Expert Group on
Future Skills Needs

Responding to Ireland's Skills Needs

The Fourth Report of the Expert Group on 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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Science

October 2003

Table of Contents

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

Ireland is at an important juncture in its history having completed the transition from an agrarian economy to a fully-fledged, first-world economy, operating at the leading edge of contemporary technology. However, Ireland, in common with other first-world regions, is now faced with the challenge of ensuring its future economic prosperity against a backdrop of rising costs at home and increasing competition from abroad, the inevitable corollary of globalisation and advances in technology. A key element in meeting this challenge is the provision of a highly skilled labour force. As other sources of competitive advantage are being eroded, skills are assuming an ever-greater importance for our future economic development.

The Expert Group on Future Skills Needs, since its establishment in 1997, has had a considerable input to skills and education policy. The Third Report of the Expert Group was produced in July 2001, before the full extent of the current economic down-turn became apparent and prior to the tragic events of September 11th that year. Therefore, this Fourth Report is particularly welcome at this time given the opportunity we have had in the interim for reflection on the developments over that period and to assess the prospects for future growth.

Skills are now an instrument for industrial development; the *a priori* provision of an appropriate skill set is a key mechanism for stimulating a particular economic sector and attracting Foreign Direct Investment. In addition, with restrictions on direct aid to firms from 2006, anticipating and subsequently satisfying firms' requirements for a highly skilled work force will be a crucial support to enable them to get a foothold in global markets.

The latest ESRI *Medium-Term Review* paints a positive picture with high potential growth in the latter half of the current decade. This report by the Expert Group is an important contribution to the preparatory work necessary to ensure that Ireland can benefit immediately and fully from the economic upturn when it arrives. In particular, it outlines a range of specific actions to ensure that an inadequate supply of skills does not hinder our economic growth. Therefore, it is with great pleasure that I receive this report and I look forward to further input on the vital national issue that is skills, from the Expert Group, in the years ahead.

Mary Harney T.D.
Tánaiste and Minister for Enterprise, Trade and Employment
October 2003

Foreword by the Minister for Education and Science

Education has long been central to Ireland's cultural, social and economic development. A seminal moment in our socio-economic development was the introduction of free post-primary education for all in 1967. This initiative, together with the major expansion of higher education provision and participation over the subsequent decades, were major contributory factors in the development of our *Celtic Tiger* economy of the 1990s. Now Ireland stands at another pivotal moment in our development as we seek to make a successful transition to the knowledge society. Education remains centre-stage in that context. A key strength of Irish education in the past has been its relevance to wider social and economic needs. In a changing society and in a rapidly evolving economy, education must continually re-invent itself to remain relevant and responsive. Education, skills, research and innovation will be the by-words for success in the new economic era.

At the centre of this connection between education policy and wider social and economic needs is the individual learner. The State has a number of basic responsibilities to its people in relation to education.
At an individual level, it strives to provide the requisite skills for active participation as an independent, responsible citizen and for equitable opportunity for the pursuit of satisfying and rewarding careers. At a macro level, it must seek to ensure that there is an appropriate supply and balance of skills available to meet overall economic and social needs, while embracing the tenets of inclusiveness and opportunity for all.

From a skills supply perspective, the impact of demographic change is already clearly visible in the decline in Leaving Certificate student numbers in recent years. Projections indicate that this decline will continue well into the next decade. This presents an economic imperative, on top of the long-standing social equity one, to address issues around participation rates and levels of attainment at all stages in the education system with a view to maximising the potential of everyone within the system.

The declining population notwithstanding, Ireland has, and will continue to have, one of the youngest populations in the enlarged EU. It is important that the State utilises this valuable resource to the maximum through supporting all individuals in achieving their full educational potential. The Expert Group on Future Skills Needs has a vital role to play in ensuring that this maximisation of individual potential can be applied to best overall national advantage through its work in identifying qualitative and quantitative skills requirements for the economy now and into the future.

We know that in addition to the technical skills acknowledged by way of formal qualifications, other competencies such as communications, team-working, leadership, and problem-solving skills are of ever-increasing importance in the workplace. A key challenge ahead for the Expert Group will be to track and monitor the dynamic nature of skills provision and provide clear policy advice on how our education and training systems can best respond to the evolving needs of the labour market.

I welcome this Fourth Report of the Expert Group on Future Skills Needs as an extremely valuable contribution to policy development. It highlights a number of trends and issues that we, as policy makers, must now be cognisant of in pursuit of our national strategic priorities.

Noel Dempsey T.D.
Minister for Education and Science
October 2003

List of Figures and Tables

Executive Summary

E.1 Introduction

Significant changes have taken place in the Irish economy since the publication of the *Third Report of the Expert Group on Future Skills Needs* (hereafter referred to as the Expert Group) in 2001. There are now significant concerns about stagnating GNP growth, and the competitiveness of the economy. The assessment of the Irish labour market shows that the tightness in the labour market observed in previous reports has eased considerably with rising unemployment and a slowdown in employment growth. The outlook for the remainder of 2003 and beginning of 2004 remains downcast but a limited recovery in the international environment should have more positive implications for Ireland thereafter.

Against this backdrop, the Expert Group reviewed the skills requirements of the key sectors of economy that had been examined in the Third Report. This Fourth Report therefore, assesses the future skills needs of the ICT sector, construction and biotechnology. However, the scope of this report is broader; it also includes an examination of other important sectors such as food processing, logistics, and an assessment of key occupations such as engineering and financial skills. The importance of soft skills to organisational success is also explored. A review of the overall labour market provides the context for the various sectoral and occupational reviews. The following sections summarise the key findings and recommendations of the report.

2. Labour Market Review and Outlook

The Expert Group noted that the slowdown in the labour market which began in 2001, continued throughout 2002. The rate of employment growth slowed appreciably from 2.5% to 1%, reflecting the deceleration in GNP growth. Unemployment continued to rise, and would have risen by more were it not for the fact that labour force growth slowed due to a fall in participation. The growth in the labour force that did occur was due to demographic factors such as the increase in the population of working age, and immigration.

Employment fell in both agriculture (-4,600) and industry (-9,700) while rising substantially in services (+32,000) in 2002. The growth in services employment was driven mainly by the increase in employment in sub-sectors dominated by the public service, with growth in health (+10,700), education (+5,300) and public administration and defence (+5,700) accounting for a combined increase of 21,700 jobs. Recruitment difficulties and labour shortages eased considerably in most areas of the labour market.

Labour supply growth also slowed during 2002, due to a fall in labour force participation rate among the 20-34 year age group. Earnings growth moderated in general in the latter half of 2002, from a high of 10.9% in Sept. 2001 to 6.2% in Dec. 2002, as wage expectations began to adjust to the deterioration in the economic environment.

The outlook for 2004 is mixed. It is likely that unemployment will rise by the end of 2003 and into 2004 as the expected delayed recovery in the EU will inevitably impact on Ireland. An optimistic view is that labour shortages per se will no longer be as significant a concern as previously. The new challenge will be to maintain competitiveness internationally by improving labour productivity in a cost-effective manner while minimising unemployment. With this objective in mind, the Expert Group's recommendations for the overall

labour market focus primarily on increasing the proportion of highly skilled workers in the labour force by: upskilling, re-skilling, improving the quality of the vocational systems, increasing the proportion of third-level science and engineering graduates, efforts to improve the take-up of further education for disadvantaged groups, and establishing a more targeted immigration policy.

3. ICT Skills

The Third Report provided estimates of the skills needs of the ICT sector to 2006. However, the industry has suffered a severe downturn since late 2000 and although there are signs of a recovery, it is likely to be gradual, and there is no general agreement as to when it is likely to happen. In view of this, the Expert Group, in association with Forfás undertook a broader study to examine the potential for the development of ICT clusters in Ireland and the skills needs of the sector to 2010. Results presented in this report are preliminary findings of the skills aspect of the project and may be subject to some changes when the cluster analysis is finalised.

Demand

On the demand side, 44 ICT subsectors are identified and examined. Demand projections are made for the following categories of graduates:

- graduates in computing at degree/graduate diploma level;
- graduates in computing at certificate/diploma level;
- graduates in engineering at degree level; and
- graduates in engineering at certificate/diploma level.

It is assumed that a market recovery will commence in 2004, although growth is expected to be significantly less than was experienced in the late 1990s. Competition between countries for ICT jobs will be more intense than was the case before the downturn.

The analysis shows that the software sector is expected to resume employment growth once the ICT market upturn occurs. Integrated circuit design is seen as being an area of high growth potential, and as being the single largest source of potential demand for degree graduates in electronic engineering. Significant growth is also expected in the international delivery of services over the Internet and mobile networks by Irish-based companies.

Mixed trends are expected in electronic hardware and systems. Lower value-added activities are likely to continue to migrate out of Ireland. However, it is expected that some areas of high-end manufacturing will continue to grow, and that manufacturing operations will continue to add business functions, and product development and other R&D work. These trends are expected to drive an increased requirement for computing and electronic engineering graduates to undertake development work, while it is anticipated that the growth in high-end manufacturing will offset the loss of low end manufacturing in terms of demand for production engineers, and for technicians.

Supply

Graduate projections are made at certificate, diploma, primary degree and graduate diploma levels for the following disciplines: computing; electronic engineering production and mechanical engineering; other engineering; and computer-related qualifications. Two projections are made in each case: *Scenario 1* assumes that the pattern of applications remains broadly similar to that of 2003 (the "No Recovery in Student Confidence" projection); and *Scenario 2* assumes the share of students entering computing and electronic engineering ramps up, reaching 80% of its previous peak by 2007 (the "Recovery in Student Confidence" projection).

Skills Gap Analysis and Summary of Recommendations

The ICT sector downturn has caused an excess of supply over demand for graduates, but the expected recovery in demand may lead to a shortage of graduates in the medium-term. Supply and demand are reasonably well balanced for computing degree graduates up to 2006. Thereafter, the analysis shows that demand is likely to overtake supply, and eventually exceed it by a substantial margin. The projection for computing diploma and certificate graduates shows a significant excess of demand over supply emerging, but this is of less concern than the degree-level gap, as it may be bridged more easily by alternative means of entry into the sector (e.g. conversion courses). A reasonable balance between supply and demand for engineering graduates is projected, but this comprises a shortage of electronic engineers and a potential surplus of other types of engineers, chiefly civil.

The Expert Group believes the ICT sector will continue to be a major driver of growth in the Irish economy. The recommendations focus on: continuing the ICT Investment Fund (established following recommendations in the Third Report); reinstating places on ICT courses; sales management and entrepreneurship training initiatives; establishing critical mass of expertise in the higher education sector in the Management of Technology Enterprises (requiring the appointment of academic staff to specialise in teaching and research in the area); promoting interest in the study of ICT courses; addressing under-performance at second level in the areas of mathematics; and increasing transfer and progression from Further Education programmes to third-level computing programmes.

4. Skills for the Biotechnology Sector

Biotechnology is widely regarded as the next wave of the knowledge-based economy (after ICT). The importance of this sector is reflected in the Irish government's strategic vision to establish Ireland as a centre of excellence in the biotechnology sector, which will also impact on future skill needs for life science graduates[1].

Demand

A central element of the analysis is the formulation of a plausible scenario for the future development of the biotechnology sector in Ireland from 2003 to 2010. In the model, demand is expressed as the average annual requirement over the seven years that it is assumed would be required for a nascent cluster to emerge. The likely growth path for the biotech sector in Ireland is based on the following primary assumptions.

1 This study focuses primarily on the skill needs for a vibrant biotechnology sector, including the potential for FDI growth. The analysis and methodology differ to the study of "Life Sciences" in the Second and Third Reports of the Expert Group. These focused on the following sub sectors: pharmaceuticals; other chemicals; plastic and rubber; medical devices; food; beverages and tobacco; and indigenous biotech.

- The scenario includes 20 research "stars" i.e. researchers who are internationally recognised as leaders in their field, who are supported in setting up research centres here in Ireland. These stars will act as nucleation sites, for the growth of cutting-edge research.
- Five companies engaged in product development, whose activity is mid-way between basic research and full-scale production, are likely to emerge, employing about 100 each at different level of qualification.
- The strategy of IDA Ireland envisages the creation of 1,500 new jobs in the biotech/biopharma sector per annum over the next five years. This represents an increase on the average of 1,000 jobs created per year in recent years.
- *Enterprise Ireland's* objective[2] is to expand the indigenous component of the biotech sector to employ 1,800 by 2006. However, these projections were formulated before the full extent of the economic downturn became apparent and a more realistic objective it to achieve this level of job creation by 2010.
- There will be an additional requirement for 30 Ph.D.s in universities to support the increased teaching load as well as the increased research management responsibilities. In addition, Government departments and state agencies charged with oversight and regulatory responsibilities will require 20 M.Sc. graduates over this period.

Supply

The projections for the supply of science-related skills are based on extrapolations of current trends. These trends are driven by two fundamental underlying factors: demographics and participation rates. The cohort sitting the leaving certificate has been declining since 1997 and will continue to do so well into the next decade (2010+). The participation rate, or take-up, of science subjects in second level has also dropped markedly in recent years.

The analysis shows that the impact of SFI funded projects is manifest in the increasing numbers attaining Ph.D. and M.Sc. qualifications. For other qualifications there is a consistent and marked decline in output. Between 2004 and 2010, there will be a cumulative increase of 280 Ph.D.s and 421 M.Sc.s whilst there will be a cumulative decrease of 1,351 B.Sc.s and 1,407 Diploma/Certificates.

Skills Gap Analysis and Summary of Recommendations

The principal conclusions are:

- Ireland's nascent biotechnology sector has the potential to grow substantially over the next 7 years;
- This will not happen by default; it will require a concerted effort involving all stakeholders (government, development agencies, educational institutions and business);
- A key element of this strategy must be the *a priori* provision of appropriate skill-sets if Ireland is to avail of this opportunity; and
- Based on current trends, there will be a shortfall in the supply of relevant skills necessary to sustain the development of a full biotechnology cluster in Ireland.

