



Responding to Ireland's growing skill needs

The second report of the **Expert Group on Future Skills Needs**



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Future Skills Needs

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



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

The Irish economy is currently experiencing unprecedented growth. This growth has been underpinned by an Irish workforce which has grown in both size and in the level of its skills and educational attainment. It is essential that we plan forward in terms of the likely manpower requirements needed to fuel continued growth. In this connection, the analysis undertaken by the Expert Group on Future Skills Needs and the recommendations made by the Expert Group are very timely.

Ten years ago, few would have predicted the situation today in which policy makers have to turn their attention to the potential difficulties which a general tightness in the labour market might bring. Then, unemployment seemed endemic and many believed that it would always be so. Now, in many instances, we appear to have more jobs than people available to fill them. Employment growth has grown significantly as a result of economic prosperity and unemployment levels are now at an all time low. This is a most welcome change-around.

For economic growth to continue, however, it is essential that we have a match between the employment being created and the people available to take up these positions. As the Expert Group points out, the issue is a complex one and requires effective manpower planning to get the balance right. This planning must encompass the issues of (i) general labour availability; (ii) the availability of people for lower skill positions; and (iii) the availability of people with higher levels of educational attainment and specific skills to meet the requirement of a range of sectors. I am very pleased that the Expert Group, in this report, has addressed this broad range of manpower issues.

While this second report of the Expert Group is broader in scope than its first report, I realise that it is not possible for the Group to examine every sector and every occupation in a single report. I am delighted that the Expert Group will continue its valuable work and that the Group intends analysing other skills needs in the economy in future reports. I have also asked the Expert Group to monitor the situation as it evolves in those sectors analysed in this report and to bring forward recommendations as appropriate.

The one certainty is that the pace of change is accelerating. We must ensure that our manpower policies are appropriate to this fast changing environment. This second report of the Expert Group will greatly assist the Government to plan forward and to address the many issues involved. In this way, effective manpower planning will facilitate the continuation of the economic growth currently being experienced, to the benefit of all.

Mary Harney TD

Tánaiste and Minister for Enterprise, Trade and Employment

Foreword by the Minister for Education and Science

The second report of the Expert Group for Future Skills Needs highlights the importance that education has played in enhancing the knowledge and skills of the Irish labour force and its contribution to our current prosperity and growth.

The nature and variety of work available in Ireland has changed considerably in recent years. New sectors and new occupations are emerging which require a flexible and adaptive workforce. Education has a key role to play in ensuring that the Irish people develop the creativity and skills required in a modern economy in which knowledge is the new currency.

Education and training are central to Ireland's continued growth. Our first commitment must be to developing a love of learning among the very young. We have been successfully encouraging more young Irish people to stay longer in the educational system and to enhance their career prospects as a result. There are still a worrying number of young people who drop-out of the system before their basic life and employment skills have been acquired. I am committed to encouraging these young people to stay longer in the educational system. All of us involved with young people have a responsibility to convince them of the very positive benefit that education and training can have on the quality of their lives.

Our school system is built on a broad base of subject choices – and rightly so. However, a decreasing number of our second level students choose to pursue a range of science subjects at Leaving Certificate level. This will greatly curtail the numbers coming forward with a genuine interest in pursuing science based courses at third level.

At third level we need a balance between the need to provide courses to meet specific skill needs as well as providing courses of a more general nature. This second report of the Expert Group recommends the type of courses and places required at third level to meet the manpower needs of the future. It makes a most valuable contribution to future education planning.

Education, however, must not be viewed as undertaken just in the formative years in full-time education. Increasingly, education involves a commitment to a continuous process of lifelong learning. In this regard, employers have a role to play in facilitating and encouraging their workers to enhance their current level of skill attainment through further education and training. The result will be a more motivated and satisfied workforce capable of delivering a quality performance in a world class environment.

As Minister for Education and Science, I intend to ensure that the educational provision is relevant to the needs of modern Ireland, that it contributes to the development of the whole person and that it plays its full part in equipping the Irish people with the knowledge and skills necessary to thrive in a modern, prosperous and outgoing society.

Michael Woods TD

Minister for Education and Science

Executive Summary

1. Introduction

1.1 Background

In order to facilitate the continued growth in the economy, the Government established the Business, Education and Training Partnership in late 1997 to assist in the development of national strategies to tackle the issue of skills needs, manpower needs estimation, and education and training for business. The key elements of the partnership are as follows:

- The Business, Education and Training Partnership Forum¹
- The Expert Group on Future Skills Needs
- The Management Implementation Group¹

The objectives of the Expert Group have remained the same since its inception. These are as follows:

- To identify, in a systematic way, the skill needs of different sectors and to advise on the actions needed to address them;
- To develop estimating techniques that will assist in anticipating the future skill needs and requirements of the economy and the associated resource requirements;
- To advise on the promotion of education/continuous training links with business at national and local levels;
- To consider strategic issues in developing partnerships between business and the education/continuous training sectors in meeting the skills needs of business; and
- To advise on how to improve the awareness of job seekers of sectors where there are demands for skills, of the qualifications required, and of how they can be obtained.

This is the second report of the Expert Group on Future Skills Needs.

Membership of the group is broadly based and includes business people, educationalists, policy makers, public servants and members of the industrial promotion agencies. While the individual membership of the Group has changed since its inception, the same broad spread of views and expertise is represented in the group.² Since the Expert Group completed its first report, a representative of ICTU has joined the Group.

1.2 First Report of Expert Group

In its first report, the Expert Group focused on the Information Technology (IT) sector.³ This report was very well received and resulted in significant additional investment by Government and the creation of substantially increased places in third level colleges, at undergraduate and postgraduate level, as well as increased places on relevant FÁS training programmes. The main elements are as follows:

- In April 1999, the Government approved an additional allocation of IR£75 (€95.23) million to the Department of Education and Science for the provision of 5,400 IT related third level places.

¹ Appendix I contains a brief description of the role and membership of the Business Education and Training Partnership Forum, the Management Implementation Group and the National Skills Awareness Group. The Business, Education and Training Partnership Forum met on 2nd December last to consider the current work of the Expert Group and its proposed recommendations. The Expert Group has taken into account the views of the Forum in framing its final recommendations which are contained in this report.

² The current membership of the Expert Group on Future Skills Needs is listed in Appendix II.

³ Published in December 1998, this report is available from Forfás.

- In January 1999, the Accelerated Technician Programmes⁴ were expanded to include information technology and thus 1,100 students are now enrolled on courses in the Institutes of Technology as part of the Accelerated Technician Programme.
- In June 1999, the Government made an additional IR£6 (€7.62) million available towards the continuing annual provision of 1,500 places on postgraduate conversion courses by the third level colleges in IT related areas.

In addition, FÁS agreed to train an additional 700 persons in relevant IT skills and an extra £3.2 (€4.06) million was allocated for this initiative by the Government in the 1999 budget.

The Expert Group welcomes the speed with which the Government responded to its original recommendations. The level of additional investment made in education and training and the scope of the initiatives in this area has meant that substantial progress has been made in the implementation of the recommendations of the Expert Group's first report.

1.3 Scope of the Second Report

This second report of the Expert Group is wider in scope. It first analyses the general labour market in terms of both general labour availability and the availability of workers for lower skill occupations (Chapter 2). Then the needs of a variety of different areas are considered and recommendations are made by the Group with a view to overcoming any existing or anticipated deficiencies in skills or labour availability. The areas covered are as follows:

- The main craft areas of the Construction Industry (Chapter 3)
- Chemical and Biological Sciences - Third Level (Chapter 4)
- Researchers (Chapter 5)
- Information Technology - Third Level (Chapter 6)

The Expert Group selected these areas for study in its second report because of their importance to the economy; the severity of labour and skills shortages prevalent in the sectors; and the need, in some cases, for longer term planning within the educational and training system to provide workers with the necessary high qualifications required.

The Expert Group wishes to emphasise, however, that it recognises that occupations within other sectors are also experiencing skills shortages. It proposes to broaden the scope of its investigation further in future reports, while continuing to report progress in those areas which have been the subject of its first two reports.

2. The Labour Market

2.1 The Labour Effects of Economic Growth

During the 1990s, Ireland achieved unprecedented rates of economic growth. The scale and sustained nature of this expansion translated into large scale job gains. During the decade there was an increase of about 450,000 in the numbers employed. Growth in the labour force and the decline in unemployment have provided the necessary human resources to fill these positions. As a result,

⁴ In 1997 a joint industry/education task force was established to urgently address the technician supply needs of high-technology companies. Arising from the recommendations of this task force, Accelerated Technician Programmes were introduced from January 1998. These highly focused programmes, of relatively short duration (18 months), were aimed at less skilled employees already working in companies which were experiencing technician shortages and at potential students who had not participated in such courses in the past.

the unemployment rate in Ireland of about 5% is now significantly below the EU average of 9%.

All this activity has totally transformed the Irish labour market. Where unemployment was endemic in the 1980s, today the labour market is tight. There are now both **labour shortages**, with insufficient number of workers available to fill positions across all categories, and **skill shortages**, with an inadequate number of particular types of specialised workers available.

A recent survey of private enterprises (excluding agriculture), commissioned by Forfás and FÁS, indicated that more than one in four of the enterprises surveyed had vacancies, the majority of which they considered difficult to fill. This situation was even more pronounced among larger firms. While the survey indicated that, relative to demand, the greatest shortage was among computer and engineering degree-holding professionals and associate professionals, it also indicated that significant shortages existed in certain craft occupations and in a number of less highly qualified categories. The situation was particularly acute in the Dublin area.

2.2 Projections of Labour Supply and Demand

The Expert Group has examined developments in the labour market and produced forecasts of labour market supply and demand for the next decade. The Expert Group estimates that the demand for labour will remain buoyant with employment continuing to rise, but at a less rapid rate than in the recent past. Notwithstanding this slowing down in the rate of employment expansion, it is anticipated that a further 356,000 jobs will be created during this period. This is an increase of over one fifth on the present employment levels. Moreover, the nature of the jobs being created will increasingly demand higher skills on the part of the workforce.

It is anticipated that the total labour force can grow by 341,000 (+20%) over this period, with the greatest relative increase coming in the years immediately ahead. Similar to demand, this growth in the labour force, while significant, will be at a rate less than that recently experienced. Significant changes in the educational profile of the Irish labour force are also expected over the next decade, with an overall rising educational attainment level anticipated.

On the basis of the projected numbers available for work and the projected number and nature of the jobs available, it is anticipated that, as long as the economy remains internationally competitive, the Irish labour market is likely to remain tight over the next decade. This tightness will relate both to general labour shortages and to skill shortages for particular categories of specialised workers.

2.3 Increasing the Supply of Labour

The means of increasing the supply of appropriately skilled workers is the main concern of the Expert Group. Its deliberations and recommendations with regard to craft construction skills and the requirement for employees with third level qualifications in the Chemical and Biological Sciences area, in Research, and in disciplines relevant to Information Technology are contained in Chapters 3-6 inclusive.

The Expert Group, however, felt it also necessary to consider the difficulties posed by general labour shortages, particularly in the less skilled areas, as these have a knock-on effect in other areas. In addressing overall labour shortages for less skilled workers, the Expert Group considered, in particular, the needs of the retail sector, the contract cleaning sector and the clothing sector, as these areas are experiencing acute recruitment difficulties and have been the focus of individual studies by FÁS.

In the view of the Expert Group, to increase the numbers available to work in these less skilled positions, a range of initiatives may be needed to encourage the greater participation in the labour force of (i) married women; (ii) older persons fit for work, but who may have taken early retirement or have been made redundant in their middle years; and (iii) those on social welfare or the partners of

those on social welfare, who are concerned that their entitlements may be adversely affected by engaging in even part-time paid employment. The Expert Group believes that greater information should be made available to these potential workers, so that they are clearly aware of the earnings which are possible without their current benefits and entitlements being affected.

In general, the Expert Group considered that the most significant factors affecting general labour shortages for less skilled positions were as follows:

- Comparatively low rates of pay, combined with the effects of the tax and social welfare system;
- A perception of poor working conditions - particularly in respect of promotion opportunities; and
- A greater range of opportunity for young people, both in terms of further education and employment, in other sectors.

The Expert Group considers that the unemployed should continue to be actively supported in their efforts to get back to work. Job referral, training, education and personal support will all be needed and the emphasis should be on a tailor-made approach to helping the unemployed. The social partners and community organisations should assist the efforts of FÁS and the Department of Social, Community and Family Affairs in this area.

The recommendations of the Expert Group to address labour shortages have a twin focus. In the first instance, they are directed at increasing the numbers generally available for work; and secondly, they are directed at overcoming the perceived barriers to the recruitment and retention of less skilled workers in sectors such as retail sales, contract cleaning and clothing.

2.4 Recommendations

With a view to increasing the overall numbers of people available for work, the Expert Group makes the following recommendations:

- **The Government should review the tax and benefit position of low paid workers and introduce changes to the taxation and social welfare systems to lighten taxes on low wage earners and to further reduce benefit claw-backs from the unemployed spouses of those earning low wages.**
- **The welcome provisions of Budget 2000 in relation to child care should be monitored to assess their effectiveness. Further initiatives in this area may be needed at Government and employer level.**
- **The unemployed should continue to be actively supported in their efforts to get back to work.**
- **Modern information and communication technologies, such as the Internet, should be used to augment increased efforts by FÁS and Enterprise Ireland to promote job opportunities in Ireland to non-residents.**
- **Employers should actively seek to recruit those over the age of 55 and those in this age group should be encouraged to take up employment.**
- **Employers should further explore flexible working time and location options. Any barriers to their increase should be identified and the relevant Government departments, with the social partners, should work together to develop initiatives to overcome.**

With a view to increasing the numbers of less skilled workers that are recruited and retained within the retail, contract cleaning and clothing sectors, the Expert Group makes the following recommendations:

- **Enterprise Ireland should support selected firms in clothing and other labour intensive sectors of Irish industry to enhance their productivity, through training in design and in modular manufacturing and production methods, so that such firms are thereby able to produce higher value added goods more efficiently and, as a result, are in a position to offer higher remuneration to their workforce.**
- **Traineeships, with recognised accreditation, which have been introduced recently by FÁS for the clothing sector, should also be extended on a nation-wide basis to those engaged in retailing.**
- **The relevant industry associations and trade unions should orchestrate an awareness campaign to highlight the full entitlements available to those returning to work and the full take-home pay opportunities.**
- **Companies should offer more flexible working arrangements and should develop forms of non-pay incentives.**
- **FÁS, in consultation with both sides of the industry, should develop an action plan for the contract cleaning sector based on the recently completed sectoral report. This should assist in improving productivity, in providing a more clearly defined career path for workers and in enhancing the status of the sector.**
- **FÁS should provide training in hygiene and safety on a regional basis for those involved in the contract cleaning sector.**
- **Basic vocational information units should be developed by the relevant industry associations for use by transition year and Leaving Certificate Applied Programme Students in order to promote working in these sectors among young people. These initiatives should be developed in full consultation with the educational authorities and with teacher representatives so that the information supplied and the associated work experience is appropriate.**

3. Skilled Construction Craftspersons

3.1 Rapid Growth to Continue

The construction industry in Ireland has grown very rapidly in recent years. The turnover of the sector was valued at IRE11.6 billion (€14.7 billion) in 1999, an increase of 13% on the previous year. Reflecting the growth in output, construction industry employment also increased by 13% between 1998 and 1999 to reach a level of 142,000 persons employed.

Reflecting the continued growth in the economy and the planned implementation of the National Plan, by the year 2003 output and employment in the construction industry are forecast to have grown by 29.4% and 31% respectively, over the 1999 levels. This represents an expected increase of over IRE3.4 billion (€4.32 billion) in output and of 44,000 persons employed in this activity over the period. The greatest relative increase in both output and employment is expected to take place in the years 2000 and 2001.

The rapid growth which the construction industry has experienced in recent years has put severe pressures on employers to find workers to fill the available positions. The Expert Group understands

that the industry is experiencing significant manpower shortages in many of the non-craft manual construction occupations as well as shortages in specific construction related craft skills.

The Expert Group considers that its recommendations in relation to increasing the number of people available for work in lower skilled areas, detailed in Chapter 2, if implemented, would have a positive impact on the labour shortages for lower skilled workers currently being experienced by the construction industry.

3.2 Requirement for Skilled Craftspersons

The Expert Group focused, in particular, on the requirement for skilled craftspersons. These include electricians, bricklayers, plasterers, painters, carpenters, plumbers and (construction) plant fitters. At present, there are almost 55,000 skilled craftspersons engaged in the construction industry. Reflecting the rapid growth in construction activity in recent years, this represents a doubling of employment in these crafts over the last five years. As a result of continuing high demand, it is estimated that there is a shortage of 5,000 skilled craftspersons at present.

The Expert Group estimates that an additional 16,000 skilled craftspersons will be required by 2003. This is an increase of 29% over the 1999 levels⁵. While the present severe shortage of skilled craftspersons is expected to ease somewhat by 2003, as those currently in apprenticeship training qualify and become available, it is expected that skill shortages will still be a feature of the construction industry at that time.

3.3 Recommendations

The Expert Group recognises that there is little that policy makers can do to immediately increase the supply of craft skills within the Irish labour market. This is because the current method of acquiring such skills, the Standards Based Apprenticeship System, takes approximately four years to complete. Accordingly, to address the difficulties experienced by the construction industry as a result of shortages of skilled craftspersons, the Expert Group focuses on both short-term and long-term solutions to the issue in its recommendations which are as follows:

- **FÁS and the Construction Industry Federation should seek to address the immediate craft skills shortages by increasing their efforts to attract to Ireland suitably qualified persons from other countries.**
- **Routes to formal craft qualification for experienced but unqualified general workers should be explored and, to this end, a committee should be formed by FÁS of all relevant parties to explore the issues involved.**
- **FÁS, in consultation with the Department of Education and Science, the Construction Industry Federation and the Irish Congress of Trade Unions, should explore the possibility of reducing the time it takes for some apprenticeships.**
- **FÁS should encourage employers to increase the number of apprentices being sponsored, particularly in those trades in which continuing skill shortages are anticipated - painters and decorators, plasterers, bricklayers and (construction) plant fitters.**
- **FÁS and the Department of Education and Science should ensure that sufficient resources are made available so that there is no delay in providing apprentices with places on the off-the-job components of the apprenticeship programme.**

⁵ The model on which the forecasts are based was developed by FÁS Planning and Research Department in response to the initiative taken by the Construction Industry Training Committee.

4. Chemical and Biological Sciences

4.1 Introduction

There are around 100,000 people currently employed in the Chemical, Biological Sciences and related fields. These sectors are the pharmaceuticals, chemicals, plastics and rubber, medical devices, biotechnology, food, beverages and tobacco industries.

It was considered that, while the main growth would be in pharmaceuticals, medical devices and in Irish owned biotechnology companies, all the other areas would also experience growth, but at a lower rate. Based on sectoral growth scenarios developed by the Expert Group, total employment across these sectors is projected to increase by one third, from 100,000 to 132,500 persons employed, by the year 2005.

4.2 Third Level Places

The particular focus of the Expert Group was on meeting the need for third level degree holders and technicians in specific disciplines which are particularly relevant to the industrial sectors outlined above.

It is anticipated that the demand for those with degrees and for technicians in chemical and biological sciences will continue to grow with the projected growth of the relevant sectors. The best estimates, at this stage, suggest that there will be an annual requirement for an additional 410 persons with either relevant degree or technician qualifications by the year 2005. This number is in addition to those that are expected to be available annually as a result of programmes already in place.

At degree level, the additional annual requirement is for 290 graduates. Most of the graduates needed are in biological sciences (+200) but there is also an additional projected requirement in chemistry (+80) and chemical engineering (+10). An additional 120 science technicians are also expected to be needed on an annual basis by the year 2005.

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. The Expert Group considers that an additional 1,150 degree places will be required on a phased basis to meet the projected shortfall for degree level skills required in this area by 2005.

In view of the current difficulties in attracting sufficient students to fill the technician places already available, the Expert Group is not recommending that additional places be provided at present for the annual additional 120 science technicians required. In order to maintain technician output, however, the Group recommends that some of the existing facilities be used to provide an additional 250 science technicians annually through an extension of the Accelerated Technician Programme. Students on this Programme are normally mature and are often employed in industry. They represent an additional source to those coming from second level.

