Ireland's Information
Technology Skills Requirements

The First Report of the
Expert Group on Future Skills Needs

To the Tánaiste and Minister for
Enterprise, Trade and Employment
and to the Minister for Education
and Science

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Foreword by the Tánaiste and Minister for Enterprise, Trade and Employment

As Tánaiste and Minister for Enterprise, Trade and Employment, I welcome the First Report of the Expert Group on Future Skills Needs.

An adequate supply of the skills required by industry will be a key determinant of the future growth potential of the economy. It is a key policy requirement that skill needs, both in terms of numbers and type, are estimated and the correct policies put in place in sufficient time to ensure that the skills demands of the economy are met. This is no easy task, as the supply chain for providing specialist skills can take up to four years and needs are difficult to estimate accurately.

Continued economic growth could put pressure on the availability of certain skills unless the appropriate policies are implemented. The reduced level of unemployment and the declining number of school-leavers are further factors. This has competitiveness implications for the economy and for our ability to grow indigenous firms and to attract international industries.

The Government established the Expert Group on Future Skills Needs to analyse these issues and to make policy recommendations. The Expert Group viewed the information technology skill needs as a priority and this, the first report of the Expert Group, identifies the potential skills deficiency for information technology professionals and technicians and makes a series of proposals which should ensure that the potential skills gaps are eliminated. The Expert Group will analyse the other skills needs in the economy in future reports.

It is important to ensure that the education/training infrastructure is used intensively. The Expert Group has prioritised the interventions that are most cost effective (use existing educational facilities) and most flexible and rapid (multi-skilling/conversion programmes). It has also sought to maximise company involvement to ensure that the response is demand-led. The recommendations include a further expansion in the number of places in the Institutes of Technology and the Universities.

The Expert Group on Future Skills Needs comprises representatives of the Development Agencies, the relevant Government Departments, the education and training bodies and industry. A Business/Education and Training Partnership Forum has also been established to provide for the interchange of ideas between all interested groups. The first meeting of the Forum was held on 18 June 1998 and was jointly chaired by the Minister for Education and Science, Mr. Michéal Martin and myself. The Forum provides a valuable interaction between industry and suppliers of education and training.

I am confident that the structures we have put in place will enable us to respond effectively to the skills needs of our economy and would in particular express my appreciation for the work of Dr. Chris Horn and the Expert Group on Future Skills Needs and to Forfás for their contribution to the Expert Group.

Mary Harney T.D.
Tánaiste and Minister for Enterprise, Trade and Employment

Foreword by the Minister for Education and Science

Knowledge is now universally acknowledged to be the key factor determining long-run economic progress. The role of the Irish education system in laying the foundations for the economic success in recent years is recognised by all. Beginning with the introduction of free universal secondary education in the 1960s and continuing with the huge expansion of the third-level sector in the last twenty years, education has contributed enormously to Ireland's prosperity. Investment in education is by its nature a long-run investment and requires long-run planning to bring it to fruition.

Consequently, I am delighted that, due to the work of the Expert Group on Future Skills Needs, Ireland is developing for the first time a long-term, coherent framework that will allow the government to plan on the basis of accurate and timely forecasts of the future skills needs of the entire economy.

The emergence of the information age has enormous implications for the education system and the nature of educational provision. An important role of the educators is to provide the type of skills that will enable both students and workers to fully participate in the knowledge economy on a scale sufficient to the changing needs of the economy.

Education and knowledge are the crucial factors determining success in the knowledge economy. Educators therefore need to ensure that the opportunities offered by the information age are spread equally among all our citizens. The government needs to provide equal access to training and education opportunities for all and to eliminate the barriers, whether economic or social, to access to education.

Michéal Martin T.D.
Minister for Education and Science

Executive Summary

1. Expert Group on Future Skills Needs

The Government established the business education and training partnership in late 1997 to develop national strategies to tackle the issue of skill needs, manpower needs estimation, and education and training for business. The key elements of the partnership are:

- The Business/Education and Training Partnership Forum

- The Expert Group on Future Skills Needs

- The Management Implementation Group

This report deals with the initial work of the Expert Group on the skill needs of the economy as a whole.

The objectives of the Expert Group are to:

- identify in a systematic way the skill needs of different sectors and advise on the actions needed to address them;

- develop estimating techniques that will assist in anticipating future skills needs of the economy and their associated resource requirements;

- advise on the promotion of education/continuous training and business links at national and local level and consider strategic issues in developing partnerships between business and the education/continuous training sectors in meeting the skills needs of business; and

- advise on how to improve awareness of job seekers and school-leavers of sectors where there are demands for skills, the qualifications required and how they can be obtained.

Membership of the Group includes business people, educationalists, policy makers, public servants and members of the industrial promotion agencies.

The Business/Education and Training Partnership Forum meets once or twice a year with the objective of achieving a consensus among all interested parties on the policies required to meet the skills needs of the economy. The Management Implementation Group has the responsibility to oversee the implementation of the approved policies on skills supply.

2. Initial Focus

The skills demands in the economy are very diverse and need to be addressed in a detailed manner. The Group has initially examined the high-level skill requirements (those provided by the universities and Institutes of Technology) of the Irish economy. The Group is aware that shortages exist in other areas. However, given the transformation of the Irish labour market since 1990, it is to be expected that skills in all sectors would not be as easily available now as has previously been the case. It was therefore agreed that the focus should be on the IT sector because:

- this is the sector in which the demand for skills is greatest;

- there are some indications of potential skill shortages in the sector;

- the opportunities for the growth of Irish companies and for attracting international investment are greatest in this sector; and

- the lead-time for the skills required is longest in high-skill sectors like IT.

3.   Skills Estimation

Matching the supply of skills with the potential future demand is a complex exercise. Ireland needs to develop a system for estimating accurately the potential future demand for skills by type of skill and quantity. These estimates will be a critical input into the investment in educational and training infrastructure.

If skill requirements are estimated correctly and the educational and training output planned to deliver the required skills, Ireland will have achieved a major competitive advantage. The supply of skills will be available to attract the growth industries. An adequate supply of skills will also help alleviate labour market shortages and reduce wage cost pressures.

The supply chain for providing new skills is from one to four years in length depending on the level of expertise required. There is a large element of uncertainty about the quantity and type of skills required four years from now. The necessary supply infrastructure - both the physical infrastructure and the education and training expertise - needs to be in place. The investment required from the State will be substantial.

4.   Demand for Technologists

To date the Expert Group has carried out a detailed assessment of the third-level-provided (degree, diploma and certificate) technology skill needs of the hardware electronics and software sectors.

The term "technologist" encompasses a wide variety of skill categories. The Expert Group has developed the following classification:

- professionals who have completed a primary or higher degree;

- higher technicians who have completed a national diploma - three years full-time;

- technicians who have completed a national certificate - two years full-time.

The demand for technologists comes not only from the electronics and software industries. The Information Society has an impact on all businesses that thereby require technology support, either from in-house resources or from outside service companies.

In developing its estimates of future skills, the Expert Group recognised that past trends are poor guides to the economy's future skills needs. In addition, it recognised the opportunities to attract incremental overseas projects because of a worldwide shortage of information technology skills. The Expert Group has taken these issues into account in developing demand estimates. The Expert Group believes that providing skilled personnel can provide a major opportunity for Ireland in attracting investment in information technology.

The Expert Group adopted the following approach to demand estimating:

a) Economy-wide projections were derived from the ESRI/FÁS Manpower Forecasting Model and used as a base. However, it was recognised by the Group and agreed by the ESRI that the accelerating change in the information technology sectors is not fully accounted for by the model. Thus the ESRI projections were amended to incorporate employment growth projections from sectoral studies on software and hardware electronics;

b) Three demand projections for engineering and computer science technologists were derived:

- the high employment growth scenario assumes that Ireland's economic growth remains high and that the recommended actions are effective in providing the skills requirements of these sectors. The high growth scenario projects an average annual demand for **8,300** engineering and computer science technologists;

- the basic growth scenario assumes that the current rate of growth in the sector will moderate and projects a requirement for **6,500** engineering and computer science technologists; and

- the reduced employment growth scenario anticipates a world recession in the IT sector, with demand for engineering and computer science technologists falling to **2,800** per annum.