If Ireland is to reap the maximum economic benefits from the dynamic field of biotechnology over the period 2004-2010, the potential skills deficiency must be addressed. The recommendations by the Expert Group to achieve this reflect three broad themes:

2 Towards a Biotech-Ireland, Feb., 2002.

- Initiatives to increase interest in the study of science and in careers in science;
- Measures to improve the capacity of the Irish education system to supply suitably skilled personnel; and
- Supporting interventions, particularly in the development of Ireland's research competency.

5. Engineering Skills

The demand and supply of engineers and engineering technicians has been examined by the Expert Group in previous reports; however on each occasion demand was addressed in the context of the IT industry only. Given the key role played by engineers in Ireland's economic development since the 1980s and the importance of engineers to many other sectors of the economy, the main aim of this study was to examine how the future supply of this key skill matches future demand over the period 2003 to 2012. The analysis takes account of the following sectors: Software and IT Services; Electronic Systems and Hardware; Integrated Circuit Design; Telecommunications Services; Construction and Engineering Consultancy; Local Authorities; Medical Devices; and Pharmaceuticals and Chemicals.

Demand

For each sector, demand is broken down by discipline. The following are the main findings.

- There is a rise in projected overall demand for engineering graduates early in the period (2004-2006) which reflects a recovery in demand arising from a recovery in global ICT markets.
- The disciplines for which most demand is projected are civil engineering and electronic engineering, both at degree level and at diploma and certificate level. The demand for civil engineering graduates is driven mainly by construction activity, while the demand for electronic engineering graduates is driven by projections of a resumption of growth in ICT industries.
- In pharmaceuticals and chemicals, potential growth in demand for engineers arises from the continued growth of an industry that requires significant numbers of engineers.

Supply

At degree level, the output of civil engineers is expected to increase significantly while the output of electronic engineers is expected to fall after peaking in the current year. The output of bio-medical engineers is expected to increase from a low base. At diploma level, there is a projected upturn in output of civil engineering graduates, and a downturn in electronic engineering. At certificate level, civil engineering graduate numbers are again increasing, as are bio-medical engineering numbers, while electronic engineering graduate numbers are falling.

Skills Gap Analysis and Summary of Recommendations

The main areas where gaps are projected are in electronic engineering and degree-level telecommunications engineering, from about 2006 onwards. A fall in numbers entering electronic engineering has the potential to limit the growth of a range of ICT sectors once markets for ICT products and services recover. The main constraint is to do with the number and quality of college applicants wishing to apply for courses. The provision of further places will only become a significant policy issue if this can be resolved. At a broader level and beyond 2006, there is a possibility that a general decline in numbers graduating in engineering may limit the potential of a wider range of sectors.

The main focus of the Expert Group's recommendations is on boosting the numbers graduating in engineering from Irish institutions. The recommendations can be summarised under six areas: promoting the study of engineering; broader science, engineering and technology promotional initiatives; actions at third-level (research space and postgraduate funding); review of mathematics and teaching methods; upskilling and life-long learning; and immigration and overseas students.

6. Construction Industry

In the Third Report, the Expert Group provided an analysis of the employment and training needs of the construction industry from 2001-2006. This section of the Fourth Report provides the findings and recommendations of a follow-up study which forecasts skills needs to 2010. The forecasts are based on a combination of quantitative statistics and qualitative information from the key stakeholders. An extensive process of consultation with the main stakeholders including the Construction Industry Federation, relevant Government Departments and professional associations also informed the forecasts. This consultative approach should reflect the influences of factors such as legislation or technology.

Demand

The industry expanded rapidly and significantly in recent years in terms of both output and employment. Output increased by over 75% in real terms between 1995 and 2002 and it is now equivalent to over €20 billion. This is expected to moderate. On the basis of the assumptions about output and productivity, total employment is forecast to decline from an estimated average of 185,000 (in 3rd quarter 2002) to 175,000 in 2006 and this decline is expected to continue throughout the forecast period reaching 165,000 by 2010 - a decline of almost 11%. Were these forecasts to materialise, construction employment in 2010 would still be considerably higher than it was in 1999 and almost as high as the average employment in 2000. However, variations exist between the forecasts of employment for professional skills and craft skills.

Supply

Overall, there has been an increase in the supply of all professional and craft skills to the industry over the period 1998-2002. This has been in response to various initiatives such as the increase in places for civil engineers, an increase in numbers attending post-graduates courses in town-planning, an ab initio degree programme in building surveying and a significant increase in the numbers undertaking apprenticeship courses as a result of the boom in the industry.

As a result of the projected decline in output and employment growth, the analysis predicts an excess of supply over demand for some of these skills. However, the construction market for skills extends to the UK and given the mobility of in particular, craft workers, it is unlikely that the decline will lead to significant unemployment in Ireland.

Skills Gap Analysis and Summary of Recommendations

The main area where a gap arises is with architects and a key recommendation of the study is that the education system should provide approx. 45 additional places annually for students who wish to study architecture. No significant gaps are forecast to arise for other occupations. The Group's recommendations focus on: monitoring the situation with Visa Authorisation and Visa schemes for certain crafts; and monitoring sponsorship levels in the construction trades of plasterer, painter and decorator and bricklayer.

Four major areas of new and emerging skill needs are identified: project management; construction demolition and waste disposal; environmental management; and safety. The education system, the professional associations, and FÁS have responded positively to these developments and there are a wide range of up-dating/up-skilling programmes available together with a number of programmes, which are designed to develop management skills in the areas of construction demolition and waste and environmental protection.

7. Food Processing Sector

The Irish food processing industry is a vital sector of the economy in terms of output, employment and exports. However, in the rapidly changing landscape in which the industry operates, the sector is set to face significant challenges going forward. These challenges will include increasing market liberalisation, greater intensity of competition, changing consumption patterns, and rapid developments in food processing technology. Responding to such challenges will be demanding in terms of the skills and expertise that the industry will require in the future. Against this background, the Expert Group decided to undertake a study of the demand and supply of skills in the food processing sector up to 2010.

Demand

Although there is a projected decline in employment levels in the industry, within this overall decline fundamental changes are expected to occur in both the profile of employees entering the sector and the skill sets required by the industry. This is due to the variety of challenges facing the industry, particularly in the skill profiles of both production/operative staff and graduate entrants. The industry survey indicates that while the demand for overall operative staff is set to remain constant or in slow decline, the demand for immigrant labour, the majority of which are employed in low-skilled jobs, is likely to increase due to competitive pressures and the difficulty in securing local labour for certain occupations.

While there is no current or likely shortfall in graduate numbers to the industry over the next five years, the skill-sets of graduates will need to evolve to reflect changes in the market environment and industry structure.

Supply

Twenty three undergraduate third-level courses at certificate, diploma and degree level of direct relevance to the food industry were identified and profiled. These courses typically produce between 500 and 600 graduates annually. Some 19 courses at postgraduate level were examined. While the numbers are sufficient to meet demand, there is a concern about the popularity of food-related courses, which is declining (as measured by student CAO preferences). This is also reflected in declining entry point requirements for these courses. It suggests a negative perception by students of employment conditions and prospects in the food processing industry.

110 training organisations were identified as being involved in providing specific training programmes for the food sector. Approximately six percent of these are public sector bodies with the balance being private sector companies. Virtually all of the training courses available are short (1-3 day type) courses and workshops, as opposed to certificate or diploma programmes. It was found that there is a generally low level of availability and interest in training in many strategically important skill areas such as new product development, operations management and customer relationship management. This reflects the industry's short-term operational focus.

Skills Gap Analysis and Summary of Recommendations

There is no evidence to suggest that the number of places on food related third-level courses needs to be increased or decreased; instead the industries' ability to attract such graduates needs to be greatly enhanced. The need to review the current third-level programmes for graduates and post-graduates was highlighted. Currently, there is a heavy science / technology orientation to third-level food-related education, with virtually all courses being organised along functional specialist lines. More broad-based general food management and marketing courses should be incorporated.

Given the drivers of change in the international food industry, there is an increasing business imperative to invest in training. Despite these measures, there is a low level of commitment to training across the Irish food processing industry, with some notable exceptions. The focus of the recommendations is on five strategically important areas identified by the Expert Group as critical to the future skills requirements of the food industry. These are: employer focused demand initiatives (such as senior management training, and a graduate fast track programme); employee focused initiatives (e.g. promotional campaign on benefits of training); third-level education measures (e.g. new modules at undergraduate level, and formally defined work placements); supply-side training initiatives (such as immigrant induction programmes, and the expansion of "train the trainer" model); and state support / training infrastructure (including a national centralised database of accredited trainers and training programmes, and expansion of Skillsnets).

8. Logistics

Based on a census of all 250 companies providing logistics services in Ireland (representing 15,600 employees), this study examines the education and training needs of the logistics sector to 2006. A survey of all those involved in providing education and training to persons working in this area was also undertaken.

Employment Forecasts and Supply of Skills

The sector is dominated by "blue collar workers", chiefly drivers and warehouse operatives, with some managers and inventory control specialists. The analysis shows Irish industry will require approx. 4,000 new recruits annually to 2006, across a range of logistics skills.

Full-time education and training provision is insufficient to meet this need and most of the part-time training and education on offer are for persons already in employment. Generic skills, such as computer appreciation, health and safety and customer relations feature prominently, but there is also a significant demand for training in specific occupational skills such as transport management and forklift driving.

Skills Gap Analysis and Summary of Recommendations

The inherent multi-disciplinary nature of current logistics occupations is often not reflected in the course curricula. Modules on information technology, for example, are absent on some programmes although a knowledge of computers is now an essential requirement for everyone working in a logistics function from the warehouse operative to the supply chain manager, albeit at different levels of proficiency. In some cases, logistics courses have developed in an ad hoc manner with relatively little formal progression between many of them or formal recognition across the different accreditation systems (although there have been improvements in this area in recent years). All of these factors militate against promoting logistics as a desirable career choice for Irish school-leavers.

The majority of the recommendations are designed specifically to increase the number of young people obtaining qualifications in logistics. Significant increases in current education and training provision in all occupations from transport and warehouse operatives to documentation specialists, involving a range of different delivery systems including full-time and part-time education and training, traineeships and in-company training, are recommended.

9. Financial Skills

This study is the first assessment of financial services occupations undertaken by the Expert Group. The financial services sector has and continues to be a major driver of growth in Ireland. Employment increased by 30% from 1998-2002 in the 10 sub-sets of financial occupations examined in this study. The provision of high-level financial skills will remain instrumental in attracting foreign direct investment and central to the preservation of Ireland's reputation in the global financial domain.

Demand

The 10 sub-sets of occupations examined are:

- Treasury and company financial managers;
- Bank managers;
- Other financial managers;
- Accountants;
- Actuaries, economists, statisticians;
- Taxation experts;
- Underwriters, claims assessors, brokers;
- Credit controllers;
- Accounts clerks, bookkeepers, other financial clerks; and
- Cashiers, bank clerks.

Principal drivers of the future demand for these financial skills include overall economic growth, regulation, technological change and the globalisation of the financial services sector. In the short run, current forecasts of the international, as well as Irish economic growth are less favourable than anticipated in previous forecasts. It is expected that employment growth across financial occupations will be slower in the next two years. The recovery is expected to occur beyond 2004. Regulatory changes are likely to produce demand for new financial skills such as compliance officers and accountants with legal backgrounds. The impact of technology (especially ICT) is expected to continue to have an impact on the skills demand. Globalisation is likely to result in increased competition for the management of funds on an international level. Overall, the demand for financial skills is expected to be low in the short run and to recover beyond 2004.

Supply

It is particularly difficult to forecast precise numbers for the supply of financial skills because: for most of the selected occupations, no mandatory qualifications are required; almost all of the professional financial skills studied are acquired through continuous rather than the initial education process and data on enrolment figures, class sizes and dropout rates is scarce; and the education process associated with professional qualifications does not have a fixed duration. Where precise data is unavailable, the supply analysis focuses on qualitative information, including interviews with stakeholders and industry experts.

The overall conclusion is that the market appears to be responding to demand. The institutions that most notably have responded to market developments include universities, private colleges, professional institutions and FÁS. An important development is the establishment by the National College of Ireland (NCI) of a new financial education and training institute. The International Financial Institute of Ireland is a response to market demand for specialist skills in the financial services area, and it is an effort to enhance co-ordination and integration between the existing education system and industry.

Skills Gap Analysis and Summary of Recommendations

In the short run, the supply of skills appears to be sufficient to meet demand. Employment growth is not predicted to be significant in the short run; thus, demand for the ten financial occupations studied should not increase significantly. Redundancies in London and New York have further increased the available pool of workers with financial skills.

The medium to long-term outlook is favourable. No major shortages are forecast. However, specific skills need to continue to be carefully monitored as some occupations may prove more difficult to source (e.g. actuaries, project accountants and quantitative modellers). The Expert Group's recommendations focus on: the need for the Group to monitor changes in the financial regulatory environment which impact on skills needs: extending the FÁS Traineeship for junior financial advisors in the insurance industry to other regions in Ireland; monitoring the actuary occupation closely; and suggestions for combined skills courses at the new financial services institute at the NCI.

10. Soft Skills

It is widely recognised that soft skills, which can be defined as *the inter-personal and intra-personal skills required to be effective in the workplace* are becoming ever more important for organisational success. Inter-personal skills include the ability to work on a team; communication and influencing skills; and leadership and coaching skills. Intra-personal skills include self-management, orientation to learning, creativity and flexibility; motivation and perseverance and problem-solving. High performance work practices, the increasingly higher educational level of a significant number of new entrants to the Irish labour force, and their expectations of opportunity and development, the growth in employment in the services sector, and changes such as more family-friendly arrangements and intercultural diversity, have resulted in greater emphasis on the need for soft skills in a successful work environment.