4.3 Technology Foresight

The extensive programme for research, proposed as part of the Technology Foresight⁶ initiative, will generate additional demand for degree holders and technicians in chemical and biological sciences. The level of this demand will depend on the eventual scale and design of the programme. The Expert Group proposes to bring forward additional recommendations to meet these requirements when

⁶ The Technology Foresight Initiative brought together scientists, engineers, Government officials and others to identify areas of strategic research and emerging technologies likely to yield greatest economic and social benefit. The findings of the initiative were published by the Irish Council for Science, Technology and Innovation in April, 1999.

detailed plans to implement the Technology Foresight initiative have been agreed.

4.4 Candidates for Third Level Places

A decreasing number of students are coming forward from second level with a genuine interest in pursuing courses in science related areas at third level. This is particularly noticeable with regard to the fall-off in those applying to study at technician level, but it is also relevant to those wishing to pursue degree level studies.

The Expert Group notes that the Leaving Certificate choices being made by second level students are moving away from the relevant science areas. For example, the proportion of students taking chemistry in their Leaving Certificate has fallen from 21% in 1987 to 12% in 1999. The perception would appear to be that for the equivalent effort, it is “easier” to get high marks in non-science subjects and accordingly, students are choosing non-science subjects over science subjects in order to increase the likelihood of attaining higher points.

Moreover, this problem is compounded by the overall decline in the number of Leaving Certificate students due to demographic changes. The Expert Group believes that there is an urgent need to introduce a range of initiatives to reverse the decline in the number of students taking science subjects at Leaving Certificate level.

Given the present difficulty in attracting sufficient numbers of Leaving Certificate students to pursue science related studies at third level, the Expert Group believes that companies should actively encourage their existing employees to obtain further qualifications - those without formal qualifications to become technicians and those already at technician level to obtain degrees. There is also a need to encourage mature students from other areas to undertake science courses. In this context, the Accelerated Technician Programme can have a specific role to play and should, as proposed above, be extended as soon as possible to cater for additional science technician students.

4.5 Recommendations

The Expert Group makes the following recommendations designed to meet the need for additional persons with third level qualifications in chemical and biological sciences:

- **An extra 1,150 places on degree level courses should be provided in relevant science disciplines on a phased basis over 4 to 5 years so that an additional 290 graduates may become available each year.**
- **The Accelerated Technician Programme should be extended as soon as possible to cater for 250 science technician students.**
- **The information campaign recently undertaken by the FÁS Chemicals and Allied Products Industry Training Committee should be extended. Further awareness raising should be undertaken by Forfás and by the relevant industry associations to inform potential students, their parents and teachers, of the range of interesting career opportunities available to science graduates.**
- **The third level colleges should examine the promotion of their existing science courses, and should consider rebranding and repositioning these with a view to increasing their attractiveness to potential students, e.g. “Pharmaceutical Technology” instead of “Chemistry”.**
- **The Government should establish an Interactive Science Centre to encourage a greater interest in science among primary and secondary school children.**

- **As recommended by the Commission on the Points System, the factors affecting the subject choices of Leaving Certificate students, and the perceived variation in marking between subjects, should be examined as a matter of urgency by the Department of Education and Science. The Department should also consider appropriate strategies to ensure a more even distribution of grades across subjects.**
- **The Expert Group endorses the recommendation of the Commission on the Points System that a committee should be established of all interested parties to examine the proposed access by second level students to professional healthcare courses through a compulsory preliminary general science route.⁷**
- **Employers should actively pursue a policy of upgrading the skills of those already employed within the sector to technician and degree level as appropriate. In this connection the Department of Enterprise, Trade and Employment and the Department of Education and Science should come together with the relevant interests to devise appropriate programmes.**

5. Researchers

5.1 Introduction

Ireland's sustained growth will increasingly be based on the country's ability to develop a knowledge driven economy. This will require an even greater investment in developing the knowledge and skills of the Irish people through (i) a continued focus on increasing the general educational attainment levels of Irish students completing full time education; (ii) a fostering of a culture of life-long learning; and (iii) an increase in the number of Irish people attaining doctorate level academic qualifications (PhDs). There is a particular need to increase the numbers undertaking research at PhD level.

5.2 New Research Programmes

Demand for PhDs comes mainly from the education sector for academic staff and for post doctorate research positions, and from high technology industries. Demand for researchers from these sources is expected to grow sharply in the years immediately ahead. Moreover, the major new third level research programmes currently being put in place by the Department of Education and Science, and the implementation of the Technology Foresight recommendations, recently announced by the Government, will require considerable numbers of postgraduate and post doctorate researchers over the next decade.

5.3 Supply of Postgraduate Researchers

While strong advances have been achieved in recent years in the number of PhDs awarded in all fields, the actual number awarded is still relatively low. There is also concern that the student numbers registered for higher degrees has levelled off in recent years. This is probably a result of the current buoyancy in the labour market, with attractive employment opportunities now available to degree holders who, in other circumstances, would be potential PhD students. This is a matter of concern as the levelling off in the number of students registering for higher degrees will affect the numbers of PhDs awarded in future years.

⁷ The Commission on the Points System recommended in its December 1999 Report that the key bodies and institutions involved in policy-making on healthcare training, e.g. the Medical Council, the Universities, the Higher Education Authority and the Department of Health and Children, should set up a committee to explore the issue of access to high points professional healthcare courses, (e.g. medicine, pharmacy and dentistry) through a preliminary science course. There is potential to increase interest in the sciences by such a proposal, if it were to be implemented.

While it is not possible to put exact numbers on the demand for highly skilled researchers over the next five to ten years, the Expert Group, on the basis of its preliminary research, is concerned that the supply of postgraduate researchers available, on the basis of present trends, will fall significantly short of what is required to meet the substantially increased demand that will arise during this period.

Initiatives are required to significantly increase the number of researchers available over present levels. Given the length of time it takes to complete doctoral studies, after a primary degree has been awarded, the Expert Group considers that certain short-term measures will be needed immediately to boost the supply of researchers, as well as longer term measures designed to increase the number of highly qualified researchers graduating annually from the Irish education system.

5.4 Recommendations

The recommendations of the Expert Group to increase the numbers of PhD and other highly qualified researchers available within the Irish economy are as follows:

- **Forfás, in the context of the ‘Science, Technology and Innovation Awareness’ campaign, should focus specifically on promoting the awareness of research as a career and should work with the higher education institutions in this regard.**
- **The Higher Education Authority (HEA) should examine options for ensuring that complementary mechanisms are in place for the support of postgraduate and post doctorate researchers, including appropriate levels of financial support, and for the development of research as a career.**
- **In order to meet the short term needs for such researchers, the third level institutions, with the support of the HEA and Forfás, should develop and implement strategies to attract postgraduate students and post doctorate researchers in appropriate disciplines from abroad. This would include the attracting back to Ireland of suitably qualified Irish persons now living and working overseas.**
- **The Government should ensure that no impediments, in the form of over restrictive immigration controls, prevent suitably qualified persons from other countries from taking up research posts in this country.**
- **The HEA should establish a central database on higher education research activities for all third level colleges. This should include information on new post graduate registrations and awards by field of study and financial supports for students.**

As the Government’s major Science and Technology research initiatives are implemented, with their heavy demands for PhD researchers, the Expert Group will continue to closely monitor this area, to ascertain more exactly the emerging shortfall in the numbers of researchers required and the areas in which the most pressing needs are arising, and will bring forward further recommendations as appropriate.

6. Information Technology

6.1 Introduction

The first report of the Expert Group, published in December 1998, focused on the higher level skills needs of the software and hardware areas of the Information Technology (IT) sector. This report

identified clear and significant skill shortages and made specific recommendations as to how these could be addressed.

On the basis of these recommendations, the Government responded with a £75 million (€95.23 million) investment to bridge the identified skills gap by increasing the number of degree professionals and technicians which would be available each year.⁸

The Expert Group has continued to monitor changes in the situation since its last report was published. It has noted that, as a result of the Government's investment, the projected annual supply of IT degree professionals will be more than double the 1996 levels by the year 2003, while the projected annual supply of IT technicians will increase by 50%. The Expert Group at this time is therefore not recommending that further additional places be provided over the very substantial number of places currently being put in place as a result of the recommendations in its first report. The Expert Group will, however, continue to monitor the situation within the Information Technology sector and will bring forward recommendations as appropriate.

6.2 Electronics Hardware

The Expert Group has updated the employment projections for the computer hardware related areas of the Information Technology sector. One change which has been identified is that, within the overall projected growth in employment in this area, there is an increased demand for degree professionals as a percentage of the total employed. This is now expected to be 20% of overall employment, compared to an estimate of 13% contained in the first report. This is offset to some extent by a somewhat lower projected employment. In addition, the demand for technicians is now estimated to be slightly lower than projected, 22% compared to 25.5% in the first report. The increasing skill content is a result of the growth in higher skill new projects being supported by the development agencies and an increasing focus on R&D activities by existing companies.

The Expert Group recognises that there will continue to be an overall shortage of engineering degree professionals for companies engaged in electronic hardware related activities to the year 2003. However, additional places have now been provided and the situation should improve after 2003, as these students obtain their qualifications and become available for work.

The Expert Group is not recommending a change in the number of places for degree professionals in electronic hardware related areas at this time, but will continue to monitor the situation and will update the projections.

6.3 Software

The software sector is developing broadly as projected in the first report in relation to projected employment. However, in relation to technicians, the Expert Group is concerned that there could be a shortfall in the supply of computer science technicians for software activities. Many of the extra technician training places have been allocated to engineering courses in the 1999-2003 period, to meet electronics hardware skill requirements. As a result, the Expert Group considers that there is an urgent need for measures to increase the number of computer science technicians as recommended in the first report.

An awareness campaign targeted at first year students in Institutes of Technology is also considered necessary to inform them of the enhanced career prospects if they complete their current course of study rather than dropping out of college to take up immediate employment.

Every effort should be made to continue to ensure a full uptake of the postgraduate software conversion places in the light of improved graduate employment prospects. The annual intake of 1500

⁸ The principle initiatives, made possible by the Government's investment, are set out in the introduction to the Executive Summary on page 4.

students on such courses, as recommended in the first report of the Expert Group and now being implemented, is a critical element in the plans to increase the supply of suitably qualified personnel needed to bridge the identified skills gap.

6.4 Employees and Mature Students

In its first report, the response proposed by the Expert Group to the identified skills gap for IT degree professionals and technicians mainly focused on creating additional places in the Universities and Institutes of Technology for school leavers, or, in the case of conversion course places, for recent graduates. The implementation of these proposals will, it is expected, significantly close the skills gap identified in the first report. However, demographic changes will make this type of solution less appropriate to meeting any additional demands that will arise in the economy in the future. As there will be fewer students leaving secondary school, new and non-traditional sources of degree professionals and technicians will increasingly be necessary. For example, the encouragement of mature students and existing workers to obtain additional skills and qualifications will become increasingly important. In this context, the Accelerated Technician Programme will be central and its funding should be put on a permanent basis.

Companies should be further supported to actively encourage their existing less qualified workers to obtain third level qualifications at technician or degree level as appropriate. In-company training within the IT and other sectors, which is aimed at upgrading the skills of the existing workforce, will be further studied by the Expert Group. The objective of the study will be to ascertain the current level of such training and to identify new approaches which may be needed to further augment the numbers of workers undergoing enhanced skill training.

6.5 Recommendations

Based on its current review of the sector, the Expert Group makes the following recommendations:

- **Priority should be given to increasing the numbers on Accelerated Technician Programmes in computer science, ensuring that places approved in Institutes of Technology are filled.**
- **Programmes such as the Accelerated Technicians Programme, which educate mature students and existing workers, should be put on a permanent footing in terms of funding and resources.**
- **Companies should be further supported to actively encourage their existing less qualified workers to obtain third level qualifications at technician or degree level as appropriate.**

7. Conclusion

Ireland is currently experiencing unprecedented growth. General labour shortages and specific skill shortages should not halt that trend.

The result of the Government's significant investment made in response to the Expert Group's first report has had a very positive impact on the Information Technology sector.

The Expert Group now presents its analysis and recommendations across a broader range of employment areas in this its second report and trusts that a positive response by all involved in implementing its recommendations will have the same beneficial effect across a range of sectors, so that Ireland can continue to thrive and prosper to the benefit of all its citizens.

1. INTRODUCTION

1.1 The Expert Group

This is the second report of the Expert Group on Future Skills Needs. The Expert Group was set up by the Government in late 1997 as part of a Business, Education and Training Partnership to facilitate continued growth in the economy. The remit of this Partnership is to assist in the development of national strategies to tackle the issue of skills needs, manpower needs estimation, and education and training for business.

The three strands of this partnership are (i) The Business, Education and Training Partnership Forum; (ii) The Expert Group on Future Skill Needs; and (iii) The Management Implementation Group⁹.

The objectives of the Expert Group have remained the same since its inception. These are as follows:

- To identify, in a systematic way, the skill needs of different sectors and to advise on the actions needed to address them;
- To develop estimating techniques that will assist in anticipating the future skill needs and requirements of the economy and the associated resource requirements;
- To advise on the promotion of education/continuous training links with business at national and local levels;
- To consider strategic issues in developing partnerships between business and the education/continuous training sectors in meeting the skills needs of business; and
- To advise on how to improve the awareness of job seekers of sectors where there are demands for skills, of the qualifications required, and of how they can be obtained.

Membership of the group is broadly based and includes business people, educationalists, policy makers, public servants and members of the industrial promotion agencies. While the individual membership of the Group has changed since its inception, the same broad spread of views and expertise is represented in the group.¹⁰ Since the Expert Group completed its first report, a representative of ICTU has joined the Group. The current membership of the Expert Group is listed in Appendix II.

1.2 First Report of the Expert Group

The first report of the Expert Group focused on the Information Technology (IT) sector. This report was published in December 1998. The report was very well received and resulted in significant additional investment by Government and the creation of substantially increased places in third level colleges, at undergraduate and postgraduate level, as well as increased places on relevant FÁS training programmes.

- In April 1999, the Government approved an additional allocation of IRE75 (€95.23) million to the Department of Education and Science for the provision of 5,400 IT related third level places.
- In January 1999, the Accelerated Technician Programmes¹¹ were expanded to include information technology and thus 1,100 students are now enrolled on courses in the Institutes of Technology as part of the Accelerated Technician Programme.

⁹ Appendix I contains a brief description of the role and membership of the Business Education and Training Partnership Forum, the Management Implementation Group and the National Skills Awareness Group. The Business, Education and Training Partnership Forum met on 2nd December last to consider the current work of the Expert Group and its proposed recommendations. The Expert Group has taken into account the views of the Forum in framing its final recommendations which are contained in this report.

¹⁰ The current membership of the Expert Group on Future Skills Needs is listed in Appendix II.

¹¹ In 1997 a joint industry/education task force was established to urgently address the technician supply needs of high-technology companies. Arising from the recommendations of this task force, Accelerated Technician Programmes were introduced from January 1998. These highly focused programmes, of relatively short duration (18 months), were aimed at less skilled employees already working in companies which were experiencing technician shortages and at potential students who had not participated in such courses in the past.

- In June 1999, the Government made an additional IRE6 (€7.62) million available towards the continuing annual provision of 1,500 places on postgraduate conversion courses by the third level colleges in IT related areas.

In addition, FÁS agreed to train an additional 700 persons in relevant IT skills and an extra £3.2 (€4.06) million was allocated for this initiative by the Government in the 1999 budget.

The Expert Group welcomes the speed with which the Government responded to its original recommendations. The level of additional investment made in education and training and the scope of the initiatives in this area has meant that substantial progress has been made in the implementation of the recommendations of the Expert Group's first report.

1.3 Scope of the Second Report

The Expert Group considers it important that continued economic growth is not constrained unnecessarily by skill or general labour shortages. The fact that there are at present many unfilled job vacancies reflects a tightness in the general labour market as well as a shortage of specific skills. Accordingly, the Expert Group in its second report focuses on the current general labour market situation and on the availability of workers for less skilled occupations, as well as on a range of specific skills needs.

The report first analyses the general labour market in terms of both general labour availability and the availability of persons for lower level skills occupations (Chapter 2). Then the needs of a variety of different areas are considered and recommendations are made by the Group with a view to overcoming any existing or anticipated deficiencies in skills and labour availability. The particular areas covered are the main craft areas of the Construction Industry (Chapter 3), Chemical and Biological Sciences graduate manpower requirements (Chapter 4), highly skilled Researchers (Chapter 5) and the third level skill requirements of the Information Technology sector (Chapter 6). Chapter 6 also includes an update on the progress which has been achieved in implementing the recommendations of the Expert Group, in respect of the IT sector, which were contained in its first report.

The Expert Group selected these areas for study in its second report because of their importance to the economy; the severity of labour and skills shortages prevalent in the sectors; and the need, in some cases, for longer term planning within the educational and training system to provide workers with the necessary high qualifications required.

The Expert Group wishes to emphasise, however, that it recognises that other occupations within other sectors are also experiencing skills shortages. It proposes to broaden the scope of its investigation further in future reports, while continuing to report progress in those areas which have been the subject of its first two reports.

The Expert Group, in framing its final recommendations which are contained in this report, has taken into account the views of the Business, Education and Training Partnership which met last December to consider the current work of the Expert Group and its proposed recommendations.

2. THE LABOUR MARKET OUTLOOK

During the 1990s, Ireland has achieved unprecedented rates of economic growth. The scale and sustained nature of recent Irish economic expansion has transformed the Irish labour market.

Where unemployment was endemic in the 1980s, today the labour market is tight.

Human resources have been a driving force in Irish economic development. This Chapter traces the evolution of the labour market during the 1990s, summarises current demand and supply conditions and finds that the labour market is likely to remain tight in the short to medium-term. A profile of the rising educational qualifications of the Irish workforce is shown, together with projections of the likely shape of labour demand. The Chapter then identifies areas of policy that may require adjustment in the years ahead to ensure that insufficient labour does not inhibit the continuance of rapid economic growth into the future. Issues in respect of labour shortages in lower-skill occupations in particular sectors are also considered.

2.1 The Labour Effects of Economic Growth

Ireland's economic transformation over the past decade is attributable to an array of mutually-reinforcing factors: low inflation, moderate increases in money wages under successive national agreements, the correction of the public finances, continuing inflows of private foreign direct investment, financial transfers from the European Union, tax reductions and broad stability in exchange rates. All of these factors have allowed the enterprise sector to regain international competitiveness while restoring credibility to public policy.

Underlying these factors, however, two long-term trends have dictated the pace of economic growth, the rising quantity and quality of labour supply.

- (i) The size of the Irish labour force has increased rapidly during the 1990s, as those born during the baby boom of the 1970s came of age and stayed in Ireland in larger numbers.
- (ii) The quality of the labour force improved as those who had benefited from the expansion of education at second and third levels, dating back to the 1960s, advanced through the cohorts of working age.

Through the decade, the ready availability of well-educated and trained labour has been one of the principal factors attracting continuing strong inflows of foreign direct investment to Ireland.

Over the past decade, Irish economic growth has been well-balanced, with indigenous and overseas sectors exhibiting robust growth in both manufacturing and services. Some sectors, such as software, electronics and call centres have shown exceptional rates of output and employment growth. Major segments of Irish-owned industry, such as engineering and consumer food, have also demonstrated a capacity for sustained expansion of production and employment in recent years.

A telling feature of Irish economic performance during the 1990s has been the translation of rapid economic growth into large-scale job gains. Between 1990 and 1999, Irish GNP in real terms has expanded by almost two thirds¹² while the number at work has advanced by almost 37%. As the decade has progressed, the pace of Irish economic activity has quickened. In the five years after 1994, real GNP advanced at an annual average rate of almost 8%, while the numbers at work have risen at an annual average rate of more than 5%.¹³

These remarkable gains in employment have been accommodated by sustained increases in the size of the labour force, rising labour force participation rates (LFPRs) and reductions in unemployment. The most important trends in evidence through the 1990s included the following:

- Between 1991 and 1999, Ireland's population increased by 219,000 persons to 3.745 million, representing an advance of 6.2%.