The Expert Group advises that Ireland should plan on the basis of the high growth scenario as that provides a significant upside potential for the economy with limited downside costs. Providing this number of skilled people would give Ireland a major competitive advantage. Planning on the basis of either of the lower projections would effectively be self-fulfiling, as reducing the potential for attracting inward investment would automatically reduce the demand for skills.

The reasons for recommending policy responses based on the high growth employment scenario are as follows:

- The planning of future skills supply should be used to stimulate and maintain economic growth;

- The high growth scenario is achievable based on past trends;

- Growth in the global demand for IT jobs will continue to be rapid;

- The disadvantage of skills under-production out-weighs the disadvantage of skills over-production;

- The availability of skills will become more important in attracting investment as the EU acts to reduce grant incentives; and

- Irish industrial policy has always been predicated on the economy having a good supply of skilled staff available to businesses.

The Expert Group acknowledged both the substantial investment already committed to technological skills and the substantial costs implied in any new commitments. It also noted the substantial return to the Exchequer that will result from increased employment in technology sectors. Overall the Expert Group believes that a proactive stance in getting ahead of the growth in skill demand is required.

The breakdown of the annual 8,300 additional technologists[1] projected to be needed by the economy as a whole up to 2003 under the high growth scenario is as follows:

- Engineering professionals   2,000

- Engineering technicians   1,800

- Computer science professionals   2,400

- Computer science technicians   2,100

- **Total**   **8,300**

There will be additional substantial demand for skilled and semi-skilled operatives in the IT sector.

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1   The projection of technicians supply includes civil engineering technicians. Insofar as such technicians are used by the construction sector and related industries or are not adaptable to use in the broad IT sector, the projections of net balances of technicians required could be underestimated. Any possible consequences of this need to be kept under review and taken into account in future revisions of the projections.

5. Supply of Technologists

The supply of technologists is estimated at 6,100, of which new graduates account for 5,400. The remainder are returned emigrants with appropriate qualifications and existing employees qualifying through up-skilling courses. Returned emigrants can be supplemented by attracting increased numbers of qualified non-Irish people. Up-skilling of existing employees to technician level through in-company training is a further important source of supply. The supply of graduates is:

- Engineering and computer science professionals   3,600
- Engineering and computer science technicians   2,500
- **Total**   **6,100**

These figures include the Government's plan, announced in March 1997, to substantially increase the number of engineering technicians (with an extra 750 entrants annually) and computer professionals (with an extra 1,000 entrants annually). Full implementation of these initiatives is necessary to ease the existing supply pressure. Since a major part of the increase in employment envisaged under the high growth scenario is for skilled operatives, a significant proportion of the non-technologist group also needs to be trained and educated. Such skills can be provided through FÁS, the VEC Post-Leaving Certificate courses, in-company trainers and private sector trainers.

6. Skills Gap

The gap between the annual estimated demand for technologists, estimated at 8,300 under the high growth scenario, and the estimated supply at 6,100 per annum implies a annual shortfall of 2,200. This shortfall comprises:

- Engineering and computer science professionals   800
- Engineering and computer science technicians   1,400
- **Total**   **2,200**

7. The Policy Response

The policy response should be based on eliminating any potential supply deficit. The cost of producing the proposed supply of skills will be substantial. The Expert Group has prioritised the interventions that are most cost-effective (more intensive use of existing educational facilities) and most flexible and rapid (greater use of multi-skilling and conversion programmes). It has also sought to maximise company involvement to ensure that the response is demand-led.

Given that the higher skills require multiple year courses, the number of places is a multiple of the annual number of graduates. The Group proposes a significant increase in technology graduates from the third-level sector, with an additional increase in supply due to conversion and other programmes. A substantial proportion of the technicians shortfall is to be filled by initiatives that are company-based or company-sponsored.

Four initiatives are recommended to increase the supply of professionals and technicians. They have different time and cost implications and have different educational place requirements. The recommended approach is to achieve maximum flexibility, minimise the cost and ensure that the supply of graduates is demand-led.

The four strategies are:

- *Conversion courses*

  This is a well-established method of developing extra skills. Around 1,100 graduates qualify on these technology courses each year. The Expert Group considers that extra graduates could be provided each year if a pro-active campaign was introduced in the universities and Institutes of Technology to attract students.

- *Employee up-skilling*

  This involves night-time and part-time study for existing employees. Greater promotion of these courses and greater involvement of the companies would increase the supply of professionals.

- *Full-time education*

  Arrangements to accommodate the extra full-time technology students need to be put in place as soon as possible.

- *Improved completion rates*

  Completion rates at degree level are currently about 80 per cent and about 65 per cent at technician level. Improved completion rates would be one of the most cost-effective ways of increasing skill supply.

The issues involved in achieving the increased supply from these sources are complex. Pro-active policies need to be put in place. The resources need to be allocated. Any delay in implementing the required policies could lead to a shortfall in supply with consequent adverse implications for Ireland's economic growth and possibly for costs and competitiveness.

8.   Policy Recommendations

It is recognised that educational establishments cannot significantly increase the number of people it educates within such a short period as two years. In contrast, businesses can only plan their skill needs with confidence over the short term. Hence all mechanisms that increase the flexibility of skill provision must be encouraged. These include:

- recruiting skilled people from abroad;

- in-company training;

- multi-skilling/conversion education;

- accelerated learning programmes; and

- modular delivery of programmes.

The proposals made in the report to ensure an adequate supply of skills for the economy are summarised below. The body with responsibility for implementation is given after each proposal. The number at the end of each proposal corresponds to the section of the report in which the proposal is made. The Management Implementation Group has been making substantial progress on the implementation of the proposals.

T h i r d - l e v e l   C o l l e g e s   a n d   I n s t i t u t e s

The number of places required is a multiple of the annual number of graduates, as specialised degree courses can take up to four years to complete. Apart from increasing the capacity of the third-level sector, there are a number of additional recommendations that will increase the supply of technologists.

1. For the 2,200 additional graduates needed annually, the places required are as follows:

   For Professionals

Employee Up-skilling	200 places providing 50 graduates each year
Multi-skilling/Conversion	460 places providing 350 graduates each year
Full-time Education	2,120 places providing 400 graduates each year
Improved Completion Rates	100 graduates each year

   For Technicians

Employee Up-skilling	900 places providing 300 graduates each year
Full-time/Sandwich/Block Education	1,700 places providing 650 graduates each year
Improved Completion Rates	350 graduates each year

   Sufficient resources should be allocated to facilitate the creation of these places in the third-level sector. (Departments of Education and Science and of Enterprise, Trade and Employment) (3.2.1)

   Improved Course Completion Rates

   The studies of students' completion rates should be reviewed on an on-going basis with a view to developing strategies to improve the low completion rates, particularly in the technician area. (Expert Group) (3.2.2)

   Multi-skilling and Conversion Courses

   Multi-skilling and conversion programmes and industry/Institute sandwich and block release programmes have considerable potential to become a core part of the education system's response to the rapidly changing skill needs of the economy. The co-operation of the educational sector in these innovative and flexible forms of training is critical.

   It is proposed to review the strategic potential of the multi-skilling and conversion programmes and identify any implications for resource allocation. (HEA) (3.2.3)

   The Supply of R&D Research Staff

   The situation of research students should be specifically examined, with a view to increasing their numbers. Highly qualified research staff are required in the third-level sector and are also a critical resource in IDA Ireland's policy of encouraging multinationals to establish and expand R&D facilities in Ireland. (HEA/Forfás) (3.2.5)

   Ensuring a Rapid and In-depth Educational Response to Skill Needs

   Practices such as modular delivery, accreditation of prior learning, modular credits and more flexible progression should be examined with a view to substantially expanding their roles in the provision of third-level education. (Department of Education and Science) (3.4.6)

Industry/Education Partnership

As the ultimate users of the skills output, it is vital that mechanisms are developed to ensure that industry views are taken into account in the provision of qualified staff. The argument in favour of greater business/education collaboration applies to the whole economy, not just the IT sector. There is a range of existing mechanisms, including the Business/Education and Training Partnership Forum, the FÁS industry training committees and individual industry/Institute of Technology schemes, to facilitate such interaction. All institutions involved in training and education should be encouraged to involve local businesses and be obliged to report annually on how they have done this.