The analysis identifies the role, nature and importance of soft skills in the workplace, establishes an Irish employers' viewpoint on soft skills through a survey, and profiles the current Irish education and training provision with regard to soft skills.

Demand

Soft skills are difficult to quantify and describe precisely, which makes their identification and assessment difficult. However, the key findings of the employers survey undertaken for this study reveal the following:

- In general, there was broad satisfaction with the current level of soft skills possessed by most employees, but it was recognised that such skills would become more important in the future;
- Occupational grades and levels require varying degrees of soft skills capability;
- Companies invest heavily in soft skills development;
- Soft skills were the most important differentiator of effectiveness in managing people;
- Good practice involves the use of a range of HR practices to instill and support a team-working culture; and
- Concerns were expressed with regard to new entrants in certain sectors (e.g. the hospitality sector).

Supply

In Ireland, unlike some other EU countries, there is no explicit formal statement of policy regarding soft skills which would provide a focus of attention and direction to education/training providers. Soft skills are part of some elements of the education system, including junior cycle and transition year at second level. Development of soft skills at second level is hindered by certain factors, including little formal assessment of achievement in these areas.

In the Further Education and Training sector (FET), programmes integrate education and training on vocational skills in particular disciplines and the development of personal skills. The extent of soft skills development however varies between programmes and between providers. Universities have their own discretion to decide what emphasis should be given to soft skills; consequently this varies across colleges and across courses. Until recently, little formal recognition of the importance of soft skills has been acknowledged by the universities.

Skills Gap Analysis and Summary of Recommendations

The continued emphasis on developing core technical skills is essential for the Irish economy. However, the need for complementary soft skills is increasing and requires attention to prevent a gap arising in the future. Among the recommendations made by the Expert Group in this area are: the need for soft skills development to be explicitly taken into account in a national policy agenda; initiatives in transition year; the need for soft skills to be incorporated into vocational programmes; and the further development of soft skills at third-level.

1. Introduction

1.1 Introduction

In the context of rapid economic and technological change, globalisation, imminent EU enlargement, strengthened competition and changing labour costs, Ireland's future economic growth and competitiveness will increasingly depend on the extent to which it can support high value knowledge based industries.

Knowledge based industries will drive Ireland's economy in the future. By addressing the skill needs of the next wave of knowledge industry more quickly than others, Ireland will gain a significant national competitive advantage. In effect, ensuring Ireland has an adequate supply of the required key skills will increasingly become an instrument for industrial development and future economic prosperity.

1.2 The Business Education and Training Partnership

The ***Expert Group on Future Skills Needs*** (hereafter referred to as the Expert Group) has made a significant input into Government policy in this area and proposed many actions since its formation in 1997. The Expert Group is one key element of the Business Education and Training Partnership (BETP); the others are the Business Education Training Forum, (BETF), the Joint Secretariat, the Skills and Labour Market Research Unit (SLMRU), and the Management Implementation Group.

The Business Education and Training Forum

The BETF 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. The aim of the forum is to provide an environment in which all relevant agents in the education/training sector can meet, discuss the findings of the Expert Group and consider strategic issues.

The Expert Group on Future Skills Needs

The aim of the Expert Group is to develop national strategies to tackle the issue of skill needs, manpower forecasting, and education and training for business. The objectives of the Group have remained the same since its inception. In particular, the objectives are to:

- identify in a systematic way the skill needs of different sectors;
- advise on actions needed to address identified skills needs;
- advise on the promotion of education/continuous training/business links at national and local level; and,
- advise on how to improve the awareness of job seekers where there are demands for skills that have been identified by the Expert Group. The main channel through which this is done is the National Skills Awareness Campaign.

The Expert Group consists of a Chairperson, Secretary (Forfás representative) and the group members. Membership has included business people, educationalists and training providers, policy makers, public servants, members of the industrial promotion agencies and the social partners[3]. The Expert Group operates via sub-committees, drawn mainly from its membership, but also includes other experts, to oversee and monitor research into particular sectors or issues identified for study by the Group.

3 See Appendix 1 for a list of current members of the Expert Group on Future Skills Needs and Appendix 2 for a list of the members of the Group's sub-committees.

The Joint Secretariat (JS)

A steering group, the Joint Secretariat, comprising members of Forfás, FÁS, Department of Enterprise, Trade & Employment, Department of Education & Science, and the HEA exists to support the work of the Expert Group. The main aim of the JS is to act as the operation committee of the Expert Group.

The Skills and Labour Market Research Unit (SLMRU)

The SLMRU is based in FÁS and it was established to support the work of the Expert Group. The aim of the SLMRU is to ensure that the Group's work is grounded to the greatest extent possible in a comprehensive and quantitative understanding of the labour market at occupational and sectoral level. A key focus of the SLMRU is the establishment of a national data-base in relation to skills and the labour market to enable the Expert Group analyse the balance between skills demand and supply.

The Management Implementation Group

The aim of the Management Implementation Group is to discuss and agree on the best means by which the Expert Group recommendations can be implemented. The objectives are:

- to review best implementation processes; and
- to implement the recommendations of the Expert Group.

1.3 The Work of the Expert Group on Future Skills Needs

The work of the Expert Group has focused on bringing together the different elements of the demand-side and supply-side of key sectors (and occupations) within the labour market. The sectors/occupations chosen for analysis were largely based on the importance of the sector to the Irish economy, the knowledge (from industry, state-agencies, government departments, etc.) of shortages in the area (both current and into the future), the severity of the shortages, and the need for long term planning in the education and training systems.

The Expert Group has published many reports[4] that have identified in a systematic way, the future skills needs of key sectors and occupations in the Irish economy and advised on the actions needed to address them. The Group has had considerable success in encouraging the implementation of its recommendations.

During 2002/03, the Group was of the view that it was important that its' work continue to concentrate on areas of high value if Ireland is to pursue its strategic goal of a knowledge-based economy. Several sectors and areas were identified by the Group for study. These included: the biotechnology sector; food processing sector; construction and logistics. The Group also undertook an analysis of the engineering profession, financial services occupations, and the need for soft skills in Irish industry. It also carried out a national survey of vacancies in both the public and private sectors. Other work by the Group included an assessment of education and training in Ireland relative to other EU countries. Implementation of its recommendations remained a key focus of the work of the Expert Group.

1.4 The Scope of the Fourth Report

This report is the fourth in a series of reports that examine the skills needs of key sectors. The Third Report in 2001 built on the previous two reports, broadening the scope to include additional sectors and include an analysis of the overall labour market. This current report broadens the scope even further. It includes a summary of the key findings and recommendations of all the various sectors and occupations analysed by the Expert Group over the period 2002/2003.

4 See Appendix 3 for a full list of the reports published by the Expert Group for Future Skills Needs.

Chapter 2 provides the overall labour market context that allows us to examine how the skills needs of the economy have changed since the publication of the Third Report. It concludes that the slowdown in the labour market since 2001 has resulted in a lessening of recruitment difficulties and a decline in labour shortages over the period.

Chapter 3 addresses the skills needs of the ICT sector. The analysis reviews and updates the forecasts in the Third Report in light of the global downturn. It proposes that the ICT sector will continue to be a key driver of economic growth, but the recovery in the sector is likely to be gradual and growth rates are likely to be significantly less than experienced in the 1990s. The analysis identifies the main areas where skills gaps are likely to arise.

Given the importance of the biotechnology industry globally, and the stated national strategies for Ireland in this area, chapter 4 examines the skills needs for a vibrant biotechnology sector. The analysis shows that Ireland is well positioned to benefit from the anticipated rapid growth in the biotechnology sector worldwide over the next 7 years. However, if the sector is to achieve its full potential, the supply of science-related skills must be increased considerably.

The supply of engineering skills has played a significant role in the development of the Irish economy in the past. Given the importance of an adequate supply of this key skill, the aim of chapter 5 is to examine how the future supply of engineers and engineering technicians in Ireland will match the requirements of industry and public bodies, and to identify ways to bridge any gaps. The analysis shows that the main constraint is to do with the number and quality of college applicants wishing to apply for engineering courses, particularly electronic engineering. The conclusion is that the take-up of engineering as a career must be promoted by all those involved, from government to educational institutions, employers and the engineering profession.

Chapter 6 reviews and updates the position in regard to the skills gap in the construction industry, identified in the Third Report. The focus is solely on skilled construction workers as opposed to those who are working in the construction industry, but who do not possess construction skills or who are unskilled. A decline in employment of approx. 11% over the period 2003-2010 is forecast, but even if these forecasts were to materialise, construction employment in 2010 would still be considerably higher than it was in 1999 and almost as high as the average employment in 2000. The chapter identifies the main areas where specific skills gaps are likely to arise.

The food processing industry, which makes a significant contribution to output and employment in Ireland, is the focus of Chapter 7. The industry faces many challenges over the coming years. The conclusion from the analysis is that that although the sector is expected to experience a decline in employment over the period to 2007, it will continue to represent a significant sector in Ireland, both as an employment provider and as a major exporter.

Chapter 8 focuses on the financial skills occupations and concludes that no major skills shortages are projected over the medium-term, as the industry responds well to any changes in the labour market.

The skills needs of the logistics sector are examined in Chapter 9. Specific skills gaps in the areas of transport, warehousing and distribution, and purchasing and e-procurement are identified. The barriers to successful supply-chain management in Ireland are also highlighted.

Chapter 10 focuses on the importance of soft skills in national curricula. The conclusion emerging is that soft skills are becoming increasingly important in the workplace globally, and although some improvements have been made in the delivery of such skills in the education and training systems in Ireland, more needs to be done to prevent a gap arising in the future.

2. Overview of the Labour Market

2.1 Introduction

This latest report of the Expert Group comes at a time of significant change in the economy in general, and the labour market in particular. For the first time since the establishment of the Expert Group, GNP growth has lessened and unemployment is rising. There are also question marks over the competitiveness of our labour force in an international context. This chapter provides the broad context for assessing how the skills needs of the economy may have changed since the publication of the Third Report of the Expert Group in 2001. The chapter reviews recent developments in the labour market, assesses short to medium term prospects and makes a number of specific policy recommendations aimed at improving the supply of skills to the economy.

2.2 Review of 2002

In reviewing the year 2002, the Expert Group noted that the slowdown in the labour market which began in 2001, continued throughout 2002. Although the total number in employment increased, the rate of employment growth slowed appreciably, reflecting the deceleration in GNP growth. Unemployment continued to rise, and would have risen by more were it not for the fact that labour force growth slowed due to a fall in participation. The growth in the labour force that did occur was due to demographic factors such as the increase in the population of working age, and immigration.

While employment rose by 1% during 2002, this represented a slowdown when compared to the 2.5% employment growth rate recorded in 2001. The recent deceleration in employment growth was most marked in manufacturing, where employment actually fell in 2002, and in financial services. To the extent that employment did grow in 2002, it was primarily due to large-scale public sector recruitment. Part of the reduction in labour demand in the private sector was reflected in reduced working hours rather than layoffs.

Employment fell in both agriculture (-4,600) and industry (-9,700) while rising substantially in services (+32,100). The substantial growth in services employment was driven by the increase in employment in sub-sectors dominated by the public service, with growth in health (+10,700), education (+5,300) and public administration and defence (+5,700) accounting for a combined increase of 21,700 jobs. Most of the increase in the education and health sector was accounted for by female workers (13,000 out of a total of 16,000).

TABLE 2.1: PERSONS IN EMPLOYMENT BY BROAD SECTOR ('000S)

SECTOR	2001Q4	2002Q4	% YOY
Agriculture	124.4	119.8	-3.7%
Industry	502.8	493.1	-1.9%
Services	1125.7	1157.8	2.9%
Total	**1752.9**	**1770.7**	**1.0%**

Source: CSO Quarterly National Household Survey, 2002 Quarter 4.

Turning to trends in occupational employment, data for the fourth quarter of 2002 reveals that three occupations registered significant changes in annual employment levels both in absolute and proportional terms: professionals (+12,500), personal and protective workers (+7,400) and plant and machinery operatives (-16,600).

TABLE 2.2: EMPLOYMENT BY OCCUPATION, 2002 QUARTER 4

BROAD OCCUPATIONAL GROUP	(000S) 2002 Q4	(000S) ANNUAL INCREASE	% ANNUAL INCREASE
Professional	190.8	12.5	7%
Personal & security service	176.5	7.5	4%
Craft & related	239.4	5.3	2%
Associate professional & technical	158.9	3.1	2%
Other (including labourers)	150.5	2.9	2%
Sales Workers	145.3	2.4	2%
Clerical & secretarial	219.0	1.3	1%
Managerial & administrators	312.0	-0.9	0%
Plant & machine operatives	178.1	-16.6	-9%
Total	**1770.7**	**17.8**	**1.0%**

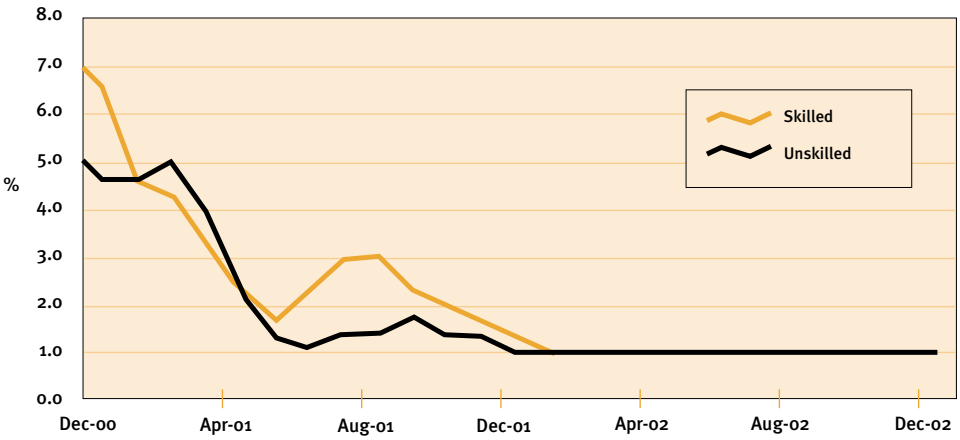
Source: CSO Quarterly National Household Survey, 2002 Quarter 4.

