



Responding to Ireland's Growing Skills Needs

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



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Future Skills Needs

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

Forfás 

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

A large part of our recent employment and economic growth can be attributed to the skills and flexibility of our workforce. The Expert Group on Future Skills Needs has made a significant contribution to growth by rigorously analysing skills and labour needs and developing supply side solutions to meet them.

The challenge of growth is intensifying. Our success in creating more and better jobs has resulted in an inevitable tightening of the labour market. At the same time, demographic trends mean that there will be fewer young people entering the jobs market or going on to further education.

These challenges make the work of the Expert Group more relevant than ever. But they also imply a need for a more sophisticated and wide ranging response to the new environment. The focus of the recommendations in this third report on upskilling for those already in employment, on more flexible approaches to the delivery of education and training and on skills-based immigration reflect this are both timely and relevant.

In recognition of the key role played by the group, the Minister for Education and Science and I are issuing a new mandate to the group. The mandate positions the group as the central resource advising government on skills needs and provides for a strengthening of the group's membership and resources to reflect the breadth and depth of its work.

I welcome the Group's third report and look forward to the its continuing endeavours in identifying and addressing existing and emergent skills needs.

Mary Harney T.D.

Tánaiste and Minister for Enterprise, Trade and Employment

July 2001



Foreword by the Minister for Education and Science

It is widely acknowledged that Ireland's current economic prosperity and growth has been underpinned to a large extent by the role that the education system has played in developing the knowledge base of our work force. While the massive expansion in the education sector since the 1960s has played a vital role in this regard, new challenges are now emerging.

As Ireland develops as a knowledge based economy, new sectors and new occupations are emerging which require a flexible and adaptable workforce. Today's Ireland is a bustling, high-tech, business-friendly country, driven by competitive and innovative companies experienced in international business at its leading edge. It is an economy that has strategically placed itself as a knowledge based economy. The acquisition of knowledge and the accumulation of knowledge capital is an essential part of this process, and involves many actors and linkages between them. The formal education system, industry-education links, workplace education, further education, basic and applied research all contribute to the appreciation of knowledge capital. The key challenge for the education system now is to develop the necessary mix of creativity and skills to enable us to respond to the needs of the labour market, and to continue to develop in this vein.

In responding to such a challenge, the need to provide a long term framework in which to develop our response is essential. It is here that the work of the Expert Group on Future Skills Needs comes to the fore. The challenge for the Expert Group will be to attempt to keep pace with the fast changing environment of the Irish and world economies and to develop a coherent framework for the future planning of our skills needs. It is on foot of the timely and accurate forecasts of the Expert Group that the education system must strive to ensure that the measures are put in place to ensure that we will meet the rapidly changing demands of the labour market in the years to come.

In addressing the issues and challenges which the Expert Group have highlighted we must make a commitment at every level of our education system, from the very young just entering school, to the level of postgraduate research in our institutions of higher education. In doing so we must also embrace the tenets of inclusivity and opportunity for all. It is in mobilising and educating our human capital in this way that we will ensure that Ireland continues to grow and prosper as a successful knowledge based economy.

Dr. Michael Woods T.D.

Minister for Education and Science

July 2001





Executive Summary

1. Introduction

Since the publication of the Second Report of the Expert Group on Future Skills Needs (hereafter referred to as 'the Expert Group'), three other reports have been produced by the Expert Group on In-Company Training, eBusiness Skills and Shared Services. Significant progress has been made in implementing the recommendations made by the Expert Group and contained in these Reports.

The Irish economy continued to record very high levels of output growth in 2000 driven by a combination of strong exports and domestic demand. The international environment was positive, with a robust US economy for much of the year and stronger growth in the euro area.

However, this growth was accompanied by increasing signs of overheating. Labour shortages became more widespread, the industrial relations climate deteriorated and wage rates began to rise more rapidly. The housing market also continued to experience strong demand and there was further upward pressure on prices.

The outlook for this year is for some slowing in output growth, mainly due to a smaller contribution to growth from exports. The external environment is less benign than in 2000 with a large degree of uncertainty over developments in the U.S. economy, following a slowdown in output growth in early 2001 and some rationalisation in the technology sector. The euro recovered significantly on foreign exchange markets in the early part of this year, although it subsequently fell back somewhat. The slowdown in the U.S. economy could prove to be protracted and might impact significantly on investment and activity in the high-technology manufacturing sectors in Ireland. In addition, the agricultural sector has been affected by particular difficulties, notably Foot-and-Mouth Disease and the impact of BSE.

Given the enormous changes in the Irish economy, even since the publication of the Second Report (1999), the Expert Group believed that it was necessary to up-date previous work and to develop further projections for certain sectors. This Third Report, therefore, examines the future skills needs of the Information Technology (IT) sector, the Construction sector, and demand for and supply of Life Sciences Graduates and Researchers. Overall reviews of the labour market and of progress in the implementation of existing Expert Group recommendations were also conducted. The following summarises the key findings and recommendations of the Report.

2. Labour Market Outlook

Introduction

The Second Report of the Expert Group included an analysis of the labour market outlook for Ireland. The Report noted the unprecedented growth of the Irish economy since the mid-1990s and the consequent rapid increase in employment. The analysis highlighted that there were both *skills shortages* and more generalised *labour shortages*. Forecasts of likely future demand for and supply of labour for the period to 2009 were



made. These showed that the Irish labour market would remain 'tight' throughout the decade. The Report made a number of recommendations to try to ensure that a sufficient supply of labour would be forthcoming to meet expected demand.

Review of 2000

Economic growth in 2000, at about 10% of GNP, was considerably stronger than that expected at the time the Second Report of the Expert Group was in preparation. This was due to the unanticipated strength of real domestic consumer spending and the boost to exports through the low value of the euro. This strong growth led, in turn, to more rapid employment growth than predicted in earlier forecasts.

During 2000, the numbers at work in Ireland increased to 1.69 million, representing a rise of 76,000 or 4.7% on the 1.61 million people at work in 1999.¹ While substantial, this growth in employment represented a significant slowdown on the pace of job growth in 1999, when average employment increased by 95,000 or by 6.3%. Unemployment also continued to decline, reaching exceptionally low levels by late-2000. The International Labour Organisation (ILO) unemployment rate, at 4.3% in 2000, was 1.3 percentage points lower than the 5.6% rate recorded in 1999. By the final quarter of 2000, the unemployment rate had fallen to 3.9%. Long-term unemployment also fell steadily, reaching 24,200 by the final quarter of 2000 - a rate of 1.5%.

Key features of the employment situation in 2000 were:

- As many women as men gained employment during the year.
- Most of the net addition to employment comprised full-time jobs.
- In sectoral terms, absolute additions to employment were highest in the services sector, while Construction registered the biggest proportionate job gains. Farm employment fell steeply.
- Occupationally, the largest employment gains were concentrated among intermediate skill groups such as operatives, personal service workers and sales staff.
- Regionally, job gains were proportionately highest in the Border, Midland and Western (BMW) Region.

Labour Force Supply

Since the mid 1990's, growth in the Irish labour force has been driven by two principal factors. First, the expansion of the labour force reflected growth in the population of working age, due to a natural increase in the domestic population and to net immigration. Second, labour force growth was augmented by rising labour force participation rates among those of working age (primarily women). Together, these factors were responsible for the large increase in the labour force between 1998 and 1999. However, almost all of the growth in the labour force between the fourth quarters of 1999 and 2000 was due to an expansion of the population of working age, i.e. those between 15 and 64 years. This contrasts with the change in the previous year, when the increased participation rates accounted for more than half of the increase. As much as one-third of the contribution of population growth to the expansion of the labour force in 2000 was attributable directly to net immigration inflows. There was a significant increase in the issue of Work Permits in 2000 to approximately 18,000, compared to 6,500 in 1999. The Government also introduced a new Work Visa system to facilitate the recruitment of suitably qualified people for designated sectors where skills shortages are particularly evident.

¹ Quarterly National Household Surveys, 1998-2000, Central Statistics Office.



Employers continued to experience difficulties in recruitment during 2000. The Economic and Social Research Institute (ESRI) undertook a survey of employer vacancies on behalf of the Expert Group in early 2000. It found that, overall, 31% of companies had vacancies compared to 27% in the previous survey. Half of the Manufacturing companies surveyed had vacancies and, in the case of Construction firms, those with vacancies rose significantly from 19% to 34%. In total, there were 77,600 vacancies compared to 64,700 in the previous survey. This represents a vacancy rate of 6.5%, compared to 5.8% in 1999.

Outlook for 2001

It is expected that Irish economic growth in 2001 will be lower than previous years due to the impact of the slowdown in the U.S. economy and the Foot-and-Mouth crisis. The June 2001 Central Bank forecast is for 6.5% growth of GNP in 2001, which is still high, both by international standards and by Irish standards prior to the 1990s. Given the existing low levels of unemployment, official forecasts for a further 3.5% rise in employment during 2001, and a projected further slowdown in labour supply growth, the domestic labour market looks set to remain tight into 2002.

Recommendations

Based on these projections, the Expert Group believes that further measures are required to augment labour supply. These should build on existing initiatives. They include:

- *Fiscal and structural supports aimed at encouraging increased participation by women in the labour force.*
- *Efforts to induce older people - those aged 55 years and over - to participate in or to re-enter the labour market on a full- or part-time basis.*
- *Initiatives to encourage the economically inactive who want to work to be able to do so.*
- *An administrative system designed to ensure a sufficient and timely supply of Work Permits and Work Visas for immigrants in order to supplement the rate of domestic labour force growth.*
- *Further development of the National Employment Service, aimed at reducing 'frictional'² unemployment through encouraging effective and speedy matching of job seekers with available jobs.*
- *Development of targeted initiatives under the Life Long Learning strategy that will allow individuals, employed and unemployed, to train or re-train for jobs where labour is in particularly scarce supply.*

3. Information Technology (IT)

Introduction

In its First Report, the Expert Group proposed initiatives to increase the supply of IT professionals and technicians by third-level institutions and to increase in-company training and up-skilling. As a result, in 1999, the Government allocated a total of £75m (€95.23m) for 5,400 new IT places in third-level

² This relates to unemployment that occurs as a result of persons switching between jobs (i.e. job turnover).



education. Combined with existing places, this was expected to lead to an average annual supply of 8,300 graduates to work in IT in the period 1996-2003. Given the fast pace of change in the industry and its importance to the Irish economy, IT skills demand and provision have been kept under review by the Expert Group.

In its report on high-level skills provision for the period 2001-2005, the Expert Group also considered the impact of the recent slowdown in the U.S. economy on demand for high-level IT skills in Ireland. Based on available evidence, the Group considers that the slowdown is unlikely to have a major impact on IT skills demand in Ireland in the medium to long-term. This is largely due to the scale of IT shortages world-wide, projected expansion of high value-added activities in Ireland and the importance of the European market to the Irish-based industry.

Demand

Strong growth in demand for labour during the period 2001-2005 is forecast for the *software sector*. It will require some 4,400 computer science professionals and 1,600 computer science technicians each year. This is based on growth projections for indigenous industry (25% per annum on average) and demand for software across the economy (10% per annum on average). The main reasons for this increased demand are: the increase in the high-level skills requirements of the IT sector; the emergence of new sectors of IT such as digital media and Internet data centres; growth in eBusiness and the increasing penetration of IT into business in the wider economy. As a result, the anticipated demand for professionals is substantially higher than was forecast in previous reports of the Expert Group.

In the *hardware sector*, total demand for engineers has remained more or less constant since 1998 but the composition of that demand has altered significantly. In 1998, the First Report of the Expert Group predicted an average annual demand for 2,000 engineering professionals and for 1,800 engineering technicians. Average annual demand is now forecast to be some 2,500 engineering professionals and 840 engineering technicians for the period 2001-2005. The principal catalyst for this change in demand is the increased investment and expansion by companies in high value-added activities such as Integrated Circuit (IC) design. This is driving up demand for engineering professionals from 13% (1996-2003) of the overall labour force requirement of the sector to 33% (2001-2005). Demand for technicians is expected to drop from 25.5% of the total to 14% over these periods.

Supply

On the supply-side, the key influences on student intake in the period 2001-2005 are demographic constraints and the phased introduction of new places in IT. The falling age cohort of 17-18 year olds will reduce the pool from which most entrants into third-level are drawn. This pool is expected to fall by about 15% over the period 1998-2005. While the third-level output of computer science professionals and engineering professionals is each expected to be about 150 more per annum in 2001-2005 compared to the projection period 2000-2003, this will not be sufficient to meet demand. The average annual supply of IT professionals and technicians to the labour market is now forecast to be 4,350 and 1,600 respectively for 2001-2005.

Skills Gap

When the demand side is factored in, it is estimated that there will be an annual average shortfall of about 2,500 professionals and about 800 technicians over the projection period. The total shortfall of some 3,300 IT graduates is largely due to strong growth in demand and a change in the composition of that demand.



There has been volatility in both the demand for and supply of *technicians* in the IT industry since the late 1990s. In contrast, there has been steady growth in the demand for and supply of IT *professionals*. Here, the phased introduction of new IT degree places will yield graduates after 3-4 years. This should secure a steady supply of skilled IT professionals in the medium to long-term.

Recommendations

The Expert Group recommends that:

- *New, additional, investment of £130m (€165.07m) should be made in the IT area over five years. This should be used to:*
 - *Increase access to IT-related skills education through expanding part-time education including company up-skilling*
 - *Increase the provision of post-graduate conversion courses including on a part-time basis*
 - *Improve completion rates in IT-related areas in third-level*
 - *Renew equipment and develop state-of-the-art facilities for third-level education.*
- *A dedicated expert Project Team should be established within the HEA to oversee and administer the proposed new provision of £130 million. It will also ensure that the potential of existing programmes is realised and examine and propose a development strategy for IT-related education.*
- *Urgent action should be taken at second-level - in particular, a review of career guidance structures - to ensure that future levels of intake into full-time third-level education in IT-related areas remains constant.*
- *Partnerships between third-level educators and industry should be developed and promoted across the regions. This would allow, for example, the release of company executives to lecture and create opportunities for academics to work in industry.*
- *Further steps should be taken to encourage the immigration of IT professionals into Ireland. These should include a targeted recruitment drive.*
- *The Expert Group should continue to monitor and review policy recommendations for the IT sector on a regular basis.*

4. Researchers

Introduction

The Expert Group examined the supply of and demand for researchers in its Second Report. It recommended that urgent action be taken to encourage careers in research and awareness of research opportunities and particularly in relation to the further development of appropriate funding of research activities and researchers. The Report proposed that the number of research students in Ireland would have to increase substantially.

Since the publication of the Second Report, there have been a number of important policy developments with respect to research. Science Foundation Ireland (SFI) has been established to promote excellence in



scientific research and has allocated its first round of funding. The results of the second cycle of funding under the HEA's Programme for Research in Third-Level Institutions were announced in July 2000 and a further cycle has begun. The Minister for Education and Science has announced the establishment of the Irish Research Council for Science, Engineering and Technology to complement the establishment of the Irish Research Council for the Humanities and Social Sciences.

Demand

The demand for researchers in Ireland will be influenced by new support measures including those of Science Foundation Ireland, the HEA and the expansion of the research activities of industry. The number of post-doctoral researchers employed by third-level institutions has already increased by 41%, from 488 in 1998/99 to 686 in 1999/00. All areas of study show significant growth. Under the National Development Plan (NDP), significant research funding is to be made available on an increasing basis up to 2006. This will lead to new support for around 600 post-graduate and 240 post-doctoral researchers annually from 2003 onwards.

A survey of job advertisements in 1999-2000 indicated a strong growth in the number of positions that require a Masters degree or above. The number of private sector advertisements for researchers increased by 57% from 99 in 1999 to 155 in 2000. The number of public sector advertisements, however, rose more slowly from 554 in 1999 to 613 in 2000, an increase of 11%.

Supply

The lack of data available in the HEA database makes it difficult to provide comprehensive estimates of future supply of researchers across all disciplines. The Group had to rely heavily on data available for the academic years 1998/99 and 1999/2000. This showed that enrolments in PhD and Masters programmes have risen slightly from 1998/99 to 1999/00, to 2,315 full-time PhD students (an additional 570 are studying part-time) and 2,011 full-time Masters students (615 more are studying part-time). This is encouraging at a time when buoyant labour market conditions, combined with relatively low levels of support for post-graduate study, make continuing education financially unattractive in the short-term. The number of PhDs being awarded has also increased in recent years, but the number of Masters research awards has declined slightly. Overall, it would appear that the total number of research awards is relatively constant, averaging 800-900 per annum between 1998-2000.

However, the general trend is for a reducing percentage of those attaining degrees following full-time study to progress immediately to research study. Since the absolute number of students attaining full-time undergraduate degrees seems likely to peak in the near future, there will be a need to increase the rate of transfer of students moving from completed undergraduate to initial postgraduate study in order to retain the existing number of research degrees or indeed increase it in line with demand trends.

Skills Gap

A critical policy issue concerns the number of doctorates awarded in science and engineering. While this has increased between 1996 and 1999, the Irish level per head of population remains well below leading nations such as Switzerland and Finland. Without it being possible to make precise estimates of demand for researchers holding doctoral qualifications, the availability of funding for research in the NDP, as well as the need for highly skilled graduates in industry, will ensure a continuing and increasing need for people with PhD degrees. A comparison between existing output figures for PhDs (a total of 417 in 1999 across all disciplines) and the places estimated to be available for post-doctoral researchers under the NDP on an



annual basis by 2003 (a total of 245) shows the demand which will arise from NDP activity alone will account for over half of current PhD output. Furthermore, it is estimated that by 2003 around 600 post-graduate students per annum will receive funding under the new supports (i.e. from SFI, the HEA and the two Research Councils) leading to 1,800 post-graduate students being in receipt of such funding in any given year from 2005. On this basis, the Group found that national policy should aim to increase substantially the output of doctorates, particularly in science and engineering.

Plugging the Gap from Abroad

In view of the projected skills gap between the demand for researchers with a PhD degree and the probable supply from within Ireland over the coming years, the Expert Group believes that it will become increasingly necessary to attract suitably qualified people from abroad. It therefore commissioned a benchmarking study of mechanisms and strategies which other countries use to attract researchers from abroad. This will be published by Forfás and the HEA. The study examined the situation in five leading research countries, including three small ones. It made the following policy recommendations to attract researchers from abroad to Ireland:

- Build up centres of research excellence
- Improve international networks and the international viability of Irish universities
- Improve the status and remuneration of research students and post-doctorates
- Make the move to Ireland for researchers as smooth as possible

Recommendations

The Expert Group recommends that:

- *National research policy should aim to achieve a substantial increase in the output of doctorates, particularly in science, engineering and technology by building on the newly launched funding and support measures for research in 2000/2001.*
- *Measures should be taken to increase the attractiveness of research among under-graduates in particular.*
- *Measures should be taken to attract researchers from abroad.*
- *A working group including Forfás and the HEA, as well as representing the Deans of Research in higher education institutions and the two Irish Research Councils, should be set up to examine international networks and the international visibility of Irish universities and how to make the move to Ireland of researchers as smooth as possible.*
- *The HEA database on research activities in third-level institutions should be further developed.*
- *The HEA should continue to benchmark Irish third-level research performance.*



5. Life Sciences

Introduction

The Second Report of the Expert Group identified four main areas where projections of labour demand exceeded projections of supply - Chemistry degrees, Biological Sciences degrees, Chemical and Biological Sciences sub-degrees and Chemical Engineering degrees. It recommended that 200 more degree graduates per annum should be produced in the Biological Sciences; 80 more in Chemistry, and 10 more in Chemical Engineering. The Report recommended that the new places required to meet this increased output be introduced on a phased basis.

In response to the recommendations made in the Second Report, the HEA requested proposals from third-level colleges to create additional college places as a first phase response to the Expert Group's report. The proposals accepted will lead to an increase intake of 81 students into Chemistry programmes (50 into the universities and 31 into the Institutes of Technology), and 74 into Biological Sciences programmes (50 into the universities and 24 into Institutes of Technology) for the academic year 2000/01. A proposal to increase intake into Chemical Engineering by 12 from academic year 2001/2 has also been accepted. These proposals will meet 81% of the overall projected requirement for additional Chemistry degrees; 30% of the overall projected requirement for additional Biological Sciences degrees; and the entire projected requirement for additional Chemical Engineering degrees.

Demand

Two factors have had a significant impact on the demand projections. Firstly, after another year of strong growth in the Pharmaceuticals sector, the base level of employment on which the current projections are founded is now about 10% higher than in the previous year - this increases the volume of demand projected by about 3%. This has a material impact on the projections of demand for chemists, biological scientists, chemical engineers and science technicians. Secondly, increased experience with the formation and development of indigenous Biotechnology companies has led to a more conservative view of what can optimistically be expected of the sector. There have also been many major developments in Bioinformatics³ in 2000, and a significant rise in interest from companies in the Biopharmaceutical⁴ sector, both of which generate demand for high-level skills. Significant growth is expected in these sectors and their specific skills needs will be reviewed by the Expert Group in the future.

Based on the updated sectoral growth projections, the projected demand for life science graduates is for an increase in demand from the Pharmaceuticals, Chemicals, Plastics, Rubber and Medical Devices sectors from 744 graduates in 2000/01 to 1,103 by 2005/06. The corresponding increase for the Food, Drink and Tobacco sectors is from 324 to 339, with a decrease in demand for the indigenous Biotechnology sector from 68 to 181.

Supply

The number of graduates with *certificates* is falling significantly in both Chemistry and Biological Sciences. This trend is expected to continue, resulting in the possible discontinuation of some courses. The numbers of graduates with certificates in Instrumentation Physics⁵ has also been falling, but appears to have recovered in 2000.

- 3 Bioinformatics is concerned the application of computer-supported data analysis to the Biological Sciences. The requirement for people with skills in this area has been increased greatly by the opportunity to make practical and commercial use of the vast amount of genetic data emerging from the Human Genome Project and related initiatives.
- 4 Biopharmaceuticals are defined as the production of pharmaceutical products through biotechnology rather than through chemical synthesis.
- 5 Instrumentation Physics focuses on the physics and practicalities of measurement. Courses in the area prepare students to work as Instrumentation Engineers and Technicians. Industries in which these occupations are important include Pharmaceuticals, Chemicals, Medical Devices and Electronics.



The number of graduates with *diplomas* has remained steady for Chemistry and has fallen for Biological and Food Sciences in recent years. However, as rates of transfer from certificate to add-on diploma programmes are already high, diploma numbers are expected to fall in both Chemical and Biological Sciences. The fall may, however, be partially mitigated if students from the Accelerated Technician Programme and the new Institute Trainee Programme progress to further study in significant numbers after receiving certificate-level qualifications. The number of graduates with diplomas in Instrumentation Physics has also been falling in recent years, but appears to have held steady in 2000.

The supply of *degree* level Science graduates (excluding Computing) and degree holders in Instrumentation has been improving, partially due to the increased transfer rate from sub-degree courses and the addition of a new add-on degree in Instrumentation Physics in 199/00. However, the positive trend in the degree-numbers graduating from the Institutes of Technology now faces reversal. Most of the relevant degrees are one-year add-on courses whose intake depends on the supply of diploma-holders. If the supply of diploma holders falls as anticipated, this will adversely affect the intake, leading to a reduction in the number of degree graduates.

Skills Gap

The Expert Group reiterates its concern 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 in the years ahead. The 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 welcomes the initiatives taken by the Minister for Education and Science to address the fall-off in participation in the Physical Sciences at both second-level and third-level, especially the establishment of the Task Force on the Physical Sciences.

Due to changes in industry demand and the measures already undertaken plus changes in output, no further intervention is required at present to increase places on Chemistry, Food Science, Agricultural Science or Biological Sciences degree programmes, provided that the existing output can be maintained from the universities and Institutes of Technology. A further intervention sufficient to produce at least another 24 degree graduates per annum is required in Chemical Engineering in order to meet projected future demand. The relevant industry sectors have identified a shortage of Instrumentation Physics graduates. However, the extent of the shortage has not been quantified accurately.