Developing and promoting learning programmes at local third-level education establishments entails company support in terms of college fees, staff release and lecturing inputs. It requires a partnership approach between businesses and trainers. Co-operation between companies and local educational establishments, already occurring in many areas, should be extended.

Employee Up-skilling

A review should be carried out by Forfás, FÁS, the Departments of Enterprise, Trade and Employment and of Education and Science and the development agencies, in conjunction with the social partners, of the training and education priorities for existing employees and of the practical policies required to increase such training and education as an aid to competitiveness. (Expert Group) (3.3.1)

Company Co-operation

Companies need to be specifically encouraged to become more involved in the process of skill development through the Business/Education and Training Partnership Forum and through discussions with the development agencies and the education and training organisations. (Development agencies, FÁS, HEA, Forfás) (3.3.2)

Involvement of Business in the Identification of Skill Needs

Universities, Institutes of Technology and FÁS Training Centres should be encouraged to make proposals on how to involve relevant local businesses and other interests in course design and choice. They should be asked to report annually on how they have involved such interests. (Department of Education and Science, Department of Enterprise, Trade and Employment) (3.3.3)

Overseas Recruitment

The Enterprise Ireland "Opportunities Ireland" campaign should be extended to cover the hardware sector as well as the software sector. It should target the USA, the EU and the rest of the world and should be resourced as appropriate. (Enterprise Ireland) (3.3.4)

Skilled Operatives in the Electronics Sector

There should be 800 entrants each year to FÁS programmes and 500 to PLC Programmes. These students would be available for work at a sub-technician level. (FÁS, Department of Education and Science) (3.3.5)

Awareness of Skill Opportunities

The number of school-leavers is declining. If Ireland is going to satisfy the potential demand for technology skills, a greater number of the school-leavers will have to be attracted into the appropriate courses. The proportion of 17-18 year olds taking technology education will have to increase from the current 17 per cent to perhaps 24 per cent.

Participation in Technology Education

A study should be carried out into the factors affecting student choices at second-level, especially their choice of technology careers. (Forfás/Department of Education and Science) (4.1)

Skills Awareness

The Skills Awareness Programme should be strengthened and appropriately resourced. (Forfás) (4.3)

A series of workshops and/or company visits should be organised for principals, teachers, counsellors and parents. (Forfás) (4.3)

A skills opportunities web site should be developed and linked to similar web sites. (Forfás) (4.3)

9.   Other Issues

The skills needs of other high-technology industries will be analysed, as will the general low and medium skill requirements of the economy.

1. Introduction

1.1 Overview

A highly skilled and motivated workforce is essential to remaining globally competitive. The excellent employment growth of recent years, and in particular Ireland's success in attracting overseas electronic companies, has put pressure on Ireland's supply of certain skills.

The Government announced a new Business, Education and Training Partnership in late 1997 to develop national strategies to tackle the issue of skill needs, manpower estimating and education and training for business.

The key elements of the Partnership are:

- The Business/Education and Training Partnership Forum;

- The Expert Group on Future Skills Needs; and

- The Management Implementation Group.

This report reflects the Group's initial perspective on Ireland's growing needs for high-level IT skills, based on analysis carried out by the ESRI and others and on extensive consultations with relevant interests. The report also prepares the ground for further work by the Expert Group which will include analysis of the general labour market and low/medium-level skills in information technology, existing employee skills, enterprise training, increasing awareness of skill opportunities and strategic issues in the business and education/training relationship.

1.2 The Business, Education and Training Partnership

The key elements of the Partnership are:

- The Business/Education Partnership Forum;

- The Expert Group on Future Skills Needs; and

- The Management Implementation Group.

The Business/Education and Training Partnership Forum is co-chaired by the Tánaiste and Minister for Enterprise, Trade and Employment and by the Minister for Education and Science. It is representative of the highest levels of the business sector, the education and training sector, the trade unions, Government departments and the development agencies. The first meeting occurred on 18th June 1998. The objective of the Forum is to form a consensus on how to approach the critical issues underlying the business and education/training relationship and to generate policy proposals. The first meeting, attended by 200 people, was very successful. It considered the problem of skill shortages in the technology sector and a number of significant proposals for resolving the issues were discussed.

The Expert Group on Future Skills Needs builds on work carried out by the Forfás Interim Skills Group (1996-97). The Group is chaired by Dr. Chris Horn of IONA Technologies and consists of representatives of the relevant Government departments, the development agencies, educational and training interests and industry. (Membership of the Group is given in Attachment 1). It is carrying out analysis of the future skills needs of the economy and developing proposals to meet these skill needs. Its initial focus is on the skill needs of the technology sectors. It will extend its analysis to other sectors of the economy in the future. The Expert Group is serviced by Forfás and FÁS and reports to the Tánaiste and to the Minister for Education and Science.

A Management Implementation Group has also been established, comprising the Chairman of the Expert Group together with the Secretaries-General of the Departments of Enterprise, Trade and Employment and of Education and Science, the Chairman of the HEA, a representative of the

Department of Finance, and the CEO of Forfás. (Membership of the Group is given in Attachment 3). Forfás and the HEA service the Group. The Management Implementation Group met a number of times in 1998 and made very substantial progress in achieving the implementation of the policy proposals developed by the Expert Group on Future Skills Needs.

1.3 The Expert Group on Future Skills Needs

The objectives of the Group are to:

- identify in a systematic way the skill needs of different sectors and advise on the actions needed to address them;

- develop estimating techniques that will assist in anticipating the future skills needs and requirements of the economy and the associated resource requirements;

- advise on the promotion of education/continuous training and business links at national and local levels;

- advise on how to improve awareness among job seekers and school leavers of sectors where there are demands for skills, the qualifications required and how they can be obtained; and

- consider strategic issues in developing partnership between the business and education/ continuous training sectors in meeting the skills needs of business.

The Group's work programme for 1998 realises these objectives as follows:

a) *Identify skill needs and develop estimating techniques*
   The Group has developed, with the ESRI, an approach to identifying future technology skill needs and has begun an examination of the general labour market and low/medium-level skill needs;

b) *Advise on how to improve skill awareness*
   A sub committee of the Expert Group - the Skills Awareness Committee - has organised a national skills awareness programme and is developing further ways of increasing awareness of opportunities in IT at second-level; and

c) *Analysis of strategic issues in developing business/education and training partnerships*
   The Group has considered a number of strategic issues relevant to business/education partnerships and has identified both proposals and areas for further work.

1.4 The Skills Issue

Having surveyed the outlook facing the Irish economy for 1998, the Department of Finance noted:

"However, this favourable outlook is not without risk. The most immediate arises from emerging shortages of both skilled and unskilled labour. If not dealt with, these shortages have the potential to bring the current strong growth phase to a premature end. Tackling the changing needs of the labour market will be one of the most important features of Government policy over the next few years".[2]

There are a number of factors contributing to the growing skill needs of the Irish economy. They are:

- *Information Technology is transforming the global economy*
   As a result of the information technology (IT) revolution, the global demand for IT skills is growing and there is now a worldwide shortage of these skills. Ireland is disproportionately sharing in the world growth of the IT industry, with major expansions of the software and hardware electronics sector. More generally, IT skills are needed across all sectors in the move to the Information Society.

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2   Budget 1998: Economic Background, Department of Finance, December 1997.

● *A tightening labour market*

Employment in Ireland has grown by an annual average of 3.9 per cent in the period 1995-97. This compares with an annual average growth rate in the US of 1.7 per cent in the same period. The vacancy rate in the internationally trading sector has doubled over the last year. It has also increased in other sectors, such as construction, tourism and the retail sector.

