

## **Evaluation of the Advanced Manufacturing Technology Programme**

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### **SUMMARY**

In 1992, at the request of the Department of Enterprise and Employment, Technopolis Ltd conducted an external evaluation of AMT Ireland – one of the oldest of the Programmes in Advanced Technology.

The evaluation concluded that AMT Ireland was performing an important role in national industrial development by providing technology transfer and consultancy services in Advanced Manufacturing Technology to both indigenous firms and to multinationals located in Ireland. The programme had successfully built up a team of thirty people across Ireland providing a useful service to increase the technological capabilities of industry.

The technological quality of the work done by AMT Ireland was solid, and performance was rising over time. Users of the programme were generally satisfied with the technical aspects of the service they received and intended to use the programme again.

At the time of our review, however, many of the commercial disciplines needed for AMT Ireland to operate efficiently were weak. The bulk of our recommendations dealt with ways to improve these disciplines, and during the year following the evaluation needed improvements were put into place. AMT Ireland was thereafter able to increase its revenues significantly and to move towards the cost-recovery goals laid down for it by the Department of Enterprise and Employment.

AMT Ireland's activities divide between services for which it is developing a market and actions to deal with market failure. Where the programme is selling projects to capable buyers who can make rational investment decisions about technology, there is every reason to charge economic prices. However, AMT Ireland activities such as generating awareness or dealing with small companies which lack the means or the capability to diagnose their own technology needs should be subsidised. The present across-the-board subsidy regime fails to distinguish between these two categories and therefore encourages the programme to serve those who need it least. State funding should be more specifically channelled towards the areas of market failure.

Today, AMT Ireland is successfully serving companies in the Irish engineering and food sectors, and is beginning to win business abroad. Cost recovery has passed the 50% mark, and continues to rise. One small company has been spun off, and at least one more is likely to be created. The programme is working with growth firms to help expand capabilities, employment and wealth.

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## INTRODUCTION

AMT Ireland was established in 1988 as a programme intended to promote industrial development by transferring Advanced Manufacturing Technology (AMT) capabilities from university-based centres into Irish-based industry. In 1990, it became one of several Programmes in Advanced Technology (PATs), receiving support from European Structural Funds in addition to national money.

This report summarises the evaluation we undertook of AMT Ireland in 1992 and the progress subsequently made by the programme in fulfilling its mission. Our brief to evaluate AMT Ireland covered

- (a) the appropriateness for Ireland of the niche technology areas in which it is involved
- (b) the suitability of its current objectives, and the extent to which they are being met
- (c) the efficiency and effectiveness of its management structure, operating procedures and marketing methods
- (d) the scientific, technical and commercial merit of the work being undertaken
- (e) the extent of industry involvement in the programme's activities
- (f) its current and potential impact on industrial development in Ireland

We assembled an interdisciplinary team with experience in technology programme evaluation, AMT technologies, business and programme management in order to fulfil our brief, and worked in five stages ahead of delivering a final report

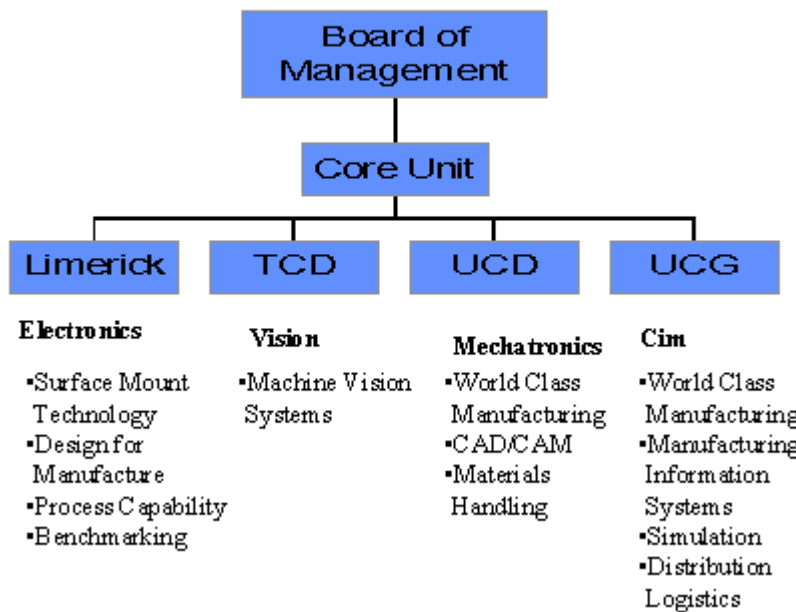
- Reviewed Irish industrial and policy needs in AMT
- Conducted a peer review of 58 projects at the AMT centres
- Interviewed 34 customers of the programme
- Audited management processes
- Reviewed our findings with AMT Ireland management