¹² 'National Income and Expenditure, 1998', CSO, July 1999, Table 6 and Budget 2000, December 1999.

¹³ The total numbers at work (ILO basis) increased from 1.160 million in April 1990 to 1.591 million in the second quarter of 1999. Derived from Table 9, "Quarterly National Household Survey - Third Quarter 1999", CSO, December 1999.

- Over the same period, the country's population of working age - those between 15 and 64 years - rose by 312,000 to 2.494 million, representing an increase of 14.3%. Thus, through the 1990s, the population of working age - from which the labour force is drawn - was increasing at more than twice the rate of the national population.¹⁴
- Domestic population and labour force growth has been buttressed by a turnaround in migration. Where net emigration from Ireland amounted to 160,000 people between 1985 and 1990, net immigration into Ireland numbered almost 58,000 people in the years 1993-1999.¹⁵
- Irish women's participation in the labour force has advanced swiftly since the early 1980s. In 1983, just over one-third of working-age women in Ireland were active in the labour force. By the second quarter of 1999, more than 54% of women of working age were members of the labour force. Women now account for more than two out of every five people working outside the home. By the Spring of 1999, almost 644,000 women were working in paid employment.
- In combination, all of these trends caused the Irish labour force to increase in size by more than one-quarter between 1990 and 1999. The numbers in the Irish labour force rose by 356,000 during the decade, from 1.332 million in April 1990 to 1.688 million in the second quarter of 1999.
- Within the labour force, rapid employment growth has improved the opportunities for unemployed people to find jobs. Between April 1993 and the Spring of 1999, total unemployment (ILO basis) fell from 220,100 to 96,900. During this period, the unemployment rate - the numbers out of work as a proportion of the labour force - fell by ten percentage points, from 15.7% to 5.7%.¹⁶
- The long-term unemployed have shared in the jobs boom. The numbers out of work for more than one year have fallen from 125,400 in April 1993 to just 41,600 by the Spring of 1999. Over this period, the long-term unemployment rate has declined from 8.9% to 2.5% of the national labour force.
- Through the 1990s, the total numbers at work in Ireland increased by 431,000 or by 37.2%. Total employment rose from 1.160 million in April 1990 to 1.591 million in the Spring of 1999.
- The nature of work in Ireland is changing. One-third of the net addition to Irish employment between 1993 and 1999 consisted of part-time jobs. By the Spring of 1999, the number of part-time workers had risen to 266,500 and they comprised one in every six members of the national workforce.
- Through the 1990s, the non-agricultural private sector accounted for almost all of the net increases in national employment. The numbers employed by the non-farm private sector increased by two-thirds during the 1990s, rising from 662,000 in 1990 to 1.107 million in 1999. Jobs growth has been concentrated in private sector services, though manufacturing industry has also contributed significant employment increases. The numbers working in agriculture continue to decline.
- Both labour force growth and employment expansion continued at a very swift pace through the Summer of 1999. In part reflecting inflows of school-leavers and students, the numbers in the labour force rose by 82,200 or by 4.9% between the second and third quarters of 1999. Seasonal factors, added to a strong underlying demand, raised the total number at work by 78,100 or by 4.9% between the second and third quarters of 1999. Despite the scale of labour force growth in the third quarter, the ILO unemployment rate remained constant at 5.7% while the long-term unemployment rate declined further to 2.1% of the labour force.¹⁷

14 'Census 96 - Principal Demographic Results', CSO, July 1997, Table 5A; 'Population and Migration Estimates - April 1999', CSO, October 1999, Table 2.

15 'Population and Migration Estimates - April 1999', CSO, October 1999, Table 5.

16 Labour market data for the second quarter of 1999 is taken from the 'Quarterly National Household Survey - Second Quarter 1999', CSO, October 1999.

17 'Quarterly National Household Survey - Third Quarter 1999', CSO, December 1999, page 1.

- The continuing tightness of the Irish labour market can be seen from the fact that the number on the Live Register, which broadly measures the numbers signing on for unemployment benefits or credits, had declined to 176,162 by January 2000. The seasonally-adjusted standardised unemployment rate for January 2000, derived from these figures, was 4.9%. This represents the lowest rate on record since the current series was introduced in 1983.

2.2 Enhanced Human Resources Critical to Continued Economic Growth

The performance of the enterprise sector in the years ahead will continue to shape trends in Irish employment and living standards. The future success of the Irish enterprise sector will be determined by its broadly-defined competitiveness. Ireland is no longer a low-wage or low-cost economy. The globalisation of world markets, the advent of the Euro, the prospective enlargement of the European Union to the East and the competitive threats posed by low-cost producers world-wide, all indicate that the future of Irish enterprise lies in offering markets high value-added/high-skill products and services, shaped to customers' specifications.

Meeting this marketing challenge will require a continuous emphasis on innovation and productivity improvement. Such advances can be achieved only by upgrading the physical capital stock and by widening and deepening the human resource base available to enterprises. From a public policy standpoint, it is of paramount importance that the future international competitiveness of Irish enterprises is not compromised by an insufficiency of labour or by deficiencies in labour quality. Hence, the Expert Group recognises the importance of identifying the likely future demand for labour and taking measures to ensure its adequate supply. The analysis and recommendations of the Expert Group are intended to provide a contribution towards these objectives.

The successful enterprises of the future will be founded on effective human resource strategies. While public policy can influence the external labour market environment, the specific development of human resources will devolve on enterprises themselves. In a tight labour market, individual enterprises will need to pay greater attention to recruitment, remuneration, career development and staff retention policies. At the same time, raising enterprise productivity through effective in-company training will assume ever-greater importance.

Enhancing the skills and capacities of those already at work has acquired critical importance for two reasons:

- (i) as the economy approaches full employment, it becomes progressively more difficult to raise output by recruiting more people; and
- (ii) the number of new domestic entrants to the labour force is set to slow down sharply in the years ahead.

Hence, the task of pushing out the economy's production possibility frontier, while at the same time generating the productivity gains necessary to underpin cost competitiveness, will devolve in significant measure on programmes targeted at raising and up-dating the skills of those already at work. The importance of re-skilling the existing workforce has already been emphasised in the Government's Green Paper on Adult Education. The Expert Group concurs with its conclusions:

"Demographic trends in recent years also imply that the task of renewing the economy's human capital will increasingly fall on those already within the workforce rather than on new entrants to it. This will require a strengthening of the interaction between education and training institutions and the world of work, significantly increased flexibility in provision in terms of timing, access routes, progression pathways and modularisation and flexible certification systems with mechanisms for accreditation of prior learning and work-based experience."¹⁸

¹⁸ 'Adult Education in an Era of Life-Long Learning', Green Paper on Adult Education, Government of Ireland, November 1998, pages 32-33.

The Expert Group considers that not only are enhanced levels of in-company training necessary to narrow the skills gap with Europe, but, through skills upgrading, they can play a part in alleviating specific skills shortages. The Expert Group has commissioned further research in this area, including an identification of the barriers to training among SMEs.

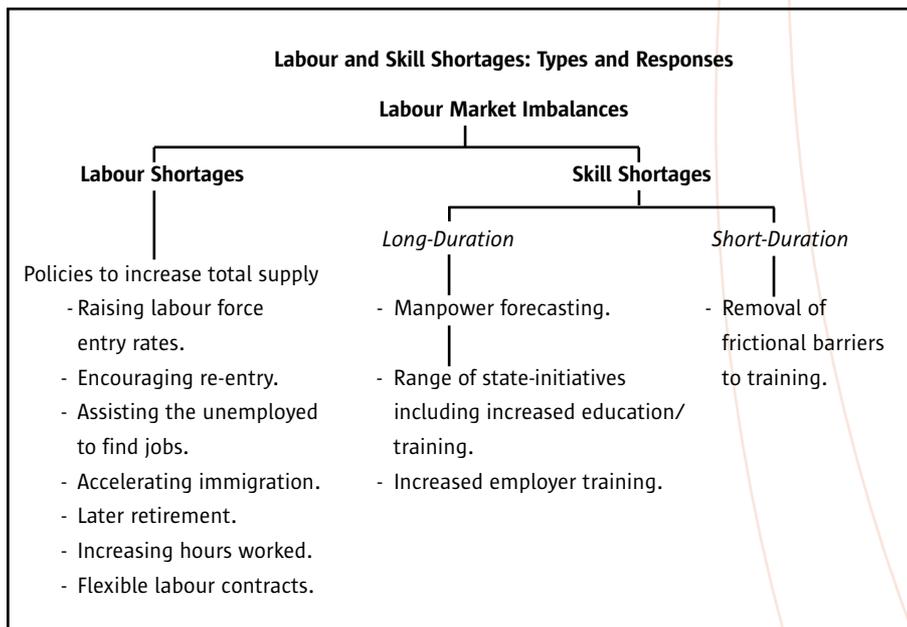
2.3 Current Labour and Skill Demand and Supply Balances

This section first draws distinctions between different types of deficiencies in the supply of labour and then proceeds to outline current supply and demand balances in the Irish labour market.

2.3.1 Labour Shortages¹⁹ and Skills Shortages²⁰

The national policy response to generalised labour shortages is different in character to policies designed to alleviate specific skills shortages. Appropriate responses to general labour shortages aim to expand the overall supply of labour in the economy. Such responses could include attracting new entrants into the labour market, seeking to encourage those who have left the labour force to re-join, increasing the hours worked by the existing workforce, assisting the unemployed to gain jobs and raising immigration to augment the domestic labour supply.

The table below presents a representation of the different types of labour and skill shortages and potential responses to them.



Over most of the last two decades there has been an over-supply of labour with consequent high unemployment and a ready supply of workers to meet employers' needs. From time to time particular skill shortages have arisen but these have not lasted for any sustained period of time. The situation in Ireland since the late 1990s has been different. There are now significant skill and labour shortages.

Surveys of employers' vacancies have been carried out in 1996, 1997 and 1998.²¹ The 1996 and 1997 surveys showed that a significant minority of employers were experiencing difficulties in filling their vacancies and that the position worsened between 1996 and 1997. The latest survey took place in the Autumn of 1998 and was based on a representative sample of the whole of private enterprise, excluding agriculture. The survey results represent 78,000 enterprises with a total employment of 869,000 persons.

¹⁹ Labour shortages occur where there is a generalised insufficiency of workers at prevailing rates of pay.

²⁰ Skill shortages arise where there is an insufficiency of particular types of specialised workers, even where the aggregate supply and demand for labour are in balance or, indeed, surplus. Skill shortages may relate to deficiencies in the number of persons possessing a particular qualification, set of skills, level of experience or some combination of all three.

²¹ A survey of manufacturing, construction and parts of the services sector was carried out by Irish Marketing Surveys on behalf of FÁS in 1996. A survey of manufacturing and internationally-traded services was undertaken by the ESRI for Forfás in 1997. The 1998 survey was also conducted by the ESRI on behalf of Forfás and FÁS.

At the time of the survey 21,200 (27%) of the 78,000 enterprises covered in the survey had vacancies, and 18,700 (24%) had vacancies which they considered difficult-to-fill. Such problems were much more common among larger firms. Half of all large firms had difficult-to-fill vacancies.

There were 53,600 vacancies in total – a rate of 6% of employment.

The results of the 1998 survey are not unexpected in the context of the very rapid growth in employment in Ireland in recent years. On the positive side it might be noted that the majority of firms were not facing any problems in filling vacancies. However, a significant minority had difficult-to-fill vacancies. The pattern of vacancies was as expected, with the most severe skill shortages (in percentage terms) being for computer and engineering specialists. Skilled craftspersons were also in short supply. Lower skill level occupations in the services sectors also showed significant unfilled vacancies, thus indicating generalised labour shortages in the economy.

The survey results distinguish between the situation in Dublin and the rest of the country. One third of firms in Dublin had vacancies, compared to 24% of those elsewhere. Similarly, 28% of firms in Dublin had difficult-to-fill vacancies compared to 21% in the rest of the country. Dublin firms were particularly short of computer professionals (17% of employment), sales and personal services staff, and labourers. However, they were relatively better off with regard to engineering technicians and security staff.

Seventeen percent of firms stated that they had difficulties in retaining existing staff. This was more of a problem for large firms and Dublin-based ones. The most commonly cited areas were in respect of clerical, craftspersons and unskilled workers.

Firms were asked a number of other qualitative questions about their difficult-to-fill vacancies. In general, firms found difficulties in filling vacancies because of a shortage of applicants with adequate experience and/or practical skills and, to a lesser extent, qualifications. In some cases, wage levels, conditions of employment and unsocial hours were given as reasons for their difficulties. The existence of difficult-to-fill vacancies had led to extra strain on management and staff in covering the shortages, and, for half of firms with difficult-to-fill vacancies, this situation had placed restrictions on the development of their business and had impacted negatively on the quality of service offered. Forty percent of these firms stated that their running costs had increased due to overtime, subcontracting or using temporary employees. Firms had taken a range of measures to deal with their problems. Nearly half (46%) had considered a wider range of persons for vacancies, while 45% had offered higher pay. Over a third of large manufacturing companies with vacancies had attempted to recruit abroad, as had 41% of finance, insurance and business services companies.

2.4 The Future Labour Demand and Supply Outlook

This section projects labour demand and supply over the next decade. The methodology used involves applying the growth rates for total employment and for the labour force, as forecast in the ESRI's Medium-Term Review 1999-2005, to the known bases for employment and the labour force, as shown in the Quarterly National Household Survey (QNHS) for the second quarter of 1999. The two sides of the labour market are then compared and unemployment levels and rates are derived. The analysis is presented in terms of ILO definitions of employment and unemployment.

2.4.1 Projected Total Demand for Labour

The demand for Irish labour is a function of the demand for Irish output. The Irish economy is expected to continue to enjoy the prospect of strong, though decelerating, economic growth over the next decade. In consequence, the demand for labour is likely to remain buoyant.

The ESRI's recently published Medium-Term Review provides forecasts for economic growth and the expansion of employment for the decade ahead. These are presented in the table below.

GROWTH , EMPLOYMENT AND INFLATION FORECASTS 2000-2010		
	2000-2005 (% p.a.)	2005-2010 (% p.a.)
Real GNP	+ 5.1%	+ 4.3%
Employment	+ 2.1%	+ 1.6%
Consumption Deflator	+ 2.9%	+ 2.6%

Source: 'Medium-Term Review 1999-2005', ESRI, October 1999, Page viii.

The ESRI projections show real economic growth continuing at very healthy rates throughout the next decade. The ESRI anticipates that this expansion path should support average employment growth of 2.1% annually between 2000 and 2005 and 1.6% annually in the succeeding five-year period. Applying the employment growth forecasts to the known 1998 employment base allows predictions to be made for employment in the years to 2009. This is illustrated in the following table.

TOTAL EMPLOYMENT FORECAST 1999-2009 (SPRING)

YEAR	EMPLOYED ('000s)	INCREASE ('000s)	% CHANGE
1999 Actual	1,591	+ 97	+ 6.5%
2000	1,645	+ 54	+ 3.4%
2001	1,684	+ 39	+ 2.4%
2002	1,723	+ 39	+ 2.3%
2003	1,756	+ 33	+ 1.9%
2004	1,789	+ 33	+ 1.9%
2005	1,823	+ 34	+ 1.9%
2006	1,858	+ 35	+ 1.9%
2007	1,890	+ 32	+ 1.7%
2008	1,918	+ 28	+ 1.5%
2009	1,947	+ 29	+ 1.5%
CHANGE			
1999-2009	+ 356	+356	+22.4%

Sources: QNHS Second Quarter 1999, CSO, October 1999; ESRI Medium-Term Review 1999-2005, Table 5.10.

As this table illustrates, employment is forecast to increase by 356,000, or by over one-fifth in the years to 2009. The anticipated expansion in employment is heavily concentrated in the early years of the projection period reflecting the very rapid pace of current economic growth.

Mirroring these trends, the ESRI anticipates that "the bulk of the increase in employment is expected to be in 'high skilled' areas".²² Three human capital-intensive segments – other market services, high-tech manufacturing and education/health – are expected to account for 64% of all employment gains between 1998 and 2006. At the same time, employment in farming, traditional manufacturing and food processing is projected to decline throughout the decade ahead.

22 Medium-Term Review 1999-2005, ESRI, October 1999, Page 92. See Section 5.6 and particularly Table 5.10 for detailed discussion of the employment forecast.

2.4.2 Projected Labour Supply

The principal factors determining the scale of the future growth of the labour force include: the 'natural' growth of the domestic population of working age; labour force participation rates (LFPRs); and migration trends. The labour supply can be further augmented by additions to human capital, reflecting, inter alia, rising levels of educational attainment.

In its latest Medium-Term Review, the ESRI is forecasting a sharp deceleration in labour force growth from an annual average growth rate of 3.0%, between 1995 and the year 2000, to 2.0% in the years 2000-2005 and 1.5% annually between 2005-2010.

The ESRI also forecasts net immigration of 18,000 in the year to April 2000. Thereafter, the annual number of net immigrants are expected to decelerate sharply to an average of 12,500 annually between 2000 and 2005, reflecting in part the anticipated tightness in housing markets.

The labour force forecasts, recently published by the CSO, are broadly similar to those made by the ESRI. Building on the forecasts of these two organisations, the Expert Group anticipates that the labour force will increase to the year 2009 at the rates illustrated in the table which follows:

LABOUR FORCE PROJECTIONS TO THE YEAR 2008

YEAR	LABOUR FORCE (<i>'000s</i>)	INCREASE (<i>'000s</i>)	CHANGE (%)
1999 Actual	1,688	+ 67	+ 4.1
2000	1,730	+ 42	+ 2.5
2001	1,766	+ 36	+ 2.1
2002	1,805	+ 39	+ 2.2
2003	1,841	+ 36	+ 2.0
2004	1,876	+ 35	+ 1.9
2005	1,910	+ 34	+ 1.8
2006	1,944	+ 34	+ 1.8
2007	1,975	+ 31	+ 1.6
2008	2,003	+ 28	+ 1.4
2009	2,029	+ 26	+ 1.3
CHANGE			
1999-2009	+ 341	+341	+20.2

Sources: QNHS, Second Quarter 1999, CSO, July 1999; Medium-Term Review 1999-2005, ESRI, October 1999, Table 5.10. The Medium-Term Review 1999-2005 provides forecast of labour force growth for individual years to 2005. Thereafter, an annual average growth of 1.5% is shown for the period 2005-2010.

'Natural' growth amongst the population of working age, the forecast rise in participation rates amongst women and sustained net immigration are the principal factors supporting the projected labour force increase of 341,000 in the decade after 1999. Labour force growth is forecast to be fastest in the early years of the projection period. The pace of labour force expansion tapers off rapidly after 2005, reflecting, in particular, the steep decline in the birth rate through the 1980s.

2.4.3 Future Labour Demand/Supply Balance

The Expert Group has considered the projections for labour force growth and employment expansion in the years to 2009 and has derived estimated annual unemployment levels, which are illustrated in the table below.

THE PROJECTED DEMAND AND SUPPLY OF LABOUR 1999-2009²³ (In 000s of people each Spring)

YEAR	LABOUR FORCE	EMPLOYED	UNEMPLOYED	UNEMPLOYMENT RATE
1999	1,688	1,591	97	5.7%
2000	1,730	1,645	85	4.9%
2001	1,766	1,684	82	4.6%
2002	1,805	1,723	82	4.5%
2003	1,841	1,756	85	4.6%
2004	1,876	1,789	87	4.6%
2005	1,910	1,823	87	4.6%
2006	1,944	1,858	86	4.4%
2007	1,975	1,890	85	4.3%
2008	2,003	1,918	85	4.2%
2009	2,029	1,947	82	4.0%
Change				
1999-2009	+341	+356	-15	

These projections suggest that labour force growth over the next decade should be sufficient to accommodate the anticipated increase in employment. However, on the stated assumptions, they make clear that the labour market will remain tight throughout the next decade. Unemployment is forecast to fall further to 82,000 in 2009, a rate of 4%.