The Expert Group will continue to monitor skills needs in Chemical and Biological Sciences, in particular the effects of (i) any changes in demand within the overseas and indigenous Biotechnology and Pharmaceuticals sectors and (ii) the fall in third-level applications.

Recommendations

The Expert Group recommends that:

- *No additional places be introduced on Chemistry or Biological Science degree programmes, provided that the existing output from Universities and Institutes of Technology can be maintained.*
- *Given the addition of a new add-on degree in 1999/00, no further increase in Instrumentation Physics places should be made.*
- *Provision should be made for the supply of at least another 24 degree graduates per annum in Chemical Engineering, bringing total annual output to 110.*



6. Construction Industry

Introduction

The Construction industry has grown rapidly in recent years. Output was valued at £14.2 billion (€18.03 billion) in 2000 and employment had risen to 178,100 by the end of 2000.⁶ This represented an increase of 74% in output (volume) and 84% in employment since 1995.

In 1999, FÁS, on behalf of the Expert Group and the Construction Industry Training Committee, carried out an analysis of the employment needs of the Construction sector for the period 1999-2003.⁷ The analysis focused in particular on the number of craft workers that would be required by the industry in the period 1999-2003. The Expert Group has decided to update these forecasts and to extend the forecast period to 2006 and the number of occupations covered by the analysis to include professional and non-craft skilled workers.

Demand

The National Development Plan involves total investment of £22.646 billion (€28.754 billion) on physical infrastructure. Achievement of the targets in the National Development Plan will give rise to a significant increase in demand for construction workers in the following three areas: the construction of roads, social housing and environmental services. By the second quarter of 2006, the total number of construction workers in employment is forecast to be almost 220,000. This represents an increase on the estimated employment figure of 176,300 in 2000 of 43,612 or just over 7,000 per annum. This is significantly below the level of employment growth recorded in the two years immediately preceding the forecast period, when direct employment increased on average by 20,000 a year. Factors affecting future employment growth include a decline in output growth (to 8% in 2001 and declining thereafter) and positive productivity gains, partially due to the higher proportion of total expenditure allocated to civil engineering projects than to residential construction.

An employment level of 220,000 by 2006 will require recruitment of 80,000 workers, including 50,000 skilled workers while taking natural wastage into account. The composition of these 50,000 jobs is as follows: 5,101 in management/site supervision, 7,286 professionals, 31,682 craft workers and 6,891 other skilled workers (e.g. motor mechanics, accountants).

Supply

The Construction industry has significant levels of labour mobility in response to changing patterns of demand in different economies at different times. Factors that will have a major influence on the supply of skilled construction workers over the forecast period 2000-2006 are the demographic trends in the Irish labour market and emerging skill shortages in the Construction industry in the United Kingdom; the latter resulting from a major investment programme in infrastructure improvements. This could have a serious impact on the capacity of the Construction industry in Ireland to undertake the civil engineering projects envisaged by the National Development Plan.

6 Output figures from Construction Industry Review 1999, Outlook 2000-2002, Department of Environment. Employment figures are taken from the Quarterly National Household Survey (QNHS), 4th Quarter 2000, Central Statistics Office.

7 The Second Report of the Expert Group on Future Skills Needs, Forfás, 2000.



Over the period 2001-2006, it is estimated that a total of 24,544 persons will qualify in various aspects of construction. This comprises 1,648 in management/site supervision, 3,207 professionals and 19,689 craft workers. There is little scope for an increase in the supply of workers to the industry from the unemployed or from returning Irish immigrants.

Skills Gap

The number of skilled construction workers qualifying in Ireland over the forecast period will be approximately 26,400 less than the number required to achieve the level of projected output over the period. This shortage consists of project managers/site supervisors (3,453), professionals (4,079), craft workers (11,993) and other skilled workers (6,891).

Recommendations

Management skills

The Expert Group recommends that:

- *Priority should be given to increasing the current low level of provision of training programmes in both project management and supervisory skills.*
- *The Department of Education and Science should consider the introduction of one more additional full-time degree programme in construction management, to be located in Dublin.*
- *Increased funding amounting to £300,000 (€380,921) per annum should be made available to grant-aid further management and supervisory training for employees.*
- *FÁS should commission a research study on the changing role of managers and the implications for education and training provision.*

Professional skills

The Expert Group recommends that:

- *As part of the FÁS Jobs Ireland campaign, there should be a specific initiative to attract suitably qualified construction professionals from abroad, focused on civil engineers, surveyors, planners and architects.*
- *The Expert Group should undertake a study of the human resource requirements of the Engineering sector, as the needs of this sector interact with those of the Construction sector.*
- *The Department of Education and Science should review current level of education and training provision for architects, quantity surveyors and building surveyors and civil engineers.*

Craft skills

The Expert Group recommends that:

- *The Construction industry and FÁS should give priority to encouraging employers to increase their current levels of sponsorship of apprentice bricklayers in particular.*
- *While a further small increase in carpenter and fitter apprentice intake could be justified, there should be no further increases in intake of apprentice plumbers.*
- *The situation in regard to apprentice electricians should be further considered in the light of demands in non-Construction sectors.*



- *The issue of balancing overall apprentice intake to better match projected requirements should be considered further.*
- *A 'Fast-Track' system of obtaining formal national craft qualifications should be developed and introduced on a pilot basis specifically for adults who are working in the 'wet trades' but who are not in receipt of a National Craft Certificate.*
- *Mechanisms should be put in place to ensure that the 'Fast-Track' system does not result in any diminution in current standards.*
- *The possibility of reducing the time it takes to complete some apprenticeships should be actively considered by the relevant interests.*
- *The FÁS Jobs Ireland campaign should continue to focus on attracting qualified construction craft workers to Ireland as a matter of priority.*
- *The Expert Group should conduct a study to establish the total requirement of the economy for all engineering craft workers, including electricians.*
- *The Expert Group commission a study to determine the level of and reasons for the apparent low retention rates of skilled workers in the Construction industry and the development of proposals to address this.*
- *FÁS should promote the Construction Skills Certification Programme. It should seek to provide training for between 5,000 and 7,000 non-craft skilled workers over the duration of the National Development Plan.*
- *Training by FÁS should provide for between 4,000 and 5,000 construction operatives and supervisors on road-construction and maintenance. This training should be made available to both the private sector and the public sector.*
- *The Department of Enterprise, Trade and Employment, the Immigration and Policy Advisory Committee (IPAC) and the Expert Group should consult and co-ordinate their policy approaches to minimise any constraints to non-EEA contractors who wish to bring non-EEA construction employees to Ireland for a specific period to execute specific projects.*
- *FÁS should develop a register of all skilled workers in the industry.*



7. Expert Group Work Programme

Of the 96 recommendations made to date by the Expert Group, excluding those made in this Report, only 13 have not as yet been implemented. The 13 recommendations in question were contained mainly in the later reports on eBusiness Skills, In-Company Training and Shared Services.⁸

Key Responses to Expert Group Recommendations

- *The First Report of the Expert Group, published in December 1998, focused on the IT sector and resulted in significant additional investment by the Government – over £90 million (€114 million). Substantially increased places in third-level colleges were created at undergraduate and postgraduate levels. Training places on relevant FÁS programmes were also increased. Overall, approximately 4,000 new training and third-level places were created.*
- *The Second Report, published in February 2000, analysed the labour market in general, the availability of workers for low skills occupations, the crafts areas of the Construction industry, Chemical and Biological Sciences graduates, researchers and IT graduates. Since its publication, the number of apprentices in the Construction trades has risen from 4,142 at the end of 1998 to 5,473 by the end of 2000. An additional £5m (€ 6.35 million) was allocated for new apprenticeship courses in 2000. The number of places on Accelerated Technician Programmes has been increased, particularly in the areas of IT.*
- *The Report on In-Company Training, published in August 2000, focused on a qualitative assessment of training needs of small-medium sized companies in the Construction and Traditional Manufacturing sectors. Developments to-date include the provision by the Department of Education and Science of funding for 1,000 places on a new Institute Trainee Programme for 2001. The aim of the programme is to target skill needs identified by the Expert Group in, for example, Construction, Pharmaceuticals and eBusiness.*
- *The Report on eBusiness Skills, published in August 2000, focused on the content of education and training relevant to eBusiness covered in the third-level sector and elsewhere. Discussions are underway to establish the eBusiness Skills Partnership recommended by the Expert Group, which will address many of the recommendations on e Business made by the Expert Group. A third-level Computing Forum is also being established and it will address recommendations on computer course content and design. The Institute of Directors of third-level colleges is in the process of developing a national programme on access to education in eBusiness for all graduates.*
- *The Report on Shared Services, completed in August 2000, examined the growth in this activity in Ireland and future growth opportunities. It made recommendations on how this growth might be capitalised upon. The National Skills Awareness Campaign is promoting the Shared Services sector in schools. IDA Ireland has targeted overseas companies in Shared Services with a view to attracting them to Ireland and has met with regional Institutes of Technology to discuss graduate output for Shared Services.*

While the Expert Group is encouraged by the progress made on addressing skills shortages, it is conscious that much remains to be done. In particular, it believes that it is essential to continuously monitor progress being made on remedial action taken to address these shortages. This monitoring should be combined with updating and refining of skills supply and demand projections for these sectors which are vital if Ireland is to retain and improve its competitive edge in the global economy.

⁸ This report remains unpublished for competitive reasons.



1. Introduction: Third Report

1.1 Introduction

The economic climate in Ireland has changed dramatically in the 1990s. Over the decade, Irish GNP in real terms expanded by almost two-thirds⁹ and the number at work grew by over one-third. The number of people of working age (those aged between 16 and 64) rose, as did labour force participation rates. Net immigration became a feature of the 1990s compared to net emigration in the 1980s. Unemployment fell and an extensive range of unfilled vacancies existed across many sectors of the economy.¹⁰ At the end of the 1990s, Ireland was experiencing both labour shortages and specific skill shortages.

1.2 New Structures to Respond to Skills Shortages

In 1997, the Government responded to Ireland's growing labour and skills shortages by establishing the Business Education and Training Partnership. The Partnership comprises three key elements. These are:

- The Business Education and Training Partnership Forum;
- The Expert Group on Future Skills Needs; and
- The Management Implementation Group.

The Business Education and Training Partnership Forum is widely representative of the highest levels of the business sector, the education and training sector, the social partners, Government departments and the development agencies. Its role is to consider strategic issues and it meets once or twice a year with the objective of achieving a consensus among all interested parties on the policies required to meet the skills needs of the economy.

The Expert Group on Future Skills Needs engages in the identification of skill needs, the promotion of education and continuous training, and raising awareness of job opportunities.

The Management Implementation Group has the responsibility to oversee the implementation of the approved recommendations on skills supply. This Group comprises senior civil servants from the Departments of Education and Science; Enterprise, Trade and Employment; and Finance and senior executives from the Higher Education Authority and Forfás.

1.3 The Expert Group on Future Skills Needs

The membership of the Expert Group is broadly based and includes business people, members of the educational community, policy makers, public servants and members of the industrial promotion agencies. Appendix 1 provides a list of its current membership. The Expert Group operates via sub-groups drawn mainly from its membership to oversee research into particular issue areas.

⁹ 'National Income and Expenditure, 1998', Central Statistics Office, July 1999, Table 6 and Budget 2000, December 1999.

¹⁰ 'National Survey of Vacancies in the Private Non-Agricultural Sector in August 1998', ESRI, 1999.



1.4 Objectives

The objectives of the Expert Group are to:

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

1.5 Scope of the Third Report

This Report provides an overview of the labour market and up-dates previous data on skills needs in four important areas of growth in the Irish economy – Information Technology (IT), Researchers, Life Sciences and Construction.

Chapter 2 contains the overview of the labour market. It concludes that, despite the slowdown in economic growth, low levels of unemployment and a further slowdown in the growth of labour supply in 2000, further measures are needed to augment the labour supply.

Chapter 3 addresses the skills needs of the Information Technology sector. Despite the current period of uncertainty in the IT industry, notably in the U.S. economy, it continues to be one of Ireland's most important industries and remains a key driver of economic growth. Its importance to the future health of the Irish economy cannot be under-estimated and the Expert Group therefore considers that regular updating of forecasts on supply and demand for workers within the industry is very important. This chapter builds on the forecasts for the sector contained in the First and Second Reports of the Expert Group and identifies key skills needs for the future.

Allied to IT is the need for skilled researchers to carry out research in a range of areas from Electronics and Food to Biological and Chemical Sciences. Chapter 4 builds on the Expert Group's initial examination of the need for Researchers contained in the Second Report. The Government has made a significant commitment to growing Ireland's Research and Development capacity in the National Development Plan. The provision of researchers and workers with appropriate skills and experience will be a key factor in achieving the objectives set out in the National Development Plan. This chapter reviews skills needs, mechanisms to attract researchers and the likely supply of Researchers in the future.

Chapter 5 reviews and up-dates the position in regard to the skills gap in Life Sciences graduates identified in the Second Report. Life Sciences such as Chemistry and Biology are also important areas for development if our Pharmaceutical, Healthcare, Biotechnology, Chemical and Food industries are to continue to grow. The publication of the first draft of the Human Genome means that major developments in Bioinformatics are expected. The implications of these developments for future skills needs are identified in this chapter.



Chapter 6 reviews the skills needs of the Construction industry. The Construction industry continues to exhibit severe labour and skills shortages. The National Development Plan involves an investment of £22.6 billion (€28.754 billion) on physical infrastructure over the period 2000-2006. Investment in roads, transport and housing are major components of this planned investment. Roads and transport account for over one-third of planned investment. The demand for labour has fuelled the growth in demand for new housing as emigrants return to Ireland and immigrants are attracted to a growing economy. Housing accounts for over one-quarter of planned investment. Other areas of physical infrastructure that will have significant expenditure over the lifetime of the National Development Plan include environmental services, health and education. This chapter up-dates the data provided in the Second Report of the Expert Group and examines the skills needs of the wider Construction industry over the timeframe for completing the National Development Plan (2000-2006).

This Report concludes with Chapter 7 which records progress on the overall work programme of the Expert Group and the implementation of its recommendations.



2. Overview of the Labour Market

2.1 Introduction

The Second Report of the Expert Group included an analysis of the labour market outlook for Ireland in 2000. The Report noted the unprecedented growth of the Irish economy since the mid-1990s and the consequent rapid growth in employment. This growth in employment was facilitated by a large fall in unemployment, inflows of young persons from the school system and women from the home, reduced emigration and significantly increased immigration. Despite these various sources of additional supply, the labour market tightened considerably with many employers experiencing difficulties in recruiting suitable employees. The analysis found that there were both in the labour market *skills shortages* and more generalised *labour shortages* in Ireland. Forecasts of likely future demand for and supply of labour for the period to 2009 were made. These showed that the Irish labour market would remain tight throughout the decade. However, assuming that increases in female participation and ongoing net immigration would continue, there should be just enough labour supply to meet demand. The Report made a number of recommendations to try to ensure that a sufficient supply of labour would be forthcoming to meet expected demand. These included measures relating to tax and social welfare policy, childcare, helping the unemployed to return to work, immigration and more flexible working arrangements. In this chapter, labour market developments in 2000 and the outlook for 2001 are reviewed.

2.2 Review of Labour Market Developments

In reviewing the year 2000, the Expert Group noted that economic growth, at about 10% of GNP, was very strong and considerably stronger than expected at the time the Second Report was being prepared (1999). This was due principally to the unanticipated strength of real domestic consumer spending and the boost to exports through the low value of the euro. This strong growth led, in turn, to more rapid employment growth than earlier forecasts.

The numbers at work in Ireland increased during 2000. Unemployment also continued to decline, reaching exceptionally low levels by late-2000. Quarterly data for 2000 are presented in Table 2.1 along with comparable data for 1998 and 1999. Table 2.1 shows that average Irish employment (those 'at work') in 2000 stood at 1.692 million, representing an increase of 76,000 or 4.7% on the 1.616 million people at work in 1999. While substantial, the growth in employment achieved in 2000 represented a significant slowdown on the pace of job growth a year earlier, when average employment increased by 95,000 or by 6.3%.

Labour force growth also decelerated through 2000. The size of the labour force averaged 1.768 million during 2000. This represented an expansion of 57,000 or 3.3% on the average numbers in the labour force in 1999, compared with 65,000 or 4.0% growth over the previous year.



TABLE 2.1: LABOUR MARKET TRENDS IN IRELAND (ILO BASIS) 1998-2000 (in '000s)

PERIOD	AT WORK	UNEMPLOYED	LABOUR FORCE	UNEMPLOYMENT RATE
Q1 1998	1,483	139	1,622	8.5%
Q2 1998	1,495	127	1,621	7.8%
Q3 1998	1,560	129	1,689	7.6%
Q4 1998	1,545	106	1,651	6.4%
AVERAGE 1998	1,521	125	1,646	7.6%
Q1 1999	1,555	95	1,650	5.8%
Q2 1999	1,591	97	1,688	5.7%
Q3 1999	1,669	101	1,770	5.7%
Q4 1999	1,647	89	1,736	5.1%
AVERAGE 1999	1,616	95	1,711	5.6%
Q1 2000	1,650	82	1,732	4.7%
Q2 2000	1,671	75	1,746	4.3%
Q3 2000	1,738	78	1,816	4.3%
Q4 2000	1,710	69	1,779	3.9%
AVERAGE 2000	1,692	76	1,768	4.3%

Sources: *Quarterly National Household Surveys 1998-2000, Central Statistics Office*

Note: Figures have been rounded to the nearest 1,000.

Unemployment, measured on an International Labour Organisation (ILO) basis, continued to decline in 2000, averaging 76,000 or 4.3% of the labour force during the year. Average unemployment levels fell by almost 20,000 people or by more than one-fifth between 1999 and 2000. The ILO unemployment rate, at 4.3% in 2000, was 1.3 percentage points lower than the 5.6% rate recorded in 1999. By the final quarter of 2000, the unemployment rate had fallen to 3.9%, the first time in recent decades that the rate had dipped below 4%. Long-term unemployment also fell steadily, reaching 24,200 by the final quarter – a rate of 1.5%. Thus, short-term unemployment exceeded long-term unemployment by a ratio of almost two to one.

In the context of this continuing growth in employment, there are several noteworthy features in relation to employment in 2000:

- As many women as men gained employment during the year.
- Most of the net addition to employment comprised full-time jobs.
- In sectoral terms, absolute additions to employment were highest in the Services sector while Construction sector registered the biggest proportionate job gains. Farm employment fell steeply.
- Occupationally, the largest employment gains were concentrated amongst intermediately skilled groups, operatives, personal service workers and sales staff.
- Regionally, proportionate job gains were highest in the Border, Midland and Western (BMW) Region.



2.3 Labour Force Supply

It is important both in the short and long-term to examine labour force supply to see to what extent it is likely to be a brake on economic performance. During 2000 there was a very significant deceleration in labour force growth, from an annual rate of 5% in the first quarter to just 2.9% by the final quarter of the year.

Irish labour force growth since the mid-1990s has been driven by two principal factors. First, the expansion of the labour force has reflected increases in the population of working age, due both to increases in the domestic 'natural' population and to net immigration. Second, labour force growth has been augmented by rising labour force participation rates (LFPRs) amongst those of working age (primarily women).

As Table 2.2 shows, both additions to the working age population and rising LFPRs were together responsible for the large increase in the labour force between 1998 and 1999. While the impact of domestic population growth - reinforced by net immigration - strengthened further between 1999 and 2000, the contribution of rising LFPRs to labour force growth was minimal. Increases in LFPRs in the year to the fourth quarter of 2000 added just 1,900 people to the labour force compared with a contribution of 46,500 in the preceding year.

TABLE 2.2: LABOUR FORCE GROWTH ('000s)

LABOUR FORCE	CHANGE Q4 1998/ Q4 1999	CHANGE Q4 1999/ Q4 2000
Total Labour Force Growth	+85.4	+43.0
Of which:		
■ Population growth (15-64)	+38.9	+41.9
■ Participation rates (LFPRs)	+46.5	+1.9

Source: QNHS, Q3 2000, page 2 and Table 10.

Almost all of the growth in the labour force between the fourth quarters of 1999 and 2000 was due to an expansion of the population of working age. This contrasts starkly with the change in the previous year, when increased participation rates accounted for more than half of the increase in the labour force. In turn, as much as one-third of the contribution of population growth to the expansion of the labour force over the year 2000 has been attributable directly to net immigration inflows.

A detailed analysis of labour force participation rates shows that male rates actually fell marginally in 2000 and female rates rose by a relatively small 0.8 percentage point (compared to 2.6 percentage points in the previous year). The rate for married women rose by 0.6 percentage points (compared to 2.2 percentage points in the previous year). These rates of increase are lower than might have been expected in the context of the introduction of tax individualisation from April 2000. Despite considerable increases over the last few years, female participation rates in Ireland remain several percentage points below the EU average, and if the trend in 2000 persists, they will continue to remain so. Thus, this source of labour force growth cannot be presumed to continue. This lower participation rate reflects lower participation rates in Ireland among women in older age cohorts.

A further source of potential labour supply is those persons who are not recorded as employed or unemployed but who want to work. The Central Statistics Office's (CSO) Quarterly National Household Survey asks a number of questions to establish persons' interest in working and hence those 'marginally attached to the labour force' and others who want to work. In 2000, a total of 120,000 persons fell into these categories. This is a pool of potential workers, some of whom could take up employment with suitable



support. Another possible source of increased labour supply is persons working part-time. While survey evidence suggests that few of these would like to work full-time, there may be potential for some of them to work more part-time hours. The Expert Group will undertake further analysis of these issues.

The Work Permit system enables employers with vacancies that they cannot fill with citizens from Ireland or from within the European Economic Area (EEA) to recruit employees from other non-EEA countries. There was a very significant increase in Work Permits issued in 2000 to a figure of about 18,000, compared to 6,500 in 1999. The Government also introduced a new Work Visa system to facilitate the recruitment of suitably qualified people for designated sectors (Information Technology, Nursing and Construction professionals) where skills shortages are particularly acute.

Employers continued to experience difficulties in recruitment during 2000. The ESRI undertook a survey of employer vacancies on behalf of the Expert Group in early 2000, replicating a survey undertaken twelve months earlier. The survey covered all private sector companies across the Manufacturing, Construction and Services sectors. It found that 31% of companies overall had vacancies compared to 27% in the previous survey. In relation to Manufacturing, half of companies had vacancies, and in the case of Construction firms, vacancies rose significantly from 19% to 34% of firms surveyed.

In total, there were 77,600 vacancies compared to 64,700 in the previous survey. This represents a vacancy rate of 6% (of the total labour requirement) compared to 5.8% a year earlier. The types of occupations with the highest rates of vacancy were engineering technicians (15%), skilled maintenance and production workers (11%) and personal service workers (11%). Other key findings of the survey were the increased use of overseas sources of recruitment, the continued difficulties firms had in filling their vacancies and the increasing extent to which recruitment difficulties were experienced outside the Dublin area. Table 2.3 presents the results for each of the main occupational groups.

TABLE 2.3: SUMMARY OF VACANCIES BY OCCUPATIONAL GRADE 1999/2000 (All Sectors in Aggregate)

OCCUPATIONAL GRADE	CURRENT EMPLOYMENT	VACANCIES	VACANCY RATE (per cent)
Managers/Proprietors	142,600	2,900	2
Engineering Professionals	19,500	1,500	7
Science Professionals	7,700	300	4
Computer Professionals	8,700	900	9
Other Professionals	40,700	4,000	9
Engineering Technicians	18,500	3,300	15
Science Technicians	3,900	100	2
Computer Technical Staff			
Associate Professional Level	9,400	1,000	10
Other Associated Professional	13,300	300	2
Clerical and Secretarial	158,600	10,300	6
Skilled Maintenance & Skilled			
Production	119,300	14,600	11
Production Operatives	181,500	8,200	4
Transport & Communications	82,900	4,400	5
Sales	138,200	7,400	5
Security	5,300	200	4
Personal Service	104,100	12,400	11
Labourers	86,800	5,800	6
TOTAL	1,141,000	77,600	6

Source: National Survey of Vacancies in the private non-agricultural sector, 1999/2000, ESRI for Forfás and FÁS.