● *Deficiencies in the skills of existing employees*

A Forfás/ESRI Survey in mid-1997 showed that 30 per cent of companies see skill deficiencies as a problem and 60 per cent of companies see a need for increasing skill levels, especially in technology and customer service. More generally, SMEs in Ireland have relatively low labour productivity. For example, productivity in firms with 0-9 employees is 65 per cent of UK levels. One cause of this productivity gap is low investment by SMEs in skills.

1.5 Government Response to Date

Since 1995, companies across a number of industrial sectors have signalled a growing problem with the availability of high-skill IT labour. This pressure has been particularly acute for computer software staff, technicians for the broad electronics sector and teleservices staff.

An initial Government response in 1995 was to allocate 1,200 (later 1,800) of an extra 6,000 places approved for the university sector to engineering and software.

Forfás, at the request of the Department of Enterprise, Trade and Employment, established the (Interim) Skills Group chaired by Dr. Frances Ruane in late 1996 to examine emerging skill needs. The Group's analytical work provided the basis for the Government Memorandum of January 1997 that led to the announcement in March 1997 of "An Action Plan for Skills". The Action Plan provided for the intake of an extra 3,200 students into software professional, electronic technician and teleservices staff courses run by the universities, Institutes of Technology and Post Leaving Certificate (PLC) Colleges. The Government launched the £250m Scientific and Technological Education (Investment) Fund in November 1997. The Technician's Taskforce, chaired by Dr. Seán MacDonagh, was established in July 1997 to examine the need for technicians for the broad electronics sector.

In a related development, the Tánaiste announced the Business/Education and Training Partnership to develop national strategies at the highest levels to tackle the issue of skills needs, manpower estimating and education for business.

There have also been considerable efforts to attract greater numbers of people into work, thereby increasing the supply of labour. These efforts are aimed at reducing the numbers who are unemployed, especially those who are long-term unemployed. The new national Employment Action Plan, which aims to reduce unemployment to 7 per cent by 2000, and to 5 per cent within 4-5 years, provides a strategic framework for a range of interventions. Reducing unemployment, together with associated issues of reducing early school-leaving and tackling unemployment black spots and rural poverty are key targets in the Plan. Other important elements in the Plan include measures to boost the flexibility of businesses and their employees, strengthen equal opportunities policies, develop entrepreneurship, improve provision of childcare facilities and assist disabled persons in gaining greater access to the world of work.

1.6 Future Work

The current report is confined to the needs of the economy for high-skilled IT staff. The Expert Group will extend its work to the skill requirements of the information technology sector at operative level and to the skills needs of other high-tech sectors. This analysis will be subsequently extended to other areas of the economy.

It is recognised that the data and information available at present are not sufficient to allow the Expert Group on Future Skills Needs to make firm recommendations about increases/decreases in the requirements for medium/low-level specific skills or occupations. Further research and consultations will take place under the auspices of the Expert Group on Skills to provide better information for planners.

The following steps are proposed:

● Identify from existing sources the main areas of current shortage;

● In respect of key occupations in these areas, carry out detailed studies of demand and supply to estimate the required level of training supply;

● Carry out a series of consultations with development agency personnel, employer associations and Industry Training Committees to identify other occupations where skills are currently in short supply or where shortages are expected to emerge;

● Obtain information from training and education providers on their current and expected output of sub-tertiary qualified persons; and

● Draw all the above information into an overall report giving indications of the current levels of skills provision, identify the main areas of current and future skills shortages and make proposals for actions to meet the needs identified.

This approach will provide the basis for specific proposals on skill and labour supply in the economy, in those areas where skill shortages warrant specific interventions.

2. Information Technology Skills - Supply and Demand

2.1 Approach to Assessing Technology Skills Needs

The Expert Group carried out a detailed assessment of the third-level technology skill needs of the hardware electronics and software sectors. The focus of this report is on this assessment.

The work has involved the following studies:

- *Employment projections based on the FÁS/ESRI Manpower Forecasting Model*
  This model provides output and job projections for the economy;

- *Analysis of skill needs in the electronic hardware sector*
  This study, based on a survey of the major companies in the sector, was carried out for Forfás by Eirlink International;

- *Analysis of skill needs in the software industry*
  This study was carried out for FÁS by McIver consultants;

- *Examination of the supply of professional and technician graduates*
  This study was carried out by the ESRI;

- *Survey of the skill needs of the internationally trading sector*
  This survey was carried out in mid-1997 for Forfás by the ESRI; and

- *A review of skill studies*
  This involved an examination by the ESRI of around 70 skills studies carried out over the past few years for various agencies and bodies.

Following detailed work by the ESRI and the Forfás Executive and after consultations with the Expert Group, the ESRI drafted a Synthesis Report[3] on existing and future skills needs.

Technologists for the purposes of this Report are defined as engineers and scientists, classified as follows:

- Professionals: people who have completed a primary (four year full-time) or higher degree;

- Higher Technicians: people who have completed a national diploma (three year full-time); and

- Technicians: people who have completed a national certificate (two year full-time)[4].

Technologist graduates refers to all people who have successfully completed programmes at professional and technician levels.

Employees, other than technologists as defined above, are termed skilled and semi-skilled operatives. This includes those who have completed FÁS and PLC-certified programmes (of up to one year full-time duration) and those who have completed shorter courses.[5]

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3   Synthesis Report on Existing and Future Skills Needs. ESRI August 1998.
4   Technicians for the broad electronics industry includes mechanical, production and manufacturing technicians. Technicians also includes computer science technicians.
5   There can be some overlap to the extent that some FÁS and PLC graduates who complete one year full-time courses are acceptable to employers as technicians.

2.2 Demand For Technologists

2.2.1 Approach

The Information Technology revolution is bringing about a situation where past trends are a poor guide to future skills needs in the sector. In addition there is an opportunity, if adequate skills are available, to attract more foreign investment because of the world shortage of information technology skills. The Expert Group has taken these issues into account in developing estimates of demand. The Group has taken a cautiously optimistic and reasoned approach on providing for future employment opportunities.

The Expert Group adopted the following approach to demand estimation:

- Economy-wide job projections, from the FÁS/ESRI Manpower Forecasting Model, were used as a base. The model estimates demand for various skill categories based on past trends. The Group took the view, which was endorsed by the ESRI, that the accelerating change in the information technology sectors is not fully accounted for in the model; and

- The projections of jobs growth from the macro-economic model were replaced by job growth projections from sectoral studies on software and hardware electronics.

This approach provides a more realistic estimate of the potential demand for skills in the information technology sectors. The ESRI model is a useful analytical tool and will be used, in the future work of the Expert Group, to provide the base estimates of the demand for skills in the sectors of the economy which are experiencing less spectacular growth.

2.2.2 The Three Technologist Demand Scenarios

Three demand projections for engineering and computer science technologists were derived:

The High Employment Growth Scenario
The high growth jobs projection assumes that Ireland's economic growth remain strong and that implementation of the proposal policies will be effective in meeting the demand for skills arising from continued high inward investment in the information technology industry.

For the software sector, the McIver sectoral study envisages an increase in jobs from 20,000 in 1997 to 51,000 in 2003, assuming that skills shortages are avoided. This scenario reflects recent peak job growth in the sector and the assumption that there will be a major contracting out of IT work by firms in the rest of the economy. The annual net demand for IT staff from companies operating outside the information technology sector is estimated by McIver as 250.[6]

For hardware electronics, an overall growth from 33,000 jobs in 1997 to 62,000 in 2003 is possible assuming strong action on the skills constraint. This scenario reflects IDA targets for 1998 and 1999, based on projects negotiated or under negotiation, and anticipates both continued high overall jobs growth and the attraction of more research and development centres in the IT sector.

The high employment growth scenario projects an average annual demand for **8,300** engineering and computer science technologists between 1996 and 2003.

The Basic Employment Growth Scenario
A basic growth employment projection assumes that the current pace of growth will moderate.

For software, the McIver sectoral study has basic projection of jobs growth from 20,000 to 41,000, alongside a net annual demand for 250 IT specialists in the rest of the economy. For hardware electronics, the sectoral study projects net growth of 17,500 over five years. This represents a major slowdown in the sector's employment growth after 1999. Overall, the basic employment growth scenario projects an annual demand of 6,500 for engineering and computer science technologists.