It should be emphasised that increases in the labour supply, on the scale projected, will not come about automatically. Further significant increases in the rate of labour force participation by women are unlikely to occur unless it is made easier and more financially attractive for married women to return to the workforce in their middle years. Similarly, the projected increase in working age immigrants will impose extra demands on social infrastructure - particularly affordable housing - if they are to be accommodated.

As the unemployment rate declines, policies aimed at helping the most disadvantaged amongst the unemployed to find pathways back to work will need to be strengthened.

In summary, the projections suggest that as long as the economy remains internationally competitive, the Irish labour market is likely to remain tight over the next decade. Labour is likely to remain in short supply and significant numbers of employers may continue to find it difficult to fill vacancies.

²³ The unemployment levels shown are those conforming to ILO definitions. The unemployment rate represents the numbers unemployed as a percentage of the labour force. The unemployment rates derived are about three-quarters of a percentage point lower throughout than those shown in the Medium-Term Review. This reflects the very strong employment gains recorded in the year to Spring 1999 and the consequent reduction in the unemployment rate to 5.7%.

2.5 Occupational Profile of the Future Labour Force

2.5.1 *The Need for Increasing Educational Attainment Levels*

The previous section forecast total employment growth during the rest of the decade. However, not all occupations will grow at a similar pace.

The FÁS/ESRI Manpower Forecasting Project makes regular forecasts of employment growth for over 40 occupational groups in Ireland. The most recently published forecasts show, in proportionate terms, that the largest increases forecast between 1997 and 2003 are for professionals (+ 32.3%), proprietors in services (+ 29.2%), catering occupations (+28.9%), managers (+ 27.5%) and sales workers (+ 25.4%). Declines in employment are forecast in agriculture, labouring and other personal services. It is perhaps symbolic of the changing profile of Irish employment that the number of managers is forecast to exceed the number of farmers in Ireland for the first time by the year 2003.²⁴

These trends have been consistent for a number of years and are replicated in most developed Western countries. The trends show a common pattern of increased demand for professional workers, usually requiring third-level qualifications; increased demand for service workers at both higher and lower levels of skills; and decreased demand for unskilled manual workers and agricultural workers. Accordingly, they bear out the need for increased education and training within the workforce and the likely difficulties facing persons without adequate skills.²⁵

2.5.2 *Educational Profile of the Future Labour Force*

Improving the future quality of the labour force depends principally on two factors:

- (i) Raising the educational and technical qualifications of new labour market entrants;
- (ii) Adapting, augmenting and refining the skills and capacities of those already at work, through a greater concentration on in-company training and lifelong learning.

In relation to qualifications, research by the ESRI has shown significant changes in the educational profile of the Irish labour force over the last decade and forward into the next²⁵. The rising educational attainment of the labour force is evident from the following table.

EDUCATIONAL ATTAINMENT OF THE IRISH LABOUR FORCE

HIGHEST LEVEL ATTAINED	1991-95	1996-2000	2001-05	2006-10
Primary	21.8%	16.2%	12.2%	9.1%
Junior Cert	26.1%	24.6%	22.7%	20.5%
Leaving Cert	30.5%	30.8%	32.8%	33.8%
Third Level	21.7%	28.4%	32.3%	36.7%

Source: ESRI Working Paper, No. 103.

The implication of this increase, in the educational attainment of the Irish labour force, is more 'positive' in terms of enabling economic growth than a purely quantitative measure would indicate, as the demand will increasingly be for those with higher levels of skills and educational qualifications.

²⁴ Occupational Employment Forecasts, D. Duggan, G. Hughes, J.J. Sexton, ESRI, November 1999.

²⁵ 'A note on estimating unemployment by education', I Kearney, ESRI Working Paper No. 103, 1999.

In summary, there is an on-going trend in Ireland towards jobs that require higher levels of skills and qualifications. The Irish labour force has become significantly more qualified over the last decade and will continue to become so. Because of the difficulties of forecasting, it is not possible to assess with confidence whether the qualifications mix demanded in the future will be adequately supplied by the projected labour force. However, the evidence that is available suggests that the relative mix of qualifications arising in the labour market is broadly satisfactory to meet future needs with the exception of those who leave with no educational qualification at all. Clearly, such persons will have particular difficulty in obtaining employment and steps need to be taken to minimise their number.

2.6 Labour Shortages in Lower-Skill Occupations

Labour shortages are a serious problem in many lower-skill occupations. This section focuses on three specific occupations to illustrate the type of issues involved: retail sales assistants, contract cleaners and industrial sewing machinists. These occupations have been chosen because research studies indicate that recruitment difficulties are particularly acute in these skill-areas²⁶. The Expert Group, moreover, believes that the analysis of the reason for the labour shortages in these sectors, and the proposed recommendations to alleviate them, are also relevant to many of the other lower-skill occupations that are experiencing labour shortages.

A very large number of persons are employed in lower skill occupations. 400,000 persons are employed in the five main occupational groups - sales, personal services, clothing/textiles, industrial operatives and builders labourers. Demand for labour in these areas is high for two reasons; firstly, some are in fast-growing sectors such as catering and building; secondly, even in slow-growing or stagnant sectors, there is considerable recruitment demand due to relatively high labour turnover rates (+15% p.a.).

These occupations have certain characteristics in common. These are as follows:

- There is considerable transferability of labour between occupations and sectors as skills are quickly learned. (This is one of the factors explaining the high labour turnover rates.)
- Wage levels are generally low and there is little scope for career advancement.
- Many of the services sector occupations, for example sales, cleaning and catering, have a high proportion of female workers and many of these are part-time. (For example, 28% of sales workers and 38% of personal services workers are part-time.)

The most important difference between sectors and occupations within the low-skill, labour-intensive, area is their ability to pass on wage increases as higher prices to their customers and still remain competitive. In the case of Irish indigenous companies in internationally-traded sectors, increases in Irish unit wage costs greater than in competitor countries cannot be passed on, and will result in reductions in profit levels and (potentially) job losses. As services become increasingly traded internationally, more sectors will fall into this position.

2.6.1 *The Magnitude of the Problem*

The problem of labour shortages in many low-skill occupations is not a new one. In 1991 a report by Mclver Consulting on the clothing sector (conducted on behalf of the FÁS Clothing and Textile Industry Training Committee) noted that four out of every ten clothing firms surveyed had vacancies and, at that time, the majority of vacancies were for sewing machinists²⁷. The Mclver Consulting update report on clothing indicated that the problem of labour shortages had further intensified.²⁸

With regard to the contract cleaning sector, the 1999 Circa report on the sector (conducted for the FÁS Contract Cleaning Training Advisory Committee) shows that of the fifty firms surveyed, thirty-one (62%) indicated that they had vacancies. The majority of these vacancies were for cleaning operatives. When

26 'Developing Human Resources in the Contract Cleaning Industry', the Circa Group Europe Ltd. January 1999. 'The FÁS Clothing Study Update', Mclver Consulting, February 1998. 'The Retail Sectoral Study', Goodbody Economic Consultants, March 1995.

27 The Clothing Sectoral Study Report, Mclver Consulting, FÁS, 1991.

28 The FÁS Clothing Study Update, Mclver Consulting, FÁS, 1998.

these results are grossed-up to reflect the overall numbers of vacancies in the sector, it emerges that there is, on any given day, over one thousand vacancies in the sector.

The 1998 FÁS/ESRI/Forfás vacancy survey found that 23% of distributive services companies had vacancies that they found difficult to fill.²⁹ Among companies employing over ten persons, 47% reported difficult-to-fill vacancies. The vacancy/employment ratio for sales staff was 6%. Applying this percentage to the estimated number of sales assistants in 1998 would indicate a figure of about 5,300 vacancies for sales assistants at the time of the survey.

2.6.2 The Causes of Labour Shortages

It is possible to identify a number of causes of labour shortages from the studies undertaken by FÁS. Three factors are particularly significant:

- (i) The comparatively low rates of pay offered by the sectors, combined with the effects of the interplay between the tax and social welfare regime.
- (ii) A perception that working conditions in these sectors are relatively poor – particularly in respect of promotion opportunities.
- (iii) A greater range of opportunity for young people, both in terms of further education and employment, in other sectors.

2.6.3 Measures to Increase the Supply of Labour in Specific Low Skill Areas

The Expert Group recognises that a simple increase in wages is not a viable solution for Irish manufacturing firms engaged in the production of low value-added goods or services subject to international competition. Clothing is a case in point. In other high-wage economies, such as Denmark, commodity production in the clothing sector is not competitive and has been transferred to low-wage economies. Only the design and prototype production has been retained in the Danish parent company. In general, firms which produce low-volume, high-fashion, items for niche markets have continued to prosper in Western Europe. Such firms typically utilise short-run, modular production systems, and organise their production around ‘project teams’ or ‘cells’. These arrangements promote higher rates of productivity and, combined with a higher level of value-added in the product, allow for the payment of attractive rates of remuneration.

There are lessons here for the Irish Clothing sector, and, indeed, for other relatively labour-intensive sectors such as timber processing and furniture. A higher value-added strategy requires, however, substantial investment by companies, particularly in the areas of modular manufacturing methods, improved production-planning and design. State agencies can play a role in encouraging and supporting these changes. Specifically, the Expert Group recommends that Enterprise Ireland should continue to offer advice and training programmes in these areas to selected firms in the Clothing industry. A similar approach is required for other labour-intensive, low net-output per person, sectors of Irish industry.

With regard to the retail and cleaning sectors, firms in these sectors are operating in an extremely competitive domestic environment and the individual firm is constrained in the extent to which it may raise wages. Industry-wide increases in wages, however, do not negatively impact on individual company success. The introduction of the national minimum wage will result in an increase in pay for many employees in these sectors and the tight labour market is likely to lead to further upward pressure on wage rates over the coming years. This will help to encourage persons to take-up employment in these relatively lower-paying sectors which will partly correct the labour shortage. There is also scope to increase productivity in these sectors through:

²⁹ National Survey of Vacancies in the Private Non-agricultural Sector 1998, J. Williams, G. Hughes, FÁS/ESRI/Forfás, 1999.

- (i) improved work organisation;
- (ii) the adoption of new technology; and
- (iii) training, which can permit higher wages for at least some employees.

However, these sectors are likely to continue to experience recruitment difficulties as wage levels increase in other sectors also. The implication of these changes is increased costs of services to customers.

The Expert Group believes that there is also scope for better promotion of the full financial benefits of working to potential recruits. It is recommended that industry associations consider preparing publicity material that explains the full range of work incentives available to persons who take-up employment such as the Back-to-Work Allowance and the retention of medical cards.

The State in conjunction with employers and their representatives, through the appropriate training agencies, can play a positive role in enhancing the status of occupations in these sectors. Over the last year, FÁS has been consulting with employers in both the retail sector and in the clothing sector with a view to introducing 'traineeships', which will have recognised accreditation and career paths. Employers have responded positively to these initiatives and a traineeship commenced in 1999 in the clothing sector.

With regard to the contract cleaning sector, a number of specific measures have been agreed by the Contract Cleaning Training Committee of FÁS as a result of the recent study of the human resource needs of the sector. It has been agreed that the Report should be published and circulated to both sides of the industry for examination and review. It is proposed that, following this consultation process, both sides of the industry should develop an action plan for the sector to be implemented by the industry and FÁS. It is also recommended that a Health and Safety Programme for cleaning operatives be provided on a regional basis. This course would be modelled on the Health and Safety Programme that was designed and piloted in 1999.

The low value-added labour-intensive sectors cannot offer wages comparable to the high-tech computer and electronics sectors. Firms in these sectors, therefore, will have to develop non-pay incentives in an effort to attract and retain staff.

In this context, retail and clothing companies may alleviate some of their recruitment problems by offering flexible working arrangements. These arrangements can be attractive to older workers, particularly women who may have been out of the labour force for some time. Some large supermarket chains have already made special efforts to attract older women to return to work³⁰. All companies can offer more flexibility of time including part-time, evening or morning shifts, or arrangements which build-in flexibility for time-off to look after children during holidays or sickness. Other fringe benefits such as pensions, sick leave etc. might also be used as attractions.

In an attempt to attract young people into employment, stakeholders in the sectors should consider the development of basic vocational units for use within the Transition Year of secondary school and in the curriculum for the Leaving Certificate Applied Programme along with associated work experience placements. Care should be taken to develop these activities in conjunction with appropriate educational authorities and teacher representatives so that the information supplied and the associated work experience is appropriate.

The Clothing Sector Policy Review Group report in November 1999 endorsed the recommendations of the FÁS Labour Shortage Study and also recommended the creation of a Clothing Sector Training Network. It recommended that individual companies and representative bodies should work more closely with the colleges to ensure that courses meet the industry's needs.

³⁰ While female participation rates for young Irish women reached average EU levels during the last few years, rates among older women are still quite low.

2.6.4 *Specific Recommendations to Increase the Supply of Labour*

In summary, the Expert Group makes the following specific recommendations, with a view to increasing the numbers of less skilled workers that are recruited and retained within the retail, contract cleaning and clothing sectors.

- **Enterprise Ireland should support selected firms in clothing and other labour intensive sectors of Irish industry to enhance their productivity, through training in design and in modular manufacturing and production methods, so that such firms are thereby able to produce higher value added goods more efficiently and, as a result, are in a position to offer higher remuneration to their workforce.**
- **Traineeships, with recognised accreditation, which have been introduced recently by FÁS for the clothing sector, should also be extended on a nation-wide basis to those engaged in retailing.**
- **The relevant industry associations should orchestrate an awareness campaign to highlight the full entitlements available to those returning to work and the full take-home pay opportunities.**
- **Companies should offer more flexible working arrangements and should develop forms of non-pay incentives.**
- **FÁS, in consultation with both sides of the industry, should develop an action plan for the contract cleaning sector based on the recently completed sectoral report. This should assist in improving productivity, in providing a more clearly defined career path for workers; and in enhancing the status of the sector.**
- **FÁS should provide training in hygiene and safety on a regional basis for those involved in the contract cleaning sector.**
- **Basic vocational information units should be developed by the relevant industry associations for use by transition year and Leaving Certificate Applied Programme students in order to promote working in these sectors among young people. These initiatives should be developed in full consultation, with the educational authorities and with teacher representatives, so that the information supplied and the associated work experience is appropriate.**

2.7 Increasing the General Labour Supply

It has been noted above that the types of responses needed to alleviate labour shortages on the lower rungs of the labour market differ markedly from those necessary to relieve specific skills shortages. General labour shortages can be addressed through measures to increase the supply of labour. Shortages of specific high-level skills can be addressed through increased inputs of relevant education and training and by much greater emphasis on the continuing training and skills upgrading of those already at work.

It is not in the remit of the Expert Group to make detailed recommendations about how best policy should address general issues such as tax and social welfare policy, many of which are already under consideration by Government, its departments and agencies. The Expert Group believes, however, that it is very important to point out where action is likely to be needed if Irish employment and economic growth is not to be hindered in the future by labour shortages.

With the economy now close to full employment, the overall emphasis in labour market policy needs to shift from unemployment prevention to supply-side mobilisation. By force of circumstance, such labour mobilisation efforts will need to focus on raising participation rates amongst married women and older people and on the orderly development of immigration inflows.

The Expert Group acknowledges that progress has been achieved over recent years in respect of the following:

- synchronising the operation of the taxation and social welfare codes in a more employment-friendly way;
- reducing the average personal income tax rates of employees;
- engaging systematically with persons on the Live Register to increase their prospects of securing training and employment; and
- assisting the low-paid through the introduction of a national minimum wage.

The Expert Group accepts also that further progress on these and other measures has been achieved in Budget 2000 and in the Programme for Prosperity and Fairness (PPF). The Group believes, however, that there are a number of areas in which policies will need to be further developed and refined in order to ensure that labour force growth is sufficient to support sustained economic growth into the future. These are outlined in the sections which follow.

2.7.1 Income Tax Obstacles to Workforce Entry Need to be Removed

- (a) Those on very low incomes remain liable to pay income tax. Even in the wake of Budget 2000, single people will find themselves liable to income tax in 2000/2001 when they earn in excess of £110 per week, or approximately one-third of the average industrial wage. For example, the adult rate of the new minimum wage is set at £4.40 per hour - equivalent to £176 for a 40-hour week. Thus, single adults working a full week at minimum wages will pay income tax in the year ahead. The levying of direct taxes on such low incomes acts as a disincentive to people taking up low-paid employment.
- (b) For married households, where one spouse is working in low-paid employment, the household income may be so low as to exempt them from income tax. Where there are children, the household may also be claiming Family Income Supplement (FIS). Where the second spouse enters employment, the initial income tax rate faced will be the marginal relief rate of 40%. In addition, the household will face a clawback on FIS payments as earned income rises.
- (c) Even in the aftermath of Budget 2000, where the spouse of an unemployed person is working, any earnings over £70 per week will result in progressive reductions in the amount of unemployment benefit paid to the spouse out of work. At weekly earnings of £135, all unemployment benefits and Child Dependent Allowances are withdrawn.

All of these constitute financial obstacles to undertaking low-paid work and thus act to inhibit workforce mobilisation. They penalise, in particular, single, unskilled workers and low-paid, part-time workers, whose spouses are unemployed.

The Partnership for Prosperity and Fairness (PPF) makes a series of important commitments relevant to the gross earnings and take-home pay of those on low incomes. These are as follows:

- Through the provision of flat-rate cash increases, the pay terms embedded in the PPF make specific provision for above-average pay rises for the low-paid in each of the agreement's three stages;
- The minimum wage (adult rate) is to be raised to £4.70 per hour in July 2001 and to £5 per hour in October 2002; and

- “It is an agreed policy objective of the Government and the social partners that, over time, all those earning the minimum wage will be removed from the tax net”.³¹

The Group recommends that the Government should seek to remove those earning the minimum wage from the tax net as quickly as is consistent with economic and budgetary stability. It also recommends that further efforts be made to reduce benefit clawbacks from the unemployed spouses of those earning low wages.

2.7.2 *Physical Barriers Preventing Entry to the World of Paid Employment Should Be Removed*

A 1998 consultancy study found that significant barriers to women’s participation in the Irish labour force existed with the

“most significant of these being the cost of childcare and its interaction with the income tax code, as it affects wives”³².

The inadequate provision of childcare constitutes a significant barrier to women with children entering the workforce. This poses a particularly acute problem, since women are projected to contribute 58% of the increase in the labour force in the years to 2011.

The 2000 Budget provided £46 million for childcare. In drawing up its proposals the Government accepted the report of an inter-departmental committee which argued that the most urgent task was to increase the number of childcare places. The principal measures were £23 million to expand the Equal Opportunities Childcare Programme; £10m for a grant scheme for childcare service providers towards the capital upgrading of premises; and smaller sums for local childcare network initiatives and after-school childcare services.

Budget 2000 also introduced the first phase of an income tax ‘individualisation’ programme which, if completed, would significantly improve the after-tax incomes of married couples, when both were working outside the home.

The Programme for Prosperity and Fairness (PPF) states that the Government will adopt, before the end of 2000,

“an equitable strategy to support parents in meeting their childcare needs, for implementation in the period of this Programme”³³

Further, the PPF supports tax individualisation:

“The social partners support the policy of establishing a single standard rate income tax band for all individual taxpayers”³⁴

The Expert Group welcomes these developments, adds its voice in support of establishing a single standard rate income tax band for all individual taxpayers and looks forward to the completion of the Government strategy on childcare support before the end of the year.

31 ‘Programme for Prosperity and Fairness’, 2000, p.11.

32 ‘The Economics of Childcare - Ireland’, Goodbody Economic Consultants in association with the ESRI, the Department of Psychology, UCD, the UK Policy Studies Institute, 1998.

33 Programme for Prosperity and Fairness, 2000, p 120.

34 Programme for Prosperity and Fairness, 2000, p 11.

2.7.3 Encouraging Moves from Unemployment to Employment

Recent years have seen continuous reductions in unemployment and particularly steep declines in long-term unemployment. Income tax reductions, Family Income Supplement and interventions such as the Back to Work Allowance Scheme have all assisted in improving the financial attractiveness of work relative to unemployment support. During the current year, the minimum wage and the supports offered by the 'Employability' pillar of the National Employment Action Plan will provide further encouragement for those who are unemployed to seek work.