In 1993, we returned to monitor the implementation of our recommendations and the subsequent progress of the programme. We believe that this process of evaluation and follow-up has been among the major factors leading to the significant improvements in programme performance. It reinforces our faith in so-called 'formative' evaluation, where the job of the evaluator is not merely to award marks for performance, like an Olympic judge, but to intervene to help improve performance, like a sports coach.

### AMT IRELAND

At the time of our review, AMT Ireland employed some 30 people. The total has now risen to 50. The programme comprises a Core Unit at Forbairt in Dublin and four university-based AMT Centres (Exhibit 1). Each has a Centre Manager and a number of engineers, engaged in AMT technology transfer projects: consultancy and/or training courses for industry.

### AMT Ireland Organisation



Every Centre also has an academic Director who is already a Head of Department or Director of a Research Unit in the University. These Directors provide the intellectual link with the university and oversee any research done. They are not paid by the programme but AMT Ireland funds a small amount of strategic research in their areas.

The programme has been governed by a Board comprising industrialists and officials. This Board played an important role in guiding the programme's development.

The overall goal laid down for the PATs was "to develop new technology in selected niche areas and transfer it to industry." However, in practice AMT Ireland functions as an 'industrial extension service.' Its mission was "to support the Advanced Manufacturing Technology needs of industry in Ireland, having as its main focus the transfer of technology to SMEs."

Like all the PATs, AMT Ireland has a target of moving from substantial dependence on State money to become largely self-financing. Government subsidy is set to be below 50% after 5 years and below 20% after 7 years. This is a much more demanding financing pattern than is usual for equivalent programmes abroad.

### AMT IRELAND'S ROLE AND OBJECTIVES

AMT Ireland focuses on technologies central to modern manufacturing. This includes both 'soft' organisational technologies and 'hard' process technologies.

Strengthening manufacturing capability

- 1 The share of the agriculture-based sector in total employment will continue to fall because of a combination of rising productivity and the effects of the Common Agricultural Policy
- 2 The historical 'infant industry' policy of industrial development behind high tariff barriers left indigenous industry weak because it was sheltered from international levels of competition and the effects of new technology
- 3 While almost half of manufacturing employment is in subsidiaries of multinational companies, these firms tend to be 'footloose' and the cost (in grants and tax holidays) per job attracted is high – one of the factors underlying Ireland's combination of high personal taxation and high national debt

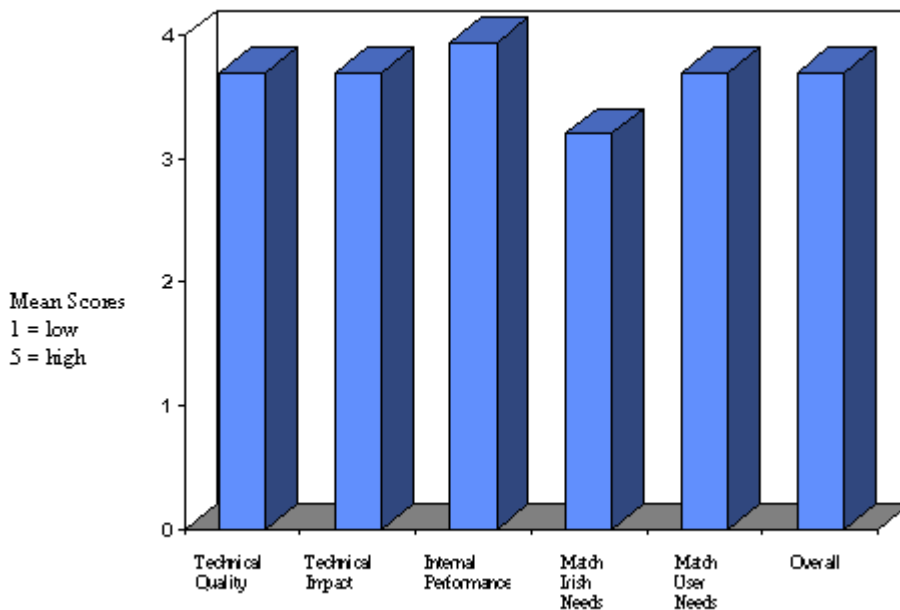
The Culliton Report reflected the growing agreement in Ireland that, while inward investment is important it cannot be a substitute for developing indigenous industrial capabilities. AMT Ireland aims to make a significant contribution to that development.