2.4 Outlook for 2001

Looking to the future, the Expert Group notes the current difficulties facing the world economy because of the slowdown in the U.S. economy as well as the specific problems in Ireland due to the Foot and Mouth crisis. Irish economic growth in 2001 will undoubtedly be reduced compared to recent years. The June 2001 Central Bank forecast for economic growth is of 6.5% in GNP. Given the existing low levels of unemployment; official forecasts for a further 3.5% rise in employment during 2001; and a projected further slowdown in labour supply growth from domestic sources, labour markets look set to remain very tight through 2001. Thus, the Expert Group believes that further measures are required to augment the labour supply. A range of micro-economic initiatives are needed, building on measures already in train. These include:

- **Fiscal and structural supports aimed at encouraging increased participation by women in the labour force.**
Policies include the three-year tax individualisation programme and increased public spending on childcare provision. However, structural, legal and administrative difficulties continue to hamper the establishment of sufficient reasonably-priced childcare places. These should be addressed.
- **Efforts to induce older people - those aged 55 years and over - to participate in or to re-enter the labour market on a full- or part-time basis.**
Such efforts should focus on alleviating direct taxes on the combined income older people derive from pensions and earnings. The Expert Group is currently carrying out a study on the Over 55s which is intended to lead to initiatives in this area.
- **Initiatives designed to encourage the economically inactive who want to work to be able to do so.**
The numbers in this category are large (about 120,000 during each of the last three years) and two-thirds of them are women. More research is needed to ascertain the factors that are blocking their participation in the labour market.
- **An administrative system designed to ensure a sufficient and timely supply of Work Permits and Work Visas for immigrants in order to support domestic labour force growth.**
However, further interventions in this sphere would have to take cognisance of the impact of greater numbers of residents on the country's already over-burdened economic and social infrastructure.
- The further development of the National Employment Service aimed at reducing 'frictional' unemployment through encouraging effective and speedy matching of job seekers with available jobs.
- **The development of targeted initiatives under the Life Long Learning strategy that will allow individuals, employed and unemployed, to train or re-train for jobs where labour is in particularly scarce supply.**

In conclusion, the Expert Group reiterates its overall prognosis that the labour market in Ireland is likely to remain tight for the foreseeable future. In this context, there is an ongoing need to develop measures and initiatives to increase labour supply from a range of sources.



3. Information Technology – Third Level Skills Provision 2001-2005

3.1 Introduction

The provision of high-level skills in the Information Technology (IT) sector has been recognised in previous reports of the Expert Group to be central to the competitiveness of the sector, to the attraction of Foreign Direct Investment and to the growth of the Irish economy as a whole. In its First Report, in December 1998, the Expert Group proposed initiatives to increase the supply of IT professionals and technicians by third-level institutions and to increase in-company training and up-skilling. As a result, in 1999 the Government allocated a total of £75m (€95.23m) for 5,400 new IT places in third-level education. This was expected to lead to an average annual supply of 8,300 graduates to work in IT in the period 1996-2003.¹¹

Given the fast pace of change in the industry and its volatility, IT skills demand and provision have been kept under review by the Expert Group.¹² In 2000, the Expert Group commissioned two sectoral studies of demand for the period 2001-2005. McIver Consulting reported, December 2000, on the skills needs of the software industry, demand for software skills across the economy and the emerging areas of eBusiness, digital media and multi-media. Its growth forecasts are based on consultations with the industry, IDA Ireland and Enterprise Ireland, employment and vacancies' surveys and historical trends in the developments of the Irish and international software sectors. Eirlink reported, December 2000, on changing skills requirements and overall demand for skills in the hardware sector. It consulted with key industries (indigenous and non-indigenous), the IDA and Enterprise Ireland on anticipated expansion and new investments over the period 2001-2005. In each case, demand forecasts were adjusted to take account of anticipated job losses. Both of the studies found that growth in the IT sector is constrained by the availability of skilled personnel.

A third study by the ESRI, completed in February 2001, provided labour market projections and forecasts for the supply of third-level graduates in IT. This examined trends in student enrolments in IT-related areas (principally Computing, Electronic Engineering, Software Engineering) in universities and Institutes of Technology, the numbers successfully completing studies and their entry into the labour force. On this basis, the ESRI projected the likely supply to the IT industry of graduates with IT skills over the period 2001-2005.

The demand figures of Eirlink and McIver Consulting were substituted for ESRI forecasts of overall labour force requirements of the IT sector because they provided a micro-analysis which more accurately captured high-level skills needs. These forecasts were reviewed in the light of the downturn in the U.S. economy and its effects on the Irish economy and on the IT sector in particular. A specially convened Forfás/Higher Education Authority (HEA) IT Forum¹³ considered this and other issues surrounding policy recommendations. Policy recommendations were then agreed by the Group to ensure that third-level IT skills needs are secured in the period 2001-2005 and beyond. The Expert Group underlines the continued importance of the IT

11 The supply forecasts (1998 and 2000) assumed that the proportion of third level graduates entering the IT industry directly on completion of their studies would increase over time and that third-level completion rates would improve significantly. The ESRI review undertaken in 2000/01 shows that these assumptions did not hold for all areas. As a result, supply levels are expected to be less than was previously forecast - see text for details.

12 In 2000, the Expert Group in its review of the IT sector reported high growth rates in both the hardware and software sectors. Demand in the high-value area of the electronic hardware was particularly strong. It anticipated that the supply of skilled professionals (i.e. those with degrees or post-graduate qualifications) would be sufficient to meet this demand in the medium-term (2000-2003). It raised concerns about a possible shortfall in the supply of software technicians and recommended that measures be taken to increase student uptake and awareness of career options in this area.

13 The Forfás/HEA IT Forum consisted of experts from the IT review group, industry, the third level sector, government departments, the agencies and consultants involved in the IT review process. It met on 28th March 2001.



sector to the development of a knowledge-based economy and its contribution to government revenue, the need to expand access to training and education in IT skills across society and to promote the integration of IT across the economy as a whole. For these reasons, significant additional resources must be invested in IT skills provision.

The main findings and recommendations are presented below.

3.2 Projected Demand for Graduates with IT Skills

The consultants' reviews focus on the provision of IT skills, in terms of graduates of universities and Institutes of Technology, and the demand for these skills in the IT industry in the period 2001-2005. Figures are broken down between professionals and technicians. The scope of the IT industry includes hardware and software producers, such as Microsoft, Intel, Hewlett Packard, Iona and Parthus, IT departments in companies and organisations, eBusiness, digital media and multimedia. The kinds of third-level skills required by the industry range from electronic engineering, software engineering, systems development and Java analysts to programmers and Web developers. In practice, the distinction between hardware and software engineering is blurred within IT companies. In terms of skills provision, this creates demand for broader range of skills and for continued learning.

The sector level consultants, McIver Consulting and Eirlink, forecast strong growth in demand for the period 2001-2005. The *software* sector will require some 4,400 computer science professionals and 1,600 computer science technicians each year. This is based on strong growth projections for indigenous industry (25% per annum on average) and in demand for software across the economy (10% per annum on average). These forecasts are based on historical trends in the development of the international software sector. The main reasons for this increase in demand are the increased high-level skills requirements of the IT sector; the emergence of new sectors of IT such as digital media and Internet data centres; growth in eBusiness and the increasing penetration of IT into business in the wider economy. As a result, the anticipated demand for professionals is substantially higher than was forecast in previous reports of the Expert Group.

In the *hardware* sector total demand for engineers has remained more or less constant since 1998 but the composition of that demand has altered significantly. In 1998, the First Report of the Expert Group predicted an annual demand for 2,000 engineering professionals (those with degrees or post-graduate qualifications) and for 1,800 engineering technicians (those with certificate or diploma qualifications).¹⁴ Annual demand is now forecast to be some 2,500 engineering professionals and 840 engineering technicians for the period 2001-2005. The principal catalyst for this change in demand is the increased investment and expansion by companies in high value-added activities such as IC design. This is driving up demand for engineering professionals from 13% (1996-2003) of the overall labour force requirement of the sector to 33% (2001-2005). Demand for technicians is expected to drop from 25.5% of the total to 14% over these periods.

3.3 Third Level Provision of Graduates with IT Skills

On the supply side, the ESRI review shows that the key influences on student intake in the projection period are demographic constraints and the phased introduction of new places in IT. The falling age cohort of 17-18 year olds will reduce the pool from which most entrants into third-level are drawn. This pool is expected to fall by about 15% over the period 1998-2005. The ESRI estimates that the average annual forecasts for future third-level supply to the labour market, notwithstanding significant Government investment in providing new places in IT, will not be sufficient to meet demand. The third-level output of computer science professionals and engineering professionals is each expected to be about 150 more per

¹⁴ First Report of the Expert Group on Future Skills Needs, Forfás, December 1998, p. 19. These projections related to the period 1996-2003.



annum in 2001-2005 compared to the projection period 2000-2003. These projections are broadly in line with earlier Expert Group Reports and reflect the uptake of extra IT-related places in third-level.¹⁵

The annual supply of IT professionals to the labour market is forecast to be 4,350 for 2001-2005 (see details in Table 3.1 below). In 1998, the supply forecasts, which included estimates of graduates returning to Ireland and the results of up-skilling of the existing labour force, were for an annual average supply of 4,500 professionals.¹⁶ The corresponding figure for technicians was 3,700.¹⁷ Now, the ESRI estimates that the annual supply of IT technicians will be some 1,600 for 2001-2005. When the demand side is factored in, the ESRI estimates that there will be an annual average shortfall of about 2,500 professionals and about 800 technicians over the period. The total shortfall of some 3,300 IT graduates is largely due to strong growth in demand and a change in the composition of that demand. The fall in the supply of technicians is caused by some decline in student enrolments, and the tendency of certificate and diploma holders in the Science areas as a whole to go on to further study rather than enter the labour market directly. This fall in the number of technicians immediately available for work therefore has a positive impact on the supply of IT professionals. It is an important mechanism for the up-grading of skills to meet the needs of industry. The three studies report variability in both the demand for and supply of technicians in the IT industry since the late 1990s. In contrast, there has been steady growth in the demand for and supply of IT professionals. Here, the phased introduction of new IT degree places will yield graduates after 3-4 years. This should secure a steady supply of skilled IT professionals in the medium- to long-term.

3.4 Projected Skills Gap

Table 3.1 demonstrates that, despite increases in the provision of IT-related places in third-level institutions and a substantial increase in graduate numbers, major supply deficits are likely to occur over the period 2001-2005 for Computing professionals and technicians. The software sector is larger and growing faster than the hardware sector. The principal cause of this is the growth in demand in high-value added areas and the increased penetration of software across the economy. There is a particular demand for electronic engineers as a proportion of overall demand in the hardware sector. Here, in the area of IC design, industry investment and expansion is primarily driven by the availability of skilled professionals.

The figures in Table 3.1 are annual averages and some variation can be expected over the projection period. The projections are based on data available up to 1999, the last year for which a full data set was available. Limitations on the data mean that figures are presented for total demand and supply for engineers in the labour force, as detailed breakdowns for IT engineers only were not available.

- 15 First Report of the Expert Group on Future Skills Needs, Forfás, December 1998; Second Report of the Expert Group on Future Skills Needs, Forfás, February 2000. The ESRI has provided forecasts for those who expected to graduate and for the number of graduates that are expected to be immediately available for work (given that some graduates emigrate or go on to further study). The difference between the two figures can be very large - for example, an increasing proportion of certificate and diploma holders in science now go on to further study rather than going directly into the labour market.
- 16 The First Report estimated that 400 skilled personnel would be available each year as a result of up-skilling of employees and that 300 would be available through immigration (i.e. of graduates from Ireland that migrated after completing their studies (p.61). Given the absence of reliable data and difficulties in measuring up-skilling, the review group decided to omit this figure from its forecasts for 2001-2005.
- 17 This projection includes annual figures of 150 graduate technicians who have migrated and were expected to return to Ireland and 150 of the labour force who were expected up-skill to the level of technician over the period 2000-2003.



TABLE 3.1: ANNUAL AVERAGE DEMAND AND SUPPLY OF THIRD LEVEL SKILLS IN INFORMATION TECHNOLOGY, 2001-2005

SKILLS LEVEL	DEMAND	SUPPLY ¹⁸	BALANCE
Engineering and Computer Science Professionals	6,842	4,350	- 2,492
<i>Of which</i>			
Computing	4,383	2,770	- 1,613
Engineers	2,459	1,580	- 879
Engineering and Computing Technicians	2,462	1 520	- 840
<i>Of which:</i>			
Computing	1,623	523	- 1,100
Engineers	839	1,099	260
TOTAL	9,304	5,972	- 3,332

Source: ESRI (2001), Eirlink (2000), McIver Consulting (2001) for the Expert Group.

Prior to finalising its recommendations, the Expert Group considered the impact of the downturn in the U.S. economy on the IT industry in Ireland and consulted with a broader group of stakeholders in the Forfás/HEA IT Forum on the key findings of the Group. It should be noted that the timing and scale of downturn in the U.S. economy and, in particular, that of the IT industry, was not in general anticipated by industry or market analysts. There still remains considerable uncertainty about the duration and scale of the downturn and its long-term effects on the IT industry. In the first quarter of 2001, many IT corporations announced large cutbacks in jobs, profits and expansion plans. However, these took place against the background of global shortages of skilled IT personnel. For example in 2000, the International Data Centre forecast that, of over 800,000 job openings in the U.S. in 2001, at least 455,000 will not be filled. This figure is broadly supported by a study of the U.S. market (2001) from the Information Technology Association of America. In 2000, the European Commission estimated that there were 800,000 vacancies for IT professionals in Europe and that this could rise to 1.7 million in 2003.

Having examined these issues, the Expert Group considered that, as some volatility is already built in to the demand forecasts for 2001-2005 and provided that the U.S. downturn is not prolonged, the demand forecasts are robust. It took account of the different growth dynamics of the hardware and software sectors. In the software sector, the availability of skilled personnel is a main driver of growth. For example, in the 1990s, software companies migrated and expanded in countries where skilled personnel were available, e.g. Ireland, Israel, India. Employment data for the U.S. to March 2001 shows continuous growth in employment in the software sector. Looking forward, the Expert Group considered two possible scenarios - a return to IT-market conditions prevailing in 1991, with overall employment growth of 5%, and a return to 1995/96 conditions when employment growth averaged 15% per annum in the U.S. On balance, given the large degree of uncertainty surrounding the U.S. and its broader effects, the fact that projections are for a five year period rather than the short-term and the key role of skills availability as a factor of growth, the Expert Group decided not to revise the demand forecasts for the software sector.

In the hardware sector, although it has been negatively affected by the U.S. downturn, the response of the industry is to focus heavily on high-value added activities and to shed lower value-added activities or move them to low-cost locations. This means that the demand for high-value added activities such as those promoted in Ireland will at least remain steady if not increase in the medium-term. Given that R&D drives

¹⁸ Supply forecasts concern graduates that are available for work. They also include post-graduates - a detailed assessment of post-graduate needs and provision is considered in Chapter 4.



much of the projected growth in the hardware sector in Ireland, the Expert Group considered that the demand projections should not be revised. On the contrary, the developments in the U.S. reinforce arguments for continued investment in higher-value added activities and in the necessary skills to underpin this.

Overall then, based on evidence available in early 2001, the Expert Group considers that the slowdown in the U.S. is unlikely to have a major impact on the IT sector in Ireland in the medium- to long-term. This is largely due to:

- (1) the scale of world-wide and Europe-wide shortages of skilled IT professionals.
- (2) the scale of investment and projected expansion of high value added activities, including R&D, by the Irish-based producer industries. This activity is at the core of their competitiveness.
- (3) the importance of the European market, which is less affected by the U.S. downturn, to the Irish-based industry.

The Expert Group expects that there will be continued high growth rates in the IT industry in Ireland over the period 2001-2005 and a further integration of software across the economy. However, it is recognised that a prolonged recession in the U.S. economy could have a negative impact on future growth in the IT sector in Ireland.

3.5 Recommendations

Given the strong growth in demand for IT skills, the changing composition of demand and critical changes in the factors affecting the supply of graduates, the Expert Group strongly feels that recommendations must be made to close the gap between the supply of and demand for third-level IT skills. Availability of a skilled labour force in IT is an increasingly important factor in attracting inward investment in the IT industry in Ireland. Given global skills shortages in the IT industry, the capacity to provide skilled IT graduates is a major competitive advantage for Ireland. The Expert Group calls for new measures to secure high-level IT skills in view of their importance to the future of the IT sector in Ireland, the importance of the sector in generating government revenues and in developing a knowledge-based economy. On the contrary, failure to adequately provide for high-level IT skills could have high costs for future employment, competitiveness and growth in the IT sector and in the economy as a whole.

In the past, the provision of more full-time student places has been the key focus of Expert Group recommendations. The resulting investment in the provision of third-level IT skills has begun to pay off. Now, the Expert Group recognises that significant labour market and demographic constraints operate against the provision of new full-time under-graduate places. The age cohort of 17-18 year olds, from which most third-level students are drawn, is projected to fall by some 15% between 1999-2005 and to fall further after that. As a result, the Group recommends that existing graduate potential be maximised by ensuring that all third-level places are filled and that retention rates in third-level institutions improve. It recommends that part-time education be significantly expanded as a means to increase access to third-level education and so meet future skills shortages. These measures will place increased demands on Computing and Engineering departments, all of whom are experiencing difficulties in attracting and retaining staff (lecturers and demonstrators). Issues of pay and conditions for IT staff in higher education institutions arise.



Given the different needs of the hardware and software sectors, the Expert Group finds that different policy interventions are required for each. For example, conversion courses are not, in general, an option for meeting demand for engineering professionals while they are very useful to the software sector. Action in the hardware sector therefore could focus on partnerships to provide specific modules on IC design in Engineering courses and staff exchanges to facilitate lecturing and professional education, as well as appropriate up-skilling for those employed in industry. In the software sector, the accreditation of specific modules and in-company training are well suited to meeting specific needs. In practice, it is becoming increasingly the case that the distinction between technicians and professionals in software development is disappearing - this opens up the possibility for innovative solutions to meeting skills needs. In addition, as engineering technicians usually have the skills to work in either the hardware or software sectors, the surplus of engineering technicians may fill part of the gap forecast for software technicians.

The key recommendations of the Expert Group are listed below. Where possible, quantitative estimates of their impact on closing skills gaps are given. In other cases, such as that of improving completion rates, precise interventions and their impacts must first be identified. For this reason, and in order to detail the costs involved, an expert Project Team should be put in place to implement the key recommendations concerning additional finance for IT skills provision.

3.5.1 *Priority areas for investment in Information Technology*

Recommendation 3.1

- ***A new, additional, investment of £130m (165.07m) should be made in the IT area over five years.***

The volume and duration of this investment will facilitate planning and mark a long-term commitment to the sector. The expert Project Team, Recommendation 3.11 below, would be responsible for identifying and assessing needs, seeking proposals, examining their feasibility and costings and implementing actions.

Four priority areas for new investment in IT skills are:

- *part-time education including company training*
- *post-graduate conversion courses including on a part-time basis*
- *completion rates in third-level*
- *equipment renewal and state-of-the-art facilities for third-level education in IT-related areas*

The objectives and issues involved in each area are indicated below.

Recommendation 3.1.a

- ***Access to third-level education should be increased for mature students and for marginalised and disadvantaged groups through an increased provision of part-time education and Company up-skilling.***

This would create a real shift in the provision of part-time education in the IT area. In addition to meeting skills needs, this would help prevent the emergence of a digital divide in society. Central to achieving this objective is substantial multi-annual funding for part-time courses in IT-related areas. This would facilitate the introduction of new courses and places. It should also allow, if possible, for a substantial subsidisation of fees for students. While the Group finds that action on access, part-time education and fees are necessary to address skills shortages in the IT area, it is cognisant of the broader equity concerns surrounding these issues. It notes that the Taskforce on Life Long Learning, amongst others, is addressing these issues and that its findings should be taken into account in framing interventions to meet IT skills shortages.



Measures must also be taken to encourage companies to release employees to undertake up-skilling (i.e. re-training and the acquisition of new skills) and to encourage workers to avail of this. This would address medium-level skills shortages and also serve to channel increased numbers into study at higher levels. The new Institute Trainee Programme now commencing in a number of Institutes of Technology provides a good model of skills provision that integrates part-time education, company release and new funding arrangements.

The delivery of courses and programmes through, for example, distance learning and e-Learning should be promoted. Consideration should also be given, in the context of increasing industry demand for specific skills sets, to the design of course modules for accreditation. Examples of these, in the software sector, are network design, information systems and project management.

Recommendation 3.1.b

- **The provision of Post-Graduate Conversion Courses including on a part-time basis should be increased.**

These courses provide a rapid and efficient response to immediate IT skills shortages. There is evidence of excess demand for places on post-graduate conversion programmes and that an extra 1,000 places per annum could be filled. However, the existing funding base of these programmes is temporary. Future student intake could suffer as a result of competition for space and other resources. Hence, the Group recommends that the programmes be put on a more permanent footing by providing additional multi-annual funding for new places. Also, it recommends that these programmes should be made available as far as appropriate on a part-time basis. In addition, the Expert Group considers that a small number of places, around 30, be made available for a specialisation/conversion course for physics graduates to IC Design.

Recommendation 3.1.c

- **Urgent measures should be taken to improved completion rates in IT-related studies in third-level institutions.**

The Expert Group considers that there is an urgent need to improve completion rates in IT related areas, which are in general lower than for other areas of third-level study. Third-level providers are also concerned that completion rates in IT-related areas could get worse unless urgent action is taken. The issues to be addressed include informed student choice of courses/programmes of study; staff/student ratios; course design; student guidance and support; social pressures to drop out of courses and failure of students to meet examination standards. It appears likely that there are reasons particular to IT that demand targeted intervention. For example, the expansion of places has caused an increase in staff/student ratios and put extra pressure on facilities. The Expert Group considers that a long-term financial commitment must be made to improving completion rates so that the output of IT graduates increases substantially above current levels.

Recommendation 3.1.d

- **New provision should be made for equipment renewal and the development of state-of-the-art facilities for third-level education in IT-related areas.**

The Expert Group recognises the need for continued investment in equipment and laboratories. There is already considerable pressure on these from existing programmes and post-graduate conversion programmes in particular. In order to maintain and develop state of the art facilities and to expand access to IT-related education, it is proposed that funding be provided for IT capital renewal.



Recommendation 3.II

- **A dedicated expert Project Team should be established within the HEA to oversee and administer the new provision of £130 million. It will also ensure that the potential of existing programmes is realised and examine and propose a development strategy for IT-related education.**

It will have responsibility for identifying and assessing needs, seeking proposals from educational institutions, examining the feasibility of proposals and costings and developing and implementing actions. It shall identify priorities and targets for investment in the four priority areas above (part-time education and up-skilling; post-graduate conversion programmes; completion rates and renewal of equipment and facilities). The Project Team will liaise with an advisory group of the major stakeholders. The advisory group will include representatives of third-level institutions, the Expert Group, the Skills Initiative Unit, the Department of Education and Science, IBEC and ICTU. All seven universities, twelve Institutes of Technology and the Dublin Institute of Technology will be eligible for funding.

3.5.2 Additional measures to secure IT skills provision.

In addition to proposing a significant new investment in IT-related areas above, the Expert Group recommends the following measures to secure IT skills provision.