The average unemployment rate in 2002 was still only 4.4%, only slightly higher than the rate of 3.7% in 2001 and much lower than the EU average of 7.8%. Long-term unemployment has also remained at historic lows, averaging 1.2% in 2002.

While the downturn in the world economy has reduced the demand for Irish exports, the subsequent decline in the demand for labour has not been as large as might have been expected. The reduction in the length of the average working week would seem to imply that up to now many employers have adopted a 'wait and see' approach by cutting down on overtime.

Two related problems that have eased during the downturn are labour shortages and recruitment difficulties. Results from the IBEC/ESRI Monthly Industrial Survey point to a decline in labour shortages in the manufacturing sector. Figure 2.2 charts the percentage of manufacturing firms surveyed who responded positively to the question "is production by your firm being constrained at present by insufficient skilled/unskilled labour?" The graph shows that there has been a reduction in the number of firms experiencing labour shortages. Only 1% of manufacturing firms surveyed in 2002 said that output was constrained by shortages of skilled labour and another 1% said that output was constrained by shortages of unskilled labour.

FIGURE 2.1: IBEC SURVEY OF LABOUR SHORTAGE PRODUCTION CONSTRAINTS



Source: IBEC Monthly Industrial Survey, various issues.

The latest national vacancy survey, undertaken by the ESRI for the Expert Group, confirms that the number of unfilled vacancies has been decreasing in the private sector. In 1999/2000 there were 77,600 vacancies. By 2001/2002 this figure had fallen by 48% to 40,000. Nearly all occupational categories experienced large reductions in the number of vacancies (except for science technicians, see Table 2.3). The most noticeable reduction in vacancy numbers occurred for engineering technicians (-67%) and personal service workers (-66%).

TABLE 2.3: SUMMARY OF PRIVATE SECTOR VACANCIES BY OCCUPATIONAL GRADE, 1999/2000 & 2001/2002

OCCUPATION	1999/2000	2001/2002	% CHANGE
Managers/Proprietors	2,900	1,800	-38%
Engineering Professionals	1,500	900	-40%
Science Professionals	300	300	0%
Computer Professionals	900	500	-44%
Other Professionals	4,000	2,000	-50%
Engineering Technicians	3,300	1,100	-67%
Science Technicians	100	400	300%
Computer Technical Staff	1,000	600	-40%
Other Associated Professional	300	500	67%
Clerical and Secretarial	10,300	4,100	-60%
Skilled Maintenance & Skilled Production	14,600	8,300	-43%
Production Operatives	8,200	4,400	-46%
Transport & Communications	4,400	2,000	-55%
Sales	7,400	4,800	-35%
Personal Service	12,400	4,200	-66%
Labourers/Security	6000	4,200	-30%
Total	**77,600**	**40,000**	**-48%**

Source: National Survey of Vacancies in the Private Non-Agricultural Sector, 2001/2002,EGFSN/FÁS/Forfás.

The Expert Group also undertook a national survey of vacancies in the public sector for the first time. Previous vacancy studies have focused exclusively on the private sector. The survey found that the absolute number of vacancies in the public sector (12,000) was much less than in the private sector (40,000). This is hardly surprising, given that there about 4 private sector jobs for ever public sector job. However, the proportion of vacancies in the public sector at 4% was slightly higher than the 3% vacancy rate in the private sector. Public sector vacancies were concentrated in the high skill Manager/Proprietor, Professional and Associate occupations while private sector vacancies were most significant for Skilled Maintenance and Skilled Production workers. Table 2.4 presents the key findings for both private and public sector occupations.

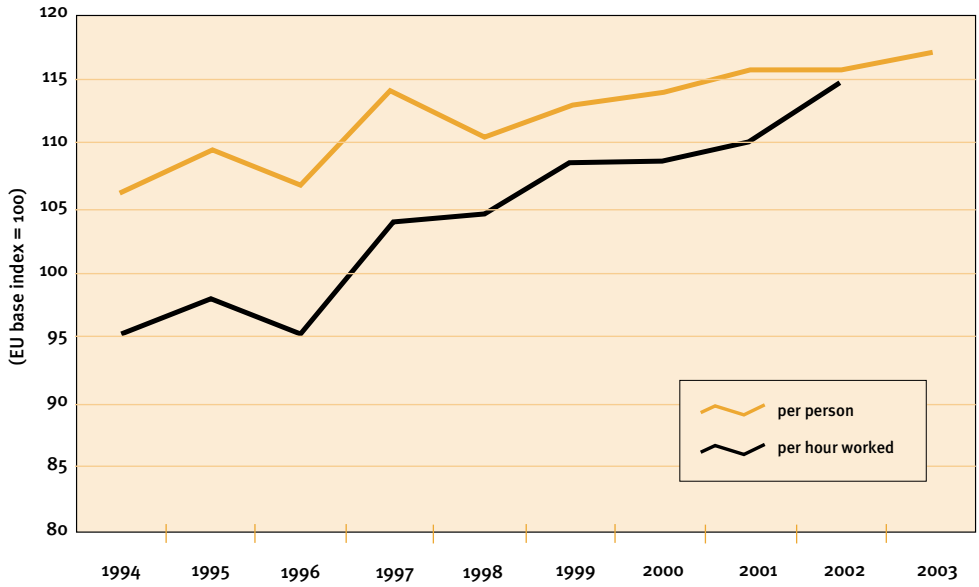
TABLE 2.4: SUMMARY OF VACANCIES BY OCCUPATIONAL GRADE 2001/2002, IN THE PRIVATE AND PUBLIC SECTORS

OCCUPATIONAL GRADE	PRIVATE NON-AGRICULTURAL SECTOR			PUBLIC SECTOR		
	VACANCIES	VACANCY RATE (%)	SHARE OF ALL VACANCIES (%)	VACANCIES	VACANCY RATE (%)	SHARE OF ALL VACANCIES (%)
Managers/Proprietors	1,800	1	5	1,000	4	8
Engineering Professionals	900	3	2	500	12	4
Science Professional	300	5	1	100	5	1
Computer Professionals	500	3	1	0	3	0
Other Professionals	2,000	4	5	2,200	3	18
Engineering Technicians	1,100	5	3	100	7	1
Science Technicians	400	4	1	400	6	4
Computer Technical Staff	600	4	2	200	13	2
Other Associated Professional	500	3	1	2800	6	23
Clerical and Secretarial	4,100	2	10	2,000	4	17
Skilled Maintenance & Skilled Production	8,300	8	21	100	1	1
Production Operatives	4,400	2	11	0	2	0
Transport & Communications	2,000	3	5	0	1	0
Sales	4,800	3	12	0	4	0
Personal Service	4,200	4	10	900	4	8
Labourers/Security	4,200	4	10	1,600	4	13
Total	**40,000**	**3**	**100**	**12,000**	**4**	**100**

Source: National Survey of Vacancies in the Public Sector,2001/2002,EGFSN/FÁS/Forfás.

Turning to labour productivity, Figure 2.2 compares Irish productivity per person employed and per hour worked relative to the EU in recent years. Labour productivity per person employed in Ireland has remained above the EU average and has risen fairly steadily since 1996 when Irish labour productivity was 7% higher than the EU. Labour productivity per hour worked, which was considerably lower than per person in 1994 (over 10 percentage points), has increased even more rapidly since 1996. However, high productivity levels have been heavily influenced by a few exceptional industrial sectors - notably chemicals and electronics, which account for only a small proportion of manufacturing employment. For example the chemicals sector now accounts for 42.3% of industrial output but only 9.7% of employment.

FIGURE 2.2: IRISH LABOUR PRODUCTIVITY – GDP IN PPS RELATIVE TO THE EU, 1994-2003*

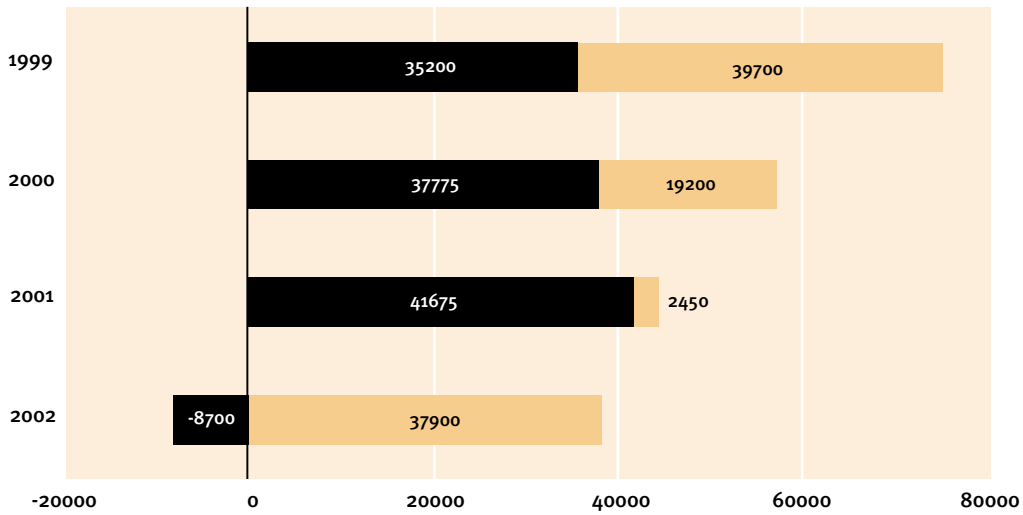


Source: IBEC Monthly Industrial Survey, various issues.

2.3 Labour Force Supply

Labour supply growth slowed dramatically in the fourth quarter of 2002, increasing by only 29,200 annually, compared to a 46,400 increase the previous year. This deceleration in the rate of growth was due to a fall in labour force participation among the 20-34 year age group, which may be viewed as a form of "hidden unemployment". The growth in the labour force that did occur was due to demographic factors such as the increase in the population of working age, and immigration, which between them added an estimated 37,900 to the labour force. This was partially offset by a net decrease in participation of 8,700. The importance of the participation effect for labour force growth has diminished dramatically since 1999, when growth attributable to participation factors (+39,700) was more significant than demographic factors (+35,200).

FIGURE 2.4: ANNUAL LABOUR FORCE GROWTH 1999-2002*



Source: CSO 2002 Quarter 4, National Employment Action Plan 2002.
Note: The 2002 figure is the year on year growth ending the fourth quarter of 2002.*

Immigration from outside the European Economic Area (EEA) continues to be a significant contributor to labour force growth. In 2002, 40,321 work permits were granted to non-EEA nationals, an increase of 10.7% on the 36,436 permits granted in 2001 (see Table 2.5). However, there was a reduction of 21.2% in the number of new permits from 29,599 in 2001 to 23,326 in 2002. The number of work visas and work authorisations issued in 2002 (all of which are new) also fell while the number of renewed permits increased dramatically from 6,485 in 2001 to 16,562 last year. Despite the annual decline in new permits and visas/authorisations, the number issued, at 25,936, is still extremely significant, given that the overall increase in the labour force for the year was 29,400.

TABLE 2.5: TOTAL WORK PERMITS/VISAS/AUTHORISATIONS ISSUED 2000-2002

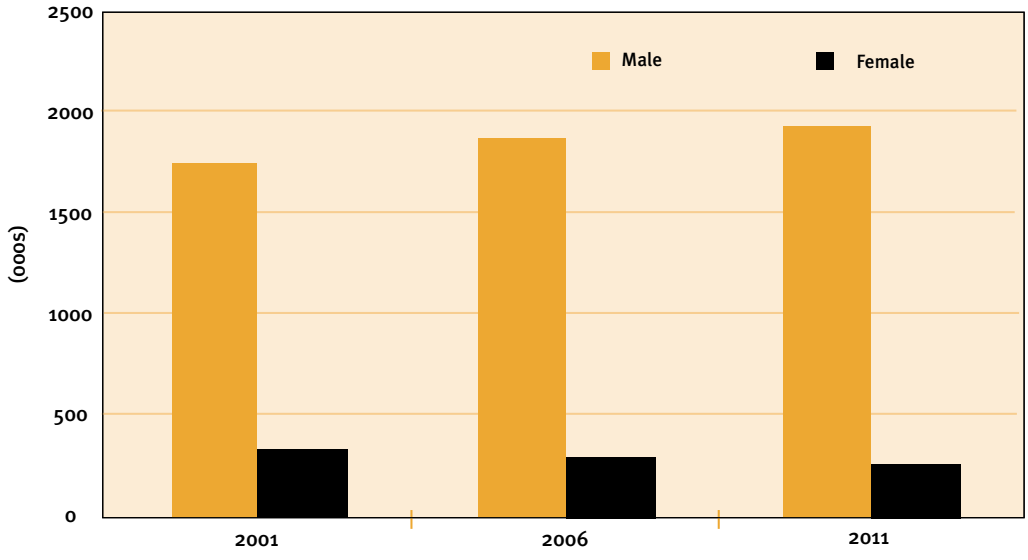
YEAR	NEW PERMITS	RENEWALS OF PERMITS	GROUP PERMITS	TOTAL WORK PERMITS	VISAS & AUTHORISATIONS	TOTAL
2000	15,434	2,271	301	18,006	1,383	19,389
2001	29,594	6,485	357	36,436	3,749	40,185
2002	23,326	16,562	433	40,321	2,610	42,931

Source: Department of Enterprise, Trade and Employment.