In practice, AMT Ireland serves both the multinational and indigenous sectors. At the time of our evaluation, each provided about half the programme's revenues. Serving the multinationals is useful for two reasons. First, the programme raises the quality of the 'technological service infrastructure' in Ireland, making inward investment more attractive and helping to root investors more firmly in the Irish economy. Second, the multinationals provide AMT Ireland with a reference point for the level of international technology, helping ensure the programme's capabilities are kept up to scratch.

However, the rising level of cost recovery required of the programme means that it must increasingly focus on the larger, more profitable projects which the multinationals provide rather than on smaller, less profitable projects for indigenous companies. The programme's cost-recovery objective therefore conflicts to some degree with its industrial development objective.

### SCIENTIFIC, TECHNICAL AND COMMERCIAL MERIT

Our team of technical peers reviewed 58 projects, both qualitatively and by allocating scores to each along five dimensions. The average scores (Exhibit 2) show that the technical quality and impact of the projects were good. Internal performance, which measures how well the projects were managed and executed in a technical sense, was the strongest dimension. The match between the projects and the generality of Irish needs was fair. This reflects a diverse set of technical specialisms in the Programme, some of which have wide application in Ireland while others are applicable only to a few advanced companies. The match to individual users' needs appeared good. Largely, then, projects were being done which were important for their customers, even if not all of these projects could subsequently be exploited across Irish industry generally.



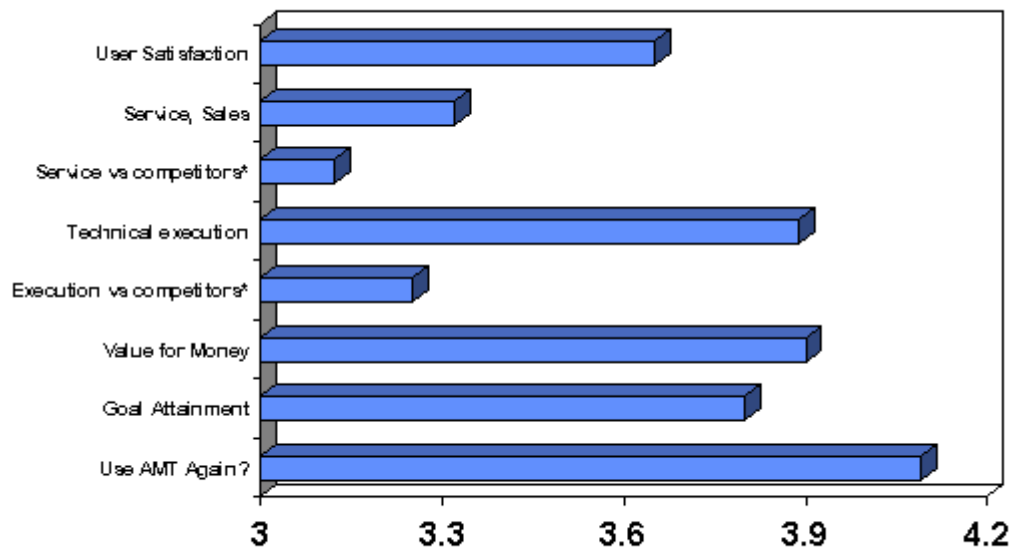
The 'Overall' scores represent our team's judgements about each project taken as a whole. The mean Overall score of 3.7 confirms the impression of solid work being done in the Programme. Disaggregating the scores over time shows a rising level of performance since 1990, indicating progress along a learning curve.

Interviews with users confirmed our impression that projects were generally useful. Multinationals valued the availability of AMT services in Ireland. Irish managers in multinationals felt the programme strengthened Ireland's position compared to alternative plant locations. Indigenous companies valued the glimpse of international best practice and the technology transfer and the technological learning the programme offered.