Recommendation 3.III

- **Urgent action should be taken at second-level to ensure that future levels of intake into full-time third-level education in IT-related areas remains constant.**

Given the demographic constraints and the strong possibility that, in conditions of a tight labour market and changing student attitudes to completion,¹⁹ actual supply may fall short of the forecasts above there is an urgent need to review the structures of career guidance so that this is effective, relevant, accessible to all students and adequately resourced. Prospective third-level students must be better informed of the content of third-level programmes in IT-related areas and of career paths they lead to. Awareness of IT careers must be promoted i.e. through expanding existing awareness programmes, such as those managed by Forfás, and increasing access to relevant material. In particular, efforts must be made to attract females, who constitute about one third of students in IT-related areas, into IT-related studies. Particular action must be taken to promote the study of honours Maths, Physics and Chemistry at Leaving Certificate level, which is necessary to secure future intake into third-level Engineering courses.

Recommendation 3.IV

- **Partnerships between third-level educators and industry should be promoted and expanded across the regions.**

Partnerships can play a useful role in the communication of needs, capabilities and resources and ideas between the key stakeholders. The accelerating pace of change and growth in the IT sector creates demands for new skills sets - communication of these needs and the design of curricula can be promoted through industry/education partnerships. Existing ones, such as the MIDAS Group,²⁰ are beginning to provide for staff exchanges (which, for example, facilitate professional education, course design, student placement and research). The Expert Group considers that there is a need to

19 Representatives at the IT Forum pointed out that a factor affecting completion rates was the low value attached by some students to the successful completion of courses of study, particularly at a time when the labour market offers attractive alternatives to completion.

20 MIDAS is a partnership between industry and third level education in IC design. It aims to increase the flow of graduates in IC design into industry through measures such as curriculum design, the up-grading laboratories and secondment of personnel (from industry to education and vice versa). Those involved include UCC, UL and companies such as Analog Devices, Xilinx and Parthus.



ensure that, where staffing difficulties arise in higher education institutions, there is some capacity for industry staff to assist in teaching and in related support areas. Furthermore, there is a need to increase opportunities for academic staff in higher education institutions to gain work experience in industry.

The new Institute Trainee Programme, which promotes the training of technicians, is a good model of partnership. Other examples of good practice in partnership include the Fastrack to Information Technology (FIT) initiative for the Ballymun area in Dublin. This could be introduced in other regions. The appointment of education officers by regional groupings such as the Cork Electronics Industry Association also helps develop stronger ties with third-level institutions. The Expert Group recommends that such partnerships be promoted and expanded to other areas of IT and to other regions.

Recommendation 3.V

- **Further steps should be taken to encourage the immigration of IT professionals into Ireland.** The fast-track scheme of Work Authorisations and Work Permits is an efficient means to bring skilled IT professionals into the industry. It is recommended that the Immigration and Policy Advisory Committee (IPAC) should investigate whether more can be done to remove obstacles to the take-up of IT jobs in Ireland by non-nationals. The Group requests IPAC to consider the following issues in order to encourage the immigration of IT professionals to Ireland: a) a waiver of the requirement that skilled IT personnel must have a firm job offer; b) targeted recruitment drives in selected countries, e.g. South Africa and India, and of Irish immigrants; c) the attraction of students into Ireland to take up IT places in third-level institutions; and d) the identification of specific IT skills sets required for entry into Ireland.

Recommendation 3.VI

- **The Expert Group should continue to monitor and review policy recommendations for the IT sector on a regular basis.** This is central to effective implementation. The quality and detail of data on IT skills needs and supply must also be improved. Given the scope of measures required to ensure that the foundations for providing high-level skills are secured at second-level, the Group recommends that consideration be given to expanding the membership of the Expert Group to include persons with high-level policy responsibilities for second-level education.



4. Researchers

4.1 Introduction

Ireland's sustained growth will increasingly be based on the country's ability to develop a knowledge driven economy or a *learning society*. Ireland needs to have available to it the intellectual infrastructure required to sustain its policy of moving up the value chain to ensure continued competition and increasing levels of income. This will require a sustained investment in developing the knowledge and skills of the Irish people through a continued focus on raising the general educational attainment levels of Irish students completing full-time education and on fostering a culture of life-long learning after formal education has finished. Of equal importance is the need to increase the numbers continuing on to postgraduate study, particularly those undergoing research training leading to a doctorate level qualification (PhD).

These considerations led the Expert Group to examine the supply and demand for researchers in detail in its Second Report (1999). This chapter updates this work and reviews the implementation of the recommendations contained in the Second Report. It recommended that urgent action was needed 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, the Report proposed that the number of research students in Ireland would have to increase substantially. It indicated that a number of important issues needed to be considered including: appropriate financial support for post-graduate research; the support mechanisms necessary to develop research as a career; and the preparedness of third-level institutions for the substantial increase in their research activity which is now emerging.

The Report also noted that it was clear that the supply of PhD students and graduates from the Irish education system would not be adequate to meet the substantially increased demand that has been projected over the next few years. The Report considered that postgraduate students and post-doctorate researchers must be attracted from abroad and any existing impediments which could hinder this must be eliminated.

Since the publication of the Second Report there have been a number of important policy developments. Science Foundation Ireland (SFI) has been established to promote excellence in scientific research and has recently allocated its first round of funding. The results of the second cycle of funding under the Programme for Research in Third-Level Institutions were announced in July 2000 and a further cycle has now been announced. Furthermore, the Minister for Education and Science has announced the establishment of the Irish Research Council for Science, Engineering and Technology to complement the establishment of the Irish Research Council for the Humanities and Social Sciences.

4.2 Demand for Researchers

4.2.1 *PhD Requirements in the Irish Economy*

The Second Report of the Expert Group compared existing PhD output levels, the likely trends in output in coming years and the possible sources of demand for PhDs in the economy. There are a number of uncertainties that make any such comparisons of dubious value for planning purposes. One such uncertainty is the level of response to the new research support measures from SFI and the HEA: will these succeed in attracting significant numbers of new entrants to a scientific research career or will they mainly provide a more secure and better paid option for those who would have entered anyway? The full impact of the new measures can only be expected to be felt when students have had a few years to appreciate that a radical



change in the career environment for research in Ireland has taken place. A key element of a better post-graduate infrastructure will be the new Research Council for Science, Engineering and Technology. It will be important for this Council to put in place as quickly as possible a basic support system for postgraduate study, including an attractive remuneration for PhD students. Until this happens, the lack of incentives that characterised the system in the past will continue to affect the vast majority of those contemplating a research career. In this context, the 'Report of the Review Committee on Post Secondary Education and Training' stated that the present level of post-graduate provision is below Ireland's strategic objective and that steps are needed to ensure that we have sufficient post-graduates available in Ireland to remedy this deficiency.

A second uncertainty is the demand from industry for researchers. The Second Report identified a transition situation in Irish industry between the old, Manufacturing-only scenario of past decades and the proposed movement up the value chain of future inward investment and to new, technology-based businesses. A survey of existing research performers gave little indication that Manufacturing industry was experiencing a shortage of research personnel with or without a PhD, or that they anticipated a shortage in the foreseeable future. On the other hand, a survey of high technology sectors such as communications, electronic hardware and the software industry indicated that the availability of highly skilled graduates with research expertise would lead to further expansion of those sectors on a research-led basis and that the absence of such graduates would be a serious impediment to development. Furthermore, the success of an inward investment strategy with a heavy emphasis on research activities and research-based companies would be dependent both on a significant research infrastructure in Ireland and on the ready availability of highly qualified researchers.

The Expert Group considered that a study of recruitment advertisements would be a useful indicator of the demand for researchers. On behalf of the Expert Group, Tom Martin & Associates reviewed the Irish Time's Friday Appointments Supplement for the period January 1999 to November 2000. The objective of the research project was to establish the number of positions advertised by employers, both in the private and public sectors, seeking people with either:

- (1) a Master's degree;
- (2) a Ph.D.; or
- (3) post-doctoral research experience.

The study indicated that of a total of 1,463 positions for which a Masters degree or higher qualification was required, 1,201 (82 per cent) were advertised by public sector employers. A total of 673 positions required a Masters degree and 471 posts were advertised which required a PhD. The number of advertisements for post-doctorates amounted to 57.

The analysis indicates that the divergence between public and private sector job advertisements increases with the level of academic qualifications sought. While the number of private sector employers seeking candidates with a Masters degree represented a fifth of all positions requiring a Masters, private sector companies accounted for only 15 per cent of PhD and 3 per cent of post-doctoral positions advertised.

For the period January-November, in both 1999 and 2000, there was strong growth in the number of posts requiring a Masters degree or higher. The number of private sector advertisements increased by 57 per cent from 99 in 1999 to 155 in 2000. The number of public sector advertisements, however, rose more slowly during the period under review: total numbers increased from 554 in 1999 to 613 in 2000, an increase of 11 per cent. The number of public sector post-doctoral positions fell significantly from 47 in the first eleven



months of 1999 to 10 in the same period of 2000. The number of public sector posts requiring a Masters degree also fell from 345 in 1999 to 305 in 2000. The number of positions in the public sector requiring PhDs increased significantly from 162 in 1999 to 298 in 2000, an increase of 84 per cent.

Whilst these advertisements are a useful indicator of demand for researchers, they do not capture total demand. It has to be recognised that this type of advertising for highly skilled positions is probably in decline, with the Internet as well as various personal networks providing very strong alternative sources of information.

4.2.2 Post-Doctoral Researchers employed in Third Level Colleges

Information was sought from the third-level institutions in relation to the number of post-doctoral researchers that they employ. The information included in Table 4.1 is classified according to UNESCO's ISCED system (International Standard Classification of Education). The aim is that all of the information on enrolments and awards will in the coming years be classified in this way.

All areas of study show significant growth in the number of post-doctoral researchers employed. Overall, between 1998/99 and 1999/00, there was an increase in the total number of 198, or 41 per cent.

**TABLE 4.1: POST-DOCTORAL RESEARCHERS (FULL-TIME AND PART-TIME) BY FIELD OF STUDY IN THE ACADEMIC YEARS 1998/99 and 1999/2000**

FIELD OF STUDY	1998/99 TOTAL	1999/2000 TOTAL
EDUCATION (ISC 14)	7	11
Teacher Training (ISC 141)	1	0
Education Science (ISC 142)	6	11
HUMANITIES AND ARTS	14	33
Unspecified Arts	0	0
Arts (ISC 21)	0	3
Humanities (ISC 22)	14	30
Combined Arts & Humanities	0	0
SOCIAL SCIENCES, BUSINESS AND LAW	18	34
Social and Behavioural Science (ISC 31)	16	29
Journalism and Information (ISC 32)	0	0
Business and Administration (ISC 34)	2	5
Law (ISC 38)	0	0
SCIENCE	253	310
Unspecified Science	2	5
Life Sciences (ISC 42)	138	176
Physical Sciences (ISC 44)	98	107
Mathematics and Statistics (ISC 46)	6	14
Computing (ISC 48)	9	8
Combined Science	0	0
ENGINEERING, MANUFACTURING AND CONSTRUCTION	109	141
Unspecified Engineering	5	11
Engineering and Engineering Trades (ISC 52)	61	81
Manufacturing and Processing (ISC 54)	41	46
Architecture and Building (ISC 58)	2	3
AGRICULTURE	8	9
Agriculture, Forestry and Fishery (ISC 62)	4	3
Veterinary (ISC 64)	4	6
HEALTH AND WELFARE	76	139
Health (ISC 72)	76	139
Social Services (ISC 76)	0	0
SERVICES	2	8
Personal Services (ISC 81)	0	0
Transport Services (ISC 84)	1	2
Environmental Protection (ISC 85)	1	6
Security Services (ISC 86)	0	0
Not known or unspecified	1	1
TOTAL	488	686

Source: HEA



4.3 Supply of PhDs

A key part of the recommendations in the Expert Group's Second Report was that the HEA should establish a central database on higher education research activities for all third-level colleges. While the Expert Group now has significantly more information available to it to look at the future supply of researchers, the detail available within the data is poor. The Expert Group considers that it is necessary for the HEA to further develop its database and to make more detailed information available. This should address a number of weaknesses. The data have been grouped according to historical classifications which differ between enrolments and awards and thus makes it very difficult to track students. In particular, there is still no significant information on the research activities of the Institutes of Technology. Furthermore, while there is some information by field of study this is not detailed enough, particularly in relation to awards information. In addition, the available information does not set out the year of study for post-graduates which is vital information for planning purposes.

The Expert Group examined international comparisons in participation and attainment in post-graduate research studies. Tertiary graduation rates show what percentage of the relevant age-cohort in a country graduates at a certain level. This is relevant when looking at the likely graduation of young people. These percentages are generally recorded by the OECD as net graduation rates.²¹ Some countries, including Ireland, provide gross graduation rates. For these countries the number of graduates is divided by the population at the typical graduation age. This gives an indication of the percentage of people within the age-cohort attaining higher education awards as a percentage of all in that age-cohort and enables cross-country comparisons to be made.

TABLE 4.2: PHD GRADUATION RATES, 1998

Percentage of Population cohort obtaining a PhD	0.8%
OECD County Mean	1.0%
No. of countries surveyed	22
Ireland's Ranking	14

Source: Education at a Glance, 2000, OECD, p. 173

Note: PhD graduation rates refer to the percentage of people within a virtual age cohort who obtain a tertiary qualification, thus being unaffected by changes in population size or typical graduate age (OECD)

In relation to doctoral graduation rates, Table 4.2 shows that Ireland is below the OECD mean and is in the third quartile of countries surveyed. Examples of countries with a much higher percentage include Switzerland (2.5 per cent), Finland (2.3 per cent) and Sweden (2.2 per cent).

Tables 4.3 and 4.4 below set out the numbers of students registered in 1998/99 and 1999/00 for PhDs and Masters degrees based on the data supplied by the HEA database.

²¹ The OECD defines net graduation rates as "the percentage of people within a virtual age cohort who obtain a tertiary qualification, thus being unaffected by changes in population size or typical graduate age".

TABLE 4.3: NUMBER OF REGISTERED PHD STUDENTS, 1998/99 and 1999/00

	*FULL-TIME 1998/99	*FULL-TIME 1999/2000	**PART-TIME 1998/99	**PART-TIME 1999/2000
Science	1085	1093	148	217
Engineering, Manufacturing	264	311	51	63
Education	20	22	26	30
Humanities & Arts	447	469	84	120
Social Sciences, Business & Law	175	170	53	42
Agriculture	57	87	15	11
Health, Welfare	116	148	76	77
Unknown	10	15	2	10
TOTAL	2174	2315	455	570

Source: HEA and Department of Education and Science

Note: * These columns include the number of full-time research students in the institutions funded by the HEA and in all the Institutes of Technology.

** These columns include the number of research students in the institutions funded by the HEA and in the Dublin Institute of Technology. Information on the other Institutes of Technology was not available.

TABLE 4.4: NUMBER OF REGISTERED MASTERS RESEARCH STUDENTS, 1998/99 and 1999/00

	FULL-TIME 1998/99	FULL-TIME 1999/2000	PART-TIME 1998/99	PART-TIME 1999/2000
Science	681	638	143	167
Engineering, Manufacturing	382	335	95	107
Education	20	20	16	21
Humanities & Arts	534	484	119	100
Social Sciences, Business & Law	219	236	128	145
Agriculture	74	80	20	10
Health, Welfare	88	209	54	42
Unknown	27	9	17	23
TOTAL	2025	2011	592	615

Source: HEA and Department of Education and Science

Note: This table includes information on the number of full-time research students in the institutions funded by the HEA and in the Dublin Institute of Technology. Information on the other Institutes of Technology was not available.

It was not feasible for the Expert Group to have a considered view of trends based on the information available from two years of enrolments. The picture emerging from the information is that enrolments have generally risen slightly from 1998 to 1999. This is encouraging at a time when buoyant labour market conditions, combined with relatively low levels of support for post-graduate study, make continuing education financially unattractive in the short-term.

The picture emerging from the information on full-time awards is that the numbers of PhDs being awarded has increased in recent years and that the number of Masters research awards has declined slightly. Overall



it would appear that the total number of research awards is relatively constant, averaging 800-900 per annum. Appendix 2 provides details of these awards.

A key issue in looking at post-graduate research students is the transfer rate from full-time degree studies to full-time post-graduate research studies. The Expert Group examined this on the basis of information contained in the HEA First Destinations Database. This information relates to the first destination of students nine months after they have attained their primary degree. Based on the first destination of students, Table 4.5 sets out an estimate of the numbers qualifying with a primary degree following full-time study who went on to study immediately at masters/doctorate research level in Ireland or abroad. Further details are provided in Appendix 2.

TABLE 4.5: ESTIMATED NUMBER PROCEEDING DIRECTLY FROM A PRIMARY DEGREE TO A POSTGRADUATE RESEARCH STUDY

	NUMBERS PROGRESSING TO RESEARCH STUDY	NUMBERS PROGRESSING TO RESEARCH STUDY IN IRELAND	NUMBERS PROGRESSING TO RESEARCH STUDY ABROAD
1993	778	699	79
1996	913	835	78
1998	766	698	58
1999	773	710	63

Source: HEA

In assessing the transfer rate from full-time degree studies to post-graduate study, it is relevant to note that the number of primary degrees awarded following full-time study increased from 9,845 in 1993 to 15,773 in 1999. The general trend is for a reducing *percentage* of those attaining degrees following full-time study to progress immediately to research study. Given the increase that has been recorded in the number of degrees awarded, the *number* progressing to further research was around the same in 1998 and 1999 as it was in 1993. Within specific subject areas, the transfer rate has reduced at just about the average rate for Science graduates but has decreased faster for Engineering graduates. It is also of note that there has been a slight decrease, in real terms, in the numbers progressing to research study abroad. In conclusion, it would appear that the increase in the numbers attaining full-time degrees will peak in the near future and that to retain the existing number transferring, there will be a need to increase the rate of transfer.

4.4 Development of the Research System

4.4.1 Research Funding

One of the greatest challenges for Irish economic and social development for the immediate future is to develop an intellectual infrastructure to support industrial development in rapidly changing circumstances. A vibrant and excellent research system will be at the heart of such an infrastructure. The outlook and environment for research in higher education in Ireland has improved considerably in recent years, particularly when compared with the very low historical levels of funding. The transformation of the research landscape is already underway, particularly with the implementation of Science Foundation Ireland and the Programme for Research in Third-Level Institutions.



Enterprise Ireland and the Health Research Board have traditionally been involved in the funding of individual research proposals and projects following competitive application processes and peer review assessments. This funding has been very modest in the past but the National Development Plan (NDP) provides for increased funding for research. It has provided for expenditure of £1.95 billion (€2.48 billion) on research, technological development and innovation, of which at least half is expected to be spent within third-level institutions.

In addition, there are a number of recent new initiatives for State funding of research within the higher education sector. The Research Council for the Humanities and the Social Sciences has been in place since 2000. The establishment of a Research Council for Science, Engineering and Technology was announced in January 2001, and first met in June 2001. These Councils will now provide funding for project research, scholarships and other support schemes. SFI has also now been established, with a research budget of over £500m (€634.87m) for the period up to 2006. Its establishment arises from reports prepared by the Irish Council for Science, Technology and Innovation (ICSTI). Announcements of the outcomes of the first call for proposals are expected in the summer of 2001.

Institutional research strategies are funded through the Programme for Research in Third Level Institutions (PRTL). This was launched in late 1998 and has involved a total allocation of £220m (€279.34m) to date, of which somewhat more than half is being provided by the Government. A further call for £260m (€330.13m) of proposals has now been made. The programme, which is administered by the HEA on behalf of the Department of Education and Science, aims to ensure that institutions have the capacity and incentives to formulate and implement research strategies which will give them critical mass and world level capacity in key areas of research. This programme built upon a smaller £4m (€5.08m) programme in 1998, the first ever such funding to give direct support to the research strategies of third-level institutions.

It is expected that the funding mechanisms that are in place and those which are planned will complement each other to ensure that the research potential of higher education can be realised. The Government's aim is to enable a research structure which strikes a well-functioning balance between personal initiative and creativity (on the part of individual researchers including those pursuing their own interests and inquiries), institutional programmes and priorities and government priorities. It is difficult to be clear about the precise outcomes and effects of these funding mechanisms prior to their full implementation.

While new initiatives from Science Foundation Ireland provide welcome support for a relatively small number of researchers and research students in two strategic areas (biotechnology and information and communications technology), support for those wishing to undertake research and training in other scientific areas remains inadequate. This issue is expected to be addressed by the new Irish Science and Engineering Research Council but until it does so the remuneration and attractiveness of post-graduate study will remain low.

4.4.2 Researchers Supported under New Schemes

The Expert Group has estimated the number of post-graduate students and post-doctoral researchers for whom support is being and will be made available under existing and emerging programmes of research support. At this stage, it is not possible to be precise about the supports that are to be made available. The Group has made some very tentative estimates of researchers to be supported in order to give an indication of the scale of supports that are to be made available. Table 4.6 estimates the total number of post-graduate researchers that might have support from the new schemes in any given year. It shows the potential for significant growth (more than ten-fold) in the number of researchers expected to be supported.



TABLE 4.6: ESTIMATED NUMBER OF POST-GRADUATE RESEARCHERS TO BE SUPPORTED UNDER NEW SCHEMES, 1998-2006

YEAR	NUMBER
1998	107
1999	567
2000	767
2001	1060
2002	1150
2003	1450
2004	1650
2005	1800
2006	1800

Table 4.7 estimates the total number of post-doctoral researchers that might have support under the new schemes in any given year. Again, there is significant potential for growth in the numbers supported from 17 in 1998 to a projected 735 in 2006, an increase of 4,200 per cent.

TABLE 4.7: NUMBER OF POST-DOCTORAL RESEARCHERS FOR WHICH FUNDING IS TO BE MADE AVAILABLE IN ANY GIVEN YEAR, 1998-2006

YEAR	NUMBER
1998	17
1999	157
2000	297
2001	445
2002	495
2003	600
2004	680
2005	735
2006	735

Significant research funding is to be available on an increasing basis in the coming years, leading to support for research funding for around 600 new post-graduate researchers and 240 new post-doctoral researchers annually from 2003 onwards.

4.5 Projected Skills Gap

Based on the evidence of the two years that is available, there have been increases in the number of PhD students, both full-time and part-time. The number of Masters research students is relatively stable. In relation to full-time awards, there is a slight upward trend in the number of PhD awards and an evening off of the number of Masters research awards. The number of PhD awards in Science and Engineering per 100,000 of the population of Ireland has increased from 8.1 in 1996 to 9.1 in 1999. Nevertheless, this indicator remains well behind the leading research nations such as Switzerland (26) and Finland (15). While Ireland still ranks quite high in terms of Science and Engineering graduates as a ratio of total graduates this output does not translate into doctorate students at the same rate as leading knowledge-based economies. This is the crucial issue for policy in this area for the future.



Without it being possible to make precise estimates of demand for researchers holding doctorate qualifications, the preceding sections have shown that funding available for research in the National Development Plan (operating via the SFI, HEA and the two Research Councils), as well as the need for highly skilled requirements from industry, will ensure a continuing and increasing need for people with PhD degrees.

A basic comparison of existing output rates of PhDs (417 overall in 1999) with the places estimated to be available for post-doctoral researchers under the NDP on an annual basis by 2003 (245) shows the demand which will arise from this activity alone will account for over half of the current output of PhDs. Furthermore, it is estimated that by 2003 around 600 new post-graduate students will receive the new supports on an annual basis leading to 1,800 students being in receipt of such funding in any given year from 2005. At present there are around 4,300 registered post-graduate research students in total, of which around 2,400 are in science and engineering.

National research policy should therefore aim to increase substantially the output of doctorates, particularly in science, engineering and technology, on the assumption that existing constraints on the supply of suitable graduates will preclude output growth of a magnitude that would be undesirable. The new support measures for research recently introduced, or expected to be introduced shortly by the new Irish Research Council for Science, Engineering and Technology, should go a long way towards implementing such a policy but may still fall short of providing support for all post-graduate students.