The Expert Group believes that the following further institutional changes, aimed at smoothing the transition from unemployment to employment, could act to ease labour scarcity:

- (a) the income limit governing entitlement to a medical card should be raised significantly;
- (b) active labour market programmes (ALMPs) should lay greater emphasis on training for market employment; and
- (c) the National Employment Service, operated by FÁS, should be strengthened.³⁵

Such initiatives would both serve to induce a higher proportion of those who are unemployed or in supported work to take up open market employment, while at the same time, providing an improved mechanism for meeting their individual training, progression and placement needs.

The Expert Group supports the statements in the new social partnership agreement that the Local Employment Service be integrated with the National Employment Service and that the emphasis within active labour market programmes be shifted to training. The Group welcomes the National Development Plan 2000-2006 and notes with approval that the National Employment Action Plan structure forms a core element of the Plan's Employment and Human Resource Programme. The Group urges continued strong efforts by FÁS, in co-operation with the Department of Social, Community and Family Affairs, to actively support the unemployed in their efforts to get back to work. Job referral, training, education and personal support will all be needed, and the emphasis must be on a tailor-made approach to helping the unemployed.

2.7.4 Augmenting the Domestic Supply of Labour From Abroad

Immigration inflows will play a vital part in lessening labour scarcity and preventing skills shortages, particularly in the years immediately ahead. The Expert Group is conscious that immigration policy involves considerations beyond the needs of the labour market and makes no comment on such matters. It also believes that the first priority should be to ensure, where possible, that job vacancies are filled from amongst the ranks of the unemployed at home. The Group is pleased to note, however, that the Government endorsed the need to "encourage a balanced increase in net inward migration" in its Employment Action Plan 1999.³⁶

The Expert Group notes that the legal right to mobility of labour within the EU, the continuing high levels of unemployment in many EU countries, the availability of jobs in Ireland and the country's positive image abroad all contribute to the prospect of many EU citizens being attracted to work in Ireland in the future. At the same time, the Group also notes that improved labour market conditions at home have provided the opportunity for many former emigrants to return home to a more prosperous future in Ireland.

35 The PPF states "The Local Employment Service will be integrated with the National Employment Service...." (page 117). It also states "In broad terms, spending on ALMPs will shift to training in order to better reflect market and individual needs" (page 117).

36 'Employment Acton Plan 1999', page 8, Department of Enterprise, Trade and Employment, 1999.

The Expert Group recognises the need for net immigrant inflows to augment the domestic labour force, particularly in the years immediately ahead. In particular, returning emigrants and immigrants can play an important role in alleviating skill shortages. The Group welcomes the additional efforts made by FÁS and Enterprise Ireland in 1999 to provide information about, and to promote, job opportunities in Ireland to non-residents. It recommends that these agencies build upon these initiatives through the utilisation of new information and communications technologies, including the Internet. It also recommends that FÁS expand its Jobs-Ireland campaign during the current year.

2.7.5 Older People and the Labour Market

The recruitment of older people back into employment provides another potential mechanism for alleviating labour scarcity. Just over half of those aged between 55 and 59 years are members of the labour force while just over one-third of those aged 60-64 years remain in the labour force.³⁷ Early retirement has become a feature of many occupations. The Government has also enabled older persons on the Live Register to retire under the PRETA and PRECS schemes. However, increasing tightness in the labour market is already inducing many large Irish employers to deliberately seek to recruit older workers. Given the relatively low participation rates amongst the older cohorts of working age, there appears considerable scope for increased recruitment amongst these age groups.

Older people wishing to resume employment will in future be able to rely on the Employment Equality Act 1998, which came into force in October 1999. Its provisions prohibit discrimination on grounds of age. Within the workplace, equality legislation allows for positive action to promote equal opportunities in respect of access to employment, vocational training, working conditions and promotion for many disadvantaged groups, including those over 50 years of age.

In addition, the recruitment of older people back into the workforce would be made easier where employers offer part-time or flexible working time options. Any barriers to the provision of such options need to be dismantled.

The Group believes that more positive and creative efforts by employers to recruit older persons could make a significant contribution to easing labour scarcity. It welcomes the Employment Equality Act and advises that the Government should ensure its rigorous implementation.

2.7.6 Flexible Working Times and Flexible Locations

In the past, the dominance in working life of the standard full-time working day, in a fixed location outside the home, precluded many from taking jobs, even where they wanted work. In recent years, many innovations in modes of working have been introduced which have met, simultaneously, the needs of employers and employees. The incidence of part-time working has risen significantly, to the mutual benefit of employers and employees. Government has facilitated this change in work practices by ensuring that part-time employees are covered by relevant protective legislation. Job-sharing has been developed in the public service and has proved suitable to the needs of many. Self-employment has increased and this has allowed employers to hire labour services in a more flexible way, though the Revenue Commissioners have taken action to ensure that only bona-fide self-employment contracts are permissible. Moreover, flexibility has not been limited to the duration of employment, but has extended also to location. While most employees still work in the fixed base of their employer, increasing numbers are working from home, either full or part-time. Working from home has been facilitated by advances in the speed and power of information and communications technologies.

³⁷ 'Quarterly National Household Survey - Third Quarter 1999' CSO, December 1999, Table 5 shows participation rates for the 55-59 age cohort at 53.7% and at 36.5% for Those aged 60 to 64.

Working from home not only saves on travel time and travel expenses, but it permits many persons with dependants to enter, or remain in, the workforce, where this would not have been possible previously. In these ways, enhanced flexibility of work, both in terms of duration and location, has already increased the labour supply and the opportunity exists to enhance its contribution further.

The Group believes that greater provision of flexible working time and flexible location options can add further to labour supply in the future. It recommends that employers explore the provision of such options more fully and that they identify any barriers that might inhibit their increased provision. It recommends that, within the partnership framework, government departments, in consultation with the social partners, should develop proposals for increasing the range of options available for flexible working in the future.

2.7.7 Specific Recommendations to Increase the Supply of Labour

In summary, the Expert Group makes the following recommendations with a view to increasing the overall numbers of people available for work.

- **The Government should review the taxation and benefit position of low paid workers and introduce changes to the tax and social welfare systems to lighten taxes on low wage earners and to further reduce benefit claw-backs from the unemployed spouses of those earning low wages.**
- **The welcome provisions of Budget 2000 in relation to child care should be monitored to assess their effectiveness. Further initiatives in this area may be needed at Government and employer level.**
- **The unemployed should continue to be actively supported in their efforts to get back to work.**
- **Modern information and communication technologies, such as the Internet, should be used to augment increased efforts by FÁS and Enterprise Ireland to promote job opportunities in Ireland to non-residents.**
- **Employers should actively seek to recruit those over the age of 55 and those in this age group should be encouraged to seek employment.**
- **Employers should further explore flexible working time and location options. Any barriers to their increase should be identified and the relevant Government departments, with the social partners, should work together to develop initiatives to overcome any identified barriers to the more pervasive use of flexible working.**

3. SKILLED CONSTRUCTION CRAFTSPERSONS

3.1 Introduction

The construction industry in Ireland has grown very rapidly in recent years. The turnover of the sector was valued at IR£11.6 billion (€14.7 billion) in 1999, an increase of 13% on the previous year. Reflecting the growth in output, construction industry employment also increased by 13% between 1998 and 1999 to reach a level of 142,000 persons employed.

Reflecting the continued growth in the economy and the planned implementation of the National Plan, by the year 2003 output and employment in the construction industry are forecast to have grown by 29.4% and 31% respectively, over the 1999 levels. This represents an expected increase of over IR£3.4 billion (€4.32 billion) in output and of 44,000 persons employed in this activity over this period. The greatest relative increase in both output and employment is expected to take place in the years 2000 and 2001, as the following table illustrates.

YEAR	OUTPUT ³⁸ £ millions	EMPLOYMENT (SPRING)	% OUTPUT GROWTH	EMPLOYMENT GROWTH
1999	11,634	142,000	13%	13%
2000	12,751	157,000	10%	10%
2001	13,873	169,000	9%	8%
2002	14,429	178,000	4%	5%
2003	15,056	186,000	4%	4%

The Expert Group focused, in particular, on the requirements for skilled craftpersons such as electricians, bricklayers, plasterers, painters, carpenters, plumbers and construction plant fitters. At present, there are almost 55,000 skilled craftpersons engaged in the construction industry. Reflecting the rapid growth in construction activity in recent years, this represents a doubling of employment in these crafts over the last five years. As a result of continuing high demand, the Expert Group estimates that there is a shortage of 5,000 skilled craftpersons at present.

The Expert Group also recognises that there are also significant manpower shortages in many of the non-craft manual construction occupations. While the Expert Group did not specifically address this area, it considers that its recommendations in relation to increasing the number of people generally available for work, detailed in Chapter 2, if implemented, would have a positive impact on the labour shortages for lower skilled workers currently being experienced by the construction industry.

In the analysis which follows, the Expert Group estimates likely demand for skilled construction craftpersons to the year 2003 (3.2) and the likely available supply of such workers (3.3.). It then compares the estimated requirement of craftpersons with the estimated supply (3.4). The recommendations, which follow this analysis, are the Expert Group's view on the best means of meeting the projected skilled manpower needs of the construction industry to the end of 2003 (3.5).

3.2 Projected Demand

In order to estimate the demand for skilled construction craftpersons, the Expert Group had first to consider the likely volume growth in construction output and the mix of that output, as each component of output requires a different mix of skills to produce. For example, the number of bricklayers required for a given amount of expenditure is far greater in respect of private, residential development than it is for a civil engineering project.

3.2.1 Projected Volume Output

The Expert Group has built on the research conducted by the Department of the Environment. This shows the output of the construction industry by sub sector for 1998 and estimates the 1999 output. The estimate is for a growth of 13% or £757 (€962) million in 1999 over the 1998 levels. This growth is distributed between various sub sectors and the rate of growth is different for each sub sector. Total residential development is expected to have increased by 9% in volume terms, productive

³⁸ Output is in 1999 prices. As the output figures refer to the calendar year, it may be advisable to compare them to the employment figure of the following year when measuring productivity.

infrastructure to have increased by 23% and total social infrastructure to have increased by 19% by the end of 1999. The table which follows is taken from the Department of Environment's Review 1998, Outlook 1999-2001. Please note that the output is shown in constant 1990 prices.

Construction Activity by Sub Sector	1998 Actual (£ millions)	1999 Estimated (£ millions)	% Change
Private Housing	2584.2	2814.3	9%
Social Housing	185.1	206.2	11%
Total Residential	2769.3	3020.5	9%
Industry	471.2	537.7	14%
Commercial	611.5	733.1	20%
Agriculture	172.9	138.7	-20%
Tourism	327.8	340.1	4%
Worship	11	14.6	33%
Private Non-residential	1594.4	1764.2	11%
Roads	418.6	442.2	6%
Water services	212.4	263.8	24%
Airports, Seaports	84.8	143.8	84%
Energy	242.6	320.7	32%
Transport	76.3	102.8	35%
Telecommunications	76.9	94.5	23%
Productive Infrastructure	1111.6	1367.9	23%
Education	171.1	235.7	38%
Health	107.8	105.8	-2%
Public Buildings	103.7	107.1	3%
Other Social	38.5	51.9	34%
Total Social Infrastructure	421.1	500.4	19%
Total All Construction	5896.4	6653	13%

The Department of the Environment's Review does not forecast output by sub sector beyond 1999. For the following two years, 2000 and 2001, its forecasts are based on overall sectoral volume growth, which it estimates at 10% each year. Accordingly, the Expert Group has based its forecast of construction output growth on a pro-rata increase of 10% in respect of those sub sectors not included in the Government's National Development Plan 2000 - 2006. These sub sectors include, among others, private residential development, commercial development, energy and telecommunications.

The Expert Group considers that the overall rate of increase in output growth for these sub sectors will fall back to 4% in each of the years 2002 and 2003. The reason for this decline is that the double digit growth forecast in the private, residential development sub sector for the years 2000 and 2001 will, in conjunction with the Government's plans in respect of social and voluntary housing, increase house completions to above 50,000 after the year 2001. This level of annual house completion is considered sufficient to meet demand.

In summary, the Expert Group has based its employment forecasts on a total projected increase in construction expenditure of £3,422 million over the period from the end of 1999 to the end of the year 2003. This increased expenditure is estimated in 1999 prices and is in addition to the £11,634 million which was the output of the construction industry in Ireland in 1999.

3.2.2. Projected Demand for Construction Craft Skills

Based on the output projections for the sector outlined above, total employment in the sector - skilled and unskilled - is forecast to rise by 44,000 from 142,000 in the second quarter of 1999 to 186,000 for the corresponding quarter in 2003.

The Expert Group has estimated that of the 44,000 additional persons required by the construction sector by 2003, 16,000 of these will be skilled craftspersons. By analysing the likely growth patterns of each sub sector and their particular requirement for different skills-sets, the Expert Group has been able to breakdown the additional requirement for the individual construction crafts, as the following table illustrates:

CRAFT	EMPLOYMENT	REQUIREMENT	INCREASE	
	IN 1999	IN 2003	NO.	%
Bricklayers	6,208	8,035	1,827	29%
Carpenters	14,431	18,536	4,105	28%
Electricians	13,397	17,531	4,134	31%
Fitters	1,923	2,319	396	21%
Painters	6,321	8,052	1,731	27%
Plasterers	5,630	7,493	1,863	33%
Plumbers	6,875	8,870	1,995	29%
Total	54,785	70,836	16,051	29%

3.3. Projected Supply of Labour

The likely inflow of new trainees into the construction sector, the potential of unemployed people as a potential source of additional labour and the possibility of international migration have all been taken into account by the Expert Group in estimating the additional skilled craftspersons that may be available to the sector to the end of the year 2003. The Expert Group has also taken into account possible reductions in the number currently employed due to retirements and deaths or through the transfer of skilled craftspersons to other occupations and other industries.

3.3.1 New Trainees

The number of new trainee skilled craftspersons for the construction sector that are undergoing training is centrally available in the FÁS Apprenticeship Statistics publication which is available by year of participation.

The level of apprentice sponsorship in the construction sector increased dramatically in recent years. The level of registrations more than doubled between the academic years 95/96 and 98/99. Very large percentage increases were recorded in the intake of all trades with the exception of painters and construction plant fitters. However, the greatest increases by far, in absolute terms, were among apprentice electricians and carpenters. (Approximately 5% of apprentices 'drop-out' each year and this has been taken into account by the Expert Group).

Of course, increases of this magnitude in apprentice registrations in such a short time create practical problems in relation to the provision of sufficient places on the off-the-job components of the apprenticeship programme (i.e. Phases 2, 4 and 6). FÁS and the Department of Education have already increased the number of apprentice places significantly and they are currently engaged in intensive discussions with a view to creating further additional capacity so that all apprentices may complete

their training within the appropriate period. It is important that this aim is achieved because any delay in the time it takes for apprentices to graduate will add further to the level of skill shortages forecast in this report.

The flow into the labour force from the apprenticeship system is the key to understanding the supply-side forecasts in this chapter. This is particularly the case in respect of the later years of the forecast period, when the major increases in apprentice recruitment filters through to the work force.

The table which follows draws on the FÁS apprenticeship statistics to illustrate the registration of construction related apprentices for the last four academic years.

CRAFT	95/96	96/97	97/98	98/99	Increase	
					NO.	%
Bricklayers	150	233	328	345	195	130
Carpenters	608	830	1,092	1,338	730	120
Electricians	819	1,172	1,611	1,893	1,074	131
Fitters	54	67	93	81	27	50
Painters	78	101	116	130	52	67
Plasterers	73	105	157	166	93	127
Plumbers	303	435	562	685	382	126
Total	2,085	2,943	3,959	4,638	2,553	122

The rate of entry of these new trainees into the industry is assumed to be equivalent to the proportion in each apprenticeship which is sponsored by the construction sector. For example, at present, 99% of all carpentry and joinery apprentices are sponsored by construction firms and it is, therefore, assumed that 99% of new trainees enter the construction industry. The relevant proportion for apprentice electricians is 85%.

3.3.2 Entrants from Among the Unemployed

The Expert Group assumes that there is no one in the Irish labour force, with the appropriate craft qualifications, who is able-bodied and looking for work in the construction sector who has not found work. In other words, unemployment among skilled craftspersons is assumed to be non-existent and, therefore, this is not considered by the Expert Group as a potential supply of skilled craftspersons.

3.3.3 Skills Construction Craftsperson No Longer Available for Work in the Sector

The Expert Group assumes that the rate at which individuals leave the sector to work in other sectors is very low. There are two reasons for this assumption. Firstly, the wages that may be earned by craft workers in the construction industry are now considerably higher than the wages that could be earned through similar work in many other sectors.

Secondly, four of the seven construction crafts, plasterer, bricklayer, plumber and painter, are occupations which are virtually confined to the construction sector. In addition, carpenters will also experience some difficulty in finding jobs outside the sector because the principal alternative source of employment of these skills - the Timber and Furniture industry - is in decline.³⁹

Only electricians, and to a lesser extent, construction plant fitters, have significant possibilities of working elsewhere in the economy and these possibilities are unlikely to be pursued because of the higher wage differential currently available in the construction sector.

39 The FÁS/ESRI Forecasting Studies Report No. 7 is forecasting a decline in the employment of woodworkers between 1997 and 2003.

The death and retirement rates are also assumed to be very low. This is because the doubling of employment in these crafts over the last five years means that the age profile of the sector is now quite young. Furthermore, the relatively high wages are encouraging craftsmen to remain in the industry for a much longer period than was the case a few years ago.

For these reasons, the overall wastage rate (transferability plus death and retirement) is assumed at no more than 3% for four of the five occupations that have limited transferability and 4% for electricians, and construction plant-fitters. The exception is bricklayers, which, although it is an occupation with zero transferability, is also assigned a wastage rate of 4%. This is because data from the labour force surveys indicate that traditionally bricklayers have had a working life of only 20 years.

3.3.4 Forecast of Skilled Manpower Supply

On the basis of the assumptions outlined above, the Expert Group forecasts a strong increase in the supply of skilled craftspersons available for work in the sector, particularly over the last three years of the forecast period. This is due to the fact that the level of apprenticeship intake has increased dramatically since 1995. This increase reflects the success of a campaign undertaken by FÁS, in conjunction with the Construction Industry Federation, to persuade employers to significantly increase their recruitment of craft workers. This campaign, in turn, was motivated by, among other factors, the forecast of shortages at the time. The table which follows illustrates the Expert Group's forecasts of the increases in the supply of designated skilled construction craftspersons by the year 2003 over the 1999 levels.

CRAFT	INCREASE	% INCREASE
Bricklayers	2,059	42%
Carpenters	4,662	32%
Electricians	5,683	42%
Fitters	429	22%
Painters	1,409	22%
Plasterers	1,688	30%
Plumbers	2,370	34%
Total	18,300	33%

The projected increase in the supply of skilled construction craftspersons is estimated, by the Expert Group, at 18,300 by the year 2003. This is greater than the forecast increase in construction craft employment of 16,051 over the same span. For this reason, the Expert Group expects that craft skill shortages in construction should ease somewhat towards the end of the forecast period.

3.4 The Forecast of Skill Shortages

The Expert Group is predicting skill shortages in all seven craft skills for each year of the forecast period, despite the predicted increase in the supply of skilled craftspersons becoming available over the period to 2003.

The table below illustrates the Expert Group's analysis of the annual shortage of skilled construction craftspersons in the period 2000-2003.

YEAR	ELECTRICIANS	BRICKLAYERS	PLASTERERS	PAINTERS	CARPENTERS	PLUMBERS	PLANT FITTERS
2000	-1257	-659	-669	-604	-931	-574	-209
2001	-941	-672	-608	-517	-810	-392	-176
2002	-516	-552	-473	-525	-506	-169	-133
2003	-123	-162	-427	-589	-297	-67	-113

(Figures are not cumulative)

The shortage of skilled construction craftspersons will be most acute in 2000 (-4,903) and in 2001 (-4,116). After 2001, the pressure on skills will begin to abate so that by the year 2003 the total skills shortfall should be below 2,000 persons. This reduction in the level of skills shortages is due primarily to the increased numbers of fully trained apprentices which will be available for work for the first time in this period.