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6   The scenario takes into account both the effects of the EMU and year 2000 issues.

The Reduced Employment Growth Scenario

If the world economy moves into recession, as a result of the Asian crisis or other factors, employment growth rates in software and hardware electronics could be substantially affected. For the software sector, a sharp reduction in growth rates could imply the sector growing to only 30,000 jobs within 5 years. For the hardware sector, a reduced growth scenario implies the closure of some projects. The reduced employment growth scenario, based on the basic ESRI macroeconomic model projection for engineering and computer science technologists, implies an annual demand of **2,800**.

2.2.3 What happens if?

The Expert Group considered what would happen if, having based the policy response on one employment scenario, another of the employment scenarios materialised. In particular, they considered what the negative consequences would be.

A policy response to technology skills needs on the basis of the high employment growth scenario will, in the event of:

- *the high employment growth scenario*

  meet the skill needs of industry and provide Ireland with a competitive advantage, given the worldwide IT skills shortage.

- *the basic employment growth scenario*

  produce a surplus of IT-skilled people, reduce pressure on IT wages and/or lead to higher rates of emigration.

- *the reduced employment growth scenario*

  result in a surplus (5,510 per year) of technologists and probably lead to 1980's levels of emigration and unemployment amongst recent graduates. These surplus technologists may be available as a resource for attracting overseas industry in the medium-term.

In the event of the high employment growth scenario happening, a policy response based on the basic employment growth scenario will lead to an annual shortfall of 1,900 skilled people. A response based on the reduced employment growth scenario will lead to an annual shortfall of 5,510. The resulting significant skill shortages will lead to major wage increases and a loss in competitiveness. In short, a policy response based on the basic or reduced growth scenarios will be self-fulfiling as inward investment and the associated demand for skills would be reduced as a consequence.

2.2.4 Basis for Policy Response

The Expert Group recommends that the policy response should be based on the high employment growth scenario because:

- skill supply planning should aim to proactively stimulate economic growth to achieve the greatest employment outcome possible;

- it is an achievable outcome, based on peak past trends and the intensifying need for skills;

- growth in the global demand for IT staff is rapid. For example, the European Information Technology Observatory anticipates that the EU will require 1.5 - 2 million new IT professionals in the next five years;

- the current wage inflation for IT staff indicates that market supply, including returning emigrants and other sources of additional supply, is not addressing current needs;[7]

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7   According th the Marlborough Group Salary Survey, IT wages rose rapidly in 1997-98. An IBM mid-range programmer costs 13-17 per cent more than last year, a PC client server systems analyst costs 20-25 per cent more and an IBM mid-range systems analyst costs 11 per cent more. The McIver study of the software sector concludes that wage costs are rising by 20 per cent annually.

- the Forfás/ESRI survey of the internationally trading sector reported a demand for 7,000 technologists in 1998. When combined with the likely demand from the rest of the economy, this number should at least equal the demand for technologists in the high growth employment scenario;[8]

- the disadvantages of skills under-production - wage inflation will reduce prospects of continued rapid industrial growth - outweigh the disadvantages of skills over-production;[9]

- over-production would result in young people with high skills who can earn high incomes abroad and who will be available as a potential resource for future attraction of overseas industry;

- it is desirable to diversify Irish industrial policy by widening (e.g. attracting more telecommunications companies) and deepening (e.g. developing more R&D centres) the electronics sector;

- in the context of the EU drive to reduce grant incentives, skills availability becomes even more important. Ireland is currently perceived to be in a relatively good position with respect to skills. It is important to deliver on this.

The Expert Group recognises that the structure of Irish industry is changing rapidly, with the IT sectors growing faster than other sectors. Under the basic growth and high growth employment scenarios, the IT sectors are projected to account for 22 per cent and 31 per cent respectively of the total employment growth estimate for 1996-2003 by FÁS/ESRI.

As a consequence of different sectoral growth rates, the needs of the economy for technology skills will increase the proportion of engineers and scientists in the Irish workforce to internationally high levels. Engineering and science professionals and technicians were 3.5 per cent of the workforce in 1995, compared with 3.7 per cent in the USA in 1996. The employment growth projections for Ireland will result in technologists increasing to 5.6 per cent of the total workforce (basic employment growth scenario) or 6.9 per cent (high employment growth scenario) by 2003, compared to a projection for the USA of 4.2 per cent by 2006. States such as Massachusetts, that are oriented to technology industries, already have engineers and scientists at 6.4 per cent of their workforce. In areas like Silicon Valley, the percentage of the workforce that are engineers and scientists is even greater.[10] Attracting the larger technology plants requires significant levels of technology employment, regardless of the size of the host economy and labour force.

The Expert Group acknowledges both the substantial investment already committed to technology skills[11] and the substantial costs implied in additional commitments. It also recognises the substantial returns to the exchequer that result from the increased employment in technology sectors.

The Expert Group believes that a proactive strategy of getting ahead of the growth in skills needs is optimal. Market forces will, in one way or another, bridge the gap between skills demand and supply. The policy issue is whether the skills gap should be bridged by wage inflation and reduced skill demand or by increased skill supply. The Group's preferred strategy is to increase the skill supply in as cost-effective a way as possible.

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8   The Forfás/ESRI survey suggests additional demand in 1998 for 7,000 technologists in the manufacturing and international services sector alone, compared to the 9,500 annual average demand for engineers and all scientists for the overall economy that is implied by the high growth jobs scenario. The 9,500 total demand comprises 8,300 engineers and computer scientists and 1,200 other scientists.

9   There has been reference to the mid 1980's experience. Increased provision was made for engineering graduates in anticipation of increased demand from overseas industry. The economy slowed down and many of the engineers who graduated in the mid 1980's emigrated. There are major differences between the 1980's and 1990's experience. In particular, the companies likely to demand extra engineers are mostly already here and expanding. The real lesson of the 1980's experience is that the returning engineers provided a key resource for the IDA in attracting the larger electronic plants of the 1990's. The return on the educational investment in this case was slow, but in the end would appear to have been substantial.

10   In Santa Clara County; the heartland of Silicon Valley, 12 per cent of the non-farm employment of 800,000 is accounted for by engineers and scientists, of which 75 per cent are professionals and the remainder technicians.

11   According to the OECD, Ireland already has the highest number of engineering and science graduates as a proportion of the 25-34 year old employees in the OECD. However, Ireland still has a relatively low proportion of engineers compared to the UK and Netherlands.

2.2.5 The High Growth Demand for Technologists

The high employment growth scenario - reflecting strong action on the skills constraint – implies an annual average demand for **8,300** technologists[12] from 1996 to 2003. The demand breakdown is set out in Table 1.

Table 1: Average Annual Demand for Technologists 1996-2003[13]

Engineering Professionals	2,000
Engineering Technicians	1,800
Computer Science Professionals[14]	2,400
Computer Science Technicians	2,100
Total	**8,300**

It needs to be recognised that in addition to the demand for technologists indicated above, there is also a substantial demand for skilled and semi-skilled operatives in the IT sector. Both sectoral studies, by Eirlink International and McIver Consultants, point to a substantial demand for skilled operatives.

2.3 Supply Of Technologists

2.3.1 The Supply of Recent Graduates

The annual average supply of technologists (Table 2) is projected to be **6,100** from 1996 to 2003.

Table 2: Annual Supply of Technologists 1996-2003

	Graduates	Net Immigration	Up-skilling	Total Supply
Engineering and Computer Science Professionals	3,300	150	150	3,600
Engineering and Computer Science Technicians	2,100	150	250	2,500
Total	**5,400**	**300**	**400**	**6,100**

Current capacity in the third-level education sector can provide 5,360 graduates annually. This projection includes the Government's plan, announced in March 1997, to substantially increase the numbers of engineering technicians (750 additional entrants annually) and computer professionals (1,000 additional entrants annually).

The supply estimates take account of people becoming available through job losses and takes into account graduates who emigrate or go on to further study. No account is taken of graduates who find jobs outside their area of qualification, for example, in teaching or management.