The anticipated increase in the immediate future in the demand for post-doctoral researchers, caused by the new investments in research in the National Development Plan, will necessitate the attraction of suitably qualified people from abroad. This reflects the probable shortage of candidates in the country and the need for an inflow of new blood from overseas.

The Expert Group therefore commissioned a benchmarking study of mechanisms and strategies which other countries use to attract researchers from abroad. The study, published by Forfás and the HEA, was undertaken by Technopolis Ltd., who examined the situation in relation to attracting researchers from abroad in five countries – the two big international players, the U.S. and U.K., and three smaller European countries, Finland, Denmark and The Netherlands. They also looked briefly at the situation in France and South Korea. The key findings of their report are that:

- Despite the international reputation for research and the attractiveness of some universities in the U.K. and the U.S., both countries actively work to attract research graduates. In particular, the U.K. has many funding opportunities for foreign research graduates from all over the world. Countries more similar to Ireland, i.e. the Netherlands, Denmark and Finland, are not as successful in attracting foreign researchers and at the same time are less active in pursuing activities to improve this.
- Regulatory barriers are a key obstacle to international movement by foreign researchers. Impediments include insufficient information and lack of transparency concerning funding opportunities and application rules; complex immigration procedures; and difficulties with practical arrangements such as housing.
- The amount and level of funding for research graduates and post-doctoral researchers varies enormously among the benchmark countries. In the smaller European countries, foreign research graduates and post-doctoral researchers are typically part of the university staff, do not pay any fees and receive a salary during their degree course or their post-doctoral research. This is different from the U.K. and U.S. where foreign research graduates pay – sometimes high – fees and have to find their own sources of funding from various organisations offering grants and stipends.



- The three smaller European countries all state in their key policy documents that internationalisation of research and improving mobility of researchers is important. But the attraction of foreign researchers is not an explicit or significant element of their strategies to tackle their skills shortages problem. The expansion of the research system, the filling of vacancies in some science areas and the improvement of career structures in all three countries are predominantly tackled through internal improvements of the research system, and only marginally by pro-actively targeting foreign researchers.
- The key strategies and mechanisms to attract researchers found in the countries benchmarked are:
 - Making the academic system more open and flexible (Netherlands, France, Finland, Denmark)
 - Improving regulatory conditions, particularly ac concerns immigration (France, U.S.)
 - Better sign-posting and information at national level (Finland, France)
 - Dedicated grants for foreign researchers (U.K., Finland, Netherlands, South Korea)
 - Adapting income situations to market forces (Netherlands, Finland)
 - Providing tax reductions specifically for researchers and knowledge-workers (Netherlands, Denmark, France)
 - More active international marketing and support for international researchers at the level of universities (Finland, Netherlands, U.K.).
- The universities themselves are the most active players in the search for foreign talent. In the cases examined, the universities had good liaison and support functions in place for foreign students. Pro-active marketing is done on an inter-continental scale. International networks are used to exchange or identify potential candidates.

Technopolis made the following policy recommendations to attract researchers from abroad to Ireland:

- **Build up centres of excellence**
The human mobility literature is very clear on the fact that for the best talents to move to another country, the main attraction is the possibility to work with internationally renowned professors, research groups and universities. Therefore, the key long-term strategy is to strengthen Ireland's science system as a whole and its centres of excellence in particular.
- **Improve international networks and the international visibility of Irish universities**
This works both ways: through international networks senior Irish researchers can identify and acquaint themselves with talented graduate researchers and the latter group can be made aware of opportunities in Ireland.
- **Improve the status and remuneration of research students and post-doctorates**
Up to recently, remuneration levels in Ireland were significantly below those in the benchmark countries. This is improving dramatically with the new funding schemes, but needs to be made known to the international science community.
- **Make the move to Ireland for researchers as smooth as possible**
If practical barriers make the move to Ireland a lengthy and complex process, the decision to go to another country where this is much easier could make Ireland lose out on talents. Ireland should exploit its advantages such as a good quality of life and the use of English as its main language.



4.6 Recommendations

Recommendation 4.I

- **National research policy should aim to achieve a substantial increase in the output of doctorates, particularly in Science, Engineering and Technology by building on the funding and support measures for research introduced in 2000/2001.**

The new Irish Research Council for Science, Engineering, and Technology, in consultation with the HEA and with SFI, should put in place as soon as possible mechanisms to support all suitably qualified people wishing to study for a PhD as well as subsequent career paths for post-doctoral researchers.

Recommendation 4.II

- **Action should be taken to increase the attractiveness of research amongst under-graduate students in particular.**

Efforts must be made to promote research as a career option to under-graduates so that transfer rates from under-graduate to post-graduate study are increased. In addition, efforts must continue to be made to make science and engineering degrees an attractive option for school-leavers in order to increase the pool of potential researchers in the future.

Recommendation 4.III

- **Measures should be taken to attract researchers from abroad.**

The two recommendations in the Technopolis Report in relation to centres of excellence and remuneration of post-graduate and post-doctoral researchers are already being addressed to some extent in the new and emerging funding mechanisms although the urgent need to improve the status and remuneration of all research students and post-doctorates has been noted already. Universities should be allowed to recruit from abroad with the current and new funding mechanisms. They should also seriously consider the provision of housing or housing grants to those coming to Ireland from abroad.

The two recommendations in relation to international networks and visibility of Irish universities and making the move to Ireland as smooth as possible require further consideration.

Recommendation 4.IV

- **A working group including Forfás and the HEA, as well as representing the Deans of Research in higher education institutions and the two Irish Research Councils, should be set up to examine international networks and the international visibility of Irish universities and how to make the move to Ireland of researchers as smooth as possible.**

Recommendation 4.V

- **HEA Database should be further developed.**

The Expert Group now has significantly more information available to it to look at the future supply of researchers. However, it considers that it is necessary for the HEA to develop further its database and to make more detailed information available. In particular, there is still no significant information on the research activities of the Institutes of Technology. Furthermore, there are gaps in the availability of data by field of study particularly in relation to awards information. In addition, there is a need to set out the year of study for post-graduate students as this is vital for planning purposes.



Recommendation 4.VI

- ***The HEA should continue to benchmark Irish third-level research performance.***

The Expert Group noted the statement of the Minister for Education and Science on the need for the HEA to take a number of steps to implement the report of the Review Committee on Post Secondary Education and, in particular, that the HEA should benchmark Irish performance vis-à-vis the top quarter of OECD countries on an ongoing basis and recommend any necessary adjustments to the level of third-level provision.



5. Life Sciences

5.1 Introduction

This Chapter of the Report deals with the demand and supply of skilled staff to industries in the following sub-sectors:

- Pharmaceuticals;
- Chemicals; and
- Biotechnology.

It has become increasingly evident that there is a major shift in the pattern of companies looking at Ireland as a location for investment in these sectors, with a significant rise in interest from companies in the Biopharmaceutical²² sector. The next Expert Group review of the sector will widen the scope of skill sets examined and will examine in some detail the additional types of professionals required by these new industries.

The Second Report of the Expert Group addressed the demand for Chemical and Biological Sciences skills from the Pharmaceuticals, Other Chemicals, Plastics & Rubber, Medical Devices, Food, Drink and Tobacco sectors. It identified four main areas where projections of demand exceeded projections of supply. These were:

- Chemistry Degrees;
- Biological Sciences Degrees;
- Chemical and Biological Sciences Sub-degrees; and
- Chemical Engineering Degrees.

The Second Report recommended that 200 more degree graduates per annum should be produced in the Biological Sciences; 80 more in Chemistry, and 10 more in Chemical Engineering. The Report recommended that the new places be provided on a phased basis.

As part of the increase in numbers studying Biological Sciences, the Second Report indicated a need for a number of graduates with expertise in Bioinformatics.²³ Rather than creating specialised programmes in this area, it suggested that this requirement should be addressed through specialisations in the second and third year of Biological Sciences programmes. While the Second Report found that another 120 science technicians were required per annum, a fall-off in interest among college applicants meant that it would be a challenge to maintain existing output, so that the provision of additional places on existing programmes was not an appropriate response. Instead, the Report recommended that the Accelerated Technician Programme be extended to cater for 250 science technicians, and that more emphasis should be placed on up-skilling people already working in the sector.

²² Biopharmaceuticals involve the production of drugs using a biotechnology process rather than through the traditional chemical process.

²³ Bioinformatics involves the application of computer-supported data analysis to the Biological Sciences. The requirement for people with skills in this area has been increased greatly by the opportunity to make practical and commercial use of the vast amount of genetic data emerging from the Human Genome Project and related initiatives.



The Second Report also highlighted a fall-off in interest in Science among college applicants, which threatened the number of students taking Science. It made a number of recommendations designed to increase interest in the subject.

In response to the recommendations made in the Second Report, the HEA requested proposals from third-level colleges to create additional college places as a first phase of the response to the Expert Group's report. The proposals accepted amount to an increase in intake of 81 into Chemistry programmes (50 into universities and 31 into Institutes of Technology), and 74 into Biological Sciences programmes (50 into universities and 24 into Institutes of Technology) for the academic year 2000/01. A proposal to increase intake into Chemical Engineering by 12 in the academic year 2001/02 has also been accepted.

The responses are planned to meet:²⁴

- 81% of the overall projected requirement for additional Chemistry degrees;
- 30% of the overall projected requirement for additional Biological Sciences degrees; and
- all of the projected requirement for additional Chemical Engineering degrees.

The requirement for graduates with skills in Bioinformatics is being addressed through the expansion of four existing degrees (leading to an increase in intake of 71), and through making Bioinformatics courses available (either as an option or a core subject) as part of these degrees. Bioinformatics courses are available to the existing intake as well as the new intake of students.

The Institutes of Technology have developed a Science Accelerated Technician Programme. The first intake was of 90 students in January 2000. This intake was constrained by the number of suitable applicants. Preliminary indications are that the intake in 2001 will be greatly lower than this.

5.2 Updated Demand Projections

The projections of demand for scientists in the Second Report were based on projections of industry growth, and were based on a demand model that converted these growth projections into projections of demand for high-level science skills.²⁵ In order to update the analysis, the Expert Group updated the industry growth projections, and applied these updated projections to the growth model. The terminal date of the analysis was moved on from 2005 to 2006. The results are presented below in Tables 5.2-5.4. Two factors have had a significant impact on the demand projections. Firstly, after another year of strong growth in the Pharmaceuticals sector in 2000, the base level of employment on which the projections are founded is now about 10% higher than in 1999. As the available evidence suggests that employment is increasing at a compound rate, and as no very substantial changes in the sector's prospects have emerged in 2000, this increases the volume of demand projected by about 3%. This has led to projections of increased demand for Chemists, Biological Scientists, Chemical Engineers and Science technicians.

Secondly, increased experience with the formation and development of indigenous Biotechnology companies has led to a more conservative view of what can optimistically be expected of the sector. This has led to a projected fall in average annual demand for Biological Scientists (from 145 to 117) and more than offsets the increase in demand for scientists in the Pharmaceuticals sector (from 98 to 110).

²⁴ In each case, non-completion rates of 20% are assumed i.e. 20% of first year students in life sciences are not expected to graduate.

²⁵ For details of the model, see Second Report, 1999, p. 43.



There have been many major developments in Bioinformatics in 2000, including the publication of the first draft of the Human Genome. To assist the Expert Group in proposing responses to these rapid changes in circumstances, IDA Ireland and Enterprise Ireland are carrying out a review of industry Bioinformatics skills needs, and are consulting with third-level colleges on the courses being offered and proposed.

The Expert Group has updated its employment projections and reviewed the prospects of each of the sectors covered. Table 5.1 provides the original employment projections (1998) that formed the basis of the Second Report's projections and Table 5.2 provides the up-dated projections based on an assessment of growth in each of the sectors covered.

TABLE 5.1: ORIGINAL SECTORAL EMPLOYMENT PROJECTIONS, 1998-2005

	PHARMA -CEUTICALS	OTHER CHEMICALS	PLASTIC & RUBBER	MEDICAL DEVICES	FOOD	BEVERAGES & TOBACCO	INDIGENOUS BIOTECH
Annual Change	+8.8% pa	+3.3% pa	+2.8% pa	+10% pa	+300 pa	+1% pa	not available
1998	12,200	9,000	11,400	11,700	45,900	6,000	400
1999	13,300	9,300	11,700	12,900	46,200	6,100	500
2000	14,400	9,600	12,100	14,100	46,500	6,100	700
2001	15,700	9,900	12,400	15,300	46,800	6,100	900
2002	17,100	10,300	12,700	16,400	47,100	6,100	1,100
2003	18,600	10,600	13,100	17,600	47,400	6,200	1,500
2004	20,300	10,900	13,500	18,800	47,700	6,200	1,900
2005	22,000	11,300	13,800	20,000	48,000	6,200	2,400

Source: McIver Consulting, 1998, based on CSO and IDA and Enterprise Ireland projections

TABLE 5.2: UPDATED SECTORAL EMPLOYMENT PROJECTIONS, 1999-2006

	PHARMA -CEUTICALS	OTHER CHEMICAL	PLASTIC & RUBBER	MEDICAL DEVICES	FOOD	BEVERAGES & TOBACCO	INDIGENOUS BIOTECH
Annual Change	+8.82% pa	+3.31% pa	No Change	+10% pa	+400 pa	+50 pa	not available
1999	14,000	9,600	11,300	11,900	47,200	6,100	*
2000	15,200	9,900	11,300	13,100	47,600	6,100	415
2001	16,600	10,200	11,300	14,400	48,000	6,100	514
2002	18,000	10,600	11,300	15,800	48,400	6,100	630
2003	19,600	10,900	11,300	17,400	48,800	6,200	772
2004	21,400	11,300	11,300	19,100	49,200	6,200	949
2005	23,200	11,700	11,300	21,000	49,600	6,200	1,168
2006	25,300	12,100	11,300	23,200	50,000	6,200	1,442

Source: McIver Consulting, 2000, based on CSO and IDA and Enterprise Ireland projections

A new projection of demand for graduates was developed by inserting the updated sectoral growth projections into the existing model. Table 5.3 sets out the projected demand for Life Sciences graduates.



TABLE 5.3: COMPARISON OF ORIGINAL AND UPDATED PROJECTIONS FOR LIFE SCIENCES GRADUATES

	PHARMACEUTICALS, CHEMICALS, PLASTICS & RUBBER, MEDICAL DEVICES		FOOD, DRINK, TOBACCO		INDIGENOUS BIOTECHNOLOGY	
	Original	Update	Original	Update	Original	Update
1997/98	618	738	400	310	*	*
1998/99	659	629	321	416	128	*
1999/00	670	689	311	299	149	*
2000/01	739	744	313	324	153	68
2001/02	800	805	314	327	170	79
2002/03	823	870	328	329	257	96
2003/04	895	941	318	343	297	118
2004/05	929	1018	320	334	357	146
2005/06		1103		339		181

Source: McIver Consulting, 1998 and 2000

The model divides the overall demand for Life Sciences graduates according to the type of qualification required, based (primarily) on the mix of qualifications of graduates recruited from among 1997 graduates (see Table 5.4). Engineering graduates (except for Chemical Engineers) are excluded from this analysis, as they are addressed in other chapters of this Report.

TABLE 5.4: COMPARISON OF AVERAGE ANNUAL DEMAND OVER PROJECTION PERIODS FOR ORIGINAL PROJECTION (2000/01 to 2004/05) AND UPDATED PROJECTION (2001/02 to 2005/06)

	PHARMACEUTICALS, CHEMICALS, PLASTICS & RUBBER, MEDICAL DEVICES		FOOD, DRINK, TOBACCO		INDIGENOUS BIOTECHNOLOGY*		TOTAL	
	Original	Updated	Original	Updated	Original	Updated	Original	Updated
Scientist Higher Degree	95	108	10	10	102	65	207	183
Scientist Graduate Diploma	60	68	17	18			78	86
Chemistry Degree	89	101	3	4			93	105
Applied/Analytical Degree	19	22	8	9		27	31	
Biological Sciences Degree	98	110	26	27	145	117	268	254
Other Science Degree	74	83	14	14		88	97	
Scientist Sub-degree	219	248	139	147		358	395	
Ag. Scientist Higher Degree	4	5	8	8		12	13	
Ag. Scientist Degree	2	2	14	14		15	16	
Food Science Higher Degree	0	0	14	15		14	15	
Food Science Degree	4	4	29	31		33	35	
Chemical Engineering Degree	33	37	3	4			36	41
Total*	697	788	285	301	247	165	1229	1264

Source: McIver Consulting, 1998 and 2000.

Note: * Updated projections are for annual demand in 2006, rather than for average annual demand over the period.



5.3 Updated Supply Projections

5.3.1 *Sub-Degree Level*

The number of graduates with *diplomas* in Chemistry has been quite steady over a period of years, dipping in the academic year 1998/99. Graduation figures in 1999/00 suggest that the supply has recovered since then. The number of graduates with diplomas in Biological and Food Sciences decreased by approximately 40 between 1997 and 1999. Graduation figures suggest a further fall of around 30 is likely to have occurred in the academic year 1999/00.

Numbers of graduates with *certificates* is falling in both Chemistry and Biological Sciences. The number of graduates with certificates in Chemistry is projected to fall from 214 in the academic year 1996/97 to 103 in 2000/01. The number of graduates with certificates in Biological Sciences is projected to fall from 444 to 207 over the same period.

The trend in college applications and acceptances suggests strongly that intake into Chemistry and Biological Sciences certificate programmes will continue to fall, further reducing the output of graduates with certificates. The reduction in the supply of students is likely to cause some courses to be discontinued.

As rates of transfer from certificate to add-on diploma programmes are already high, and as most relevant diploma programmes are add-on (rather than ab-initio), diploma numbers are expected to fall in both Chemical and Biological Sciences. A fall is already evident in Biological Sciences, and is expected to become evident in Chemistry within the next year or two. This fall may, however, be partially mitigated if students from the Accelerated Technician Programme and the new Institute Trainee Programme continue their studies in significant numbers after receiving certificate-level qualifications.

A further factor constraining the supply of sub-degree graduates is that the rate of transfer into degree level courses has been rising, increasing the supply of degree level qualifications, but reducing the supply of graduates with sub-degree qualifications directly to the labour force.

5.3.2 *Degree Level*

Even discounting the skills supply interventions that have followed on the Expert Group's recommendations, the supply of degree level Science graduates (excluding Computing) has improved in the 1990s. The number of graduates from the universities has been increasing since 1997 (the base date used in the Second Report), although current enrolment statistics suggest that graduate numbers in relevant disciplines will return to 1997 levels by perhaps 2004 (again, discounting the skills supply interventions).

The number of degree graduates from the Institutes of Technology has been increasing, driven particularly by increases in the numbers undertaking add-on degrees. The number of Chemistry graduates increased by around 60 between 1997 and 2000, while the number of Biological Sciences graduates increased by around 30 over this time.²⁶

However, this positive trend in the Institutes of Technology now faces reversal. Most relevant degrees are one-year add-on courses whose intake depends on the supply of diploma holders. If the supply of diploma holders falls as anticipated, this will undermine degree intake, leading to a reduction in the number of degree graduates. It is not possible to be precise about this, but the resulting fall in degree numbers could be in the region of 35 in each of Chemistry and Biological Sciences over a period of two years.

26 This assumes that numbers graduating amount to 90% of graduation year class numbers.



Historically, two courses have supplied approximately 60 graduates in Chemical Engineering each year. As the Second Report of the Expert Group was being prepared, the University of Limerick introduced a graduate diploma in Chemical Engineering, which is now producing approximately 16 additional graduates per annum. The Second Report of the Expert Group recommended that a further 10 Chemical Engineering graduates should be produced per annum, leading to a total increase of 26 (or 43%) in annual output.²⁷

5.4 Projected Skills Gap

5.4.1 *Constraints on the Future Supply of Qualified Scientists*

The Expert Group reiterates its concern 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 in the years ahead. Numbers of applicants are falling both in absolute terms and as a percentage of college applicants. The 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 continues to be concerned at the perception that Chemistry is a difficult subject in which to achieve high points in the Leaving Certificate. In this regard, it notes the view of the Joint Oireachtas Committee on Education and Science²⁸ that:

“It is far more difficult to obtain high points in the Leaving Certificate in Physics and Chemistry than in other subject options. This has undoubtedly contributed to the declining choice of these subjects. Physics and Chemistry at Leaving Certificate attracts far more high performers at the Junior Certificate than other subjects. However, these high performers do not do correspondingly well in their Leaving Certificate. There is a substantially higher degree of difficulty in science subjects, particularly Physics and Chemistry, and especially for pupils of ordinary levels of ability and those who take Ordinary Level papers. In 1999 and again in 2000, the Department substantially relaxed the marking in Physics and in Chemistry. However, this change in direction of policy is not being communicated and has not persuaded pupils to opt for these subjects.”

The Expert Group believes that the shortage of third-level applicants is, at least in part, a result of the continuing decrease in the numbers studying Chemistry at second-level. It welcomes the initiatives taken by the Department of Education and Science, and by the National Council for Curriculum and Assessment (NCCA), to increase numbers studying Chemistry.

The Expert Group particularly welcomes the establishment of a Task Force on the Physical Sciences by the Minister for Education and Science, with the brief of examining and addressing the fall-off in participation in the Physical Sciences at second-level and third-level.

²⁷ The demand analysis took into account the requirement for Chemical Engineers in the Process Engineering Consultancy sector, as well as in the Pharmaceutical and Other Chemicals sectors. It also made an allowance for the requirement for Chemical Engineers in other sectors.

²⁸ Report of the Joint Committee on Education and Science on Science and Technology.

5.4.2 Chemistry, Biological Sciences and Chemical Engineering

The Second Report of the Expert Group made significant recommendations for the creation of new places in Chemistry, Biological Sciences and Chemical Engineering degree programmes. In assessing what remains to be done, it is necessary to have regard to:

- Changes in requirements resulting from updating the projections of industry demand;
- The interventions already undertaken; and
- Changes in output that are not related to the skills interventions undertaken, particularly the increase in degree output from the Institutes of Technology.

When these factors were taken into account, the Expert Group found that no further intervention was required to increase places on Chemistry or Biological Sciences degree programmes, provided that the existing output can be maintained from the universities and Institutes of Technology.

It found that a further intervention sufficient to produce at least another 14 degree graduates per annum is required in Chemical Engineering in order to meet the future demand projection. This would bring the annual output of Chemical Engineering graduates (including graduates with diplomas) to approximately 100. However, there is an existing backlog of vacancies in the Pharmacy, Chemicals and Biotechnology sectors, which is large relative to annual third-level graduate output. To address this, the Expert Group recommends that the actual increase in graduates with degrees should be 24 per annum (rather than 14). This would bring the annual output of Chemical Engineering graduates to 110.

TABLE 5.5: UPDATE ON RECOMMENDED INCREASES IN ANNUAL DEGREE GRADUATE NUMBERS FROM SECOND REPORT OF THE EXPERT GROUP

	RECOMMENDED INCREASE IN GRADUATE NUMBERS (2ND REPORT) (A)	CHANGE IN REQUIREMENT AS A RESULT OF UPDATED PROJECTIONS (B)	UPDATED RECOMMENDATION (C) = (A+B)	SKILLS INITIATIVE PROVISION ARRANGED TO DATE (D)	IMPACT OF GROWTH IN INSTITUTES OF TECHNOLOGY OUTPUT (E)	BALANCE REQUIRED (F) = (C-D-E)
Chemistry Degree	80	+47	+127	65	60	2
Biological Sciences Degree	200	-114	+86	59	30	-3
Chemical Engineering Degree	10	+14	+24	10		14

Aside from the Accelerated Technician Programme intervention, the supply of sub-degree graduates to industry continues to deteriorate, increasing the size of the gap between supply and demand. The deterioration is caused both by a continuing decline in the numbers entering certificate programmes and by a significant increase in the numbers proceeding to take add-on degrees. The Expert Group is of the view that it will be necessary to bridge the resulting skills gap primarily through up-skilling existing employees, and that the Institutes of Technology have a major role in supporting industry to achieve this.