While current skill deficits are forecast to decline significantly by the Expert Group by the end of the forecast period, nevertheless, significant deficits are expected to persist throughout the forecast period and for a few years beyond. This will be particularly so in the case of painters and plasterers. One of the conclusions which the Expert Group reached, on the basis of this analysis, is that the Irish labour market can absorb further increases in apprenticeship intake in respect of certain trades.

3.4.1 The Effect of Migration on the Level of Skill Shortages

The extent to which skill shortages actually emerge in the construction industry in Ireland is dependent on the level of migration. It is estimated that 5,700, mainly Irish born, construction craft workers returned from the United Kingdom in 1997 to take up employment in the Irish construction industry. This level of migration made a significant contribution to alleviating skill shortages in the sector that year. The following table illustrates the components of employment increase of skilled construction craftspersons in 1997.

INCREASE IN EMPLOYMENT	10,000
Apprentices	3,000
Immigrants	5,700
Unemployed (residual)	1,300

The Expert Group wishes to draw attention to the impact of different migration scenarios on the level of skill shortages. In this context, it is worth noting that annual inward migration of 5,000 craft workers would be sufficient to meet the projected skills deficit - even in the year 2000 when it will be most severe. This illustrates the significant impact which a policy of promoting inward migration of construction workers could have on alleviating skill shortages in the sector over the next few years.

3.5 Conclusions

Currently, there are skill shortages in all of the seven main crafts in the construction industry. Statistics on wage inflation and on vacancies indicate that demand for these skills in the Irish market exceeds supply to a significant degree. Discussions with the Construction Industry Federation and various employers also support the view that the supply of these skills is not sufficient to meet demand. The

Expert Group is predicting that these skill shortages will reach a peak of almost 5,000 in the year 2000 and will persist, but at a reducing level, in all of the seven construction crafts to 2003.

The current high level of apprenticeship registrations will be sufficient to meet the requirements of the construction industry for electricians, carpenters⁴⁰ and plumbers for the year 2004 and beyond. This conclusion is based on the assumption that employment growth will not exceed 2% per annum and that the drop-out from apprenticeship will not rise significantly.

Shortages will, however, still persist in the case of bricklayers and construction plant fitters after 2003, assuming zero rates of employment growth. The level of skills shortage in these areas will be much lower, however, than at present.

In the case of qualified painters and plasterers significant shortages will persist throughout the decade unless there is a significant increase in the level of apprentice intake or some other means is found to increase the supply of qualified craftspersons in these trades.

3.6 Recommendations

The Expert Group recognises that there is little that policy makers can do to immediately increase the supply of craft skills within the Irish labour market. This is because the current method of acquiring such skills, the Standards Based Apprenticeship System, takes approximately four years to complete. Accordingly, to address the difficulties experienced by the construction industry as a result of shortages of skilled craftspersons, the Expert Group focuses on both short-term and long-term solutions to the issue in its recommendations which are as follows:

- **FÁS and the Construction Industry Federation should seek to address the immediate craft skills shortages by increasing their efforts to attract to Ireland suitably qualified persons from other countries.**
- **Routes to formal craft qualification for experienced but unqualified general workers should be explored and, to this end, a committee should be formed by FÁS of all relevant parties to explore the issues involved.**
- **FÁS, in consultation with the Department of Education and Science, the Construction Industry Federation and the Irish Congress of Trade Unions, should explore the possibility of reducing the time it takes for some apprenticeships.**
- **FÁS should encourage employers to increase the number of apprentices being sponsored, particularly in those trades in which continuing skill shortages are anticipated - painters and decorators, plasterers, bricklayers and (construction) plant fitters.**
- **FÁS and the Department of Education and Science must ensure that sufficient resources are made available so that there is no delay in providing apprentices with places on the off-the-job components of the apprenticeship programme.**

⁴⁰ It is assumed that carpenters work as carpenters in the industry and not as site supervisors. Obviously, any change in the status of a significant number of carpenter would fuel further shortages.

4. CHEMICAL AND BIOLOGICAL SCIENCES

4.1 Introduction

There are around 100,000 people employed in companies engaged in chemical and biological sciences related activities. A growing proportion of these employees have third level qualifications in chemical and biological sciences⁴¹ and in chemical engineering. The industrial sectors employing these graduates are Chemicals, Pharmaceuticals, Plastics and Rubber, Medical Devices, Biotechnology, Food, Beverages and Tobacco.

The Expert Group developed a range of sectoral growth scenarios in order to estimate likely demand for graduates with third level qualifications in chemical and biological sciences and in chemical engineering to the year 2005. Based on the sectoral growth scenarios developed by the Expert Group, total employment across these sectors is projected to increase by a third, to 132,500 persons employed by the year 2005. The Expert Group then analysed the likely supply of students graduating each year over that period from the third level colleges with either relevant degree or technician level qualifications. Comparing likely demand with likely supply, the Expert Group could then estimate potential skill shortages in the area and has made appropriate recommendations to alleviate the identified shortfall.

The scope of the demand and supply analysis carried out by the Expert Group relates only to those third level disciplines which are specific to these sectors. Graduates in areas such as business management, or technicians in areas such as electronics, are therefore not included in the analysis.

4.2 Estimating Demand for Chemical and Biological Science Graduates 1999-2005

4.2.1 *Constructing a model of likely demand*

In order to estimate the demand for chemical and biological science graduates between 1999 and 2005, a model was constructed to convert overall employment growth projections for these sectors into projections of demand for new staff in the main occupational categories. These demand projections were converted into projections of demand for graduates with scientific qualifications, focusing particularly on the chemical and biological sciences.

The main sources of information on which this model was constructed were:

- **1996 CSO Census of Population data** - This provided information on the mix of different occupations in most of the sub sectors. It also provided a profile of the qualifications of those currently employed.
- **Higher Education Authority First Destination Survey data** - This Survey collects data on graduate destinations 9-12 months after graduation, e.g. whether graduates went on to further studies, into employment, emigration, etc. The data was grossed up to provide profiles of the number and mix of graduates from 1995, 1996 and 1997 actually recruited by the sectors under consideration.⁴² The part of the model devoted to the indigenous biotechnology sector was based on typical mixes of qualifications in young biotechnology companies.

⁴¹ Biological sciences graduate requirements for the sector are drawn from within the following fields: biochemistry, biology, biotechnology, botany, genetics, microbiology, pharmacology (not pharmacy), physiology and zoology.

⁴² The HEA's industry classification system aggregates the pharmaceutical, other chemical, plastic & rubber products and medical devices sub sectors together, and also aggregates the food and beverage & tobacco sectors.

In constructing the model, it was assumed that the mix of graduates recruited in 1997 reflected the actual needs of the sectors concerned. For most types of qualification, this is likely to be a fair assessment, as recruitment in 1997/98 does not appear to have been greatly constrained by the supply of graduates with relevant qualifications.

Three demand projections for future employment were developed for each of the industrial sectors under consideration. In each case, a high growth scenario reflected a continuation of the compound rate of growth achieved in recent years. A middle growth scenario reflected a slow-down in growth to a somewhat more modest level, while a low growth scenario reflected a significantly less optimistic view of the future.

The exception to this approach was the indigenous biotechnology sector, for which a single scenario was constructed to reflect a high growth view of future employment in indigenous biotech enterprises. The application of biotechnology world-wide is assuming increasing economic importance, in particular for industries such as pharmaceuticals, healthcare and agriculture which are important to Ireland. Internationally, in some geographical industry clusters, biotech employment is increasing by 30-40% per annum, albeit from a low base. While the extent of future growth prospects for the sector are less certain than in the case of the IT sector, a number of current or proposed significant state sponsored interventions, such as those contained in the recommendations in the *Technology Foresight* programme, reflect the recognition that the necessary human resource and other requirements must be available to meet the expected growth in the biotech sector. The scenario adopted for the indigenous biotechnology sector is based on assumptions about the increase in the number of start-ups, their success rate and the rate of growth of companies that are successful.⁴³

Developments such as the Human Genome Project mean that a substantial part of the skill requirements in the biological sciences are in developments linked with information technology - "bioinformatics".

In addition to the indigenous biotechnology sector, the pharmaceutical sector will have a particularly strong influence on the overall projections for demand, as it is expected to grow rapidly. It is a major recruiter of science graduates, particularly in chemistry.

Each of the scenarios was assessed for each sector, balancing the view that skill supply planning should aim to proactively stimulate economic growth with the need to take account of factors that may prevent the sectors from growing as quickly as in recent years. Based on this assessment, a scenario was chosen to use for planning purposes for each sector involved, which, taking the sectors as a whole, anticipates a middle to high growth scenario. Appendix III summarises the employment projections made for each sector.

Based on the sectoral scenarios, 1,220 scientific and technical graduates are projected to be needed annually by these sectors up to 2005. The demand breakdown is as follows:

Level of Award	Number
Higher degree scientists	250
Primary degree scientists	620
Technicians	350
Total	1,220

⁴³ It should be noted that this scenario is optimistic, but plausible, and that the demand for degree holders in biological science is very dependent on the actual level of growth experienced in the indigenous biotechnology sector.

4.2.2 Impact of Technology Foresight on Demand

The requirements for additional scientific and technical personnel outlined above do not take into account the impact which the implementation of the *Technology Foresight* programme will have in terms of additional demand for skilled personnel in this area, as sufficient information is not yet available to make a reliable estimate.

The Expert Group intends to continue to carefully monitor the situation and will revise its estimates of the additional demand for degree holders and technicians in the relevant areas, when the planned implementation of the *Technology Foresight* programme is sufficiently detailed to allow a well-founded estimate to be made.

The Expert Group believes that the overall demand for chemical and biological degree holders and technicians will require careful monitoring over the next few years. This is particularly important given that quick response mechanisms to meet short term skill needs, such as conversion diplomas, are not available as an option for the chemical and biological sciences area to the same extent as they are for the IT sector.

4.3 Supply of Chemical and Biological Graduates

The number of third level graduates available to work in a technical capacity in chemical and biological science related areas within companies will always be affected by the fact that a significant proportion of graduates from the relevant disciplines will choose to work in other areas, move abroad, or go on to further study. Appendix IV illustrates, by level of qualification and by discipline, the numbers of 1997 graduates which are estimated to have been available to work in these areas following graduation.

Applying this historical trend, the projected annual supply of third level scientific and technical graduates likely to be available to companies in related sectors, on the basis of present policies, is as follows:

Level of Award	Number
Higher degree scientists	280
Primary degree scientists	470
Technicians	330
Total	1,080

Other factors which are likely to bring about a further imbalance in supply and demand, are as follows:

- (i) The mix of graduates available is not expected to match the mix of graduates projected to be required. Shortages are projected at primary degree level in chemistry, biological sciences and chemical engineering. Shortages are also projected at technician level.
- (ii) Science graduates, particularly in numerate disciplines such as chemistry, are also attractive to the IT industry and there is a possibility that the percentage of these graduates entering IT will increase.

Taking into account these factors, the Expert Group considers that there will be an annual additional requirement for 410 graduates to the year 2005. This annual requirement is made up as follows:

Level of Award	Discipline	Number
Degree	Biological Sciences	200
	Chemistry	80
	Chemical Engineering	10
Technicians	Science	120
Total		410

The Expert Group proposes that an extra 1,150 places are needed at third level for degree students to meet the requirement for additional degree holders and that these should be made available on a phased basis, over four to five years, and adjusted where appropriate to take account of changes in the demand/supply ratio and in the mix of disciplines as these emerge. It should be noted that this anticipated shortfall in graduates does not take into account the impact of the implementation of the *Technology Foresight* programme. As already stated, the Expert Group will continue to monitor this situation and will update its estimates for additional requirements, as appropriate.

As part of the phased increase in places in the biological sciences, there is a need to have a number of graduates with an expertise in bioinformatics. It is considered that, while it is not appropriate to create over-specialised courses for those entering higher education, there is a possibility of specialisation from the second or third years of biological science programmes to ensure that there is an output of graduates qualified in bioinformatics. It is appropriate to prioritise this element on a phased basis in the creation of the additional places recommended.

In terms of increasing the number of science technicians that are available, the Expert Group is not recommending that additional places be provided at this time to meet the annual shortfall of 120 Technicians as the colleges are already experiencing difficulties in attracting sufficient students to fill the places already available. In order to maintain technician output, however, the Group recommends that some of the existing facilities be used to provide an additional 250 science technicians annually throughout an extension of the accelerated technician programme. Students on this programme are normally mature and are often employed in industry. They represent an additional source to those coming from second level. The enhancement of the skills of less skilled workers already working in the relevant sectors is an important means of bridging the skills gap and of providing increased motivation and remuneration to workers already employed.

4.4 Constraints on the Future Supply of Qualified Scientists

The Expert Group is particularly concerned at the falling numbers of school leavers interested in studying science at third level and the likely impact this will have on the numbers of graduates qualifying in chemical and biological sciences and chemical engineering in the years ahead. It is not sufficient to make college places available, if the students are not coming forward in sufficient numbers to take up the places on offer. (Appendix V illustrates the declining trend in the number of applicants for third level science courses, excluding computing, between 1992 and 1998).

The Expert Group also notes with concern the continuing decrease in the number of students at second level studying chemistry. The proportion of students taking this subject at Leaving Certificate level has decreased from 21% in 1987 to 12% in 1999. This situation is compounded by the fact that there is an overall decline in the number of students taking the Leaving Certificate, due to demographic changes.

The Expert Group believes that the issue of the variation in marking between Leaving Certificate subjects and the effects that this has on subject choice by second level students may also be relevant. There would appear to be a perception that chemistry is a difficult subject in which to achieve a high mark and therefore some students may select certain other subjects in preference to chemistry on this basis. In this regard, the Expert Group notes with interest that the Commission on the Points System has recommended that “research be undertaken to identify the cause(s) of the variation in existing patterns of grade allocation across subjects and to consider possible strategies to ensure a more even distribution of grades across subjects” The Expert Group recommends that this research get underway as soon as possible and that it should take into account, not only the distribution of grades in the subject, but also the ability profile of those taking chemistry.

The smaller number of school leavers interested in studying science is already impacting at both technician and degree level, in terms of the number and quality of the students choosing to pursue a course of study in science. The prospects for chemistry and biological sciences graduate numbers beyond 2002 are also uncertain. College entry points requirements, for most relevant degree courses, decreased between 1997 and 1998, reflecting the fall in applicants. There is a challenge to be faced in maintaining student throughput at current levels, given a fall in college applications for science programmes (excluding computing) since 1995. Some action has already been taken by colleges to counter this trend, using measures aimed at increasing student retention and creating new courses designed to be more attractive to students.

Given the present difficulty in attracting sufficient numbers of Leaving Certificate students to pursue science related studies at third level, the Expert Group believes that companies should actively encourage their existing employees to obtain further qualifications - those without formal qualifications to become technicians, those already at technician level to obtain relevant degrees. There is also a need to encourage mature students from other areas to pursue appropriate courses of study. In this context, the Accelerated Technician Programme can have a specific role to play and should be extended as soon as possible to cater for additional science technician students.

4.5 Recommendations

The Expert Group considers that there should be four main elements to the strategy for ensuring that skilled personnel with relevant third level scientific qualifications are available to meet the projected need of companies for such personnel in the medium term. The focus of the four elements is as follows:

- (i) To regenerate interest at school level in chemistry and other fields in which interest has been steadily declining.
- (ii) To boost student interest in the relevant science courses in order to hold graduate numbers at their present levels and, in some fields, to increase them.
- (iii) To ensure that the third level colleges have the resources to cater for the additional graduates required.
- (iv) To develop a clearly defined career progression path for employee training and competency building within chemical and biological sciences related industrial sectors.

The Expert Group will continue to closely monitor the demand and supply situation and, in particular, to monitor graduate destinations in order to identify trends at an early stage.

The Expert Group makes the following recommendations designed to meet the need for additional persons with third level qualifications in chemical and biological sciences:

- **An extra 1,150 places on degree level courses should be provided in relevant science disciplines on a phased basis over 4 to 5 years so that an additional 290 graduates may become available each year.**
- **The Accelerated Technician Programme should be extended as soon as possible to cater for 250 science technician students.**
- **The information campaign recently undertaken by the FÁS Chemicals and Allied Products Industry Training Committee, should be extended. Further awareness raising should be undertaken by Forfás and by the relevant industry associations to inform potential students, their parents and teachers, of the range of interesting career opportunities available to science graduates.**
- **The third level colleges should examine the promotion of their existing science courses, and should consider rebranding and repositioning these with a view to increasing their attractiveness to potential students, e.g. “Pharmaceutical Technology” instead of “Chemistry”.**
- **The Government should establish an Interactive Science Centre to encourage a greater interest in science among primary and secondary school children.**
- **As recommended by the Commission on the Points System, the factors affecting the subject choices of Leaving Certificate students, and the variation in marking between subjects, should be examined as a matter of urgency by the Department of Education and Science. The Department should also consider appropriate strategies to ensure a more even distribution of grades across subjects.**
- **The Expert Group endorses the recommendation of the Commission on the Points System that a committee should be established of all interested parties to examine the proposed access by second level students to professional healthcare courses through a compulsory preliminary general science route.⁴⁴**
- **Employers should actively pursue a policy of upgrading the skills of those already employed within the sector to technician and degree level as appropriate. In this connection the Department of Enterprise, Trade and Employment and the Department of Education and Science should come together with the relevant interests to devise appropriate programmes.**

5. RESEARCHERS

5.1 Introduction

Ireland’s sustained growth will increasingly be based on the country’s ability to develop a knowledge driven economy. As Chapter 2 indicated the demand in the future will be for people with greater skills and higher educational attainment levels. This will require an even greater investment in developing the knowledge and skills of the Irish people through a continued focus on raising (i) the general educational attainment levels of Irish students completing full-time education; (ii) a fostering of a culture of life-long learning; and (iii) an increase in the number of Irish people attaining doctorate level academic qualifications (PhDs).

⁴⁴ The Commission on the Points System recommended in its December 1999 Report that the key bodies and institutions involved in policy-making on healthcare training, e.g. the Medical Council, the Universities, the Higher Education Authority and the Department of Health and Children, should set up a committee to explore the issue of access to high points professional healthcare courses, (e.g. medicine, pharmacy and dentistry) through a preliminary science course. There is potential to increase interest in the sciences by such a proposal, if it were to be implemented.

The particular focus of the Expert Group in this chapter is on the need to increase the numbers undertaking research at PhD level so that the future demand for highly skilled researchers can be met.

This chapter examines the impact of new initiatives on the demand for increased numbers of researchers; the estimated future supply of researchers based on present trends; and the likely shortfall in the number of researchers required. The chapter concludes with the Expert Group's recommendations aimed at increasing the number of PhD and other highly qualified researchers available within the Irish economy in order to address the potential skills shortage in this area.

5.2 Demand for Researchers

This section examines the source of the demand for PhD graduates in recent years. It then examines the drivers of future increased demand and estimates the number of such highly qualified graduates that will be required up to the year 2005.

5.2.1 Recent Demand Trends for PhD Graduates

The major demand for PhD graduates has come from the education sector, for academic staff and for post doctorate research positions, and from high technology industry. Statistics compiled by the Higher Education Authority (HEA) show that by far the largest proportion of PhD graduates found their first employment after qualification in third level education. A significant proportion of these graduates found first employment overseas. (For example, 37% of the 1998 cohort of PhD graduates who found employment did so abroad).

The table which follows is based on the HEA statistics and illustrates for each of the years 1992-1998 inclusive the relative distribution of PhD awards by sector of first employment.

Sector	1992 (%)	1993 (%)	1994 (%)	1995 (%)	1996 (%)	1997 (%)	1998 (%)	Avg.92-98 (%)
Education, 3rd.	49.1	43	36.8	46.3	45.5	34.2	43.2	42.6
Chem/pharm	15.4	8.9	17.3	15.9	13.2	15.5	17.2	14.8
Public sector	4.8	9.4	14.1	5.3	6	8.7	5.3	7.6
Other	13.5	14.9	12.3	11.7	13.6	19.3	19.3	14.9
Non comm semi-state	7.1	7.9	5.4	4	6.8	3.1	2.2	5.2
Eng./Elect	3.6	5.1	3.8	11.5	6	9.3	5.3	6.4
Education,1/2nd.	4.1	6.1	6.5	2.2	4.7	3.1	3.5	4.3
Financial	0.6	2.8	2.7	2.2	2.1	4.3	4	2.7
Food/Drink	1.8	1.9	1.1	0.9	2.1	2.5	0.0	1.5
Total	100							

5.2.2 Drivers of Increased Demand

Increased demand for highly skilled researchers is related to the growth of research and development expenditure and activity in Ireland which is expected to take place over the next decade. Significant drivers of this growth in R&D are the following.