It should be noted, however, that the net contribution of Work Permit related immigration, defined as the 12-month running total of "permits in issue" (new and renewed permits), has been declining after reaching a peak of almost 22,000 in September 2001. Latest figures for May 2003 suggest that the annual net increase in work permit related immigration was just over 3,000.

Figure 2.4 contrasts the projected growth in the labour force over the 2001-2011 period with the projected decline in the population aged 15-19. The labour force is expected to increase by 11% over this period while the population aged 15-19 is forecast to fall by 17%. This implies that there will be a reduction in the number of young people entering the workforce.

FIGURE 6: LABOUR FORCE AND 15-19 POPULATION PROJECTIONS 2001-2011



Source: CSO Population and Labour Force Projections, 2001-2031.

2.4 Earnings Trends

To the extent that there is a mismatch between supply and demand this may be reflected in earnings growth, with earnings tending to increase faster in occupations where demand exceeds supply. However, there tends to be a lag in the adjustment of earnings to a change in output. Annual earnings growth rates for various sectors are displayed in Table 2.6. The figures point to a general slowdown in earnings growth occurring in the latter half of 2002 as wage expectations began to adjust to the deterioration in the economic environment.

The moderation in earnings growth was most pronounced in the finance sector where annual earnings growth decelerated from a high of 15.1% in June 2001 to only 2.1% in December 2002. The public sector also experienced a noticeable slowdown in the rate of earnings growth, from 10.8% in September 2001 to 2.5% in December 2002. Earnings growth has been strongest in the construction sector, although there was a noticeable slowdown in the sector towards the end of the year. Annual earnings growth in the construction sector in December 2002 was 6.3%, down from 11.6% in September 2002.

Within the distribution and business services sector, earnings for those employed in the sub-sector of computer activity and R&D actually fell by 2.6% for the year. There is currently a larger supply of ICT jobseekers on the labour market than has previously been the case, due to the high number of redundancies in the sector. While annual earnings growth rates in the financial services sector has not followed a very clear pattern, the data suggests that the growth rate has moderated.

TABLE 2.6: AVERAGE WEEKLY EARNINGS ANNUAL GROWTH BY SECTOR

SECTOR	MARCH 2001	MARCH 2001	JUNE 2001	SEPT 2001	DEC 2001	MARCH 2002	JUNE 2002	SEPT 2002	DEC 2002
Financial Services	€634.3	11.4%	15.1%	10.6%	6.8%	9.6%	5.5%	0.5%	2.1%
Distribution & Business Services	€538.0	10.4%	8.5%	8.2%	5.1%	2.5%	3.5%	2.3%	4.8%
Construction	€562.4	10.6%	9.3%	10.2%	5.2%	11.0%	11.8%	11.6%	6.3%
All Industries	€534.2	7.5%	8.4%	10.9%	9.6%	7.0%	5.5%	3.9%	6.2%
Public Sector	€654.1	10.1%	10.5%	10.8%	8.3%	6.5%	4.9%	4.6%	2.5%

Source: Department of Enterprise, Trade and Employment.

2.5 Outlook for 2003/2004

While the downturn in the world economy has led to a significant reduction in the demand for exports, the decline in the demand for labour has been more muted. Nevertheless, the longer the slowdown persists, the greater the probability of a much more pronounced increase in unemployment. Some forecasters argue the economic slowdown looks set to continue in the short-term. The IMF recently reduced its growth forecast for 2003 for the US from 2.6% to 2.2%, and the European Central Bank (ECB) has again lowered its 2003 growth forecast for the Eurozone, from 1.6% to 0.7%. Apart from this deterioration in the international environment, the appreciation of the euro vis-à-vis the dollar and sterling will tend to increase the pressure on Irish competitiveness and force private sector firms to take more drastic action in reducing labour costs than heretofore. Given the current recruitment cap, the public sector can no longer be relied on to prop up employment growth. The carryover effect of very extensive public service recruitment in 2002 is likely to result in average public service employment levels during 2003 being marginally higher than in 2002.

It is likely that the average unemployment rate in 2003 will exceed 5%, with the numbers unemployed possibly reaching 100,000 by the end of the year. Past experience suggests the increase will be greater for young people, with youth unemployment possibly reaching 10%. Even in the event of an economic recovery in the near future, there will probably still be a delay before cyclical unemployment responds to any increase in economic activity, given that changes in unemployment tend to lag changes in output.

At a broad sectoral level, the ESRI is forecasting only modest annual average employment growth in 2003 for services (+0.3%) while anticipating a slight reduction in industry (-0.8%) and a significant reduction in agriculture (-3.3%)[5]. Results from recent IBEC-ESRI Monthly Industrial Surveys are even less encouraging, revealing negative employment expectations among manufacturing employers. The chemicals sector is the only manufacturing sector where employers are anticipating an increase in employment in the short-term.

Only a limited improvement in the international environment is expected in 2004, with Euro area growth forecast at a little over 2% and unemployment staying high at almost 9%. This delay to recovery will inevitably impact on Ireland. The ESRI *Medium-Term Review 2003-2010* estimates that unemployment is likely to increase again in 2004 and 2005, with the unemployment rate peaking at 5.7% in 2005 before gradually falling as the economy recovers. If unemployment exceeds 5% for several years, then long-term unemployment, which up until now has remained very low (1.3%), also looks set to rise. Although the long-term unemployed will still tend to be drawn from the most disadvantaged, the skills and social profile of the long-term unemployed is likely to be somewhat less homogeneous than in the recent past.

The speed of growth of the labour force may also be slower than previously anticipated. First, female participation, which has been one of the mainstays of labour force growth in recent years, seems to have stabilised. In fact, given that most of the recent increase in public sector employment was for females, the public sector recruitment cap could spark a fall off in female participation rates. Female participation could also decline because an increasing number of women in the workforce are of child-rearing age, and may decide to swap career work for caring responsibilities, especially if they adjudge the cost of childcare to be prohibitive. Second, the ESRI predicts that labour force growth will slow in the medium-term, with the number of immigrants declining due to the economic slowdown. The fall in net-immigration may be tempered by the fact that the government has agreed to allow workers from the accession countries unrestricted access to the Irish labour market once enlargement begins in 2004. However, slower employment growth, of itself, is likely to have a depressing effect on the level of net immigration to Ireland.

Given the expected slowdown in employment growth, the previous challenge of meeting labour shortages should not be as serious a concern in the short-term. Perhaps the biggest challenge now facing labour market policy-makers is the restoration of our international competitiveness. As a small open economy, Ireland has been hit by the slow growth in the world economy and the appreciation of the euro vis-à-vis the dollar. Given the current rate of inflation, and with wage costs increasing, improvements in productivity will need to take place if we are to remain a competitive exporter and an attractive destination for investment. Up until now, productivity levels have remained relatively high, thanks in part to our ability to attract technology-intensive companies that almost by definition have high productivity. Nevertheless, in the future, high-tech companies will invest elsewhere if Ireland is not able to provide a large pool of highly skilled labour. To maintain productivity, the workforce will need to receive up-to-date relevant training. The need for up-skilling is even more pressing given the ageing of our workforce.

5 Forecasts are taken from the ESRI Quarterly Economic Commentary, Summer, 2003.

2.6 Conclusions and Recommendations

The assessment of the Irish labour market is less sanguine than has been the case in previous reports. Unemployment now looks likely to rise for the next few years. An optimistic view is that labour shortages per se will no longer be as significant a concern as previously. The new challenge will be to maintain competitiveness internationally by improving labour productivity in a cost-effective manner while minimising the impact on unemployment. Therefore, policy should focus primarily on increasing the proportion of highly skilled workers in the labour force. With this objective in mind, the Expert Group proposes the following policy recommendations.

Recommendation 1: *Up-skilling*

Greater emphasis needs to be placed on up-skilling the existing workforce. A range of interventions will be needed including the establishment of a national framework of qualifications and standards for all occupations. Improving the HRD function within companies and incentives to train less qualified workers are needed.

Recommendation 2: *Proportion at third-level and Uptake of Science/Technology*

There is a continued need to increase the proportion of young persons entering third-level education. Further efforts must be made to reverse the decline in the take-up of science and technology courses.

Recommendation 3: *Quality of Vocational Training*

For those who do not proceed to third-level, as many as possible should be facilitated to acquire a recognised qualification. On-going efforts to ensure the quality and relevance of vocational training for young persons are needed.

Recommendation 4: Improving Further Education/Training for the Disadvantaged

In the context of life-long learning, a national effort to improve the take-up of further/higher education/training for persons from disadvantaged groups is required, involving the setting and monitoring of targets for participation among priority groups.

Recommendation 5: *Immigration Policy*

Ireland needs to develop a planned system of immigration that can meet future skill needs while at the same time being flexible enough to adapt to unforeseen economic and sectoral fluctuations.

Recommendation 6: *Re-skilling of Unemployed*

While an increase in cyclical unemployment is almost inevitable given the current economic climate, a rise in structural unemployment is to a large extent subject to the appropriateness or otherwise of labour market policies. There is a need, therefore, to ensure that appropriate interventions are in place to re-skill those who become unemployed during the downturn as there is a real danger that cyclical unemployment will become structural.

3. The Demand and Supply of Skills in the ICT Sector

3.1 Introduction

As an emerging knowledge-based economy, Ireland has one of the highest concentrations of information and communications technology (ICT)[6] activity and employment in the OECD. According to ICT Ireland, almost 100,000 people are employed in the ICT sector with over half of these jobs being provided by foreign-owned companies. In 2001, total exports of ICT products and services from Ireland amounted to €31 billion representing 33% of all exports. Ireland is currently the largest exporter of software products in the world and manufactures one third of all PCs sold in Europe.

Since late 2000, the global ICT industry has suffered a severe downturn. However, there are signs of an upturn on the horizon, although it is likely to be gradual. While there is no general agreement as to when ICT markets are likely to recover, the OECD has projected a recovery in capital investment in 2004 in its most recent Economic Outlook, which would be likely to lead to stronger ICT markets. Gartner, a prominent ICT industry research organisation, has also projected stronger markets in late 2004, based on its view of industry investment needs. Others argue that the downturn may be more prolonged.

While the ICT sector in Ireland is well established, the future of the industry depends on moving higher up the value chain; using Irish-based expertise to design innovative products for global markets and to control the marketing and strategic aspects of their development. Crucial to achieving this will be the provision of an adequate supply and match of skills for the sector.

Given its importance to the economy, the Expert Group has undertaken a number of studies of the manpower and skills requirements of the ICT sector[7]. In December 2001, the Expert Group reviewed the July 2001 skills estimates in light of the slowdown in the ICT sector and concluded that these estimates were still valid. However, due to the current slowdown and emergence of a range of specific market and technology drivers within the ICT industry in recent times, the Expert Group is of the view that it is necessary to review and re-assess the skills requirements for the sector. McIver Consulting and PA Consulting were commissioned in April 2003 by Forfás, on its own behalf and behalf of the Expert Group, to study the potential for the development of ICT clusters in Ireland and the skills needs for the sector up to 2010. The findings presented here are based on preliminary findings of the skills aspect of the project. These results may be subject to minor changes once the cluster analysis has been finalised.

The results are based on a combination of historical trends, findings from the wider study, and an investigation into the relationship between economic conditions and ICT sector employment growth. In addition, a limited number of interviews were undertaken with the industrial development agencies, companies and academics. The study has also been informed by a wide literature review.

3.2 Demand for Graduates with ICT Skills

The analysis of demand for ICT skills involves a detailed examination of employment data for the ICT sector in Ireland. Forty four industry sub-sectors were identified and analysed. Demand projections are made for the following four primary groups of graduates (see Table 3.1 for projections):

6 The ICT sector is defined by the OECD as a combination of manufacturing and services industries that support the capture, transmission and electronic display of data and information.

7 See for example, *First, Second and Third Report(s) of the Expert Group on Future Skills Needs,* (December 1998, March 2000, July 2001 respectively); and Report on e-Business Skills, August 2000.

- graduates in computing at degree/graduate diploma level;
- graduates in computing at certificate/diploma level;
- graduates in engineering at degree level; and
- graduates in engineering at certificate/diploma level.

In making these projections, it is assumed that a market recovery will commence in 2004. While it is assumed that the overall ICT market growth rate following the recovery will be in line with long-term trends, this is expected to be significantly less than was experienced in the late 1990s.

Following the market recovery, it is argued that competition between countries for ICT jobs will continue to be more intense than was the case before the downturn. In making the demand projections, the view is that Ireland can be sufficiently competitive in a number of major areas to retain most existing employment, and to grow further at, or ahead of, a rate commensurate with general international employment growth. These areas include:

- software – primarily applications software;
- integrated circuit design (or microelectronics design);
- high-end electronics manufacturing;
- business functions of ICT companies; and
- IT services.

The software sector is expected to resume employment growth once the ICT market upturn occurs. Internationally, the sector has a history of rapid employment growth, reflecting the fact that spending on software absorbs an ever-increasing share of all ICT spending, and reflecting a long-term shift from in-house software activities towards the purchase of software products and services. The rate of employment growth projected, 11% across the sector from 2004 to 2010, is much lower than that experienced in the 1990s, when growth peaked at 25% per annum, subsequently running at around 18% per annum.

Microelectronics design is seen as an area of high growth potential, and as a significant source of potential demand for degree graduates in electronic engineering[8]. The projection is based on an employment increase of 16% per annum, which is similar to that experienced between 1997 and 2000, when the available supply of electronic engineering graduates fell well short of the industry's requirements, constraining its' growth to 12% per annum.

Significant growth is expected in the international delivery of services over the Internet and mobile networks by Irish-based companies. Mixed trends are expected in electronic hardware and systems. Lower value-added activities are likely to continue to migrate out of Ireland. It is expected that some areas of high-end manufacturing will continue to grow, and that manufacturing operations will continue to add business functions (e.g. teleservices, treasury, shared services, EMEA management functions), and product development and other R&D work. These trends are expected to drive an increased requirement for computing and electronic engineering graduates to undertake development work.