The Expert Group therefore welcomes the Institute Trainee programme, which has been approved by the Department of Education and Science for implementation by the Institutes of Technology. The programme is



targeted at key technician skill needs identified by the Expert Group in a range of sectors, including the Pharmaceutical, Chemical, Healthcare and Food Technology sectors.²⁹ A graduate of the Institute Trainee Programme will simultaneously be an employee and a student, and will gain both academic and work-based credits towards a National Certificate or DIT Certificate, over a period not exceeding three years. The Institutes of Technology will develop the Institute Trainee Programme in close dialogue with industry. Employers will have an opportunity to address their needs for technicians either by up-skilling existing employees or by recruiting persons who will acquire a technical qualification through the programme. The Department of Education and Science will resource the formal educational component of the programme. The programme is planned to start in 2001.

The Expert Group has also reviewed the supply-demand position in the Chemical and Biological Sciences sectors for other skills categories, including degrees in Food Science and Agricultural Science, and higher degrees in Science. It has concluded that there is an adequate supply of Food Science and Agricultural Science graduates for industry needs. Sufficient increases in the supply of higher degree graduates should follow from the expansion of primary degree provision, provided that graduates in Chemistry and Biological Sciences from the Institutes of Technology have ready access to high quality research degree opportunities.

5.4.3 Instrumentation Physics

The Expert Group's Second Report addressed the industry's needs for graduates in the Chemical and Biological sciences, but did not address its needs for graduates in Physics. Graduates in one area of Physics – Instrumentation Physics³⁰ – are employed in significant numbers in the Pharmaceuticals and Other Chemicals sectors. The main Instrumentation courses are based in Institutes of Technology.

The industry has identified a shortage of Instrumentation Physics graduates (this is consistent with statistics from the HEA's Annual First Destination of Award Recipients survey, which suggests that there has been full employment of these graduates over a number of years). However, the extent of the shortage has not been quantified accurately. At degree level, the number of Instrumentation degree-level graduates³¹ has increased from 1997 to 1999. In academic year 1999/00, a new add-on degree was started, which should increase degree graduate output by more than half, to around 40 per annum. The Expert Group will review whether this new supply of graduates is sufficient in the future.

The number of graduates with diplomas in Instrumentation fell from around 44 in 1997 to 35 in 1999, and appear to have held steady in 2000. The numbers of graduates with certificates in Instrumentation fell from around 64 in 1997 to 48 in 1999, but appears to have recovered in 2000.

The future supply of Instrumentation sub-degree graduates faces the same threats as those facing sub-degree graduates in Chemistry and Biological Sciences. If interest in undertaking sub-degree science courses continues to decrease, this will reduce the supply of graduates. At degree level, the threat is greater than for Chemistry and Biological Sciences because existing courses depend on sub-degree graduates as the source of their intake.

29 The other sectors covered are Construction, Electronics Manufacturing, e-Business and Computing (hardware/software). The programme also addresses recommendations II and III of the Expert Group's Report on In-Company Training (2000), which are aimed at increasing the volume of education and training undertaken by operative and craft level staff.

30 Instrumentation physics focuses on the physics and practicalities of measurement. Courses in the area prepare students to work as Instrumentation Engineers and Technicians. Industries in which these occupations are important include Pharmaceuticals, Chemicals, Medical Devices and Electronics.

31 The two degree-level courses are titled 'Chemical Instrumentation'.



5.4.4 *Monitoring Future Trends*

The Expert Group will continue to monitor skills needs in the Chemical and Biological Sciences, in particular the effects of (i) any changes in demand within the overseas and indigenous Biotechnology and Pharmaceuticals sectors and (ii) the fall in third-level applications.

5.5 Recommendations

The Expert Group recommends that:

Recommendation 5.I

- *No additional places should be introduced on Chemistry or Biological Science degree programmes, provided that the existing output from universities and Institutes of Technology can be maintained.*

Recommendation 5.II

- *Given the addition of a new add-on degree in 1999/00, no further increase in Instrumentation Physics places should be made.*

Recommendation 5.III

- *Provision should be made for the supply of at least another 24 graduates with degrees per annum in Chemical Engineering, bringing total annual output to 110.*



6. Employment and Training Needs of the Construction Industry 2001-2006

6.1 Introduction

The Construction industry has grown rapidly in recent years. Output was valued at £14.2 billion (€18.03 billion) in 2000 and employment had risen to 178,100 by the end of 2000.³² This represented an increase of 74% in output volume and 84% in employment since 1995. With regard to the demand for construction workers, the factors that will exert most influence are requirements of the National Development Plan 2000-2006, and the need to address shortages in the housing stock.

In 1999, FÁS, on behalf of the Expert Group and the Construction Industry Training Committee, carried out an analysis of the employment needs of the Construction sector for the period 1999-2003.³³ The analysis focused in particular on the number of craft workers which would be required by the industry in the five-year period 1999-2003. The Expert Group has decided to update these forecasts and to extend the forecast period and the number of occupations covered by the analysis. Specifically, the Expert Group has decided to include professional and non-craft skilled workers in the analysis and to cover all of the period of the National Development Plan (i.e. 2000-2006) in its forecasts.

The Expert Group set-up a special Construction sub-committee, chaired by the Department of Trade, Enterprise and Employment, to undertake this task. It included representatives of the social partners and the Departments of Education and Science, Enterprise, Trade and Employment and Environment and Local Government.

For the purposes of this report, the Construction industry covers the activities incorporated under Division 45 of the NACE (Industrial Classification of Economic Activities in the EC) classification: these activities include site preparation, building, civil engineering, building installation and completion work.³⁴

While these activities include virtually all skilled and semi-skilled workers and general operatives working in the Construction industry, they do not include professional workers, who are employed in business offices rather than in Construction firms, but who are nevertheless engaged in construction-related activity.³⁵ These professionals include architects and architectural technicians, civil engineers, planners and quantity surveyors, and building surveyors. In the second quarter of 2000 there were 6,000 such professionals employed within the Construction industry. In addition, a further cohort of approximately 10,000 such professionals was employed outside the NACE 45 sector, but in construction-related occupations. These occupations are included in the overall forecasts of this chapter.³⁶

The Expert Group based its original forecasts of the employment needs of the Construction industry for the period 1999-2003 on a model developed by FÁS and the Construction Industry Training Committee.³⁷ It is important to emphasise that this model was designed specifically for the purpose of forecasting the demand for craft-workers, and, by implication the future requirement for apprentices in construction-related crafts.

32 Output figures from Construction Industry Review 1999, Outlook 2000-2002, Department of Environment and Local Government. Employment figures are taken from QNHS, 4th Quarter 2000, Central Statistics Office.

33 The Second Report of the Expert Group on Future Skills Needs, Forfás, February 2000.

34 For an elaboration of the various sub-categories comprising NACE 45, see Appendix 1 of the Department of the Environment Review 1999, and Outlook, 2000-2001.

35 These include consultancy businesses, local and central government.

36 Thus the baseline figure for the projections in Table 6.2 is 176,300 rather than the official employment figure for the Construction industry of 166,300.

37 The forecasts of construction employment are based on an econometric equation between projected output and employment, which has been successfully tested retrospectively for 'goodness of fit'. The appropriate 'skills mix' is applied to each component of output to predict the occupational mix.



In the FÁS model, the forecast of the number and type of construction skills required is derived from the anticipated increases in output, as outlined in documents such as the National Development Plan, the Department of the Environment Annual Review and Outlook and other relevant reports.³⁸ The forecasts are based on the assumption that all of the targets in the National Development Plan are achieved and that annual house completions will average 55,000 over the forecast period.

The model distinguishes between 39 different components of Construction output, such as roads and residential housing development, and attributes the appropriate skills mix to the level of planned expenditure under each component. This is necessary because the differing output requirements for each sub-sector demand a differing input of skills. For example, housing is highly craft-skills intensive, whereas road construction is dependent more on plant and machinery drivers and on professional skills.

To date this model has been reasonably accurate in its forecasts of craft employment. However, it is much more difficult to forecast the demand for professional employment because the relationship between output and employment is more complex than it is for craft employment. The ability of the model to accurately forecast employment growth in these professional occupations is as yet uncertain. The forecasts from the model have been adjusted, therefore, where appropriate as a result of discussions with experts and representatives of the relevant professional organisations and groups.

6.2 Demand for Construction Workers

With regard to the demand for Construction workers, the factors that will exert most influence are the requirements of the National Development Plan 2000-2006, and the need to address shortages in the housing stock. The National Development Plan involves an investment of £22.646 billion (€28.754 billion) on physical infrastructure. This represents an average annual expenditure of £3.235 billion (€4.108 billion); outlined in Table 6.1 below.

TABLE 6.1: PLANNED INVESTMENT IN PHYSICAL INFRASTRUCTURE IN THE NATIONAL DEVELOPMENT PLAN, 2000-2006 (£ /€ MILLIONS)

	TOTAL	€	AVERAGE	PER ANNUM €
National Roads	£4,700	€5,967.77	£671.4	€852.50
Non-national roads	£1,600	€2,031.58	£228.6	€290.26
Public transport	£2,234	€2,836.59	£319.1	€405.17
Environmental Services	£3,601	€4,572.33	£514.4	€653.15
Energy	£145	€184.11	£20.7	€26.28
Housing	£6,000	€7,618.43	£857.1	€1088.29
Health	£2,000	€2,539.48	£285.7	€362.76
Education	£1,624	€2,062.05	£232.0	€294.58
Other (regional)	£742	€942.15	£106.0	€134.59
Total	£22,646	€28,754.49	£3,235.1	€4,107.73

Source: Department of the Environment and Local Government Annual Review and Outlook, 2000-2002

38 While the projections for employment growth in the year 2001 are based on the official output forecast of 8%, there are indications that construction output, particularly in residential construction, has slowed down in the beginning of 2001. These trends, together with difficulties caused by the emergence of foot and mouth disease, may yet result in a downward revision of the official forecasts for 2001.



Achievement of the National Development Plan targets will give rise to a significant increase in the demand for Construction workers in three areas in particular; the construction of roads, social housing, and environmental services.³⁹ Expenditure on the national road network will rise from £228.6 million (€290.26 million) in 1999 to an annual average of £671 million (€851.99 million) over the forecast period. Thus, there will be a significant increase in the demand for Construction road-workers at all skill levels from civil engineers to general operatives. This demand will be further fuelled by the planned increased investment in environmental services, which is expected to increase from £274 million (€347.91 million) in 1999 to an annual average of £514 million (€652.65 million) over the duration of the Plan.

There will also be a substantial increase in expenditure on social housing. This is expected to rise from £400 million (€507.90 million) in 1999⁴⁰ to an average annual expenditure of £857 million (€1088.17 million). Notwithstanding this significant increase in the levels of investment planned in social housing, new private house construction will have to increase by approximately 10,000 overall to meet expected market demand for an average of 55,000 annual house completions over of the period.

Finally, there will be a significant amount of both publicly and privately funded investment in civil engineering and general contracting projects over the forecast period, which are not included in the National Development Plan. These include investment in energy, telecommunications, seaports and airports.⁴¹

The forecasts of Construction employment are based on an econometric equation between projected output and employment, which has been successfully tested retrospectively for 'goodness of fit'. The appropriate 'skills mix' is applied to each component of output to predict the occupational mix. The model forecasts that the total number of Construction workers in employment will be almost 220,000⁴² by 2006. This represents an increase on the estimated employment figure of 176,300 in the Second Quarter of 2000 of 43,612 or 24.7%.⁴³

TABLE 6.2: OUTPUT AND EMPLOYMENT FORECASTS (Base level, 2nd. Quarter 2000 = 176,300)

Year (2nd. Quarter)	Output Growth	Numbers Employed	Employment Growth	% Employment Growth
2000	9%	176,300	+24,200	16%
2001	8%	189,769	+13,469	8%
2002	6%	199,254	+9,485	5%
2003	6%	207,228	+7,974	4%
2004	4%	211,373	+4,145	2%
2005	3%	215,600	+4,227	2%
2006	3%	219,912	+4,312	2%

The rise in Construction employment forecast by the model is significantly below the level of employment growth recorded in the two years immediately preceding the forecast period, i.e. 1999 and 2000, when direct employment increased on average by 20,000 a year. In this projection, total direct employment will rise by 43,600, or by just over 7,000 a year on average.

39 Some of the expenditure under the National Development Plan will not give rise to increases in construction activity per se. This is the case in respect of some of the expenditure on public transport, education and health, where a significant proportion of expenditure is for the purchase of machinery and equipment.

40 Includes acquisitions.

41 Examples include Sports Campus Ireland and the Eastern By-Pass.

42 Note that this figure includes approximately 12,500 who are not part of the formally designated construction industry (i.e. NACE 45).

43 Includes 10,000 professionals in addition to those required in the NACE 45 categories.



The significant decline in the rate of growth in employment forecast by the model reflects the fact that the rate of increase in output growth in the Construction industry is forecast to decline to 8% in the year 2001, after two years averaging double-digit growth, and to continue to decline throughout the forecast period 2000-2006.

It is also anticipated that the relationship between output and employment will show positive productivity gains over the forecast period (i.e. output will grow faster than employment). This reflects the fact that a higher proportion of total expenditure will be allocated to civil engineering projects and proportionately less to residential construction, during the forecast period than has been the case to date. The former are less labour-intensive than residential construction and this will be reflected in a change in the output/employment relationship.

The model forecasts a rise in direct employment in Construction activity between the second quarter of 2000 and the second quarter of 2001 and will reach around 190,000. The rate of increase in employment, however, will begin to decline in subsequent years. Indeed, the model forecasts that employment growth in the Construction industry will reflect the projected average employment growth in the economy of 2% over the latter half of the forecast period. The total number of workers required to produce this level of output is a function of two factors. Firstly, the projected increase in output will require a certain number of additional workers. Secondly, some existing workers will leave the Construction sector over the forecast period, and they will have to be replaced.

Table 6.3 shows that estimated employment in Construction activity (including professionals employed in other sectors) in the second quarter of 2000 was 176,300. The forecast is for an increase in employment up to the second quarter of 2006 of 43,612. This is broken down into main occupational groups in Table 6.3. The table also shows that the estimated recruitment level required to reach the employment level is approximately 80,000, including over 50,000 skilled workers. The estimated total wastage rate over the forecast period is 35,986.

TABLE 6.3: ESTIMATED REQUIREMENT FOR SKILLED CONSTRUCTION WORKERS, 2001-2006

TYPE OF SKILLS	ESTIMATED EMPLOYMENT IN 2000	ESTIMATED EMPLOYMENT IN 2006	INCREASE 2000-2006	TOTAL WASTAGE 2001-2006	TOTAL REQUIREMENT 2000-2006
Management/contractors	13,500	15,963	2,463	2,638	5,101
Professional	13,300	17,710	4,410	2,875	7,286
Craft	70,000	87,365	17,365	14,317	31,682
Other skilled construction	13,790	17,781	3,991	2,900	6,891
<i>Total skilled workers</i>	<i>110,590</i>	<i>138,819</i>	<i>28,229</i>	<i>22,730</i>	<i>50,960</i>
General operatives, others	65,710	81,092	15,383	13,256	28,638
Overall Total	176,300	219,911	43,612	35,986	79,598

Workers leave an economic sector or occupation for many reasons, including retirement, illness, death, or simply because they wish to work elsewhere in the economy. Most of the occupations that are the focus of this chapter, with the notable exception of electricians, are specific to the Construction industry. The rate of transfer to other sectors is not significant. In addition, many of those working in the industry, particularly in the crafts, are relatively young, reflecting the increase in the apprentice/craft ratio of recent years, and the influx of professional workers from abroad. Furthermore, wages are exceptionally high for craft workers



at present. This may persuade some mature workers to remain within the sector over the next few years. For these reasons, a 3% wastage rate is assumed.⁴⁴ This results in a projected wastage of about 36,000 persons over the period.

6.3 Supply of Construction Workers

The Construction industry is inherently cyclical. Consequently there tends to be significant levels of labour mobility in response to changing patterns of demand in different economies at different times. There are two factors that will have a major influence on the supply of skilled Construction workers over the forecast period, 2000-2006. These factors are the demographic trends in the Irish labour market and the emerging skill shortages in the Construction industry in the United Kingdom. The U.K. government is investing in a major programme of infrastructure improvements over the next decade and there are widespread concerns that there will not be sufficient skilled workers to meet the needs of the industry.⁴⁵ This is particularly the case in respect of civil engineers. Recent surveys indicate that British civil engineering companies are experiencing extreme difficulties in recruiting civil engineers.⁴⁶

With regard to demographic trends, the numbers of young people in the labour force will decline dramatically over the forecast period. For example, the number of 18 year-olds will decrease from approximately 70,000 at present to approximately 54,000 by the year 2006. Contemporaneously, there will continue to be a wide choice of third-level courses available to young people. Construction-related disciplines will therefore face greater competition for new entrants.

In addition, the current low levels of unemployment mean that there is little scope for increased supply from that source. Furthermore, many Irish emigrants working in the Construction industry overseas have returned in recent years and, given the significant depletion of this pool, it may be harder to encourage others to return in the future. Thus, overall, it may be difficult to meet the projected shortages from the traditional sources of supply.

6.4 Projected Skills Gap

The emergence of skill shortages in the U.K., particularly in civil engineering, could have a serious adverse impact on the capacity of the Construction industry in Ireland to complete the civil engineering projects contained in the National Development Plan on time. A significant number of British civil engineering companies have located in Ireland in response to the opportunities presented by the National Development Plan and other construction projects. Their continued presence in the Irish market is an important factor in ensuring that there are sufficient resources available within the country to undertake the major civil engineering contracts in the National Development Plan and may be adversely influenced by the emergence of new industry demand in the U.K.

Table 6.4 below shows the estimated difference between the total number of workers required within the different occupational groups and the total number of students or apprentices who will qualify⁴⁷ in the corresponding disciplines in Ireland over the duration of the forecast period.

⁴⁴ Unpublished ESRI data shows wastage rates for professional workers at 2.8% and for skilled workers (other than maintenance) at 2.7%.

⁴⁵ UK Transport Plan July 2000 proposes an investment of £70 billion.

⁴⁶ UK Department of Environment, Construction Monitor, February 2001.

⁴⁷ The figures, other than apprentices, are based on a survey of third-level educational institutions conducted by the Construction Industry Federation in Autumn 2000. Both the figures on apprentices and construction students include only those estimated to be available to work in the industry.

TABLE 6.4: ESTIMATED REQUIREMENT FOR ADDITIONAL SKILLED CONSTRUCTION WORKERS, 2001-2006

Type of Skills	Estimated total recruitment requirement	Estimated total number qualifying**	Estimated shortages
Management/contractors	5,101	1,648	-3,453
Professional	7,286	3,207	-4,079
Craft	31,682	19,689	-11,993
Other skilled construction*	6,891	0	-6,891
Total skilled workers	50,960	24,544	-26,416

Notes:

* *Other Skilled Construction* includes general operatives and some skilled workers who are not engaged in construction activity such as e.g. motor mechanics, clerk typists and accountants.

** *Estimates of total numbers qualifying refer to new entrants or apprentices; they do not include employees, other than apprentices, who are in receipt of training. Thus, the substantial number of skilled construction workers who are receiving training from FAS under the Construction Certificate Scheme are not included in this table.*

The number of skilled Construction workers qualifying in Ireland over the forecast period will be approximately 26,400 less than the number required to achieve the level of projected output over the period. This shortage consists of project managers/site supervisors (3,453), professionals (4,079), craft workers (11,993) and other skilled workers (6,891). Appendix 3 provides a detailed breakdown by occupation for professional skills, craft skills and other skilled workers.

6.4.1 *Managers/Contractors*

There is no category for Construction foreman/woman or site supervisor in the occupational codes of the CSO. This is an unfortunate omission because these workers play a critical role in the overall management of construction projects. The CSO provides data on building managers and on contractors. The numbers employed in these categories provide a broad indication of the numbers required at senior level management and at owner-management levels.⁴⁸ In Table 6.4 above, this figure is compared to the total numbers who graduate from construction management programmes every year.

The figures show that approximately 5,100 managers/supervisors will be required by the industry over the course of the National Development Plan but that only 1,650 students will graduate in these skills, resulting in a shortage of approximately 3,450. Discussions with both employers and the Construction Industry Federation also indicate that there is a serious shortage of qualified project managers and site supervisors in the industry.

Many employees in other sectors of the economy attend part-time courses to upgrade their management and supervisory skills. Unfortunately, there are virtually no part-time courses on any aspect of construction management or supervision.⁴⁹

48 Employees (as opposed to owner-managers or contractors) in the Construction industry who work as supervisors are either categorised by the Central Statistics Office as managers or as working within the craft in which they are qualified (e.g. carpenter). Thus, the figures above understate the number of supervisors required.

49 The exception is the Site Management Education and Training Scheme offered jointly by the Construction Industry Federation and the Chartered Institute of Builders on a pilot basis in Dublin and Cork.



Furthermore, although there are a number of degree courses in construction management, they are located in the regions, specifically in Tralee, Limerick and Waterford. There is no degree course in construction management in the greater Dublin area.

6.4.2 *Professional Skills*

There were significant shortages of professional workers at the beginning of 2000. The industry has been extremely active in recruiting professional construction workers from overseas, and discussions with employers during the year 2000 indicated that virtually every civil engineering company had unfilled vacancies.

The model estimated the demand and supply of professional construction workers in respect of seven occupations: civil engineer, civil engineering technician, architect, architectural technician, quantity surveyor, town planner, and building surveyor.

Unfortunately, the model has not been able to forecast the requirement for either civil engineering technicians or architectural technicians because this would have to be based on statistics from the CSO. The levels of employment recorded by the CSO in these categories are lower than is considered to be the case. Thus, a forecast based solely on an extrapolation of these figures would indicate a serious oversupply in these occupations, which is not plausible. This issue requires further work.⁵⁰

Most of the forecast shortages occur in the early years of the National Development Plan, particularly in 2001 (2,015 compared to 285 by 2006, see Appendix 3 for more details). All occupations remain in shortage at the end of the forecast period.

The fact that the forecast of shortages for professional workers is 'front-loaded' means that any attempt to resolve these shortages primarily through an increase in training or education provision would not be appropriate as the output from such an increase would not be available until the later years of the projection period. Indeed, such an increase could result in an excess of supply in later years. It is important, therefore, that the correct balance is established in any recommendations between strategies which are designed to increase supply in the longer term, and strategies which are designed to resolve current imbalances in the labour market that are considered to be of a temporary nature.

In this context, it is notable that the recently introduced Work Visa/ Work Authorisation Scheme programme has attracted 191 construction professionals in the first nine months of its operation (2000). Furthermore, the number of professionals coming to work in Ireland under the Scheme has increased dramatically in the first two months of 2001. In addition, there were 96 architects and 72 construction engineers issued with Work Permits in the year 2000, and a further 39 architects and 66 engineers issued with Work Permits during the first quarter of 2001. Finally, feedback from the industry indicates that there has been a substantial inflow into Ireland of construction professionals from the United Kingdom, and, to a lesser extent, from other EU countries, in the year 2000 and this has continued during 2001. These two sources of recruitment should be fully exploited in order to meet those skill shortages which will occur over the first years of the National Development Plan and which are temporary in nature.

⁵⁰ It may be that many technicians acquire membership of the relevant professional bodies and are consequently classified as working as professionals.



a. Town Planners

There were an estimated 500 planners in employment in 2000 in Ireland. There are approximately 100 vacancies in the Local Authorities in 2001. In addition, the Planning Act, 2000 will give rise to a requirement for an additional 75 planners in the public sector and roughly 150 in the private sector. Including natural growth over the period, total employment of planners is forecast to reach just over 800 by 2006.