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12 The projection of technicians supply includes civil engineering technicians. Insofar as such technicians are used by the construction sector and related industries or are not adaptable to use in the broad IT sector, the projections of net balances of technicians required could be underestimated. Any possible consequences of this need to be kept under review and taken into account in future revisions of the projections.

13 The Department of Finance expressed some reservations about the high growth employment scenario and was concerned that the report may have over-estimated future demand. Other members of the Group were of the view that it underestimated the proportion of third-level graduates in high technology industries. On balance the Group accepted the estimates used in the Report.

14 Alternative assumptions regarding the professional-technician split among software staff, based on the McIver Report, would mean that the annual average demands for computer science professionals and technicians would be 2,900 and 1,600 respectively.

Graduates can also become available through:

a) *Returned Emigrants/Immigrants*

Over the past number of years, there has been a substantial number of both returning emigrants, including graduates, and immigrants coming to work in Ireland's technology industries. The McIver study speaks of "several hundred" IT graduates coming into the software industry in 1996/97. The ESRI estimates that on average 300 graduates return each year. Over the medium term this estimate could prove optimistic. In projecting the current domestic supply at 5,400 graduates, it has been assumed that a greater percentage of graduates will remain in Ireland. The implication is that the level of graduate emigration will fall and therefore there will be fewer people available to return.

There remains the option of attracting greater numbers of non-nationals to Ireland. It appears that most non-nationals who come to Ireland to work do so for one to three years. Making more work permits available for non-EU nationals would increase the inflow of people. This inflow represents a once-off increase in the supply, which should be availed of in the short-term. Attracting substantially more technologists to Ireland means that Ireland must become a bidder - mainly through higher relative wages - on the world market for technologists at a time of rapidly increasing demand.

b) *Up-Skilling of Existing Employees*

The impact on technologist supply from up-skilling of less qualified labour and current employees is difficult to assess.[15]

A proportion of FÁS course graduates is employed, both in electronics and software, in jobs that can be described as technician-level. The McIver study of the software sector estimates that about 4 per cent of recent software recruits are from FÁS and PLC programmes. Additional trainees also enter the hardware electronics industry.

Discussions with best practice companies suggest that many operatives do certificate and lower levels of training and that many people with degrees do post-graduate degrees and further add-on certificates. It is estimated that 400 people become technologists (mainly lower level technicians) each year as a result of FÁS/PLC programmes and employee up-skilling.

c) *Other Scientists*

The projections of demand and supply for "other scientists" show a supply surplus. These are a source of potential entrants for the multi-skilling programmes discussed below.

2.3.3 Additional Technology Skill Needs

The interaction of the estimated demand for technologists and the supply both from recent graduates and other sources gives rise to an annual average shortfall of approximately 2,200 engineering and computer science technologists in the 1996-2003 period, of which 900 are professionals and 1,300 are technicians (Table 3). This annual average shortfall is used as the basis for the policy response that will impact from 1998 onwards.

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15   FÁS/ESRI analysis of the labour force data in 1991 would suggest that about 25 per cent of professionals do not have degree qualifications and 25 per cent of technicians do not have third-level qualifications. To what extent this reflects an historical situation is not clear. Certainly, the newer technology companies have stressed the need for their technologists to be formally educated and trained.

Table 3: Additional Technologist Skill Needs

Average 1996-2003	Projected Demand	Total Supply	Annual Net Balances (D-S)
Engineering and Computer Science Professionals	4,400	3,600	800
Engineering and Computer Science Technicians	3,900	2,500	1,400
Total	**8,300**	**6,100**	**2,200**

While demand is bound to vary from year-to-year, the ESRI is strongly of the view that the annual average balance is most appropriate when planning a policy response, as responding to year-to-year variations would involve excessive fine-tuning. In addition, these projections are made according to broad skill classifications. Accordingly, detailed planning at skill subcategory level may also need to take account of possible imbalances in specific areas.

3. Proposals to Address Technology Skills Requirements

3.1 Overview

In developing a policy response, the Group has prioritised those interventions that are the most cost-effective (such as employee up-skilling)and most flexible and rapid (such as multi-skilling/conversion programmes). The Group's policy recommendations also seek to maximise company involvement to ensure that the response is demand-led. Other priorities are to achieve efficiencies in the current supply of skills and a balance of response interventions.

3.2 Third-level

The number of third-level places required is a multiple of the annual graduates and depends on factors such as the length of the courses and student completion rates. The ESRI estimates that if the excess annual demand of 2,200 engineering and computer science technologists were all to be filled by extra full-time places in the third-level educational sector, 12,000 extra places would be needed by 2003.

The Expert Group's proposals are summarised in Table 4. The proposals imply a substantial increase in places in both colleges and institutes, both on full-time degree, diploma and certificate courses and on conversion and other programmes. Half the shortfall in professionals can be filled by short-term initiatives. In addition, a significant proportion of the shortfall in technicians can be filled by initiatives that are company-based or company-sponsored and so are directly demand-led. The output from the various sources employed will occur at different times. For example, graduates only emerge from full-time *ab initio* degree courses after four years Therefore the mix of potential output will vary over the time period 1998-2003.

Table 4: Outline of the Additional Technologists Places Required

Professionals	Annual Output	Additional Places Required
1. Employee up-skilling	50	200
2. Multi-skilling/Conversion courses	350	500
3. Full-time education	400	2,100
1-3. Gross Extra Graduates	**800**	**2,800**
4. Improved completion rates	100	0
1-4. Net Extra Graduates	**900**	**2,800**
Technicians		
1. Employee up-skilling	300	900
2. Full-time/sandwich/block education[16]	650	1,700
1-2. Gross Extra Technicians	**950**	**2,600**
3. Improved completion rates	350	0
1-3. Net Extra Technicians	**1,300**	**2,600**
Combined Total	**2,200**	**5,400**

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16   This is in addition to the 750 extra engineering new entrants provided for under previous commitments.

Note: The places required to provide industry with the extra graduates takes account of those who emigrate, those who do not complete courses and the normal length of the course. The different costs involved in different sources of supply have not been considered by the Expert Group but are currently being examined by the Management Implementation Group.

3.2.1 Full-Time, Sandwich and Block Education

The third-level education sector should provide an additional 900 professional technology graduates and 1,300 technicians each year, requiring an additional 2,800 university places[17] and 2,600 Institute of Technology places. These courses include the innovative technicians' programme piloted under the Technician Taskforce, which should be continued, developed and extended. The third-level education sector mainly involves the existing publicly-funded colleges and institutes, but could also include private sector bodies and colleges in Northern Ireland and Great Britain (as was envisaged under the March 1997 Action Plan for Skills). Arrangements to accommodate the extra full-time technology students need to be put in place as soon as possible.

Proposal: It is proposed that places for an additional annual 900 degree professionals and 1,300 technicians should be provided, and that sufficient resources be allocated to facilitate the creation of the required places in the third-level sector. (Departments of Education and Science and of Enterprise, Trade and Employment)

3.2.2 Improved Course Completion Rates

Current completion rates are estimated to be approximately 80 per cent for graduates and 65 per cent for technicians. This represents a significant loss of people who had expressed an interest in qualifying as technologists. If completion rates were improved over the medium-term to 85 per cent and 75 per cent respectively, an additional 100 professional graduates and 350 technicians would qualify annually. The issues involved are complex and proactive policies need to be implemented to achieve such an improvement. Additional resources may be required to improve completion rates and additional resources will be needed to accommodate the corresponding increases in stock.

There are a number of initiatives being developed in the technological sector that will assist the compilation of a database on attrition/drop-out rates. These include:

- steps are being taken to initiate a study to determine and measure student attrition and retention in the technological sector;

- a National Group, representing the Institutes of Technology, has been established whose aim is to provide both short-term and long-term solutions to the varied and complex problem of attrition.

- a system has been developed to statistically monitor uncertified departures from Certificate and Diploma programmes and is being applied on a pilot basis in some Institutes; and

- the Commission on the Points System has engaged a team of researchers to undertake a feasibility study on the predictive validity of the points system in relation to the intake of students into higher education.