8 A large proportion of individuals working in microelectronics design have degrees in electronic engineering. Even a modest increase in employment could result in a significant increase in the demand for engineers.

More generally, it is anticipated that ICT firms will increasingly locate support functions and other business functions in Ireland. This will not however, drive a substantial demand for technology graduates, as most of the work involved will be in areas such as administration, supply chain management, finance, sales support and telesales in which there is no demand for large numbers of graduate-level technology staff.

While Ireland can be sufficiently competitive in these areas, it is not a foregone conclusion that Ireland will be successful. Success depends, among other factors, on exploiting and building upon the base of knowledge, experience and skills that the sector has built up over a period of decades: capabilities in entrepreneurship; capabilities in management of technology companies; advanced technology skills; and capabilities in marketing.

3.3 Supply of Graduates with ICT Skills

In considering skills supply, graduate projections have been made at certificate, diploma, primary degree and graduate diploma levels for the following disciplines:

- computing (including computer science, software engineering, business information systems, multimedia, systems administration, systems support);
- electronic engineering (including electronic engineering, computer engineering and telecommunications engineering);
- production and mechanical engineering (including production engineering, manufacturing engineering, industrial engineering, mechanical engineering and mechatronics);
- other engineering (including civil engineering, structural engineering, building services engineering, construction management, chemical engineering, food engineering, aeronautical engineering and electrical engineering amongst others); and
- computer-related qualifications (qualifications with a strong IT content, which are not primarily designed to produce ICT development professionals, including: office information systems; BA with computing; technical writing; and business degrees with a final year specialisation in IT amongst others).

Beyond the period when college entrants of 2003 are likely to graduate, two projections have been made in each case as follows.

- **Scenario 1**: the "No Recovery in Student Confidence" projection. This assumes that the pattern of applications remains broadly similar to that seen in 2003. Applications are affected by the demographic downturn.
- **Scenario 2**: the "Recovery in Student Confidence" projection. This assumes that the share of students entering computing and electronic engineering ramps up, reaching 80% of its previous peak level in 2007. Numbers entering "other engineering" fall to compensate for the increase in electronic engineering numbers. Again, applications are affected by the demographic downturn.

The analysis does not distinguish between primary degrees and higher degrees. As the vast majority of those obtaining higher degrees in technology disciplines have earlier received a primary degree (or in some cases a graduate diploma) in a closely related area, this means that the output of primary degrees can, with reasonable accuracy, be taken as equivalent to the overall degree output, with double counting for individuals with multiple degrees netted out.

Based on these graduate projections, and taking account of both the need to avoid double counting people who obtain add-on qualifications, and the need to avoid counting those who will not become available, these graduate projections have been used to produce projections of the numbers of graduates that will become available to Irish employers.

3.4 Skills Gap Analysis

Table 3.1 shows that the ICT sector downturn has caused an excess of supply over demand for graduates, but that the expected recovery in demand will lead to a shortage of graduates[9].

The projection for computing degree graduates shows supply and demand being reasonably well balanced up to 2006. Thereafter, demand overtakes supply, and eventually exceeds it by a substantial margin. The projection for computing diploma and certificate graduates shows a significant excess of demand over supply emerging. However, this is of less concern than the degree level gap, as it may be bridged more easily by alternative means of entry into the sector, such as conversion courses.

Although the projection for overall engineering degree graduates shows a reasonable balance between supply and demand, this comprises a shortage of electronic engineers and a potential surplus of other engineers, chiefly civil. Strong growth in demand for electronic engineers is projected from the microelectronics design sub-sector, while intake into electronic engineering courses has fallen sharply. A similar trend is observed for the projections of engineering diploma and certificate graduates[10].

9 See Appendix 4 for a reconciliation of the projections in this report with those contained in the Third Report.

10 Chapter 5 examines the engineering profession in more detail. There are some differences between the supply and demand projections in the analysis of ICT skills in this chapter and the demand and supply of engineers and engineering technicians. To some extent, these reflect the fact that the two studies were undertaken at different times. The analysis behind the engineering study was completed during 2002, while the ICT analysis was undertaken in the second half of 2003, as a part of a wider review of the ICT sector. Also, the ICT analysis in 2003 updated the engineering analysis, taking advantage of a significant volume of new data on ICT sector employment, student numbers, graduate numbers, graduate destinations and data on the college entry process. The wider review, of which the ICT skills analysis forms a part, has provided new inputs into the demand projections, which has also led to differences. Further, the ICT analysis takes account of preliminary information from an investigation by the Expert Group of the impact of demographic trends on skills supply. Finally, it should be noted that the engineering analysis in Chapter 5 excludes computer engineering, which is included within engineering in this chapter. On the demand side, this accounts for differences between the two analyses of over 120 graduates.

TABLE 3.1 BALANCE BETWEEN SUPPLY AND DEMAND FOR ICT SKILLS, 2003-2010*

YEAR	DEMAND	SUPPLY		BALANCE	
		Scenario 1 (No Recovery in Student Confidence	Scenario 2 (Recovery in Student Confidence)	Scenario 1	Scenario 2
Computing Degree					
2003	870	2,254	2,254	1,384	1,384
2004	2,016	2,244	2,244	228	228
2005	2,208	2,054	2,134	-154	-74
2006	2,424	1,658	1,818	-766	-606
2007	2,667	1,378	1,698	-1,289	-969
2008	2,945	1,365	1,876	-1,580	-1,069
2009	3,254	1,343	2,234	-1,911	-1,020
2010	3,612	1,299	2,395	-2,313	-1,217
Computing Diploma or Certificate					
2003	170	443	443	273	273
2004	325	372	372	47	47
2005	352	271	271	-81	-81
2006	383	208	307	-175	-76
2007	427	205	323	-222	-104
2008	472	198	321	-274	-151
2009	523	192	316	-331	-207
2010	579	193	370	-386	-209
Engineering Degree					
2003	795	1,883	1,883	1,088	1,088
2004	1,305	1,985	1,985	680	680
2005	1,378	1,840	1,840	462	462
2006	1,443	1,567	1,567	124	124
2007	1,534	1,608	1,608	74	74
2008	1,582	1,544	1,592	-38	10
2009	1,631	1,508	1,664	-123	33
2010	1,679	1,437	1,666	-242	-13
Engineering Diploma or Certificate					
2003	1,065	1,690	1,690	625	625
2004	1,449	1,686	1,686	237	237
2005	1,460	1,680	1,680	220	220
2006	1,437	1,746	1,745	309	308
2007	1,414	1,718	1,696	304	282
2008	1,417	1,667	1,603	250	186
2009	1,471	1,609	1,541	138	70
2010	1,507	1,627	1,538	120	31

* Provisional estimates.

Note: The computing and engineering categories used are compatible with earlier Expert Group reports. See Appendix 4 for a comparison of the demand and supply forecasts with those in the Third Report.

3.5 Ways to Address Skills Gap

There are a number of key issues requiring consideration when addressing the skills gap for the ICT sector. These are outlined below.

Skills Mismatch

There is a need to match skills supply with industry demands. A large part of the key to closing the gap between Ireland's ICT sector and the "best in world" lies in developing industry capabilities which are heavily skills-dependent. These require the necessary skills to support them. There are three key areas of concern:

- Higher order technology skills;
- Business skills specific to the ICT sector; and
- Researcher skills.

As a result of shortcomings in these areas, a number of changes to education and training provision are required. First, computing and electronic engineering provision at third-level has in the past focused mainly on initial education. There is a need for it to also focus on continuing education for those already in the workforce. Initiatives under the IT Investment Fund have made a good start on this, and it will be important to build on this.

Second, it is necessary to improve skills in the ICT sector in business areas such as selling, marketing, product management, entrepreneurship and business strategy. The initiative should have the following main foci:

- education and training for those already working in the sector, designed to be accessible to technologists;
- specialised technology industry graduate business and entrepreneurship courses; and
- information about ICT sector business for students and recent graduates in technology disciplines.

In order to deliver this initiative effectively, it will be necessary to develop a stronger capability in management of technology business in the higher education system. It will also be necessary to leverage resources outside the higher education system in order to deliver interventions in areas that may not be suited to delivery through the system.

Third, the general approach with the provision of opportunities for research students in computing and electronic engineering should try, so far as possible, to make places available to all suitable students interested in pursuing research. Companies interested in recruiting significant numbers of Ph.D. graduates in very specific disciplinary areas should get involved in steering the direction of research through provision of some funding. Funding agencies should consider the possibility of matching such funding in cases where this is proposed in research funding applications.

Employment Initiatives for ICT Graduates

The Expert Group welcomes ICT Ireland's initiative under which a number of major ICT companies offer temporary employment to ICT graduates currently having difficulty in finding work relevant to their qualifications. The initiative has the potential to make a significant difference to the medium and long-term impact of the current downturn. There is a need for other ICT companies to participate in the initiative, or to offer similar opportunities to graduates separately from the initiative.

Inward Migration

Inward migration provides an important part of the Irish ICT skills supply. At times of local skills shortage, it is important that companies should be able to source general ICT skills from other EU countries or, if unavailable, from outside the EU. From 2004, with the accession of ten new EU Member States, the Irish ICT sector will be able to recruit freely across much of Eastern Europe, one of the key areas from which the sector has sourced skills in the past. Other sources, such as the US, India and non-accession Eastern European states, will remain subject to immigration restrictions.

At times when there is no general skills shortage, the need for inward migration from outside the EU is reduced, but not eliminated. It is important that companies in Ireland are able to recruit skilled workers in specific identified occupations that require extensive experience when these workers are not available in the Irish workforce. If these workers cannot be sourced from within the EU, it is important that companies be able to recruit outside the EU in order to assist in bridging the sort of high level skills gaps identified in this report, especially for R&D activities going forward.

Reflecting the fact that these skills are typically most readily available in significant ICT clusters, and the fact that many of these clusters are located outside the EU, there will be a continuing need for some level of inward migration from outside the EU to meet the Irish cluster's needs for targeted high-level skills which are unavailable in the Irish labour force. In this regard, it is important that a more targeted approach to immigration policy be adopted.

Sector Cyclicality and the Education Sector

The Expert Group has taken account of the cyclicality of the ICT sector since the *First Report,* which considered that the risks inherent in providing for growth were greater than those inherent in failing to provide for it. Just as many colleges were cautious in adding permanent staff when student numbers were growing, it is important that the education sector should take account of the cyclicality when responding to the current downturn.

Gender Issues

Internationally, female college applicants are much less likely than males to choose technology subjects. This pattern is reflected in Ireland. Examination of CAO data shows that the current downturn in interest in ICT subjects has affected applications from females more than those from males. The Expert Group study, *The Demand and Supply of Engineers and Engineering Technicians,* found that many female students choosing engineering had been persuaded in that direction by some intervention. On average, females might be more likely to decide against studying technology subjects because of bad news. While there has been a significant movement of female college applicants away from ICT subjects, it is reasonable to think that it may be possible to reverse this trend once an ICT sector upturn commences. Interventions such as school visits and taster courses are known to have a positive impact on applications from females, and boosting these is a part of the strategy set out in the recommendations. In addition to promotional work, the ICT sector needs to take stock of the opportunities it offers to females. If the career opportunities are good, this will ultimately be apparent to college applicants and to those advising them. Many of the major overseas-owned operations have strong policies aimed at making this a reality. It may now be time for an industry-wide initiative.

Under-performance at Second Level

There are two issues to do with performance of second level students that tend to limit the proportion of students interested in, and well qualified for, taking courses relevant to the ICT sector at third-level. The key issues relate to male under-performance at second level, and more general under-performance in mathematics and physical sciences at second level.

Females are significantly more likely than males to take the Leaving Certificate. Having taken it, on average they outperform males by a significant margin. The differences are most dramatic at upper ability levels. This difference in performance, which probably does not reflect a significant underlying difference in ability, means that the better performing students tend to be less interested in studying technology subjects.

Patterns of performance in mathematics at second level are very different to those for other subjects. As the study of mathematics is an important element in preparation to study technology subjects at third-level, and as it plays an important role in qualifying for entry into many courses[11], under-performance restricts the number of students interested in and able for ICT courses. Similar issues arise in the physical sciences at second level, which have been addressed in the Report of the Taskforce on the Physical Sciences.

Course Intake

Applications to study computing and electronic engineering have fallen sharply since 2000. The primary reason for this is that college applicants are now much less confident of employment and career prospects in the ICT sector than during the fast growth years of the late 1990s. Interest in these courses among female applicants has fallen even more sharply than for males.

The fall in applications has had two main types of impact on the intake into ICT-related courses:

- The number of students accepting places on courses in computing and electronic engineering has fallen sharply at degree, diploma and certificate level; and
- The average quality of the intake into computing courses, as measured by CAO points, has fallen significantly at degree, diploma and certificate level. As a result, the spread of ability of students accepting places has widened. There has also been a much more limited fall in the quality of intake into electronic engineering courses. The quality of intake into most other areas of engineering has been stable, and, in some cases, has risen.

Colleges have responded to the issue of quality of intake in two ways. Many have reduced the number of places on offer so as to avoid offering places to applicants they think will be unlikely to complete a course. In addition, most (possibly all) have changed their approach to teaching and learning, offering additional learning support to students, intervening more to ensure that students keep up with their studies, and improving facilities. Many of these interventions have been supported by the HEA under the Information Technology Investment Fund, a fund established following recommendations of the *Third Report of the Expert Group on Future Skills Needs*.

Overseas Students

It is desirable, where possible, that colleges recruit overseas students to fill places on technology courses that they cannot fill will Irish students, rather than shrinking their throughput. These students may remain in the country after graduation, and contribute to the supply of graduates.