Recent initiatives, however, by both University College Dublin and the Dublin Institute of Technology, will result in a doubling of the number of students graduating in town planning by 2002 and a trebling of the output by 2003. This increased outflow will be sufficient to meet demand for 2003 and beyond.

Thus, the Expert Group does not recommend any further increase in the supply of town planners from the Irish education system. However, it is imperative that up to 300 town planners are attracted to Ireland in the short-term to fill projected vacancies in both the public and private sector.

b. Civil Engineers

It is estimated that there are approximately 6,500 civil engineers working in Ireland. The model suggests that there are shortages of approximately 1,000 civil engineers in 2001. This projection is based on the assumption that there will be a dramatic increase in expenditure on civil engineering projects in 2001.

Civil engineering is one of the occupations which is expected to be still in short supply at the end of the forecast period (e.g. in 2006 a projected shortage of 146 engineers is forecast). This should not be a cause for surprise. The proportion of university students graduating in Civil Engineering has declined dramatically in recent years. There is a consensus that there is not a sufficient number of graduate engineers qualifying each year to meet the needs of the industry. These findings indicate the need for both short-term actions to meet current vacancies as well as longer-term actions to increase the supply of qualified civil engineers.

c. Architects

There were an estimated 3,300 architects employed in Ireland in 2000. This is forecast to rise to 4,400 in 2006. The model indicates that there is a shortage of just over 500 architects at the beginning of the forecast period. Furthermore, these shortages will persist throughout the period of the National Development Plan, albeit at a much reduced level, unless measures are taken to increase the supply.

Fortunately, there are a significant number of architects arriving in Ireland to work through the 'fast-track' Work Visa/Work Authorisation and Work Permit systems. Indeed, if the current trends in inflows under these programmes continue, it should be sufficient to meet most of the projected shortfall over the duration of the National Development Plan.

However, the model forecasts that there will still be a shortage of architects at the end of the forecast period of approximately 100. There are just two degree courses in Architecture at present and these courses have been in place for well over a decade. The level of output in the industry, however, has increased by 75 percent in volume in the last five years, and the housing stock has increased by almost 200,000 units. Thus, it may be the case that the economy can support additional numbers of architects qualifying, and this is addressed in the recommendations.



d. Quantity Surveyors

It is estimated that there were 1,600 quantity surveyors employed in Ireland in 2000. This is forecast to rise to 1,990 in 2006. Discussions with industry indicate that there are shortages of quantity surveyors in the Irish economy. The model estimates these shortages at just over 100 in 2001 and that these will be eliminated by 2006. It is anticipated that shortages in this occupation will be met through inward migration. However, the situation should be kept under review.

e. Building Surveyors

There are roughly 1,200 people employed in Ireland in various aspects of building surveying, ranging from inspection to valuation and building surveying. The model projects a shortage of just over 100 in 2001 but this shortage is forecast to decline to 28 in 2006. The industry estimates that there are roughly 250-300 engaged in the actual surveying – as opposed to the valuation – of buildings. Currently, there is only one degree course in building surveying. This would seem to be adequate.

6.4.3 Craft Skills

The model estimates that there are approximately 70,000 employed in Ireland in the seven traditional construction crafts of electrician, carpenter, plumber, bricklayer, painter, plasterer and construction plant fitter in the year 2000. Employment in these crafts is forecast to increase by a further 17,365 to reach 87,365 in the year 2006. When account is taken of wastage during the period, the total number of craft-workers required rises to just over 31,682. There will be shortfalls of almost 12,000 craft workers in total over the duration of the National Development Plan.

The highest level of shortages is predicted to emerge in the early years of the Plan, specifically in years 2001, 2002, and 2003 with forecast shortages of 5,800, 2,400 and 2,000 respectively. Thereafter, the level of projected shortages is less than 1,000 per annum. The decline forecast in the level of shortages of craft workers reflects the significant increase in the number of apprentices registering in these crafts in the last four years from 2,433 in 1996 to 5,473 in 2000 (an increase of 124%). The rate of increase, however, has varied greatly between the different trades. The biggest increases have occurred in electricians, carpenters and plumbers. The rate of increase has been much lower in the 'wet trades' such as bricklayers, and, in particular, plasterers and painters. Consequently, the current craft/apprentice ratio varies from approximately 1.5 trades persons for every apprentice electrician employed in the Construction industry, to 22 trades persons for every apprentice painter employed.

Serious shortages of crafts persons in the 'wet trades' are forecast. The shortages are particularly severe during the first years of the Plan, but persist throughout the forecast period, albeit at reduced levels. In contrast, the current shortages of electricians and plumbers are eliminated, and indeed show surpluses, by the end of the forecast period. In the case of carpenters and fitters a very significant decline in the level of shortage is forecast though there are still shortages forecast for the end of the period. See Appendix 3 for details.

In the case of the painters and plasterers, employment has increased rapidly. However, apprentice intake numbers have declined as a proportion of craft employment. The relatively low level of apprentice recruitment by employers in these trades suggests that at least some of those working in these occupations are not qualified crafts-persons. This may reflect a belief on the part of some employers that some



plastering and painting work does not require a four-year apprenticeship and may be performed by a semi-skilled worker. Thus, the shortages forecast by the model for these two trades may be more 'nominal' than 'real'.

Severe shortages of carpenters and bricklayers exist at the beginning of the period. These will decline significantly by 2004.

The forecasts of supply and demand indicate that the current intake levels of apprentice electricians are sufficient to meet the demands of the Construction industry over the period of the National Development Plan. However, it is uncertain if this level of apprentice intake is sufficient to meet the economy-wide demand for electricians. Electricians are employed in many other sectors of the economy and in occupations other than maintenance and installation. Thus, for example, if all electricians working in other sectors are considered, including electricians working in production and service areas, the ratio increases to 3 crafts-persons to every apprentice. This area requires further study.

The forecasts also indicate that the current levels of apprentice intake of plumbers are sufficient to meet demand in the industry.

6.4.4 Other Skilled Workers

There are many manual skilled occupations in the Construction sector which are not designated apprenticeships.⁵¹ These skills vary in complexity and importance. Some require a high degree of skill and an adherence to rigorous standards of safety. These skills include tower crane operator, telescopic handling operator, scaffolder, steel fixer, slinger/signaller, tractor/dozer operator, 180 degree operator, 360 degree operator, mobile crane driver, crawler crane operator, sheeter/cladder, roof felter and cladding erector.

There were approximately 13,800 employed in these occupations in 2000. Employment in these occupations is expected to increase to almost 17,800 by the end of the forecast period, resulting in a requirement of 7,000 additional workers when wastage is taken into account (see Appendix 3 for details).

The Construction Skills Certification Scheme delivered by FAS provides formal skills training for these occupations. Some 3,000 workers employed in these occupations have received training under the scheme to date. There is a need to substantially increase the overall provision of skills training in these occupations over the period of the National Development Plan for both existing workers and new entrants.

⁵¹ Tilers and glaziers have recently been designated as apprenticeships. However, they are treated as 'other skilled workers' in this analysis.



6.5 Recommendations⁵²

The recommendations set out below are designed to alleviate the current and projected shortages in construction skills over the period of the National Development Plan.

6.5.1 Management Skills

Recommendation 6.I

- **Priority should be given to increasing the current low level of provision of training programmes in both project management and supervisory skills.**

The Site Management Education and Training Scheme (SMETs) programme, which is being offered jointly by the Construction Industry Federation and the Chartered Institute of Builders on a pilot basis in Dublin and Cork, should be extended to at least two other regions in the immediate future.

Recommendation 6.II

- **The Department of Education and Science should consider the introduction of one more additional full-time degree programme in construction management, to be located in Dublin.**

Recommendation 6.III

- **Increased funding should be made available to grant-aid further management and supervisory training for employees in the industry.**

The Construction Training Incentive Scheme managed by FÁS is due to close in June 2001. It should be replaced by a scheme that subsidises training in project management and supervisory skills for employees in the industry. Any new scheme should be widely promoted in the industry to ensure that there is a substantial participation in the scheme.

Recommendation 6.IV

- **FÁS should commission a research study on the changing role of managers in the Construction industry and the implications for education and training provision.**

6.5.2 Professional Skills

Recommendation 6.V

- **As part of the FAS Jobs Ireland campaign, there should be a specific initiative to attract suitably qualified construction professionals from abroad focused on civil engineers, surveyors, planners and architects.**

The needs of the Construction industry differ in certain respects from those of other industries. In particular, it is important that the Jobs Ireland campaign, in the context of recruiting professional construction workers, should focus on those countries where building practice and legislation is similar to our own. These countries include Australia, New Zealand, South Africa, and, to a lesser extent, the Scandinavian countries. The impact of the Jobs Ireland campaign on recruitment levels within specific construction occupations should be monitored on an ongoing basis by FÁS.

⁵² It should be noted that the government has approved the Construction Industry Action Plan (mid-2001) which also includes some similar recommendations to those below.



Recommendation 6.VI

- *The Expert Group should undertake a study of the human resource requirements of the Engineering sector as the needs of this sector interact with those of the Construction sector. This study should focus on the demand/supply interface for engineering occupations/skills at both professional and technical levels, including electrical and electronic technicians, structural, mechanical, electrical and civil engineers.*

Recommendation 6.VII

- *The Department of Education and Science should review the current level of education and training provision for architects, quantity surveyors and building surveyors and civil engineers. The level of activity in the housing sector has increased significantly in recent years, and the forecasts in this chapter suggest that, at the very least, an additional course in building surveying is required.*

6.5.3 Craft Skills

Recommendation 6.VIII

- *The Construction industry and FÁS should give priority to encouraging employers to increase their current levels of sponsorship of apprentice bricklayers in particular.*

Recommendation 6.IX

- *While a further small increase in carpenter and fitter apprentice intake could be justified, there should be no further increases in apprentice intake for plumbers.*

Recommendation 6.X

- *The issue of electrical apprentices needs to be further considered in the light of demands in non-Construction sectors.*

Recommendation 6.XI

- *The issue of balancing apprentice intake to better match projected requirements needs to be considered further.*

Recommendation 6.XII

- *A 'Fast-Track' system of obtaining formal national craft qualifications should be developed and introduced on a pilot basis specifically for adults who are working in the 'wet trades,' but who are not in receipt of a National Craft Certificate.*



Recommendation 6.XIII

- *Mechanisms should be put in place to ensure that the 'Fast-Track' system does not result in any diminution in current standards.*

The idea of the 'Fast Track' system is to provide a formal process of accreditation for workers who are engaged in skilled construction work, but who are not formally qualified.

Recommendation 6.XIV

- *As recommended in the Second Report of the Expert Group, the possibility of reducing the time it takes to complete some apprenticeships should be actively considered by the relevant interests.*

Recommendation 6.XV

- *The FÁS Jobs Ireland campaign should continue to focus on attracting qualified construction craft workers to Ireland as a matter of priority.*

FÁS and the Construction Industry Federation should explore ways of increasing the inflow of craft workers under the Jobs Ireland campaign.

Recommendation 6.XVI

- *The Expert Group should conduct a study to establish the total requirement of the economy for all engineering craft workers including electricians.*

The findings of such a study would complement the results of the FÁS Construction Forecasting model and would enhance the accuracy of the forecasts, particularly in respect of occupations such as electricians who are employed in many different sectors.

Recommendation 6.XVII

- *The Expert Group should commission a study to determine the level of and reasons for the apparent low retention rates of skilled workers in the Construction industry and the development of proposals to address this.*

6.5.4 Other Skilled workers

Recommendation 6.XVIII

- *FÁS should promote the Construction Skills Certification Programme. It should seek to provide training for between 5,000 and 7,000 non-craft skilled workers over the duration of the National Development Plan.*

Industry should be actively encouraged to avail of it as a means of enhancing the skills of their employees. In response to demand, FÁS should increase the current level of training under the programme and extend it on a gradual basis to encompass new entrants, in addition to existing workers



6.5.5 General Operatives/Other Workers

Recommendation 6.XVIX

- *FÁS should provide training for between 4,000 and 5,000 construction operatives and supervisors on road-construction and maintenance. This training should be made available to both the private sector and the public sector.*

During the period of the National Development Plan there is a projected requirement for about 28,000 general operatives and other workers. Traditionally, many of these persons entered the industry without formal training and would be engaged in lower-skilled manual tasks. The rapid increase in the road construction programme and likely continued labour shortages means that it is important that the full potential of all workers in the industry, including general operatives, is utilised to the full.

6.5.6 General Recommendations

Recommendation 6.XX

- *The Department of Enterprise, Trade and Employment, IPAC and the Expert Group should consult and co-ordinate their policy approaches to minimise any constraints arising for non-EU contractors who wish to bring non-EU construction employees to Ireland for a specific period to execute specific projects.*

Recommendation 6.XXI

- *FÁS should develop a register of all skilled workers in the industry. This would enable the evaluation and monitoring of the quality of the human resources available to the industry in a more effective manner.*



7. Expert Group Work Programme

7.1 Introduction

The activities of the Expert Group are described below with reference to the original objectives of the Group, which have not changed since its inception in 1997. Many of the recommendations made by the Expert Group were endorsed by the National Competitiveness Council in its Statement on Labour Supply and Skills 2000. Sections 7.2 and 7.3 outlines the criteria and the methodologies adopted by the Expert Group in undertaking its work. Sections 7.4, 7.5 and 7.6 summarise the work of the Expert Group under three key objectives:

- Augmenting the supply of skilled labour.
- Promoting a deepening and strengthening of links between business and the education and training sector.
- Raising awareness of career opportunities in key sectors within the economy.

Section 7.7 summarises other work being undertaken by the Expert Group. The final section, 7.8, details progress to date in implementing the 96 recommendations of the Expert Group in its previous reports.

7.2 Identification of Skill Needs

To date, the Expert Group has produced five reports (see below). Its areas for study were selected based on the following criteria:

- *Importance of particular sectors* to the Irish economy both now and in the future (e.g. IT, eBusiness).
- *Severity of labour and/or skills shortages* (e.g. in the Construction industry).
- *Need, in some cases, for long term planning* in the education and continuous training system (e.g. with respect to provision of researchers and In-Company Training).

The **First Report** of the Expert Group examined the high-level skill requirements of the IT sector in general. The **Second Report** examined the labour market and areas such as Clothing, Retailing and Contract Cleaning. It analysed skills needs in the craft areas of the Construction industry; Chemical and Biological Sciences, Researchers and Information Technology. It also reviewed its recommendations in the IT sector. Three further reports were produced by the Group: eBusiness, on Shared Services and In-Company Training.

The first two reports focused on quantitative issues of supply and demand. The reports on eBusiness and Shared Services focused more on qualitative issues such as the content of education and training programmes required to meet future skills needs in these sectors. The report on In-company Training examined both quantitative and qualitative issues of increasing the potential size of the labour force through the use, for example, of training to raise labour productivity and to up-skill the workforce.

Each report has provided detailed recommendations for future action. Progress to date on implementing these recommendations is summarised below – more detailed information on progress is contained in Section 7.8. The reports have also identified areas of skill needs where ongoing monitoring and review will



be necessary. The Expert Group has up-dated its forecasts for the IT sector on two occasions with the most recent up-date including areas of importance to the development of eBusiness, including general eBusiness skills, multimedia skills and networking skills. The forecasts for Life Sciences have also been up-dated.

The Expert Group plans to monitor the development of new skill requirements for eBusiness as the sector develops. It will also continue to monitor the supply of and demand for researchers and for Chemical and Biological Science graduates in the light of the Government's commitment to Science and Technology in the National Development Plan and the implementation of the Technology Foresight programme. Given the substantial housing and infrastructural investment outlined in the National Development Plan, the Expert Group has recommended that FÁS should develop a register of all skilled workers in the Construction industry in order to monitor and evaluate the quality of human resources required by the industry more effectively.

7.3 Developing Estimating Techniques

In its **First Report**, the Expert Group focused on high-level skill requirements. An approach to demand estimation was developed with the ESRI. This involved the derivation of economy-wide projections from the ESRI/FÁS Manpower Forecasting Model. The ESRI projections were amended to incorporate employment growth projections from detailed sectoral studies of software and hardware electronics. The Expert Group then developed three potential employment growth scenarios (high, basic and reduced growth) and used the model to derive potential demand for skills in the IT sector. Employment projections for the IT sector were up-dated in the Second Report and again in this report. A similar methodology was used on each occasion.

For its **Second Report**, the Expert Group used the model to forecast labour market supply and demand in general over a ten year period. A model developed by the FÁS Planning and Research Department for the Construction Industry Training Committee and research conducted by the Department of the Environment were also used as a basis to develop estimates for craft skills needs in the Construction industry.

The reports on **eBusiness** and **Shared Services** used specific mechanisms to derive supply and demand projections. The research on **In-Company Training** included in-depth interviews with forty small-to-medium sized enterprises in Manufacturing and Construction to identify qualitative issues regarding public policy and the supply of and demand for In-Company training.

7.4 Augmenting the Supply of Skilled Labour

Knowledge is recognised as the key to future economic success. The reports of the Expert Group have highlighted the importance of improving both the quality and quantity of labour in the Irish market and recognising that such improvement requires:

- *raising* the educational and technical qualifications of new labour market entrants; and
- *adapting, augmenting and refining* the skills and capacities of those already at work through in-company training and lifelong learning.

Quantitative proposals made by the Expert Group to address Labour Market supply have included:

- augmenting the domestic supply of labour from abroad on a targeted basis;
- increasing labour force participation by women;



- attracting those aged over 55 back into or to remain in the labour force; and
- encouraging moves from unemployment to employment.

Qualitative proposals have included:

- educating students to a minimum level of IT literacy (e.g. that of the European Computer Driving Licence);
- training the current workforce in order to increase productivity;
- improving literacy and numeracy skills to ensure that workers can avail of and maintain pace with technological changes;
- introducing systems to accredit prior learning and 'fast-track' the acquisition of formal qualifications by workers; and
- changing the content of certain educational programmes (notably in business studies) to reflect the needs of industry and emerging new sectors (e.g. eBusiness).

7.5 Promoting Links between the Business and Education/Continuous Training Sector

In each of its Reports, the Expert Group has highlighted the importance of the development of links between the education and training sector and business in order to ensure the relevance of courses and a demand-led approach to skills provision.

It has prioritised interventions that are the most *cost-effective* (e.g. those that use existing educational and training facilities) and the most *flexible* and *rapid* (e.g. those involving greater use of multi-skilling). The Group acknowledges the fundamental mis-match between the education and training sectors' ability to increase the number educated in a short timeframe and the ability of the business sector to plan with confidence for only short time horizons only. In its recommendations it has, therefore, proposed that mechanisms that encourage flexibility of skills provision be prioritised, e.g. multi-skilling, conversion programmes, accelerated learning programmes, in-company training, modular delivery mechanisms, and the recruitment of skilled people from abroad.

The **First Report** proposed that the third-level colleges and FÁS report annually on proposals developed by them in order to involve relevant local businesses in course design and choice. It recommended that the Skills Awareness Campaign should organise company visits for school principals, teachers, guidance counsellors and parents. It also recommended that the Business Education Partnership Forum be used to encourage companies to commit to the process of skills development. Recommendations on the interaction at both local and national level between the education/training sector and business included:

- companies contracting research to third-level institutions;
- work experience modules within courses;
- companies providing an input into course design;
- recruitment fairs in third-level colleges;



- open-days in industry;
- employer representation on education and training committees (e.g. FÁS Industry Training Committees);
- specific training initiatives such as the Apprenticeship Programme, the Graduate Skills Conversion Programme and the Institute Trainee Programme; and
- visits to companies by teachers and pupils under the Skills Awareness Campaign.

The **Second Report** proposed the development of basic vocational units by relevant industry associations in consultation with the educational authorities and teacher representatives for use by transition year and Leaving Certificate Applied students. Two new initiatives were developed in 2000, which are relevant to this recommendation. The first is a modular resource package produced by SIPTU specifically for Leaving Certificate Applied (LCA) students. It is delivered on a modular basis and connects different elements of the LCA with different industries. The second initiative is a new national programme organised by the Institute of Personnel Development and the LCA Support Services. Entitled 'Learning to Work' it is designed to assist and monitor LCA students during work experience and after graduation.

The report on **eBusiness** recommended the development of an eBusiness Skills Partnership. It proposed that this would be achieved through consultation between the third-level sector, Forfás and the Department of Education and Science. The aim of such a Partnership would be to facilitate interaction between third-level institutions and business/industry and to promote the development of third-level eBusiness education. This would incorporate consultation with companies active in eBusiness on the development of course content and, where appropriate, delivery of programmes. Discussions are currently underway on the establishment of such a Partnership.

The report on **eBusiness** also recommended the promotion of eBusiness by FÁS in the Services sector, the use of models along the lines of the Skillnets programme to form eBusiness training networks and the development of the FÁS Net College (an interactive on-line training facility) as a technical training resource for all industry sectors. FÁS has recently launched a comprehensive management development programme in eBusiness for the Services sector and a number of eBusiness skills capacity building exercises are also in train within the engineering sector. The pilot phase of Skillnets is nearing completion and an evaluation will be conducted before further decisions are made on the future of the Skillnets approach.

The report on **Shared Services** recommended that the soft skills of school leavers and graduates be improved through the use of appropriate, compulsory work experience or project work for all second-level and business studies graduates.

The report on **In-Company Training** highlighted the importance of good standards of literacy and numeracy for jobs. It recommended that the Department of Education and Science, IBEC and ICTU develop a literacy and numeracy initiative suitable for delivery in the workplace and targeted at qualified and unqualified individuals with low literacy levels. The National Adult Literacy Agency (NALA) has trained tutors to provide workplace programmes and has notified IBEC and ICTU regarding the availability of these resources. A successful project is underway in a large drinks company in Dublin. The local authority sector, in partnership with the Local Authorities National Partnership Advisory Group (LANPAG) is also running five pilot projects. The television series, Read Write Now, has been very successful with an average weekly viewership of 155,000. A national radio programme commenced in March 2001. Both of these programmes are supported by NALA.



Other recommendations on **In-Company Training** included the development of initiatives in co-operation with industry to increase the volume of education and technology training for operatives and crafts persons in the Institutes of Technology, FÁS, Enterprise Ireland and the Department of Education and Science. Plans are at an advanced stage for the introduction of a new In-Company Training programme. The Department of Education and Science will fund up to 1,000 places on the new Institute Trainee Programme in 2001. This programme will involve close partnership with employers and will target skills needs identified by the Expert Group in Construction, Electronics, Pharmaceuticals, eBusiness, Computing and Manufacturing. The Expert Group had recommended that when additional resources become available to the new National Training Fund,⁵³ they should be used for programmes to support adaptation to industrial change and for enterprise training. It also recommended the use of group-based training schemes (e.g. Skillnets, PLATO) and technology-enabled training in companies. In this regard, FÁS is continuing to develop Net College and to assist clusters of companies to identify and meet their skills needs. Enterprise Ireland offers Best Practice workshops on key topics such as recruitment and retention, reward schemes and eBusiness. Other sectoral initiatives are currently being planned.

7.6 Raising Awareness of Career Opportunities

In late 1996, the Skills Awareness Campaign Committee was formed as a sub-committee of the Forfás Interim Skills Group. This Committee later became part of the Expert Group. The objective of the Skills Awareness Campaign Committee is to increase the awareness of job seekers, especially school-leavers, of career opportunities in the information technology industries in Ireland. The Campaign has developed a skills brochure for schools; briefed national newspapers, provided supplements and maintained ongoing contact with the media; met with guidance counsellors; developed and distributed videos to schools and developed a website. Stands have been taken at the FÁS Opportunities conference and the Irish Times Higher Options conferences in 1998-2000. The Campaign is currently promoting the Shared Services sector to school leavers.