- **Emphasis by the enterprise sector on building sustainability**, both by developing multinational firms along the lines outlined in “Strategic Leadership of Multinational Subsidiaries”⁴⁵ and by increasing awareness and action by the indigenous sector in developing fully integrated enterprises with appropriate investment in research and technological development. Over the past 15 years, research and development expenditure by industry in Ireland has been growing at about 15% per annum.
- **The National Development Plan provision of £1.96 (€2.49) billion for Research, Technology Development and Innovation (RTDI) investment** over the next seven years will greatly increase the overall level of research in the country. Of this total, £550 (€698) million is ear-marked for R&D in the third level education sector and £560 (€711) million for implementing the *Technology Foresight* recommendations in relation to research.

In this environment, it is imperative that sufficient highly skilled researchers are available to facilitate the increased investment in R&D.

5.2.3 Funding Higher Education Research

The Government has recognised a need to encourage both basic research and applied research. The structure for funding basic and fundamental research by the State is now emerging in broad outline. It has four main funding mechanisms which are as follows:

- The unified teaching and research budget allocated by the HEA to the universities as a block grant.
- The funding of individual research proposals and projects following competitive application processes and peer review assessments. The Health Research Board and Enterprise Ireland are two important agencies in this area. EU Framework Programmes have been a very important source of research funding in the colleges and will continue to play a part in the future.
- The funding of institutional research strategies – again on a competitive, peer-reviewed evaluation basis. The *Programme for Research in Third Level Institutions* was launched in late 1998 and now involves a total allocation of over £230 (€292) million for the period 1999-2001 - of which slightly more than 50% is being provided by the Government. The programme ensures that institutions have the means and incentives to formulate and implement research strategies to develop critical mass in areas of existing and emerging excellence within the institutions. This programme built upon a smaller programme of £4 (€5) million recurrent expenditure in 1998 – the first ever such funding to support the research strategies of third-level institutions directly. The Programme is administered by the HEA, on behalf of the Department of Education and Science.
- The Technology Foresight programme will initiate funding for research projects in a number of mission-oriented strategic areas.

5.2.4 Technology Foresight

In April 1999, the Irish Council for Science, Technology and Innovation (ICSTI), responding to an earlier request from Minister Noel Treacy, submitted its report on the *Technology Foresight* project. The essential conclusion was that the Irish economy should be repositioned, in order to be widely recognised internationally as a knowledge-based economy. The knowledge framework can be visualised as a pyramid - where industry, the higher education sector, Government and society are the four interlinked faces forming a partnership at all levels. The report identified a gap at the apex of the pyramid: the need for a world class research capability of sufficient scale in a number of strategic areas within our universities and colleges, research institutes and industry. This gap can only be filled by a knowledge framework which will in future comprise the following elements:

⁴⁵ Strategic Leadership of Multi-National Subsidiaries (From Superior Performance to vital part of Corporate Value chain : An overview for Senior Executives) Edmond Molloy Ph.D. and Edward Delany D.B.A., November 1998, M.D.L. Management Consultants Ltd.

- Research intensive and technology based indigenous and overseas companies using high level expertise.
- A vibrant, cohesive, durable and internationally recognised competitive research base involving industry, universities and colleges and research institutes, which will provide an attractive career structure for researchers to work in Ireland.
- Investment in the physical and human infrastructure required to support this research base.
- An environment conducive to innovation.
- Citizens well informed on scientific issues in the context of an innovation culture.

ICSTI called for well focused and significant investment in upgrading the technological infrastructure of the economy to enable Ireland to achieve the following:

- The developing of a world class research capability in strategic technologies for the future competitiveness of indigenous industry;
- The undertaking of R&D in this country by multinational companies; and
- The attraction of more high-tech companies to Ireland in the future.

The *Technology Foresight* proposals in relation to research excellence have been approved by the Government and was announced at a public forum in early March 2000.

5.2.5 *Projected Demand for PhD Graduate Researchers*

The projected demand for PhD graduate researchers will arise as a result of investment in three separate areas:

- (i) Third Level sector research
- (ii) Technology Foresight implementation
- (iii) Enterprise Sector R&D

The impact of each of these areas of investment on demand for PhD researchers were considered separately by the Expert Group and its best estimates for the demand in each area are illustrated in the paragraphs which follow:

- (i) Third Level Sector

The research scene in the third level sector has been radically transformed by new Department of Education and Science initiatives in research which began in 1998. These initiatives amount to a total investment in research of over £230m between 1999 and 2001. The National Development Plan includes provision for an investment of £550m over the period 2000-2006 in Research, Technological Development and Innovation in the education sector under the aegis of the Department of Education and Science. The projects funded by these investments will involve a significant increase in the demand for post doctorate researchers and for postgraduate research students at both masters and PhD levels. It is difficult to determine the precise level of increase over the level of activity in 1998 and 1999 because there will be some element of replacement involved, where existing research personnel transfer to the new programmes. An indication of the scale of what is happening, however, can be obtained from the following table:

Expected Additional Demand due to Dept. of Education/Science Research Programmes

Research Programme	Number of new Post Docs	Number of new Post Grads (Masters and PhDs)
1998–2000	17	57
1999–2001	140	278
2000–2002	90	150
2001–2003	150	280
2002–2004	150	280
2003–2005	150	280

Not all of the participants in these research programmes will be science and technology graduates. For example, in the 1999–2001 programme, 124 out of 140 post docs and 233 out of 278 postgraduates are in the science, engineering and medical fields, with the balance in arts, humanities and other areas. Nevertheless, the expected impact will be large. The 1996 survey of third level research identified a total of 370 post doctorate researchers overall in the system, of whom 340 were in S&T fields.

(ii) Technology Foresight

The recent announcement that a Technology Foresight Fund has been established to implement the recommendations in Technology Foresight Report in relation to research excellence will have an enormous impact on the demand for people with a PhD qualification. Eventually, of course, the research initiatives supported by the new Fund will contribute to the production of large numbers of PhD graduates in Ireland. In the short-term, however, there will be a considerable mismatch between demand and supply. At this stage, it is only possible to formulate some very tentative estimates of the likely effects on the annual demand for post doctorate researchers and for PhD students. These are shown in the table which follows. The numbers are the total requirements in each year, not additional requirements.

Annual Need for Post Docs and PhD Students

	2000	2001	2002	2003	2004	2005
Post Docs						
	205	205	205	350	490	705
PhD Students						
	205	205	205	350	490	705

(iii) Business Sector

The Forfás survey of business sector R&D in 1997 introduced a new question on the employment of PhD graduates in industry. Of the 650 R&D performing companies which responded, 135 firms were employing 389 PhDs. In order to provide a better understanding of the demand for PhDs in industry, and the factors influencing that demand, a short study was commissioned by Forfás. The study focused on 141 companies known or thought to be employers of PhD graduates, was heavily biased in favour of R&D performing companies and is not therefore a representative sample of industry generally.

There were responses from 101 of these companies. The following table gives an indication of the distribution of the PhD cohort (314 in total) in these firms, between sectors and by firm ownership.

No. of PhDs Employed

Sector	Irish Owned Firms	Foreign Owned Firms
Chemical/Pharmaceutical	23	125
Engineering	29	36
Food	9	22
Communication/Software	51	19
Total	112	202

The study concluded that all sectors have experienced growth in their R&D activities in recent years. The companies interviewed stated that this trend is expected to continue. The implications for demand for PhD qualified research staff was not, in general, quantifiable but where an increase in demand was envisaged, it was not expected to be significant. Most existing R&D performers, therefore, do not anticipate getting into the type of higher level research which would involve the recruitment of large numbers of professional researchers.

A second study was commissioned by Forfás in order to obtain more data on the possible demand outside existing R&D performers. This looked at a new class of R&D aspirant company which would be likely to get involved in R&D if the conditions were right and the correct mix of highly qualified people were available. It also assessed the possible impact of IDA Ireland's success in attracting new research-intensive greenfield projects to Ireland.

The table which follows summarises the findings of this study in respect of the demand for PhD graduates in the year 2000 - 2002 inclusive from companies in the electronics, software and mechanical sectors.

Sector/Discipline	Electronics	Software	Mechanical
Electronics	35	15	5
IC Design	88	37	-
Communications	23	70	-
ERP Software	-	46	-
CAD/CAE	-	6	3
Total Demand	146	174	8

The study identifies extremely strong potential demand for advanced skills in the two broad areas of electronics and software to service dynamic sectors such as IC design and communications software. While directly comparable PhD outputs cannot be precisely identified, the most relevant would be engineering/physics with total PhD awards of 61 in 1997 and computer science with 18 PhD awards. These are very far below the potential industry demand levels. The Expert Group considers that it is a matter of particular concern that these are the precise areas where colleges are having most difficulties in persuading students to stay on for postgraduate study - immediate entry into well-paid jobs in industry is an attractive alternative and the value of a PhD for an industrial career in these industries is not yet widely appreciated.

In developing approaches to encourage postgraduate study, the Expert Group recognises that there will be a need to ensure that there are sufficient numbers of qualified people available to enter the work force in areas of particular skills need, as well as having sufficient numbers advancing with research careers. In this regard, it is important to note the work of the Expert Group in expanding the number of degree places in relevant technology disciplines areas, which are set out in Chapter 2 and the proposals in Chapter 4 for an expansion of degree places in Chemistry and Biological Sciences.

5.3 Projected Supply of PhD Researchers

The data on PhD registrations in the universities are primarily based on HEA publications and on annual returns sent to the HEA by the universities. Between 1985 and 1997 the total number of PhD awards in science and engineering fields (including medicine) increased from 115 in 1985 to 320 in 1997, although there were significant variations from year to year within that period (see Appendix VI - PhD Awards by Field of Study, 1985-1997).

Ireland has increased significantly the number of PhDs awarded annually from a low base in 1985 and has achieved an “average” position internationally, still some way behind high technology countries like Switzerland, Sweden and Finland.

The table which follows shows Ireland’s position in 1996 with regard to the number of PhD Degrees awarded in science and technology per 100,000 population compared to a number of OECD countries. Longer-term trends for Finland, the US and Ireland are also shown.

Doctorate Degrees Awarded in Science and Engineering per 100,000 Population

	1985	1996	Rank
Switzerland		26.1	1
Finland	4.8	14.9	2
France		14.8	3
Sweden		14.3	4
Germany		12.4	5
UK		11.1	6
Austria		10.6	7
US	7.2	10.0	8
Netherlands		8.6	9
Ireland	3.3	8.1	10
Canada		6.9	11
Denmark		5.0	12
Spain		4.6	13
Japan		4.3	14
Korea		4.3	14
Norway		3.9	16
Greece		3.5	17
Italy		2.5	18

Source: NSF Science and Engineering Indicators 1998

5.3.1 PhD Output in Recent Years

While strong advances in the output of PhDs have been achieved, there is a concern in the academic community, in specific industry sectors and amongst policy analysts that the increase in output has levelled off, primarily due to the attractiveness of alternative employment opportunities for the potential PhD students and the poor financial support given to students while undertaking research leading to a PhD. This is confirmed by HEA data shown and is illustrated in the following table:

Total PhD Registrations 1996–1999

Year	Total PhDs Registered
1996	2361
1998	2433
1999	2270

This shows a reduction in the total numbers of registered PhD students in 1999, even though the data would include students who enrolled first between 1995 and 1999. The probable cause of this decrease, although this can be no more than conjecture, is a decline in new enrolments in 1998 and 1999.

5.4 Projected Supply and Demand Imbalances

Both the long lead times required to obtain a doctorate qualification and the uncertainties in forecasting the complex demand pattern for those holding a PhD degree make the estimation of future demand/supply balance a difficult task. Nevertheless, the analysis undertaken in the course of this study does provide a reasonable basis on which to make recommendations.

With our small population, the absolute level of PhD awards in most fields is going to be small. It is essential to maximise the numbers who enter postgraduate study. There were 242 PhDs awarded in Pure Sciences in 1997 of these, 75 were in chemistry, 20 in physics, 18 in computer science and 6 in mathematics/statistics.

On the supply side, the output of PhDs up to 1997 had shown strong growth overall in science and engineering fields. However, HEA data for 1997-1999 provide evidence of a decline in numbers opting for postgraduate study. This reflects both the buoyancy of the labour market, with attractive starting salaries for primary graduates, and the relative unattractiveness in financial terms of spending up to five years studying for a PhD degree. In the past, when the opportunities for a research career in Ireland were very limited, a substantial proportion (37% in 1998) of those finding employment did so abroad. A significant source of future supply will come from the reduction in this level of emigration and the targeting of previous emigrants to return to Ireland.

On the demand side, the main sources of recruitment for PhDs are the higher education system – for academic staff and for post doctorate research positions – and high technology industries. The State research institutes also require PhD holders for some of their activities. The implementation of *Technology Foresight*, together with the Department of Education and Science initiatives on research in the third level sector and the implementation of other RTDI measures under the new National Development Plan, will introduce very significant extra demand for post doctorate researchers and for research students (mainly PhD) over the next six years. These have been tentatively estimated in section 5.2 above. While these initiatives will result in an increased production of PhD graduates in the medium term, in the short term there will be serious imbalances in the supply and demand for research students and for post doctorates. This gap will have to be met by attempting to increase the numbers going forward to postgraduate study as well as attracting people to Ireland who are currently working or studying elsewhere.

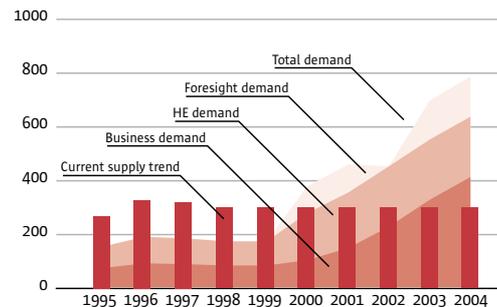
In relation to high-tech firms, there are complex and not fully understood relationships between the existence of a pool of highly trained researchers and the growth of firms and industries based on the application of new knowledge and new technologies. The implementation of the *Technology Foresight* recommendations is designed to create a dynamic environment which will encourage the development of this scenario. The surveys of industry undertaken for the Expert Group provide mixed signals. Existing R&D performers do not appear to foresee any significantly increased requirements for people

with a PhD qualification. On the other hand, a group of people and companies have been identified who would be prepared to utilise a cohort of highly trained research personnel to drive industry in the direction of higher value-added products and services based around the development and application of new knowledge and new methodologies generated by advanced research.

Furthermore, a critical strategy for achieving economic development in knowledge-based industries must be the spawning of high tech companies by university researchers. In order to ensure the growth required in the number of companies spun off from academic research, there is a need to create a more positive research, innovation and enterprise culture in our universities and to increase significantly the supply of talented researchers.

There is little doubt that, should the increased demands predicted materialise for post doctorate researchers in relation to (i) *Technology Foresight*; (ii) the new research initiatives in the third level education sector; and (iii) developments in high technology industries, then a serious gap will develop between demand and supply for PhD graduates in science, engineering and medicine. The critical time period is up to 2004, when the graduates from the new programmes will begin to emerge. The following illustration shows the potential size of this gap, assuming there is no increase in the numbers of PhD graduates above the 1997 level. It should be noted, however, that the supply trend is based on the very inadequate levels of support for PhD students which were in place in 1997 and that the support system is already changing radically through the impact of the *Programme for Research in Third Level Institutions*.

Predicted Supply and Demand for S&T PhD graduates to 2004



5.5. Recommendations

Urgent action is now needed to put in place ways to encourage careers in research and awareness of research opportunities, particularly in relation to the further development of appropriate funding of research activities and researchers. In particular, if the objectives of *Technology Foresight* and other research programmes are to be achieved the number of research students in Ireland will have to increase substantially. Important issues which need to be considered include the appropriate financial support for post-graduate research; the supportive mechanisms needed to develop research as a career; and the preparedness of third level institutions for the substantial increase in their research activity which is now developing.

It is clear from the analysis in this report that the supply of PhD students and graduates from the Irish education system will not be adequate to meet the substantially increased demand that has been identified over the next few years. Postgraduate students and post doctorate researchers must be attracted from abroad and any existing impediments which could hinder this must be eliminated.

The recommendations of the Expert Group to increase the numbers of PhD and other highly qualified researchers available within the Irish economy are as follows:

- **Forfás, in the context of the ‘Science, Technology and Innovation Awareness’ campaign, should focus specifically on promoting the awareness of research as a career and should work with the higher education institutions in this regard.**
- **The HEA should examine options for ensuring that complementary mechanisms are in place for the support of postgraduate and postdoctorate researchers, including appropriate levels of financial support, and for the development of research as a career.**
- **In order to meet the short term needs for such researchers, the third level institutions, with the support of the HEA and Forfás, should develop and implement strategies to attract postgraduate students and post doctorate researchers in appropriate disciplines from abroad. This would include the attracting back to Ireland of suitably qualified Irish persons now living and working overseas.**
- **The Government should ensure that no impediments, in the form of over restrictive immigration controls, prevent suitably qualified persons from other countries from taking up research posts in this country.**
- **The HEA should establish a central database on higher education research activities for all third level colleges. This should include information on new postgraduate registrations and awards by field of study and financial supports for students.**

As the Government’s major scientific research initiatives are implemented, with their heavy demands for PhD researchers, the Expert Group will continue to closely monitor this area closely, to ascertain more exactly the emerging shortfall in the numbers of researchers required and the areas in which the most pressing needs are arising, and will bring forward further recommendations as appropriate.

6. INFORMATION TECHNOLOGY

6.1 Introduction

The first report of the Expert Group, published in December 1998, focused on the higher level skills needs of the software and hardware related areas of the Information Technology (IT) sector. This report identified clear and significant skill shortages in these areas and made specific recommendations as to how these could be addressed.

The report was very well received and resulted in significant additional investment by Government and the creation of substantially increased places in third level colleges, at undergraduate and postgraduate level, as well as increased places on relevant FÁS training programmes.

- In April 1999, the Government approved an additional allocation of IRE75 (€95.23) million to the Department of Education and Science for the provision of 5,400 IT related third level places.
- In January 1999, the Accelerated Technician Programmes⁴⁶ were expanded to include information technology and thus 1,100 students are now enrolled on courses in the Institutes of Technology as part of the Accelerated Technician Programme.

⁴⁶ In 1997 a joint industry/education task force was established to urgently address the technician supply needs of high-technology companies. Arising from the recommendations of this task force, Accelerated Technician Programmes were introduced from January 1998. These highly focused programmes, of relatively short duration (18 months), were aimed at less skilled employees already working in companies which were experiencing technician shortages and at potential students who had not participated in such courses in the past.

- In June 1999, the Government made an additional IRE6 (€7.62) million available towards the continuing annual provision of 1,500 on postgraduate conversion courses by the third level colleges places in IT related areas.

In addition, FÁS agreed to train an additional 700 persons in relevant IT skills and an extra £3.2 (€4.06) million was allocated for this initiative by the Government in the 1999 budget.

The Expert Group welcomes the speed with which the Government responded to its original recommendations. The level of additional investment made in education and training and the scope of the initiatives in this area has meant that substantial progress has been made in the implementation of the recommendations of the Expert Group's first report.

6.2 Demand for IT Related Higher Level Skills

The Expert Group has continued to monitor changes in the situation since its last report was published and has revised the projected demand for IT personnel with higher level skills required in the period 2000-2003. The Expert Group now anticipates an annual average demand for 9,700 persons with third level IT qualifications in this period, as the following table illustrates:

Average Annual Demand 2000-2003

Level of Award	Number Required
Degree	5,000
Technicians	4,700
Total	9,700

This overall figure is broadly in line with the original estimate. The most significant changes which the Expert Group has identified are as follows:

- the increasing skill content in the computer hardware area with a stronger than anticipated demand for degree holders relative to the anticipated demand for technicians; and
- while the demand for computer science technicians is broadly as predicted, the Expert Group has identified a shortfall in the number of such technicians which will be available for the sector on the basis of present trends.