During the interviews, we asked users to rate AMT Ireland's performance in doing specific projects (Exhibit 3), again using a scale from 1 (low) to 5 (high). Technically, users were generally happy with projects and were likely to use AMT Ireland again. There was scope to improve the 'soft' side of the sales and customer service processes, and the programme has successfully done so in the succeeding period.

## Evaluation of the Advanced Manufacturing Technology Programme

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Basis: 34 users interviewed

\* Respondents' judgements about the performance of AMT Ireland compared with its competitors in terms of service and sales and in terms of technical execution.

### MANAGEMENT AND ORGANISATION

Running an industrial extension service from a university base involves a significant transition for the people involved. It was therefore not surprising that the business management processes needed to run something which functions rather like a consulting company were weak. We identified a rather long list of problems:

- Marketing, where insufficiently specific work had been done to identify and prioritise customer segments and orient the programme towards serving them
- Sales, where few commercial routines for identifying, tracking and managing customers were in use
- Management Information Systems, which did not provide a useful picture of costs or profitability at either the project or the programme level. A major problem was lack of adequate time recording which led management to overestimate capacity utilisation and to expand the staff too far ahead of demand
- Pricing was inconsistent and was not informed by experience of doing similar jobs
- Personnel, who despite their excellent technical qualifications were young and industrially inexperienced, with an insufficient leavening of senior engineers
- Procedures for proposing and contracting for projects which were insufficiently quality-controlled and standardised
- A Board with influence and a good understanding of technology and industrial needs, but whose non-executive character made it difficult to be effective

An additional factor was that Forbairt's Manufacturing Consultancy Service (MCS) and AMT Ireland were effectively competing for certain types of project. The two activities are logically complementary. In the period since the evaluation, they have begun to co-ordinate their activities more explicitly.

### RECOMMENDATIONS

Based on the evaluation of AMT Ireland, we made two categories of recommendations. First, we made a large number of detailed suggestions about how to improve operational aspects of the programme. Second, we suggested how the overall objectives and other 'rules of the game' should be adjusted in order to increase AMT Ireland's contribution to industrial development.

Our operational recommendations included:

- Clarifying the strategy of AMT Ireland through a process involving all the Centre Managers and Directors
- Focusing the technical practices on a smaller range of specialisms more appropriate to the target market
- Introducing commercial-style techniques for sales management, time management, management information and human resource management, including performance-based personnel appraisal
- Introducing and managing towards targets for capacity utilisation
- Reorienting recruitment to contain growth ahead of needs, and to introduce the needed industrial experience in each of the technology practices
- Tighter review of proposals combined with standard contracts and terms for Intellectual Property Rights
- Strengthening the role of the Board

Our recommendations about changing the 'rules of the game' were:

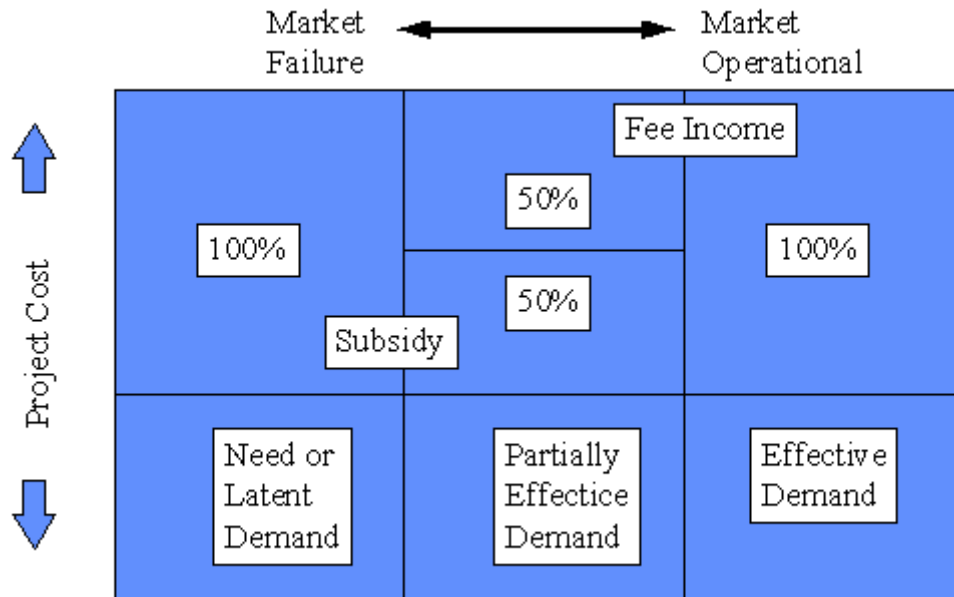
- AMT Ireland should take on the form of a limited company in order to acquire normal commercial management freedoms. The State should be the sole shareholder, but should agree to any reasonable management buy-out of parts of the company
- The overlap with MCS should be managed and exploited to improve the delivery capabilities of the two programmes
- The programme-wide cost recovery objective should be abandoned in favour of segmenting the business between full-cost projects and other work which the State should properly subsidise