Proposal: It is proposed to review this work on an ongoing basis with a view to developing strategies to increase completion rates, particularly in the technician area. (Expert Group)

3.2.3 Multi-skilling/Conversion Courses

Graduates from non-technology disciplines have successfully found employment in technology areas, particularly software, after one-year conversion courses. However, these courses are unsuited to the production of engineers. Around 1,100 graduates qualify on these technology multi-skilling and conversion programmes each year.

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17   It is not part of the brief of the Expert Group to examine the overall demand for and supply of third-level education places. The "de Buitleir" Group is currently examining this issue. The proposed extra full-time places for technologists at degree and diploma levels could be provided either through additional places or by a medium-term reallocation of places. The latter could take several years to take effect.

These programmes are cost-effective and flexible and can be directly tailored to company needs or to specialised emerging skill needs in software and other areas. Such programmes allow the education system to respond to the changing skill needs of industry and can also involve greater usage of institutional resources. Graduate conversion courses can be provided in universities, Institutes of Technology and elsewhere.

The Expert Group considers that 350 additional graduates could be provided each year if a proactive campaign to attract students was introduced in the universities. This will require 460 third-level places. The universities should take a more long-term view of the programmes and a commitment should be given in advance that funding will be maintained for 3-5 years. At present grant commitments through the HEA are made on a year-by-year basis and often made too late for the colleges' planning purposes.

Proposal: It is proposed that a campaign be implemented to attract additional students into multi-skilling and conversion courses, and that the funding of these courses be planned on a more long-term basis. (HEA)

3.2.4 University and Institute of Technology Involvement

The co-operation of the education sector, particularly with the more innovative and flexible forms of education and training envisaged, is critical. This will be explored at the Business/Education and Training Partnership Forum.

Multi-skilling and conversion programmes, such as the Advanced Technical Skills Programme (ATS), are considered to have considerable potential to become a core part of the education system's response to the rapidly changing skill needs of the economy. The experiences of the conversion and multi-skilling programmes (ATS) and of the Industry/Institute of Technology Sandwich and Block Technician courses suggest that some organisational issues need to be addressed. In particular the take-up of ATS programmes has been less than expected.

Proposal: It is proposed to review the potential of the multi-skilling and conversion programmes and identify any implications for resource allocation. (HEA)

3.2.5 The supply of R&D research students

The availability of sufficient numbers of full-time post-graduate students to undertake technology research and teaching at third-level is a critical concern. Highly qualified research staff are also a critical resource in IDA Ireland's policy of encouraging multinationals to establish and expand R&D facilities in Ireland. In the current economic climate, attracting such students is proving extremely difficult. The provision of a tax concession for post-graduate students doing recognised research is of particular benefit. Nevertheless, attracting such research students remains extremely difficult at a time when they are needed more than ever.

Proposal: It is proposed that the situation of research students be examined with a view to increasing their numbers. (HEA/Forfás)

3.2.6 Ensuring a Rapid and an In-Depth Educational Response to Skill Needs

The strength of most educational institutions is that they are capable of producing people who are educated in-depth in the principles and capabilities of particular disciplines. This implies a substantial investment over a number of years in each individual student and an additional substantial investment in the teaching infrastructure. The system is not capable of increasing the number of people it educates within a short period of time (two years or less) in response to increased demand for particular type of skills. Typically, however, businesses can only plan their skill needs with any degree of confidence over a two-year horizon or less. There is also a balance required in education between the teaching of general principles and the translation of this general capability into specific skills for particular industries and firms.

General strategies that aim to address the need for a rapid response to skill needs include:

- in-centre training;

- in-company training;

- multi-skilling/conversion education (e.g. the Advanced Technical Skills - ATS); and

- accelerated learning programmes (e.g. the new technician initiative).

Full use needs to be made of these strategies, which are complementary to "normal" third-level education provision. All of them have been used in the proposals to address technology skills need.

The issue arises as to whether a more fundamental approach is possible in the areas of delivery and accreditation e.g. modular provision of education, much greater use of student work placements, accreditation of prior learning, awards of credits for elements of courses and more flexible progression to higher levels. The work of Teastas in developing a national system of standards-based qualifications is critical in this regard. There also is the potential for developing alternative sources of educational provision, such as the VEC/PLC or the private colleges.

Proposal: It is proposed that practices such as modular delivery, accreditation of prior learning, modular credits and flexible progression be examined with a view to substantially expanding their roles in the provision of third-level education. (Department of Education and Science/HEA)

3.3 Industry/Education Partnership

3.3.1 Employee Up-Skilling

People employed in companies undertake courses of study leading to degrees. This involves attendance at night classes and/or taking part-time study leave. It could also involve day, block and sandwich release from work. Given their part-time nature, it takes students longer to complete these courses than is the case for full-time courses.

Programmes aimed at upgrading the technology skills of existing employees are already underway in various companies, such as Hewlett Packard and Intel. It is proposed to develop and promote these types of programme, so that more existing employees can upgrade their qualifications to degree level. The advantage of add-on degrees is that, being shorter in duration; they output graduates earlier and at lower cost. Investing in technician education where there is a ladder system is also an investment in graduate output. These programmes should involve use of formal assessment of prior learning (APL). They should also involve flexible course delivery arrangements and distance learning methods. Up-skilling to technician-level involves part-time education to diploma or certificate level through night courses and study-leave for people already in employment.

Companies should have a direct involvement in developing the course content and should work closely with the relevant universities and Institutes of Technology. It is envisaged that these initiatives could produce 50 additional professional graduates and 300 technicians each year.

This model is already working successfully through, for example, the close co-operation between Hewlett Packard and the Institute of Technology, Tallaght.

Proposal: It is proposed that Forfás, FÁS, the Department of Enterprise, Trade and Employment, the Department of Education and Science and the development agencies, in conjunction with the social partners, carry out a review of the training and education priorities for existing employees and of the practical policies required to increase such training and education as an aid to competitiveness. (Expert Group)

3.3.2 Company/Third-level Co-operation

A number of companies are involved in various initiatives with the Institutes of Technology in Tallaght and Cork, with DCU and with other educational and training bodies. The direct involvement of many more technology companies in training and education is critical to solving Ireland's growing skill needs. The policy response proposed by the Expert Group suggests that a significant proportion of the skills required by industry will be made available through company-based or company-sponsored programmes. This is important in supporting Industry/Institute of Technology Sandwich and Block Technician courses. It also ensures that the response, both in quantity and quality terms, is demand-led. Such company involvement entails costs in terms of support for college fees, staff release, lecturing inputs etc.

Proposal: It is proposed that companies need to be specifically encouraged to further commit to the process of skill development through the Business/Education Partnership Forum and through discussions with the development agencies and education and training organisations. (Development agencies, FÁS, HEA, Forfás)

3.3.3 Involvement of Business in the Identification of Skill Needs

As the ultimate employers of the skilled people that are produced by the education and training providers, the views of companies on the overall priorities of skills needs are of paramount importance.

The potential impact of such views in shaping the education and training provision is probably greatest at the level of individual educational or training establishment. There should of course be business/education and training partnerships at all levels – individual, local, regional and national.

There is a range of existing mechanisms and many initiatives have been put forward – including the Business/Education and Training Forum, the FÁS Industry Training Committees, individual institute/industry pilot schemes and the regional fora piloted in 1997. The issue is to ensure that there is a focused and productive involvement of business in the design and delivery of training programmes.

Full use also needs to be made of the potential of the fiscal incentives now available for the private sector to become involved with the educational sector.

Proposal: It is proposed that Universities, Institutes of Technology and FÁS training centres be encouraged to make proposals on how to involve relevant local businesses and other interests in course design and choice, and that they be asked to report annually on how they have involved such interests. (Departments of Education and Science/Enterprise, Trade and Employment)

3.3.4 Overseas Recruitment

A flow of returning emigrants and immigrants would help ease the short-term skills gap problem. Enterprise Ireland has launched a campaign to attract more software people back to Ireland. It is primarily aimed at the USA and the UK. It should be extended to cover the hardware electronics sector and to target people in the rest of the EU and non-EU nationals. Visas and work permits should be issued as required.