11 Engineering degree courses accredited by the IEI require a minimum of a C3 in higher level mathematics. Virtually all relevant courses require at least a minimum of a D3 in ordinary level mathematics.

3.6 Recommendations

In light of this analysis, the Expert Group makes the following recommendations for the sector.

Recommendation 1: *ICT Investment Fund*

It is recommended that the IT Investment Fund, established on the recommendation of the Third Report of the Expert Group, should be continued, and should be funded at the full level originally agreed.

The existing stream of activities should continue to be funded. Areas of active intervention at present are:

- *Continuing technology education;*
- *Technology training for industry; and*
- *Initiatives to promote student retention.*

The following areas should also be priorities for the future:

- *Once the ICT market recovers, it is likely that demand for graduate diploma conversion courses will increase. Sufficient funding should be made available to colleges to allow for a major expansion in intake. The "Recovery in Student Confidence" scenario assumes that computing graduate diploma output ramps up to 1,200 per annum;*
- *Support should be offered for colleges to introduce postgraduate business courses, including courses in entrepreneurship, and executive education focused on the management of technology enterprises;*
- *Training for those employed in the sector in business related skills, including selling, sales management, commercialisation, marketing, product management, entrepreneurship, and business strategy should be supported. It is likely that some of this training will leverage resources from outside the higher education system. This will be directed towards a mix of people from technology backgrounds and those in the sector from other backgrounds;*
- *Support should be offered to ICT departments in colleges to develop their activities in e-learning and distance education provision;*
- *Funding should be allocated for colleges to develop initiatives to better prepare technology students for their careers, without impacting on the technology content of their courses. Key topics include: industry knowledge; technology entrepreneurship; effective teamworking; team leading; practical project management; and understanding the client or customer perspective;*
- *Funding under the programme should be used to support mainstreaming of existing initiatives that have been shown to improve learning of technology subjects.*

Recommendation 2: *Reinstating Places on ICT Courses*

It is recommended that colleges should reinstate places on ICT courses as applicant numbers recover. In the meantime, they should ensure that any resources provided for ICT education that are diverted to other uses can easily be reclaimed or replaced once numbers increase.

Recommendation 3: *Sales Training Initiative*

It is recommended that Enterprise Ireland, FÁS and the Irish Software Association should proceed with the initiatives they have planned in sales training for the ICT sector, and should complement these with initiatives in sales management and entrepreneurship. These initiatives should be treated as a high priority in allocation of resources.

It is important to the future of the sector that the standard of selling to overseas customers should go through a step increase. There is a need to set a new and higher benchmark of competence across the sector.

Recommendation 4: *Capability of Higher Education System in Management of Technology Enterprises*

The Expert Group recommends that there should be an initiative to develop a critical mass of capability in the higher education sector in Management of Technology Enterprises. This need is distinct from the technology management initiatives already in place (focused on management technology across the sectors of industry), although there may be scope for synergy in provision.

This is required in order to enable the sector to make a sufficient contribution to continuing education and training in business skills for the sector. It will require the appointment of academic staff to specialise in teaching and research in the area. Nationally, at least four professorial appointments will be required, with appropriate numbers of more junior staff. It may be possible for some of these appointments to be endowed by industry.

Recommendation 5: *Promotion of Interest in Studying ICT*

The Expert Group recommends that existing programmes to promote interest in studying ICT should be continued, and expanded where possible to include: the expansion of STEPS to reach a higher proportion of second level students; provision of engineering taster courses; and a renewed "good news" campaign to mark the unambiguous start of an upturn in the sector.

Recommendation 6: *Under-performance at Second Level*

It is recommended that the Department of Education and Science should address issues of under-performance at second level that are undermining interest in, and preparedness to study, technology courses, and may also be undermining the adoption of technology across other sectors of the economy.

Recommendation 7: *Transfer and Progression from Further Education and Training to Third Level Computing*

The Expert Group recommends that the Institutes of Technology and the universities should do what they can within current frameworks to increase the transfer and progression of suitable computing students from PLC, FÁS, FIT and other further education and training courses into third-level. It is recommended that the NQAI and the two accreditation councils should prioritise the establishment of a new framework to facilitate colleges in further increasing transfer and progression from further education and training.

While the further education and training sectors do not have a broad-based strength in SET disciplines, they have significant numbers of computing students and trainees. Given improved transfer and progression arrangements, these could potentially transfer into third-level in significantly greater numbers than at present.

4 The Demand and Supply of Skills in the Biotechnology Sector

4.1 Introduction

The Irish Council for Science, Technology and Innovation (ICSTI) conducted a *Technology Foresight* exercise in 1998-99 whose goal was to identify which new or emerging technologies offered the best prospects for driving future economic growth in Ireland. The conclusion of this study was that Ireland should vigorously promote Biotechnology and ICT, with a view to becoming an internationally recognised centre of excellence in these niches[12]. To this end, *Science Foundation Ireland* (SFI) was established with a budget of €646 million to invest in basic research in these two areas over the period 2001-2007. Ireland is not alone in prioritising biotech in this manner; a recent study[13] has identified 17 locales, including Ireland but *excluding* the US, which are actively promoting the biotechnology sector of their economies, with an aggregate investment of $103 billion.

While the ICT sector is well established in Ireland and relatively well understood from a skills perspective, the biotechnology sector is still in its gestation phase (globally, as well as in Ireland). Consequently, there is uncertainty as to its future evolution and the resultant implications for skills[14].

Against this backdrop, the Expert Group commissioned Peter Bacon & Associates to undertake a study of this sector. The principal objectives of the study were to identify the potential growth rate of the sector, to quantify the levels of skills that would be required to realise this growth and to review the projected supply of these skills over the period 2004-2010. A central element of this analysis was the formulation of a plausible scenario for the future development of the biotechnology sector in Ireland. The study was informed by consultations and interviews with the development agencies and with a range of experts in the industry worldwide.

Biotechnology and Industrial Development

Biotechnology is the application of biological knowledge relating to genes and cells in order to develop useful *products, processes* or *services* such as new medicines and therapies, cloning, genetically modified foods and enhanced crops. It encompasses an ever-growing array of laboratory techniques for the alteration and manipulation of molecules, genes and cells and often involves the harnessing or usurping of biological processes for a particular purpose such as the biological synthesis of pharmaceutical compounds. The biotechnology industry is built upon the commercial exploitation of these techniques. The primary challenge for commercialisation is that of scaling up the extremely delicate laboratory processes to an industrial scale.

Biotechnology has the potential to impact on every sphere of human activity, from medicine to food production, and its economic impact is likely to be correspondingly large. The *European Commission* has speculated[15] that the market for biotechnology products in Europe alone could be worth €100 billion by 2005 and that by 2010 the value of the global market for the broad life sciences sector, including biotechnology, could amount to €2,000 billion.

12 The potential importance of biotechnology for future economic development in Ireland has been appreciated for some time: BioResearch Ireland was established in 1987 to commercialise the research in third-level institutions and the 1996 Forfás strategy document, Shaping Our Future - A Strategy for Enterprise in Ireland in the 21st Century, identified biotechnology as a "key enabling technology for Ireland's future industrial development".

13 The Global Reach of Biotechnology, New Economy Strategies, Washington D.C., Jan., 2003.

14 The Second and Third reports of the Expert Group examined the skills needed in the following sub sectors: pharmaceuticals; other chemicals; plastic and rubber; medical devices; food; beverages and tobacco; and indigenous biotech. The focus of this current study is primarily on biotechnology and it includes the development potential of FDI. The analysis and methodology also differ to the earlier reports.

15 Life Sciences and Biotechnology – A Strategy for Europe, European Commission, COM 27, 2002.

This imminent wave of technology-driven economic growth provides great opportunities for Ireland. Indeed, the seeds of a biotech sector are already present[16]. Also, we already have a number of strengths which could facilitate the exploitation of the biotechnology opportunity further. In particular, Ireland can lever its established critical mass of activity in the Medical Devices and Pharmaceuticals sectors to kick-start the biotechnology sector. Both of these sectors have a symbiotic relationship with biotechnology; the former provides an important application area for biotechnology, the latter a pool of highly relevant skills in pharma processing and engineering as well as specialisations such as quality control and regulatory affairs. Other advantages include the substantial investment to date in basic research in biotechnology by SFI and Ireland's highly competitive corporate tax regime. In addition, Ireland posses a considerable depth of experience in the construction of very large, high-specification facilities such as the Intel fabrication units and the Wyeth Biopharma campus.

It is worth noting that although there are many similarities between pharma and biotech, not least of which are their skills requirements, there are also important differences that set them apart. In particular, companies in the biotech sector tend to be small and recently established; they are also volatile. In addition, conversion courses would be required to re-skill many workers in the pharma sector for the biotech sector. Hence, success in cultivating a rich biotech sector is not yet guaranteed.

Biotech Clusters

There are a number of distinct possibilities for the type of biotech industry that could develop in Ireland. The first would entail Ireland focusing largely on *bioprocessing*, i.e. the deployment of biotechnology on an industrial scale for commercial production of pharmaceuticals etc. An alternative would be for Ireland to aim to develop a biotechnology *cluster* (discussed below). An intermediate possibility would be for Ireland to promote bioprocessing while at the same time developing niche activities or specialisations, which, while falling short of a full cluster, would increase the overall added-value of the biotech sector.

An industrial sector can be classified as a cluster when it exhibits a vertical depth, i.e. activity is present at several levels from R&D through to provision of raw materials/primitive components through various stages of assembly/manufacturing to fabrication of the finished product. More formally, clusters can be defined as "geographic concentrations of interconnected companies, service providers, firms in related industries and associated institutions"[17].

Success of biotech clusters around the work can be attributed to the alignment of four key factors:

- intellectual capital; (primarily research excellence, but also business acumen and expertise in the commercialisation of research);
- a collaborative culture or formal networks (to promote interaction between the business and research institutions);
- availability of venture capital; and
- government support.

Private venture capital firms are reluctant to invest in biotechnology start-ups due to the high-risk nature of the business and the long payback time for successful ventures. Therefore, Enterprise Ireland venture capital initiatives for the biotech sector should be expanded to fill this void. In addition, ways of stimulating greater interest by the private VC companies in the sector should be explored.

16 For a recent review, see Mapping the Bio-Island, InterTrade Ireland, March 2003.

17 The Competitive Advantage of Nations, Porter, M.E., Free Press, NY, 1990.

The analysis shows however, that even if these factors are all present in a region, it can take up to 20 years for a fully developed cluster to emerge. The emergence of a fully-fledged cluster offers benefits for both industry and the national economy. For industry, considerable cost savings can accrue from having suppliers and customers for a wide range of relevant products and services located in close proximity to one another. This also facilitates the interaction of people with different and complementary skills necessary to stimulate the emergence of new commercial ventures; the presence of a melting pot of biotech skills has been a major contributor to the success of clusters around the world. For the national economy, a fully functional cluster maximises the added-value to the economy by the biotechnology sector and therefore it represents the most desirable scenario from an industrial development perspective.

Each scenario requires a different skill set: the cluster places a premium on intellectual capital, primarily, research scientists, but also skills in the commercialisation of research, whereas the bioprocessing option, by its nature, requires a more diverse, but nonetheless still high-level, skill set e.g. ICT, legal (regulatory affairs), financial and marketing expertise. It should be noted that the level of scientific expertise required to operate a bioprocessing facility is also very high due to the sophisticated nature of the bio-chemical processes involved.

4.2 Demand for Skills

Labour market projections are always fraught with difficulties, particularly for an open economy like Ireland's, which is very exposed to fluctuations in the global macro-economic climate. These problems are compounded for an emerging sector such as biotechnology, which is under-going rapid, albeit uncertain, growth worldwide. A plausible scenario for the future development of the sector in Ireland, based on an analysis of other clusters around the world, as well as the strategies of the industrial development agencies in Ireland is proposed here. The scenario is based on the following primary assumptions.

- The scenario includes 20 research "stars" i.e. researchers who are internationally recognised as leaders in their field, and who are supported in setting up research centres in Ireland. These stars will act as nucleation sites, for the development of cutting-edge research capabilities. These stars would generate a requirement for 100 post-doctoral (Ph.D.) researchers as well as 50 primary degree holders (B.Sc.).

- Five new firms engaged in product development, whose activity is mid-way between basic research and full-scale production, are likely to emerge, employing approx. 100 each. The balance of skills required would typically be 20% Ph.D., 20% M.Sc., 20% B.Sc., 10% graduates of other disciplines, 15% diploma/certificate and 15% low skill.

- The third component flows from FDI; the strategy of IDA Ireland envisages the creation of 1,500 new jobs in the biotech/biopharma sector per annum over the next five years. This represents a significant increase on the average of 1,000 jobs created per year, in recent years. The primary focus for this investment would be bioprocessing and the likely skills breakdown would be as follows: 5% Ph.D., 5% M.Sc., 30% B.Sc., 30% non-science (primary) degrees, 25% certificate/diploma and 5% low skill.

- Enterprise Ireland's objective[18] is to increase employment in the indigenous component of the biotech sector by 1,400 by 2006. However, these projections were formulated before the full extent of the economic downturn became apparent and a more realistic objective would be to aim for this level of job creation by 2010. These firms are likely to be engaged in the commercialisation of academic research, i.e. product development. The skills breakdown is likely to be 20% Ph.D., 20% M.Sc., 20% B.Sc. 10% non-science (primary) degrees, 15% with sub-degree qualification and 15% low skill.

18 Towards a Biotech-Ireland, Enterprise Ireland, Feb., 2002.

- The preceding developments will give rise to an additional requirement for 30 Ph.D.s in universities to support the increased teaching load as well as the increased research management responsibilities. Also, Government departments and state agencies charged with oversight and regulatory responsibilities will require 20 M.Sc. graduates over this period.

The overall skills requirement from the demand side of the model is summarised in Table 4.1[19].