The principles of segmenting the business for cost recovery are based on differentiating between activities where there is a market failure, and where it is therefore reasonable for the State to intervene in order to promote the creation of markets, and areas where the market works.

Exhibit 4 shows the spectrum of needs addressed by the programme and the degree to which AMT Ireland activities should be funded by subsidy or by users.



## Evaluation of the Advanced Manufacturing Technology Programme



Where there is only latent demand because potential users do not understand their own needs or the opportunities which technology can provide, the first task of AMT Ireland in promoting industrial development is to educate the users. This means awareness and demonstration projects, which should be wholly funded by the State. By their nature, there can be no market for these.

Where AMT Ireland is selling services to competent buyers – notably the multinationals and high-capability nationally-owned firms – who can make informed cost-benefit judgements, there is no argument for subsidy. Demand is effective. The market works. These projects should at least cover their costs. Smaller, indigenous companies tend to fall into the intermediate category, where they to some extent appreciate the value of improved technology but are unable or unwilling (through lack of experience of consulting) to pay the full price at present. Over time, these companies should be moving towards the category of 'effective demand'.

We recommended that the State subvention to AMT Ireland be disbursed on the basis of these activity categories. The present, undifferentiated programme-level subsidy has the perverse effect of motivating AMT Ireland to serve those who least need its help: the multinationals.

### **AMT IRELAND SINCE THE EVALUATION**

On revisiting AMT Ireland in 1993, we found the performance and the morale of the programme significantly improved. A revitalised Board had taken responsibility for the programme and was holding management accountable.

The programme management and the Board had used our report as a checklist, working their way through those of our recommendations it was within their power to implement. Improved management processes and procedures were in place. The management team had unambiguously 'taken ownership' of the programme and their place in it. The range of services offered by AMT Ireland was more focused and the understanding of actual and potential clients was improved. Revenues were up to about 250% of the previous year's, and there was every indication that the programme would reach its cost-recovery targets over the coming couple of years. In 1994, AMT Ireland went on to plan and execute a diversification from its engineering focus into serving the food processing industry's AMT needs.

Progress on changing the 'rules of the game' was, unsurprisingly, more limited. AMT Ireland itself had succeeded in securing more freedom in areas such as personnel management, and there is a realistic prospect that – in common with the other PATs – it will now acquire company status, while remaining within the State sector. Our recommendation to change the basis of State funding from across-the-board subsidy to specific payments for specific tasks had not been taken up at Departmental level. Internally, the programme had tried to move in this direction by setting different rate-of-return targets for different technological practices, depending on their maturity.

Today, AMT Ireland is successfully serving companies in the Irish engineering and food sectors, and is beginning to win (fully costed) business abroad. Cost recovery has passed the 50% mark, and continues to rise. The high levels of revenue generated have allowed AMT Ireland to fund its own internal R&D, creating the basis for additional types of client services. One small company has been spun off, and at least one more is likely to be created. The programme is working with growth firms to help expand capabilities, employment and wealth.

### **ACKNOWLEDGEMENTS**

We gratefully acknowledge the co-operation and support of AMT Ireland in the course of the evaluation on which this report is based. Throughout we have been guided by the Science and Technology Evaluation Unit, now located within Forfas. We owe especial thanks to Eugene Forde, Michael Fitzgibbon, Jim Cuddy and Brian O'Grady for kindly commenting on this summary.

The willingness of over forty people in industry to be interviewed in connection with the AMT Ireland evaluation is testimony to the perceived importance of the programme in Ireland. We hope we have done justice to the kindness of all the people who helped. If not, the fault is ours, not theirs.

### **TECHNOPOLIS EVALUATION TEAM**

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