Proposal: That the Enterprise Ireland "Opportunities Ireland" campaign should cover the hardware sector as well as the software sector and should target the USA, the EU and the rest of the world; and that it should be resourced as appropriate. (Enterprise Ireland)

3.3.5 Skilled Operatives in the Electronics Sector

The sectoral studies of software/computing and hardware electronics indicate that these sectors require considerable numbers of operatives that need to be skilled at a lower level than technologist. The Expert Group accepts that there are skill needs in this area but has not yet been in a position to examine in detail the specific skills required.

The major part of the increase in employment envisaged under the high growth scenario is for skilled operatives. A significant proportion of the non-technologist group needs to be trained and educated. Such skills can be provided through FÁS, the VEC Post-Leaving Certification Courses, in-company trainers and private sector trainers.

In 1997, FÁS trained almost 400 people in software skills. FÁS also has a role in meeting the needs of manufacturing and services firms for entry-level personnel in areas such as test technician and technical support. FÁS has established successful co-operation with major companies such as Hewlett-Packard. FÁS received an additional allocation in the 1998 Budget that should allow an increase in the numbers trained in these areas by about 100 this year. Because of the need for capital investment and the development of links with companies, this type of training cannot be turned on and off instantly.

The Post Leaving Certificate Courses are also expanding into providing skills for these sectors. However, little capital investment has taken place in the PLC sector. The £250m Scientific and Technological Education (Investment) Fund could provide the funds for the additional investment required.

Proposal: It is proposed that there be 800 entrants each year to FÁS programmes and 500 to PLC Programmes. (FÁS, Department of Education)

4. Increasing the Awareness of Skills Opportunities

4.1 General Awareness of Job Opportunities

The projected increase in students taking technology programmes, at a time when the number of school-leavers is declining, implies an increase in the proportion of 17-18 year olds taking technology courses at third-level, from approximately 17 per cent in 1989 to about 25 per cent by 2003. This implies major changes in attitudes and behaviour in second-level education.

Factors to take into account in addressing this challenge are:

- many young women have negative perceptions about technology careers, which results in low participation rates by women in technology education programmes;

- the attitude of young people, parents and career guidance councillors to technical careers appears to be less favourable than to careers in the professions and management;

- the proportion of students that take science subjects at second-level is declining and this limits the opportunities for students to take technical courses at third-level;

- the absence of science subjects at primary-level;

- the historic approach to increasing third-level enrolments has been to boost arts and commerce numbers, as a cheaper option (both in capital and current terms) than engineering and science; and

- the recent commitments to investment in technology education at all levels.

The Skills Awareness Campaign and the Science and Technology (S&T) Awareness Programme aim to increase the interest and awareness of second-level students in technology careers and in science and technology generally. Major effort needs to be put into changing attitudes and perceptions of second-level students. The involvement of guidance counsellors and other teachers is vital in bringing about this change.

Proposal: It is proposed that a study (building on the existing work of the ESRI and others) be carried out into the factors affecting student choices at second-level and especially their choice of technology careers. (Forfás/Department of Education and Science)

4.2 Participation in Technology-Oriented Education

The number of young people enrolling in third-level education each year has increased substantially in recent years, from 22,323 in 1990 to 30,528 in 1996 (Table 5). This represents a rise from 31 per cent to 44 per cent of the 17-18 year old age cohort. The proportion of young people who have enrolled in technology education has increased from 14 per cent in 1990 to 18 per cent in 1996.

As the number of young people aged 17-18 years falls over the medium-term, the proportion involved in technology education needs to rise. The percentage of young people expected to enrol in technology education, as a result of existing commitments, is expected to increase to 24 per cent by 2003. The effects of the proposals in the report are to add about 1-2 per cent to this.

Table 5: Participation in Technology Education

	1990	1996	2003
Average 17-18 Year Old Age Cohort	70,000	70,000	62,000
Intake into 3rd-level Education	22,000	30,500	34,000
% of 17-18 Year Old Age Cohort	31%	44%	55%
Intake into Tech. Education	9,900	12,500	14,700
% of 17-18 Year Old Age Cohort	14%	18%	24%

Source: HEA, ESRI, Department of Education and Science

As can be seen from the CAO first preference data in table 6, school-leavers' interest in engineering and technology has increased in recent years. As a percentage of first preferences, applications for engineering degrees have risen by one–third since 1992 while applications for engineering and technology diplomas have risen by almost 50 per cent in the same period.

Table 6: First Preferences in Engineering & Technology Courses as a Percentage of Total First Preferences (1991-98)

	Degree	Certificate and Diploma
1998	16%	31%
1997	15%	25%
1996	13%	23%
1995	20%	13%
1994	13%	23%
1993	13%	23%
1992	12%	22%

Source: Central Applications Office

Achieving, major growth in both total graduates and in engineering and science graduates at a time of reducing numbers of young people poses a major challenge for the education system. It may also point to the need for new degree course combinations to ensure a better match between students' educational preferences and the employment prospects associated with those preferences.

Job-seekers at home and abroad, students at second-level and their parents and teachers, the unemployed, people returning to work and people working in other sectors need to made aware of the career opportunities that are available in the technology areas. There is also a need to ensure that people working abroad are made aware of the opportunities now available in Ireland. The market will itself provide a considerable amount of information for job-seekers who are already in the sector.

The awareness of job-seekers can be increased by using the services of Guidance Counsellors in the second-level education system, the FÁS Employment Services, the Local Employment Services and similar initiatives. Important FÁS initiatives in this area include:

- The High Skills Pool: Each Christmas, a jobs fair is organised for skilled Irish people home on holidays;

- EURES: This is an EU-wide system whereby employers can fill vacancies by employing foreign residents;

- FÁS Opportunities 98: An annual recruiting fair in the RDS aimed mainly at school-leavers and recent graduates;

- Overseas Sponsorship Programme: FÁS is currently building a database of all graduates who have participated in the programme and will use it to fill vacancies;

- WATIS: A searchable index of job seekers' CVs accessible through the FÁS website; and

- Language Register: An index of persons with language skills available to companies with vacancies.

Another initiative would be the development of a major Internet-based information clearing-house on job vacancies and on the education and training opportunities available in these skill areas.

4.3 The National Skills Opportunities Awareness Programme

In late 1996, a Skills Awareness Campaign Committee was formed, as a sub-committee initially of the Forfás Interim Skills Group and later of the Expert Group on Future Skills Needs (current membership of the Awareness Campaign Committee is given in Attachment 3). The objective of the Committee is to increase the awareness of job-seekers (especially school leavers) of the career opportunities in the technology industries in Ireland.

Over the past year the Group:

- developed a skills brochure that was issued to all secondary schools. This was revised earlier this year and 80,000 copies were sent to schools throughout the country;

- held detailed briefings for the education and economic correspondents of the national newspapers, resulting in substantial coverage;

- organised supplements in the national papers highlighting the opportunities in the key areas;

- held meetings with Guidance Counsellors;

- completed three videos (on Technicians, Software and Teleservices) and distributed them to all the schools;

- held initial discussions to develop a website, which would be extensively linked to achieve maximum coverage;

- maintained ongoing contact with the media to ensure that opportunities available are highlighted; and

- took a stand at the FÁS Opportunities conference in the RDS in January '98. Over 60,000 students attended the three day exhibition and conference.

The budget for the Skills Awareness Campaign was £100,000 in 1997. Substantially greater effort and resources are required to achieve the required level of awareness.

Proposal: It is proposed that the Skills Awareness Programme be strengthened and appropriately resourced; that a series of workshops and/or company visits be organised for principals, teachers, counsellors and parents; and that a skills opportunities website be developed and linked as appropriate to other similar web sites. (Forfás)

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Attachment 1

Current Membership of Expert Group on Future Skills Needs

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Mr. Colm Regan
Forfás

Mr. Lorcan O'Raghallaigh
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In Attendance

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Substantial work on the First Skills
Report was also carried out by the ESRI
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and by FÁS (Roger Fox and Terry Corcoran).

Attachment 2

Current Membership of the Management Implementation Group

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Attachment 3

Current Membership of Skills Awareness Programme

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