Each of these areas is considered in more detail in the paragraphs which follow.

6.2.1 The Anticipated Demands of the Electronics Hardware Area

The Expert Group commissioned several reports to assist it in accurately predicting the personnel requirements of the IT sector in the years immediately ahead. What is most striking from this research, in terms of the changed requirements for personnel with third level qualifications relative to electronics hardware, is the increased demand for degree professionals, as a percentage of the total employed.

This is now expected to be 20% of overall employment, compared to the estimate of 13% contained in the first report. This is offset to some extent by a somewhat lower overall employment projection. In addition, the demand for technicians is now estimated to be slightly lower than projected, 22% compared to 25.5% in the first report. The increasing skill content is as a result of the growth in higher skill new projects being supported by the development agencies and an increasing focus on R&D activities by existing companies.

The Expert Group is not recommending a change in the number of places for degree professionals in electronic hardware related areas at this time, but will continue to monitor the situation and to update the projections, as necessary, by the end of this year.

The Expert Group recognises that there will continue to be an overall shortage of engineering degree professionals for companies engaged in electronic hardware related activities to the year 2003. However, additional places have now been provided for engineering graduates and the situation should improve after 2003, as these students obtain their professional qualifications and become available for work.

6.2.2 The Anticipated Demands of the Software Area

While the software sector is developing broadly as projected in the first report in relation to projected employment, the Expert Group is concerned that there could be a shortfall in the supply of computer science technicians for software activities. This situation is arising as many of the extra technician training places have been allocated to engineering courses in the 1999 - 2003 period, to meet electronics hardware skill requirements. As a result, the Expert Group considers that there is an urgent need for measures to increase the number of computer science technicians, as recommended in the first report. An awareness campaign targeted at first year students in Institutes of Technology is also considered necessary to inform them of the enhanced career prospects available to them if they complete their current course of study rather than dropping out of college to take up immediate employment.

Every effort should be made to continue to ensure a full uptake of the postgraduate software conversion courses in the light of improved graduate employment prospects. The annual intake of 1500 students on such courses, as recommended in the first report of the Expert Group and now being implemented, is a critical element in the increase in the potential supply of suitably qualified personnel needed to bridge the identified skills gap in the IT sector.

6.3 Supply of IT Related Higher Level Skills

The Expert Group has noted that, as a result of the Government's investment, the projected annual supply of IT degree professionals will be more than double the 1996 level by the year 2003, while the projected annual supply of IT technicians will increase by 50%.

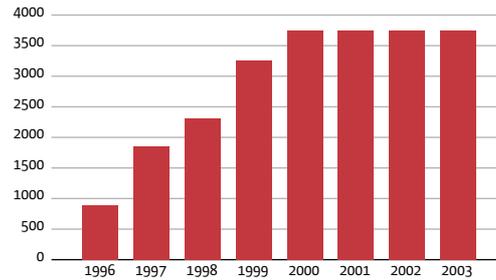
The table which follows illustrates the supply situation by the year 2003. Essentially the increase in the supply of technicians has begun to come on stream quicker than the supply of degree professionals. This is attributable to the relatively shorter period it takes to qualify as a technician, relative to the length of time it takes to obtain a degree.

Average Annual Supply 2000-2003

Level of Award	Number Available
Degree	4,300
Technicians	3,700
Total	8,000

The chart which follows illustrates the extra intake on degree professional courses over the period 1996-2003. The increased intake arises from the implementation of the recommendations of the Interim Skills Group (1996) and of the Expert Group (1998).

Extra Intake of IT Degree Professionals 1996-2003

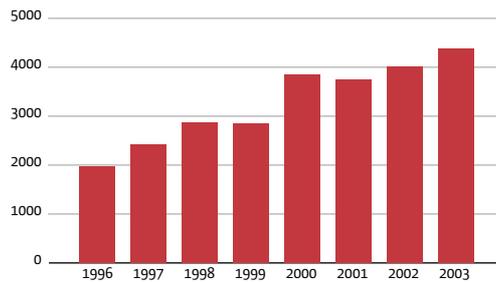


Source: ESRI

The extra intake is largely a combination of the continuation of the postgraduate conversion courses to 2003, and an increase in the intake into undergraduate Electronic Engineering⁴⁷. The intake is translated into an increased supply of graduates, assuming completion rates and availability for work rates as predicted in the first report.

The following chart shows the supply of degree professionals available for work, taking into account those who will make other choices such as to move overseas or to pursue further study in Ireland. This table illustrates that the supply of professional IT related degree holders will have more than doubled by 2003⁴⁸.

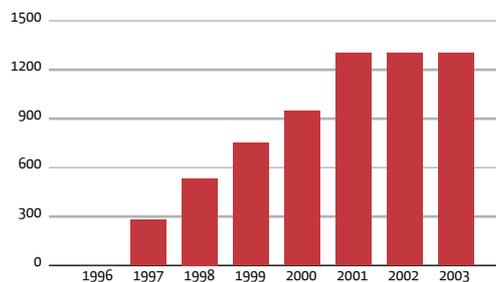
Total Supply of Degree Professionals 1996-2003



Source: ESRI

The chart which follows illustrates the increased intake of students on certificate and diploma courses over the period 1996-2003. The increased intake arises from the recommendations of both the Interim Skills Group and the first report of the Expert Group and includes extra places arising from the implementation of the Accelerated Technician Programme (ATP).

Extra intake of Technicians 1996-2003



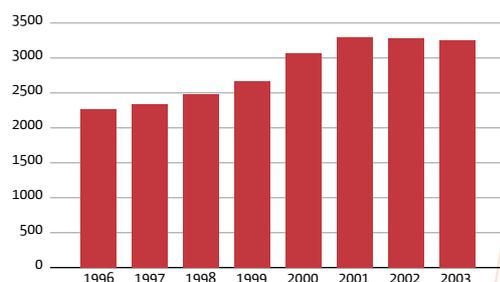
Source: ESRI

⁴⁷ Arising from recommendations from the Expert Group's First Report, there was an extra intake of over 500 onto Undergraduate Electronic Engineering degree courses.

⁴⁸ The supply of engineering professionals decreases between 2000 and 2001. This is due to a reduction in the number of enrolments into primary engineering degrees in 1997.

The chart which follows illustrates the impact of the increased intake of technician students on the availability of IT technicians for work over the period 1996-2003. In its analysis, the Expert Group has taken into account completion rates, the high proportion of certificate⁴⁹ and diploma students that pursue further study, and those likely to move abroad.

Effect of Extra Intake on Supply of Technicians 1996-2003



Source: ESRI

In the year 2000, there should be over 3,000 technicians qualifying and available for work on an annual basis. The number of technicians qualifying will depend, of course, on the number of students pursuing the Accelerated Technicians Programmes in the Institutes of Technology each year.

In its first report, the Expert Group forecast that an additional 400 skilled personnel would be available each year as a result of the upskilling of existing employees, while an extra 300 would become available through immigration. The Expert Group retains this prediction in this analysis of sources of the supply of IT skills.

6.4 Supply and Demand Balances

The Expert Group recognises that the interventions on the supply side, made possible by the Government's investment, have been very successful in meeting the objectives of the first report and provide a good example of the kind of progress that can be made through a planned co-operative approach. The Expert Group understands that the fact that Ireland has been anticipating rather than reacting to skills shortages is viewed very positively internationally by prospective investors.

The table which follows combines the anticipated annual average supply and demand of degree professionals and technicians from the year 2003.

	Revised Demand	Supply Projected Now	Annual Net Balances (S-D)
Professionals	5,000	4,800	(200)
Technicians	4,700	3,700	(1,000)
Total	9,700	8,500	(1,200)

As can be seen, it is anticipated that by 2003, the current shortage of degree professionals will be virtually eliminated. The Expert Group is, therefore, satisfied that sufficient places are now provided in the educational system for degree professionals and is, therefore, not recommending that further additional places be provided at this time. The Expert Group will, however, continue to monitor the situation, with the IT industry, and will bring forward recommendations as appropriate.

⁴⁹ The latest figures released by the HEA show that 62.5 per cent of those who graduated with a certificate in 1998 were engaged in further study by April 1999. At diploma level, 48% of graduates were also pursuing studies, presumably to degree level.

As can be seen, there will still be an anticipated shortfall in the number of technicians that will be available, relative to the number required. Hence, the Expert Group recommends that priority should be given to increasing the numbers on Accelerated Technician Programmes, especially in computer science, and to putting these programmes on a permanent footing in terms of funding and resources.

6.4.1 Meeting Future Demand

In its first report, the response proposed by the Expert Group, to the identified skills gap for IT degree professionals and technicians, focused on creating additional places in the Universities and Institutes of Technology for school leavers, or, in the case of conversion course places, for recent graduates. The implementation of these proposals will, it is expected, significantly close the skills gap identified in the first report. However, demographic changes will make this type of solution less appropriate to meeting any additional demands that will arise in the economy in the future. As there will be fewer students leaving secondary school, new and non-traditional sources of degree professionals and technicians will increasingly be necessary. For example, the encouragement of mature students and existing workers to obtain additional skills and qualifications will become increasingly important. In this context, the Accelerated Technician Programme will be central.

6.5 Recommendations

Based on its current review of the sector, the Expert Group makes the following recommendations:

- **Priority should be given to increasing the numbers on Accelerated Technician Programmes in computer science, ensuring that places approved in Institutes of Technology are filled.**
- **Programmes such as the Accelerated Technicians Programme, which educate mature students and existing workers, should be put on a permanent footing in terms of funding and resources.**
- **Companies should be further supported to actively encourage their existing less qualified workers to obtain third level qualifications at technician or degree level as appropriate.**

7. CONCLUSION

Ireland is currently experiencing unprecedented growth. General labour shortages and specific skill shortages should not halt that trend.

The result of the Government's significant investment made in response to the Expert Group's first report has had a very positive impact on the Information Technology sector.

The Expert Group now presents its analysis and recommendations across a broader range of employment areas in this its second report and trusts that a positive response by all involved in implementing its recommendations will have the same beneficial effect across a range of sectors, so that Ireland can continue to thrive and prosper to the benefit of all its citizens.

ACKNOWLEDGEMENTS

The Expert Group wishes to gratefully acknowledge the contribution made by executives in Forfás, FÁS and the Higher Education Authority to the research which underpins this report and which greatly assisted the Expert Group in its deliberations.

The Expert Group would also like to acknowledge the valuable contribution made by the ESRI, Mclver Consulting and Tansey Webster Stewart and Company in this regard.

APPENDIX I

The Business, Education and Training Partnership Forum

The Business, Education and Training Partnership Forum is widely representative at the highest levels of the business sector, the education and training sector, the social partners, Government departments and the development agencies. The role of the Forum is to consider strategic issues.

A recent meeting of the Forum considered the recent work undertaken by the Expert Group on Future Skills Needs which is the subject of this report. This provided the Forum with an opportunity for:

- The presentation of the Expert's Group's initial perspective on the skill opportunities and issues;
- An outline of the Group's detailed work on these areas and the proposals to address the way forward;
- Responses from business and from education and training interests on the perspectives and strategies presented; and
- The acceleration of the exchange of views between the business and the education and training sectors.

The Management Implementation Group

The role of the Management Implementation Group is to consider the proposals of the Expert Group and views from the Forum, and to work to implement appropriate proposals as quickly as possible. The members of this group are the top civil servants in the Departments of Education and Science, Enterprise, Trade and Employment, and Finance and top executives from the Higher Education Authority and Forfás.

CURRENT MEMBERSHIP OF THE MANAGEMENT IMPLEMENTATION GROUP

Alternative

Dr. Danny O'Hare (Chairperson)

Mr. Paul Haran

Dept. of Enterprise, Trade & Employment

Mr. John Dennehy

Dept. of Education & Science

Mr. Jim McCaffrey

Dept. of Finance

Dr. Don Thornhill

HEA

Mr. John Travers

Forfás

Mr. Michael McKenna

Dept. of Enterprise, Trade & Employment

Mr. Paddy McDonagh

Dept. of Education & Science

In Attendance

Mr. Colm Regan

Forfás

Ms. Triona Dooney

HEA

SKILLS AWARENESS GROUP

The National Skills Awareness Campaign was initiated in 1997 with the overall objective of raising awareness among job-seekers generally of the career opportunities available in certain technology sectors and to encourage school-leavers to undertake third-level technology studies.

CURRENT MEMBERSHIP OF NATIONAL SKILLS AWARENESS GROUP

Mr. Lorcan O'Raghallaigh

Chairperson, Forfás

Mr. Seamus Gallen

Enterprise Ireland
(National Software Directorate)

Ms. Una Halligan

Hewlett Packard (Manufacturing) Ltd.

Mr. Paul Lyons

IBM Ireland Ltd.

Dr. Sean McDonagh

Director, Skills Initiative Unit

Ms. Mary Sweeney

The Associate of Graduate Careers Services of Ireland

Ms. Beverly Talbot

FÁS

Mr. Frank Turpin

Intel Ireland Ltd.

Mr. Dick Ryan

IDA Ireland

APPENDIX II

CURRENT MEMBERSHIP OF EXPERT GROUP ON FUTURE SKILLS NEEDS

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Mr. John Hayden
Higher Education Authority

Mr. David Lowe
Goodbody Stockbrokers

Mr. Joe McCarthy
Arkaon

Mr. Paddy McDonagh
Dept. of Education & Science

Dr. Sean McDonagh
Director, Skills Initiative Unit

Mr. Michael McGrath
Conference of Heads of Irish Universities

Mr. Michael McKenna
Dept. Enterprise, Trade & Employment

Mr. Niall O'Donnellan
Enterprise Ireland

Mr. Seamus O'Moráin
Dept. of Enterprise, Trade & Employment

Alternative

Mr. Sean O'Foghlú
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Ms. Margo Monaghan
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Mr. Pat Maher
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Mr. Ned Costello
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Mr. Peter Rigney

Irish Congress of Trade Unions

Prof. Frances Ruane

Trinity College

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Mr. Peter Lillis

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Mr. Roger Fox

(Joint Secretary)

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Mr. Gerry Pyke

FÁS

Mr. Lorcan O’Raghallaigh

(Joint Secretary)

Forfás

In Attendance

Dr. Noel Gillatt

Forfás

Ms. Kay Hallahan

Forfás

Ms. Brenda Gannon

Forfás

APPENDIX III

Chemical and Biological Science: Employment Projections for Each Sector

	Pharma- ceutical	Other Chemical	Plastic & Rubber	Medical Devices	Food	Beverages & Tobacco	Indig. Biotech	Total Employment
	+8.8% pa	+3.3% pa	+2.8%pa	+10%pa	+300pa	+1%pa		
1994	8,700	7,900	10,200	6,800	43,100	5,900	*	
1995	9,400	8,000	10,700	7,500	43,600	5,800	*	
1996	10,500	8,500	10,700	8,400	43,000	5,800	*	
1997	11,300	8,800	11,200	9,900	44,400	5,900	*	
1998	12,200	9,900	11,400	11,700	45,900	6,000	400	96,200
1999	13,300	9,300	11,700	13,500	46,200	6,100	500	100,100
2000	14,400	9,600	12,100	15,500	46,500	6,100	700	104,900
2001	15,700	9,900	12,400	17,900	46,800	6,100	900	109,700
2002	17,100	10,300	12,700	20,500	47,100	6,100	1,100	114,900
2003	18,600	10,600	13,100	23,600	47,400	6,200	1,500	121,000
2004	20,300	10,900	13,500	27,200	47,700	6,200	1,900	127,700
2004	22,000	11,300	13,800	31,200	48,000	6,200	2,400	132,500

APPENDIX IV

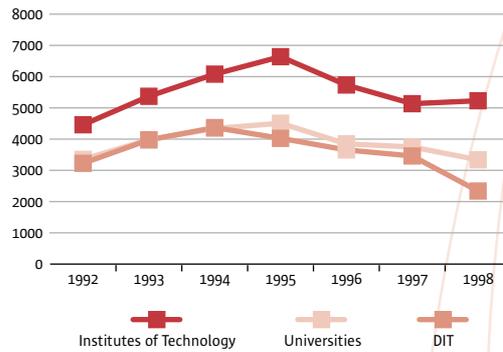
Estimated availability of graduates to the Chemical and Biological Sciences sector in 1997

	1997 Graduates	Estimated Supply Available to the relevant industrial sectors
Chemistry and Biological Science Higher Degree	225	203
Science Graduate diploma	579	42
Chemistry Degree	284	72
Applied/Analytic Degree	194	23
Biological Sciences Degree	760	226
Ag. Science Higher Degree	99	57
Ag. Science Degree	168	38
Food Science Higher Degree	34	21
Food Science Degree	124	51
Other Science		201
Chemical Engineering	60	32
Total Degrees	2527	966
Science Subdegree	2806	327
Total Sub degrees	2806	327
Total Supply	5,333	1,293*

* The supply projections (1,080) in section 4.3 of Chapter 4 represent the net available supply, when graduates not required by the sector are excluded.

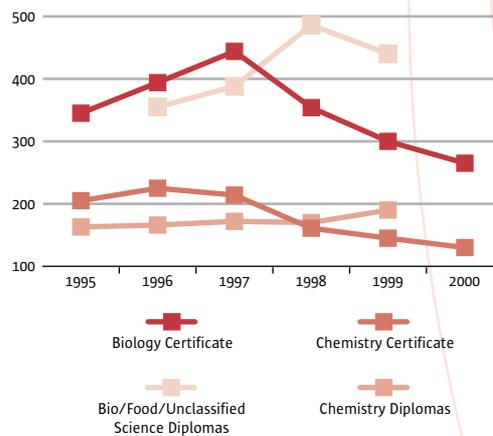
APPENDIX V

Applications for 3rd Level Science Courses Excluding Computing



Source: Research by Dr P Timpson, Sligo IT, using CAO data

Graduate numbers and projected graduate numbers from Sub Degree Programmes



Source: Compiled by Mclver Consulting on the basis of data on graduate numbers from the NCEA and student numbers from DIT and Dept of Education and Science.

APPENDIX VI

PhD Awards by Field of Study, 1985-1997

Field	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Maths/Statistics	5	7	1	7	7	4	5	8	6	9	2	6	
Physics	3	11	5	5	9	12	13	6	9	21	20	16	20
Chemistry	35	30	34	36	37	38	33	47	29	35	53	47	75
Biochemistry	11	16	12	13	19	14	4	15	7	13	12	23	37
Botany/Zoology	13	32	19	17	29	26	24	31	30	44	40	34	27
Earth Sciences	6	2	9	11	5	7	14	13	1	13	13	10	11
Microbiology	12	8	11	6	8	18	17	12	6	10	9	41	22
Pharmacology/ Pharmacy	1	5	8	11	9	7	14	13	1	13	13	16	19
Computer Science	1	1	2	3	4	3	4	2	2	5	10	17	18
Science Unknown					35	25	28	27	67	44	22	40	7
Total: Pure Sciences	87	112	101	109	162	154	146	175	160	189	189	246	242
Dairy/Food Science	5	5	2	4	1	6	1	4	2	2	5	10	6
Agriculture	5	8	5	5	4	13	14	6	11	5	7	11	6
Engineering /Architecture	14	14	9	12	16	22	18	35	51	43	38	35	41
Medicine	9	12	16	20	24	31	32	43	52	36	50	38	31
Vet Medicine	1	0	1	3	2	5	3	1	0	5	3	3	1
Economics	6	5	6	3	0	2	1	0	1	0	3	2	5
Arts/Ed./Comm./ Law etc.	46	44	53	35	53	52	58	80	46	62	82	83	111
Total: Applied Sciences	86	88	92	82	100	131	127	169	163	153	188	182	201
Overall Total	173	200	193	191	262	285	273	344	323	342	377	428	443

Sources: HEA Report Accounts & Student Statistics 1974/75 to 1992/93 & 1993/94 and special HEA tabulations

the second report of the **Expert Group on Future Skills Needs**