As the resources of the Campaign were initially limited, the First Report of the Expert Group recommended that the programme be strengthened and properly resourced. In October 2000, £200,000 (€253,947) was made available for this purpose. It also recommended the organisation of workshops and company visits for principals, teachers, guidance counsellors and parents and the linking of the website to other appropriate sites. In response to these recommendations, the Campaign was further developed in 1999 to include radio interviews, the distribution of leaflets at traffic intersections and in cyber cafes, briefing sessions with guidance counsellors, company visits for parents and teachers and the development of a skills awareness website. A television programme on careers will be launched in the near future.

The Science, Technology and Innovation (STI) Awareness Programme, operated under the auspices of the Forfás for the Irish Council for Science, Technology and Innovation (ICSTI) aims to increase the interest and awareness of primary and second-level students of technology careers and of studies in science and technology in general. The Expert Group has recommended that a study be carried out to determine the factors affecting student choices at second-level, particularly their choice of technology careers. Further measures proposed by the Expert Group to raise awareness amongst job-seekers include the use of existing services such as guidance counsellors and the National Employment Service and the development of a major Internet-based information clearing-house on job vacancies and education and training opportunities in information technology.

⁵³ The National Training Fund was announced in Budget 2000 and is to be financed by a 0.7% payroll contribution from employers.



7.7 Other Activities

The Business Education and Training Partnership, of which the Expert Group is one component, has held two Forum meetings – one in June 1998 and one in December 1999. The Forum provides the Expert Group with a platform to report its perspective on skills opportunities and related issues within the economy to a wide audience. The first Forum was presented with detailed work on Information Technology skills. The second Forum was presented with a review of progress on the implementation of the recommendations from the Expert Group's First Report and the key recommendations emerging from work on the Second Report. Over two hundred delegates representing industry, education, industrial development agencies and trade unions attended each Forum, many of whom contributed to the debate on skills and relevant policy responses. Reports of both Forum meetings were published.⁵⁴

The Expert Group reviews progress on the implementation of its recommendations and briefs the Management Implementation Group on its activities. The Group also ensures that it is briefed on work being conducted by other organisations on skills needs and the responses to meeting them, e.g. the 1999 HEA report on pharmacy graduates, the deliberations of the Task Force on Life-long Learning and the work of the IDA on IC design. Two successive surveys of job vacancies in the private non-agricultural sector, 1999 and 2000, carried out by the ESRI for FÁS and Forfás have provided important input into the Group's considerations of both general labour shortages and specific skills needs.

In addition to the reports discussed above, Expert Group sub-committees are reviewing the following areas:

- **Researchers** – this sub-group is examining the likely effects of the Technology Foresight programme and other planned investment in Research and Development, particularly under the National Development Plan, on the supply of and demand for researchers. A report benchmarking mechanisms and strategies to attract researchers to Ireland has already been completed and is feeding into the committee's deliberations.
- **Labour Force** – this sub-group is reviewing the general labour market based on the findings from the latest vacancy surveys. It is also exploring mechanisms to monitor and track labour force issues.

In addition to the Skills Awareness Campaign, the Expert Group is working with the Institution of Engineers in Ireland (IEI) in 2000 on an awareness campaign to attract students to careers in Engineering. The Department of Education and Science will contribute £50,000 (€63,497) towards such a campaign and the IEI will contribute £130,000 (€165,066). The Expert Group is also finalising the launch of its website.

7.8 Progress on the Implementation of Recommendations of the Expert Group

To date, excluding this Report, the Expert Group has made 96 recommendations aimed at addressing identified skills shortages within the Irish economy. The Expert Group completed a review of progress on these recommendations in April 2001. This review established five categories of progress on implementation as follows:

- Category A covers single-action items, such as undertaking a review, which have been completed.
- Category B covers cases where single-action items are being implemented.
- Category C relates to recommendations which by definition are ongoing.

54 'Report on the Inaugural Forum Royal Hospital Kilmainham', 18th June 1998 and 'Report on the Second Forum Royal Hospital Kilmainham', December 1999, HEA/Forfás.



- Category D covers recommendations where no action to implement has been taken to date.
- Category E covers all other cases, such as those where a recommendation has been overtaken by events.

Of the 96 recommendations, only 13 have not as yet been implemented (categories D and E). The 13 recommendations in question were contained mainly in the later reports on eBusiness Skills, In-Company Training and Shared Services. Table 7.1 summarises the position regarding each of the reports produced to date.

TABLE 7.1: IMPLEMENTATION STATUS OF EXPERT GROUP RECOMMENDATIONS (as of May 2001)

	CATEGORY A	CATEGORY B	CATEGORY C	CATEGORY D	CATEGORY E
First Report, December 1998	2	2	9	-	-
Second Report, February 2000	3	7*	23*	1	1
In-Company Training, August 2000 -	1	12*	5*	1	
eBusiness Skills, August 2000	-	-	14	-	4
Shared Services, August 2000	-	-	12	-	1
Total Number of Recommendations	5	10	60	6	7

*Note: * Two of the recommendations have two elements to them (categorised as B and C; and C and D respectively).*

The responses to the Expert Group's recommendations have been positive. The main outcomes are summarised below in sections 7.8.1 - 7.8.5.

7.8.1 First Report

The First Report of the Expert Group, published in December 1998 on the IT sector, was well received. It resulted in significant additional investment in IT Skills provision by the Government. A substantial number of new places in third-level colleges were created at undergraduate and postgraduate levels. Training places on relevant FÁS programmes were also increased. The main elements of the Government's response to the Report were as follows:

- In January 1999, the Accelerated Technician Programmes were expanded to include IT. Some 1,100 students are now enrolled on courses in the Institutes of Technology as part of the Accelerated Technician Programme.
- In April 1999, the Government approved an additional allocation of £75 million (€95.23 million) to the Department of Education and Science for the provision of 5,400 IT-related third-level places.
- In June 1999, the Government made an additional £6 million (€7.62 million) available for the continued annual provision of 1,500 places on post-graduate conversion courses by third-level colleges in IT-related areas.
- In December 1999, the Government allocated an additional £3.2 million (€4.06 million) for FÁS to train some 700 persons in relevant IT skills.



- A new Graduate Skills Conversion Programme was introduced in 1999 to replace the European Social Fund (ESF) funded Advanced Technical Skills Programme. The Programme provides a minimum of 1,400 places and has increased involvement with industry.
- The Qualifications (Education and Training) Act was introduced in 1999. It provides for the establishment of the National Qualifications Authority of Ireland, a Further Education and Training Awards Council and a Higher Education and Training Awards Council. The Act puts in place a legislative framework for standards and quality of further and higher education and training.

7.8.2 *Second Report*

The Second Report, published in February 2000, had a broader scope than the First Report. It analysed the labour market in general, the availability of workers for low-skills occupations, the crafts skills of the Construction industry, Chemical and Biological Sciences graduates, Researchers and IT graduates. Many of the Report's recommendations have been implemented already or are being acted upon, such as:

- The National Employment Action Plan, published in May 2000, expanded the engagement with unemployed persons to encourage them to return to work.
- Enterprise Ireland is working closely with IBEC, the Irish Clothing and Textile Alliance and Skillnets to facilitate in-company training in the Clothing sector and to develop links with colleges and practitioners in the area of design.
- FÁS, in co-operation with representatives of industry, Mandate and SIPTU, has designed and introduced a Retail Traineeship programme that will lead to FÁS National Skills Certification.
- An Action Plan for the Contract Cleaning sector has been completed by FÁS in consultation with the industry and is currently being implemented.
- The number of apprentices in Construction trades increased from 4,142 registered apprentices at the end of 1998 to 5,473 by the end of 2000.
- Discussions are ongoing between employer and trade union organisations regarding flexible working time, location options for work (e.g. teleworking) and non-pay incentives to work. Discussions are also being held on the development of a campaign to raise awareness of the full entitlements and the full take-home pay opportunities available to those returning to work.
- The first phase of the introduction of 1,150 places in Science places began in the academic year 2000/01.
- The HEA is developing a central database on research activities in Third Level Institutions.
- Detailed proposals on the establishment of an Interactive Science Centre have been brought to Government.
- Since the commencement of the Accelerated Technician Programmes in 1998, 2,141 students have enrolled on courses in identified key skill areas of IT, Manufacturing Technology and Industrial Science. It is intended to continue to develop these programmes in responses to identified skills needs and student uptake.



- The number of apprenticeship places being provided by FAS has increased from 4,000 in 1997/8 to 7,200 in 1999/00. In addition to the £6 million (€7.62 million) provided in 1998 and 1999 to fund additional courses, £5 million (€6.35 million) was allocated for new courses in 2000. Capacity in the Institutes of Technology will be increased by 1,300 in the 2001/2002 academic year to provide training for 8,500 apprentices. Approximately 70% of these apprenticeships are in the Construction sector.
- The Department of Education and Science has established an internal working group to consider and make recommendations on the implementation of the report of the Points Commission.
- Measures introduced in the 2000 Budget continued the progress in reducing the burden of taxation on lower-paid workers.

7.8.3 *Report on In-Company Training*

This Report was published in August 2000. It was prepared in parallel with related studies undertaken by IBEC and FÁS. It followed on from a recommendation to promote employee up-skilling contained in the Expert Group's First Report. The report provided a qualitative assessment of training needs of companies employing under 250 persons in the Construction and Traditional Manufacturing sectors

The Report's recommendations covered a range of policies that would facilitate an increase in in-company training. It is still too early to report on the full implementation of these recommendations. However, there have already been some significant developments which will facilitate an increase in the uptake of In-Company Training Schemes, such as:

- Funding by the Department of Education and Science for 1,000 places on a new Institute Trainee Programme in 2001.
- A survey by Enterprise Ireland, in co-operation with FÁS, of 'Continuing Vocational Training in Ireland' carried out in 2000. Discussions are taking place to examine the possibility of conducting more regular surveys of training needs in Irish small-to-medium sized enterprises.
- Net College, a FÁS interactive on-line training facility introduced in 2000.
- A working group to develop a framework for funding and implementing the Back to Education Initiative aimed at prioritising access for those with less than upper second-level education. IT modules have been developed by the NCVA from Foundation Level to Level 3.

7.8.4 *Report on eBusiness Skills*

The Report on eBusiness Skills was published in August 2000. It followed on from a recommendation made in the Forfás policy document, 'Report on e-Commerce: The Policy Requirements (1999)', that the Expert Group should examine the multi-disciplinary and e-commerce skills needs of major sectors. The recommendations of this Report focused on the content of education and training relevant to eBusiness provided by the third-level sector and others. Discussions are underway to establish the eBusiness Skills Partnership which is to address many of the recommendations made in the Report. A third-level Computing Forum is also being established. This will address recommendations on course content and design in the computer sciences. The Institute of Directors of third-level colleges is developing a national programme on access to education in eBusiness for all under-graduates. Enterprise Ireland is piloting a number of



eBusiness workshops on key skills such as Web Manager, Web Master, and Web Developer. FÁS has launched a management development programme in eBusiness for the Services sector and eBusiness skills capacity-building exercises for the Engineering sector.

7.8.5 Report on Shared Services

The report on Shared Services was produced in August 2000. It examined the growth of the sector in Ireland and future growth opportunities. Recommendations included the identification of most appropriate content of education and training qualifications relevant to the Shared Services sector, diversification opportunities for the sector and the attraction of overseas workers to address skills needs.

The Skills Awareness Campaign is promoting the Shared Services sector in schools. IDA Ireland has targeted overseas companies in Shared Services with a view to attracting them to Ireland and has met with Institutes of Technology to discuss graduate output for Shared Services.

7.9 Conclusion

While the Expert Group is encouraged by the progress made on addressing skills shortages, it is conscious that much remains to be done. In particular, it believes that it is essential to continuously monitor progress being made on remedial action taken to address these shortages. This monitoring should be combined with updating and refining of skills supply and demand projections for these sectors which are vital if Ireland is to retain and improve its competitive edge in the global economy.



APPENDIX 1

Current Membership of Expert Group on Future Skills Needs

Dr. Danny O'Hare (Chairperson)	President Emeritus, Dublin City University
Mr. Roger Fox (Joint Secretary)	FÁS
Mr Sean Gorman	Department of Enterprise, Trade and Employment
Mr. Seamus Gallen	National Software Directorate
Ms. Una Halligan	Irish Business and Employers Confederation
Mr. John Hayden	Higher Education Authority (HEA)
Mr. David Lowe	Goodbody Stockbrokers
Mr. Joe McCarthy	Arkaon
Mr. Paddy McDonagh	Department of Education and Science
Dr. Sean McDonagh	Skills Initiative Unit
Mr. Michael McGrath	Conference of Heads of Irish Universities
Mr. Niall O'Donnellan	Enterprise Ireland
Mr. Seamus O'Moráin	Department of Enterprise, Trade and Employment
Mr. Eugene O'Sullivan	Department of Finance
Mr. Lorcan O'Raghallaigh (Joint Secretary)	Forfás
Mr. Colm Regan	Forfás
Mr Peter Rigney	Irish Congress of Trade Unions
Prof. Frances Ruane	Trinity College, Dublin
Mr. Dick Ryan	Industrial Development Authority Ireland (IDA)
Alternates:	
Mr. Ned Costello	Department of Enterprise, Trade and Employment
<i>(Alternate to Mr Sean Gorman)</i>	
Mr. Peter Lillis	IDA
<i>(Alternate to Mr Dick Ryan)</i>	
Mr. Pat Maher	Enterprise Ireland
<i>(Alternate to Mr Niall O'Donnellan)</i>	
Ms Margo Monaghan	Department of Enterprise, Trade and Employment
<i>(Alternate to Seamus O'Morain)</i>	
Mr. Sean O'Foghlú	HEA
<i>(Alternate to Mr John Hayden)</i>	
Mr. Gerry Pyke	FÁS
<i>(Alternate to Mr Roger Fox)</i>	
In Attendance:	
Mr. Seamus Bannon	Forfás
Dr. Noel Gillatt	Forfás
Ms. Kay Hallahan	Forfás
Dr. Anna Murphy	Forfás



Appendix 2

Post-Graduate Student Numbers and Awards

The following tables set out details of PhD and Masters research awards for the period 1994 to 1999. PhD research awards increased by 18% over the period 1994-1999, while Masters awards declined by 11%:

TABLE A2.1: PHD RESEARCH AWARDS (FULL-TIME STUDENTS), 1994 - 1999

	1994	1995	1996	1997	1998	1999	% CHANGE 1994-1999
Science	225	196	233	219	284	277	23%
Engineering	44	48	35	25	37	32	-27%
Arts	39	44	56	41	74	61	56%
Commerce	7	7	7	7	8	9	29%
Medicine/Dentistry	32	17	19	21	20	16	-50%
Law	2	2	1	2	3	2	0%
Agriculture	4	6	8	7	8	7	75%
Veterinary Medicine	0	3	3	1	3	1	-
Food Science	1	3	6	6	6	12	1200%
TOTAL	354	326	368	329	443	417	18%

Source: HEA First Destination Database

TABLE A2.2: MASTERS RESEARCH AWARDS (FULL-TIME STUDENTS), 1994 - 1999

	1994	1995	1996	1997	1998	1999	% CHANGE 1994-1999
Science	217	205	185	157	154	154	29%
Engineering	128	103	124	107	64	90	-30%
Arts	175	266	186	198	149	163	-7%
Commerce	18	12	30	45	23	44	144%
Medicine/Dentistry	15	11	17	18	13	19	26%
Law	14	11	13	7	14	2	-86%
Agriculture	7	19	19	21	31	23	228%
Veterinary Medicine	3	6	2	3	1	2	-33%
Food Science	15	10	19	18	25	27	80%
TOTAL	592	643	595	574	474	524	-11%

Source: HEA First Destination Database



The following table shows the percentage of respondents to the HEA First Destinations Survey who qualified with a primary degree following full-time study and went on to study immediately at masters/doctoral research level by discipline:

TABLE A2.3: NUMBER OF GRADUATES STUDYING AT MASTERS/DOCTORATE RESEARCH LEVEL IMMEDIATELY AFTER GRADUATION WITH PRIMARY DEGREE

	1993	1996	1998	1999
Science	22.2	20.6	14.5	14.4
Engineering	12.6	8.9	5.9	5.0
Arts	4.7	3.4	3.3	2.9
Commerce	1.0	1.4	1.5	0.6
Medicine/Dentistry	0.2	0.3	0.1	0.6
Law	3.3	2.4	0.7	2.2
Agriculture	19.4	25.7	27.7	20.9
Veterinary Medicine	0.0	1.4	0.0	4.4
Architecture	0.0	1.3	0.0	0.0
Food Science	1.3	23.6	0.0	0.0
TOTAL	7.9	7.0	5.2	4.9

Source: HEA First Destination Database

Table A2.4 provides a breakdown of figures in Table A2.3 between those who went on to study immediately at masters/doctorate research level in Ireland or abroad:

TABLE A 2.4: PROPORTION OF GRADUATES STUDYING IN IRELAND OR ABROAD AT MASTERS/DOCTORATE RESEARCH LEVEL IMMEDIATELY AFTER GRADUATING WITH PRIMARY DEGREE

	% of Respondents engaged in Research Study	% of Respondents engaged in Research Study in Ireland	% of Respondents engaged in Research Study Abroad
1993	7.9%	7.1%	0.8%
1996	7.0%	6.4%	0.6%
1998	5.2%	4.8%	0.4%
1999	4.9%	4.5%	0.4%

Source: HEA First Destination Database

Appendix 3

Projected Skills Shortages in the Construction Industry and Construction Professionals working under the Work Visa/Work Authorisation Scheme

Table A3.1 shows projected shortages among various professional occupations within the Construction industry for the period 2001-2006. Significant shortages are forecasted for all professional occupations:

TABLE A 3.1: PROJECTED SHORTAGES OF PROFESSIONAL WORKERS, 2001-2006

OCCUPATIONS	2001	2002	2003	2004	2005	2006	
Total Architects	-501	-168	-179	-103	-107	-111	-1169
Civil engineers	-1011	-256	-276	-130	-137	-146	-1956
Town planners	-290	-32	-18	-3	-4	-5	-352
Quantity surveyors	-104	-46	-51	-19	-20	3	-237
Building surveyors/ inspectors	-109	-66	-70	-45	-47	-28	-365
TOTAL	-2015	-568	-594	-300	-315	-285	-4079

Source: FÁS, 2001

Tables A3.2 and A3.3 provide forecasts of shortages of workers with various craft skills in the Construction industry for the period 2001-2006. Again, significant shortages are forecast across all craft categories:

TABLE A 3.2: PROJECTED SHORTAGES OF WORKERS WITH CRAFT SKILLS, 2001-2006

OCCUPATIONS	2001	2002	2003	2004	2005	2006	TOTAL
Electricians	-645	10	158	648	45	228	644
Carpenters	-2142	-749	-618	-167	192	-218	-4086
Plumbers	-467	-184	-112	121	129	119	-394
Painters	-654	-536	-550	-371	-358	-368	-2837
Plasterers	-522	-412	-427	-270	-278	-287	-2196
Bricklayers	-560	-347	-357	-146	-156	-166	-1732
Fitters	-801	-135	-153	-82	-109	-112	-1392
TOTAL	-5791	-2353	-2059	267	719	-804	-11993

Source: FÁS, 2001



Shortages are also forecast for a range of non-craft skilled workers. They are as follows:

TABLE A3.3: ESTIMATED SHORTAGES OF NON-CRAFT SKILLED WORKERS IN THE CONSTRUCTION SECTOR, 2000-2006

OCCUPATIONS	PROJECTED SHORTAGES
Roofers, Tilers, Slaters	-1678
Glazers	-164
Scaffolders, Steeplejacks	-469
Floorers, carpet fitters, tilers	-589
Mechanical plant drivers	-2848
Crane drivers	-161
Pipe laying, pipe joiners	-297
Steel erectors	-334
Barbenders	-137
Paviours and kerb layers	-214
TOTAL	-6891

Source: FÁS, 2001

Table A3.4 below sets out the number of construction professionals working in Ireland under the Working Visa/Work Authorisation Scheme in 2000/2001.

TABLE A3.4: CONSTRUCTION PROFESSIONALS WORKING IN IRELAND UNDER THE WORKING VISA/WORK AUTHORISATION SCHEME 2000/2001

Period	Architect	Construction Engineer	Quantity Surveyor	Building Surveyor	Town Planner
June-December 2000	45	43	14	1	4
January-February 2001	28	42	9	4	1
TOTAL	73	85	23	5	5

Source: Department of Enterprise, Trade and Employment, 2000/2001



Appendix 4

Membership of the Sub-Committees of Expert Group on Future Skills Needs and of the Management Implementation Group

Construction Industry

Mr. Ned Costello	Department of Enterprise, Trade and Employment, Chairperson
Mr. Ben Kearney	Amalgamated Transport and General Workers' Union
Mr. Fergus Whelan	Irish Congress of Trade Unions
Mr. John McGrath	FÁS
Mr. Michael McCarthy	Department of Environment and Local Government
Mr. Peter McCabe	Construction Industry Federation
Mr. Roger Dunwoody	Construction Industry Federation
Mr. Vincent McCarthy	Institute of Technology Apprenticeship Committee
Mr. Pat A Houlihan	Department of Enterprise, Trade and Employment
Mr. Sean Downey	Construction Industry Federation
Ms. Eileamer Ni Bhriain	Department of Education and Science
Dr. Sean McDonagh	Skills Initiative Unit
Mr. Eoin O'Domhnaill	Department of Enterprise, Trade and Employment
Mr. Robert Byrne	FÁS
Mr. Niall Irwin	Operative Plasterers and Allied Trades Society of Ireland

Information Technology

Ms. Una Halligan	Irish Business Employers Confederation, Chairperson
Mr. Peter Lillis	Industrial Development Authority Ireland
Mr. John P. Kelly	Department of Enterprise, Trade and Employment
Ms. Margo Monaghan	Department of Enterprise, Trade and Employment
Mr. Joe McCarthy	Arkaon
Mr. Sean O'Foghlú	Higher Education Authority
Mr. Séamus Gallen	National Software Directorate
Mr. Colm Regan	Forfás
Mr. Séamus Bannon	Forfás
Dr. Anna Murphy	Forfás

Labour Market

Mr. Roger Fox	FÁS, Chairperson
Prof. Frances Ruane	Trinity College, Dublin
Mr. Frank Doheny	Department of Enterprise, Trade and Employment
Mr. John McGrath	FÁS

Life Sciences

Dr. Sean McDonagh	Skills Initiative Unit, Chairperson
Mr. Sean O'Foghlú	Higher Education Authority
Dr. Noel Gillatt	Forfás
Mr. Séamus Bannon	Forfás
Ms. Kay Hallahan	Forfás



National Skills Awareness Campaign

Mr. Lorcan O'Rahgailaigh	Forfás, Chairperson
Mr. Séamus Gallen	National Software Directorate
Mr. Una Halligan	Irish Business and Employers Confederation
Mr. Paul Lyons	IBM Ireland Ltd
Dr Sean McDonagh	Skills Initiative Unit
Ms. Mary Sweeney	The Association of Graduate Careers Services of Ireland
Ms. Beverly Talbot	FÁS
Mr. Frank Turpin	Intel Ireland Ltd.
Mr. Dick Ryan	Industrial Development Authority Ireland

Researchers

Mr. John Hayden	Higher Education Authority, Chairperson
Mr. Sean O'Foghlú	Higher Education Authority
Professor Frances Ruane	Trinity College, Dublin
Mr. Michael McGrath	Conference of Heads of Irish Universities
Mr. Michael Fitzgibbon	Forfás
Mr. Seamus Bannon	Forfás

Membership of Management Implementation Group

Dr. Danny O'Hare	President Emeritus, Dublin City University, Chairperson
Mr. John Travers	Forfás
Dr. Don Thornhill	Higher Education Authority
Mr. Paddy McDonagh	Department of Education and Science
Mr. Paul Haran	Department of Enterprise, Trade and Employment
Mr. Jim McCaffrey	Department of Finance
Mr. Seamus Bannon	Forfás, Acting Secretary

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