local industry to adopt appropriate advanced technology, is sound and imaginative. Several countries have tried similar programmes; none has yet succeeded. One reason for the lack of success is the dual objective (also set by other countries) that the Technology Centres must become economically self-sufficient within a limited time period. In comparison, the Technology Centre Programme is relatively successful.
- The aim of creating spin-off (campus) companies from the Technology Centre Programme is unrealistic and probably irrelevant. Centres, supported by their host institutions, should be required to achieve a break-even on marginal costs, ie salaries, promotional costs, travel, etc, and to make provision for future capital replacement. This implies ongoing support from the host institution in terms of overheads such as support services (computing, finance, etc) and accommodation, and the provision of legal liability insurance for the services offered.
- The centres which seek to develop into small businesses should be transferred into the ownership of their founder promoters and other investors, with the colleges retaining minority shareholding. A figure of 10-15% of the equity to be retained by the college has been suggested.
- Of the 17 Technology Centres reviewed, three are close to economic viability and significantly, all have had full-time Centre Managers throughout their existence.
 - National Avionics Ltd has become a limited liability company wholly owned by the Dublin Institute of Technology. Services to local industry are unlikely to form a significant part of its business, but it has created 17 jobs. The market place will decide its success.
 - The Food Product Development Centre is a model centre. It has created jobs in Irish companies which are clients for its services and is almost self-sufficient on its income from services without recourse to EU research funding.
 - The Clean Technology Centre has established a loyal and appreciative clientele in Irish-based chemical and pharmaceutical companies, and with the income from its EU research contracts, has become almost self-sufficient.
- One centre, the Quality Assurance Laboratory (fish testing), has been taken over by the private sector and one centre, formerly known as the Bioengineering Research Centre, but now established as a limited company, Medisolve Ltd., has only just started trading.
- The Furniture Test Centre, now that it has achieved accreditation, can provide a valuable service to both the Irish office furniture industry and its customers.
- The Industrial Control Centre, if it continues to evolve a wider range of services for the chemical process industry (eg product development rather than training services), could provide support to industry and enhance the links between the industry and the Dublin Institute of Technology.
- The centres which chose to use their grants to purchase advanced equipment have spent relatively large amounts of money for a very small return in terms of income from services, or stimulating interest from Irish industry.

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- The main weaknesses of the centres which offer little or no prospect of economic viability appear to be:
 - Poor market research (especially for the centres which focused on the purchase of advanced equipment)
 - Inadequate marketing (reliance on questionnaires and mail shots rather than face-to-face meetings)
 - Poor management (by the Centre Managers and the so-called Boards of Management which in most cases are too large and are ineffective)
 - Inadequate demand for the services offered, irrespective of the marketing effort
 - Lack of involvement of the host institution staff.

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RECOMMENDATIONS

1. The Technology Centre Programme should continue but with more stringent review of the applications for new centres and changes in their mode of operation.
2. Detailed market research of the demand for the services to be offered should precede all new centre applications.
3. Centres should build on the established expertise of the host institutions and their existing links with industry, and include the involvement of a majority of the relevant academic staff. One or two-person bands are very unlikely to be successful.
4. Boards of Management should be replaced over time by Boards of Directors. These Boards should be small: a maximum of 6 to 8 people with a majority drawn from industry. Representatives of the host institution and government agencies should be restricted to one each. The Centre Manager should be on the Board. All new centres must budget for a full-time manager.
5. It is not considered necessary for a representative of Forbairt to sit on the Board of a centre. It is recommended that Forbairt liaise on a regular basis with the Industrial Liaison Officer, or the Director of the host institution and receive regular financial reports on the performance of the centre. Performance should be reviewed annually by Forbairt and centres closed after just one year if they are significantly below their planned performance. Impact on industry, particularly job creation, should be rewarded with additional grants in the year the jobs are created. Financial self-sufficiency in three years is an over-simplistic criterion and should be scrapped.
6. Centres which aspire to become independent, profitable limited liability companies should seek investment from a range of sources to enhance growth prospects and reduce the exposure of the host institution, but in the first instance should be transferred into the ownership of their founder promoters. The host institution should hold a minority stake. A figure of 10 to 15% of the equity has been suggested.
7. Particular encouragement should be given to the establishment of Technology Centres which would support the service industries as these have become, or could become, very significant users of new technology. The main candidates are:
 - Technology for Tourism Centre
 - Technology for Retail and Distribution Services

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APPENDIX – OVERSEAS COMPARISONS

Several countries have, or have had, programmes with goals similar to the Technology Centre Programme.

SWEDEN - The Technology Centre Movement

At the beginning of the eighties, in order to help SMEs combat the perceived threat from new production technologies, the government decided to establish Technology Centres, TCs. In these, SMEs could use expensive equipment, get consultancy assistance and access to education.

In 1983-85, a government commission described the local experiments with TCs in a favourable way and argued for a spread of the TC idea. In a governmental bill, guidelines for the establishment of TCs were given in detail and this produced a flood of applications for government support based on the 'model' and prerequisites.

In two years almost 100 TCs were established, or planned. The proposed investments in computers, CAD/CAM and other expensive equipment, and in new buildings amounted to hundreds of millions SKR.

There was a widespread belief that SMEs would constitute a fast-growing market for the services given and that operations would be self-financing within three years.

However, investigations to identify and assess the real demand were rare, nor were there any penetrating discussions about the fundamental problems associated with resource-sharing, to mixing college teaching with consultancy operations or to the problem of using taxpayer's money to build up 'engineering service firms'.

Very soon the pioneer TCs revealed many problem areas. The TCs were not able to establish links with the research system and, more importantly, the demand from SMEs was much less than supposed. Much of the expensive equipment was barely used except for educational purposes.

An investigation ordered by the Department of Industry, and other investigations, produced about 30 penetrating case studies. The vast majority of these studies found the TCs studied to be failures.

By 1991, many of the started, and almost all of the planned TCs, were closed down. Remaining TCs are either firmly tied to the needs of a college, or transformed into service businesses operating strictly commercially.

GERMANY - The Steinbeis Institute

The Steinbeis Institute in Stuttgart is the hub of a network of technology centres based at local technical high schools in the Baden-Wurttemberg area of Germany. Over 130 technical high schools are included in the network covering subjects as diverse as foundry technology, computing, microelectronics and psychology. The universities in the Baden-Wurttemberg region have, for the most part, declined to participate.

The main purpose of the Steinbeis Institute is to encourage technology transfer between the technical high schools and local industry. In theory, a potential client can access the network via the small central organisation (just three people – one a secondee from National Service in France). In practice, Quo-Tec found, on a collaborative project, that the Steinbeis Institute had no power to control the quality of the output, or the meeting of deadlines from the

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professors and other members of staff of the technical high schools who had agreed to participate.

One successful service is the secondment of graduate students from the colleges to industry to conduct specific studies. For example, a student from the Mosbach Technical High School was seconded to August Lapple in Heilbron (a local press tool-making company) to conduct an environmental impact audit (cf the Erasmus students who work in Irish companies under the scheme organised by the Clean Technology Centre in Cork).

In practice the technical high schools can, and do, deal directly with local industry and the role of the Steinbeis Institute is, at best, that of a co-ordinator and catalyst, and at worst redundant.

AUSTRALIA - The CRC Programme

The Australian Co-operative Research Centre (CRC) Programme was established in the late 1980s with the following objectives:

- To encourage collaboration between research and technology institutions and avoid fragmentation of effort and expertise and wasteful duplication of facilities
- To close the gap between RED in Government (and university laboratories) and R&D in industry

Although the programme uses the term 'Research Centres', in fact the centres which have been set up resemble a mixture of the PATs and Technology Centres in Ireland, in terms of the range of their activities. It was envisaged that the Co-operative Research Centre which involves collaboration between several academic centres of excellence, industrial companies and the CSIRO would evolve into financially self-supporting limited liability companies.

Sixty-seven centres based at universities and government laboratories have been set up with an annual funding of A\$150 million (approximately IRf75 million). Funding is guaranteed for 7 years (in some cases this is to be extended to 11 years) and thereafter it was hoped that centres would survive on income from industry and other R&D funding sources.

A recent expansion of the CRC Programme resulted in the creation of 5 new CRCs (included in the 67 above) on the following topics:

- Advanced Engineering
- Sports Science and Technology
- Intelligent Transport Systems
- Textile Technology
- Building Construction Technology

– an unusual mixture of the vague and highly specific.

The Australian Government believe that the CRC scheme is a success and have therefore supported its expansion. A number of reviews have been conducted which reflect conflicting views. Some centres, particularly those closely related to a world-famous centre of expertise, eg the CRC for Cochlear Implant, Speech and Hearing Research, are rated as successful by their industrial partners.

The large majority are unlikely to become limited liability companies and the CSIRO have decided not to become shareholders in any companies which are created.

Most of the problems and complaints come from the industrial partners who have experienced feuds between academics from different universities participating in the same centre, and

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excessive logistic problems in co-ordinating the activities of several participants who are separated geographically by thousands of kilometres.

In summary, it can be said that while the objectives of the CRC Programme have much to commend themselves to other countries looking to achieve greater benefit for Government-funded science and technology and less wasteful duplication of effort and facilities, the manifestation in the form of Co-operative Research Centres is not yet seen as a model to be emulated. Perhaps the most serious indictment of the programme is that the core participants in the CRCs have effectively excluded the participation of SMEs, either deliberately or through the excessive demands on management time.

UK - Regional Technology Centre Programme

In the UK in the late 1980s, 12 regional technology centres were established with support from DTI. The contracts to operate these centres were awarded through a competitive tendering process which resulted in a variety of host organisations. These included consultancies, technical colleges and research organisations. The centres were given the same dual remit as the Irish Technology Centre Programme, ie to help local industry adopt appropriate modern technology and to achieve financial self-sufficiency.

The Regional Technology Centres in the UK, driven by the need to make money, have taken on a range of income-earning activities: conference organisation, EU research consortium management, consultancy in competition with commercial companies. Their relevance to local industry is marginal and incidental.

Summary

In summary, it can be said that no country has yet achieved a successful formula for operating Regional Technology Centres which help local industry and be financially self-supporting. The performance of the Technology Centre Programme in Ireland is, in fact, more successful than any of the comparable overseas programmes described above.