For the purposes of assessing any potential future mismatch between supply and demand, it is necessary to establish a baseline employment scenario. We adopt the year 2001 as our frame of reference and assume that the labour market was in equilibrium during that year, i.e. we assume that the number of new entrants into the labour market during that period matched exactly the net expansion of the labour force (new jobs created plus replacements for those leaving the labour force). This balance is assumed to hold at all levels of educational attainment, from sub-degree to doctorate.

This assumption is justified by the observation that the Irish economy and labour market reached a stationary/stable point in 2001 prior to the sharp drop in 2002; there was effectively full employment in the economy, while the demand for workers had levelled off. This assumption allows us to isolate the requirements of the biotechnology sector from those of other sectors.

TABLE 4.1: PROJECTED DEMAND FOR SCIENCE SKILLS IN THE BIOTECH SECTOR (2004-2010)

ADDITIONAL NEEDS OF BIOTECH CLUSTER	PH.D.	M.SC.	B.SC.	SUB-DEGREE[20]	OTHER[21]
New Research Centres built around 20 "Stars"	100		50		
5 new Product Dev. companies @ 100 each	100	100	100	75	125
Total FDI additional jobs (3,500)	175	175	1,050	875	1,225
Total new indigenous jobs (1,400)	280	280	280	210	350
Management and Regulatory support	30	20			
Total, additional needs over 7 years	**685**	**575**	**1,480**	**1,160**	**1,700**
Average demand / yr. over next 7 year period	98	82	212	166	243

In summary, the explanation of Table 4.1 is as follows. The first row indicates the new demand created by the establishment of new research centres, built around world-renowned research scientists or "stars". The second is the demand generated by the new product development centres that it is anticipated will arise based on a study of other biotechnology clusters around the world. The third row relates to the *acceleration* in the rate of FDI-driven job creation. The fourth row reflects the demand generated by expansion in the indigenous biotech sector. The fifth row reflects the once-off demand for high-level skills in the universities for the management of research activities and also in the government sector for oversight and regulation. The sixth row provides the cumulative, additional demand, relative to the assumed equilibrium in 2001. The final row shows the average requirement per year over the coming seven years.

The scenario presented above is based on the assumption that Ireland actively promotes the development of the biotech sector, rather than just aspiring to it. Satisfying the skills demand is a necessary, but not sufficient, condition to bring this about; other support measures are required too. For example, accessing capital is often a major obstacle to start-ups: private venture capital firms are reluctant to invest in biotechnology due to the high-risk nature of the business and the long payback time for successful ventures.

19 The analysis in this chapter focuses on the explicit, or net, demand for science skills; there will also be an implicit demand for approximately 180 additional B.Sc. graduates per annum to feed into the postgraduate pipeline. This demand will act to exacerbate any shortfall in skills and consequently the gaps identified by this analysis can be viewed as conservative.

20 Diploma or Certificate in science or technology.

21 Includes for example, B.A., B.Comm., A.C.C.A., B.L. & other non-science qualifications, operatives, etc.

4.3 Supply of Skills

Trends in the supply of science-related skills in Ireland are currently driven by two principal factors; *demographics* and *participation rates*. The cohort sitting the leaving certificate has been declining since 1997 and will continue to do so well into the next decade (2010+). This problem is compounded by the marked fall-off in the participation rate, or take-up, of science subjects at second and third-level, in recent years; the proportion of second level students taking science subjects in the Senior Cycle has declined by in excess of 25% over the period 1990-2003. In addition, the number of first preferences for science-related CAO courses in Feb. 2003 was down by 6% on the previous year.

Projections for the supply of science-related skills in the period 2004-2010 are based largely on an extrapolation of current trends. We assume for instance, that the current annual decline in the size of the leaving certificate cohort of 3.1% is maintained. Countering this trend has been an *increasing* rate of enrolment in higher education, both from the leaving certificate cohort as well as mature entrants. The *net* result over the period 1997-2000, has been a *decline* in the number of new entrants to university degree courses, averaging 1.6% per annum. On top of this trend, the model assumes that the correlation between the number of university graduates in a particular year and the number of entrants 4 years previously, continues to hold at a ratio of 94.5%.

The over-riding consideration in determining the number of postgraduates is the availability of funding, rather than demographics. Based on the trends in postgraduate enrolment since the advent of SFI in 2001, the projections for postgraduate awards assume that the additional (SFI) funding will result in the ratio of post- to undergraduates peaking at 37.5% in 2005/6 and remain constant thereafter.

The model assumes that the rate of enrolment for the certificate and diploma courses in ITs declines in accordance with the contraction of the LC cohort, but with an adjustment for the observed decline in the rate of acceptances onto these courses in recent years. For degree courses in ITs, the competing effects of declining acceptances and greater propensity to transfer from the sub-degree IT courses are assumed to balance, leaving the net output of degrees at the 2001 level.

Table 4.2 summarises the supply projections. Each row contains an estimate of the absolute numbers graduating at each level of qualification by year, as well as an indication of the change in output relative to 2001 (negative values imply a decline in output). The impact of SFI funded projects is manifest in the increasing numbers attaining Ph.D. and M.Sc. qualifications over this period. For other qualifications there is a consistent and marked decline in output. Between 2004 and 2010, there will be a cumulative increase of 280 Ph.D.s and 421 M.Sc.s whilst there will be a cumulative decrease of 1,351 B.Sc.s and 1,407 Diploma/Certificates.

These figures are predicted on a continuation of current trends; they cannot take account of the impact of interventions such as on-going awareness and promotional campaigns.

TABLE 4.2: PROJECTED SUPPLY OF SCIENCE SKILLS (2004-2010)

AWARD	2004	2005	2006	2007	2008	2009	2010
PH.D.	245 (-8)	252 (-1)	276 (+23)	298 (+45)	316 (+63)	329 (+76)	335 (+82)
M.SC.	221 (+25)	239 (+43)	253 (+57)	263 (+67)	269 (+73)	274 (+78)	274 (+78)
B.SC.	2,481 (-98)	2,449 (-130)	2,417 (-162)	2,385 (-194)	2,354 (-225)	2,323 (-256)	2,293 (-286)
DIP./CERT.	713 (-140)	692 (-161)	671 (-182)	651 (-202)	631 (-222)	(-241)	594 (-259)

Note: Estimated output (supply), in absolute terms, at each qualification level, by year. Changes relative to 2001 are shown in parentheses; negative values indicate a decline in output.

4.4 Skills Gap Analysis

The match between supply and demand for skills is examined by reconciling Table 4.1 with Table 4.2. The analysis shows that there is a shortfall in supply at all levels of qualification for each year between 2004 and 2010. This is a disconcerting finding and would have major repercussions for the future development of this sector, if left unchecked.

The breakdown of the skills gaps are shown in Table 4.3. The gaps are greatest, in numerical terms, at the primary degree and diploma/certificate levels. However, there is also a consistent shortage of M.Sc. and Ph.D. awards. While the numbers involved here are lower, in percentage terms they are considerable. For example, the estimate for 2004 shows a skills gap for M.Sc.s equal to 25% of projected output but practically disappearing in 2010. For Ph.D.s, the gap is 42% of projected output in 2004, falling to 4% of projected output in 2010.

TABLE 4.3: PROJECTED SUPPLY/DEMAND SKILLS GAP (2004-2010)

QUALIFICATION	2004	2005	2006	2007	2008	2009	2010
PH.D.	-106	-99	-75	-39	-35	-22	-16
M.SC.	-57	-39	-25	-15	-9	-4	-4
B.SC.	-310	-342	-374	-406	-437	-468	-498
DIP./CERT.	-306	-327	-348	-368	-388	-407	-425
TOTAL	**-779**	**-807**	**-822**	**-828**	**-869**	**-901**	**-943**

Note: Based on an assumed labour market equilibrium in 2001. Negative values indicate a deficit.

In addition to the quantitative aspects of the skills gaps summarised in Table 4.3, there is also a qualitative aspect. The particular technical skills taught in the educational institutions must be aligned with the specific skills required by industry. This poses a significant and on-going challenge for these institutions, in view of the rapid rate of advance of biotechnology.

Biotechnology firms, particularly those engaged in production activities, attach a high premium to relevant industrial experience among their recruits. Some relevant experience can be obtained by recruiting from the pool of pharmachem workers, although there may be a requirement for retraining. Nevertheless, recruitment from abroad may be necessary in the early stages of the development of the sector.

4.5 Ways to Address Skills Gap

The essential message emerging from the analysis is that the education system must increase its output of science qualifications at all levels in order to enable the biotechnology sector to achieve its full potential. The necessity to increase the pool of science skills for the future development of the economy as a whole has been stressed in numerous reports and studies in the recent past. It is strongly reinforced here.

The greatest urgency for action is in the primary and secondary school systems, due to the lengthy period required for interventions to percolate through to the workforce. A revamping of the teaching of science at both levels is required in order that the recent decline in the take-up of science subjects in the Senior Cycle is not only arrested, but actually reversed. This issue has been considered in detail by the *Task Force on the Physics Sciences*[22]. It is regrettable that progress to date on implementing its recommendations has been slow[23].

22 Report and Recommendations of the Task Force on the Physical Sciences, March 2002.

23 However, some progress has been made on this front recently and the new primary science programme is due to commence in Sept. 2003. Grants to support the introduction of the science curriculum were provided to primary schools in 1999, 2001 and 2002 to the value of €3.9m, €3.5m and €2.9m respectively. A once-off grant to support the implementation of the new Junior Cycle science programme was announced recently.

Improving the delivery of science education at second level through the provision of additional resources and the modernisation of the curriculum is not sufficient to increase the pool of S&T skills. The report of the *Task Force on the Physical Sciences* highlights the importance of student choice i.e. their decision to pursue a particular avenue of study. Factors which have a bearing on this decision include their perceptions of science-related careers. Business and industry must play a lead role in assuaging concerns of students (and parents) on these issues; they must engage with students and illustrate to them the variety of interesting and rewarding (intellectually and financially) career options opened up by the study of science subjects at second and third-level.

The particular skills that are required by the industry do not always match those being provided by the various educational institutions. Therefore, a new emphasis on flexibility in discipline boundaries, in combination with academic excellence, is required to produce the required skill sets. Three key areas in which flexibility is required are:

- The design of postgraduate courses, either taught M.Sc. or postgraduate diplomas; there is a need for these courses to adopt a more inter-disciplinary approach rather than the more traditional vertical demarcation between disciplines;
- A greater breadth of education during the Ph.D.; and
- A range of courses for non-graduates and graduates in other subjects to prepare them for employment in biotechnology. These should include conversion courses and, in particular, specially designed technician courses that closely match the identified requirements of the industry.

The third-level sector has made significant strides in recent years in aligning its research activities more closely with the interests of industry. There is also a growing appreciation by the institutions of the commercial value of the intellectual capital present within their research. Institutions are increasingly interested in unlocking this latent value. This trend is encouraged by the various public policy initiatives attempting to evolve Ireland to a knowledge economy. Major developments within the institutions in recent years include the introduction of senior positions with responsibility for innovation, technology transfer and commercialisation of research, as well as the establishment of business incubators in many institutions. These initiatives have resulted in a more strategic approach to research planning; research (and teaching) is becoming more pan-institution and less department-focused.

Nevertheless, progress along these lines varies considerably between institutions and indeed, within institutions, between faculties/departments. In many cases, these developments have arisen through the initiative of individual departments or researchers rather than as a result of an institution-wide policy. An examination is required of the extent to which the Irish university system is positioned to collaborate with industry and its overall responsiveness to industry's needs.

A key mechanism for achieving a competitive edge in biotechnology (as well as other sectors of the knowledge economy) is a proactive education system. Education policy should lead trends in industry rather than follow them. In this way, education policy can become an instrument of industrial development and shape the future evolution of industry and business.

4.6 Conclusions and Recommendations

The principal conclusions emerging from the analysis are as follows.

- *Ireland's nascent Biotechnology sector has the potential to grow substantially over the next 7 years.*
- *This will not happen by default; it will require a concerted effort involving all stakeholders, namely, government, development agencies, educational institutions and business.*
- *A key element of this strategy must be the a priori provision of appropriate skill-sets.*
- *Based on current trends, there will be a significant shortfall in the supply of relevant skills necessary to sustain the development of a full biotechnology cluster in Ireland.*

If Ireland is to reap the maximum economic benefits from the dynamic field of biotechnology over the period 2004-2010, the potential skills deficiency must be addressed. The recommendations put forward by the Expert Group to achieve this reflect three broad themes:

- *Initiatives to increase interest in the study of science and in careers in science;*
- *Measures to improve the capacity of the Irish education system to supply suitably skilled personnel; and*
- *Supporting interventions, particularly in the development of Ireland's research competency.*

Recommendation 1: *Government Funding*

The Expert Group recommends that, an unambiguous statement of long-term commitment to the public funding of science in general and biotechnology in particular, should be issued by the Government. This commitment should incorporate quantified targets for the level of support to be provided on a multi-annual basis.

It is clear from international experience that the public provision of funds for research is a key prerequisite for the development of a dynamic and sustainable biotechnology industry. Good progress has been made by SFI in attracting leading, international research scientists to Ireland. However, there is a real danger that these scientists will leave once their initial contracts have expired.

A policy statement would be particularly opportune at this juncture in view of the fact that Ireland is now over half-way through the National Development Plan (2000-2006) and that SFI is also half-way through its original remit. It would serve to dispel the growing uncertainty about the future funding of science in Ireland and to retain the confidence of key researchers and investors.

Recommendation 2: *Unpausing PTRLI*

It is further recommended that capital funding under the HEA-operated Programme for Research in third-level Institutions should be restored immediately.

Recommendation 3: *Report of the Task Force on the Physical Sciences*

The Biotechnology Sector, like other Science/Technology based sectors, requires a sustained commitment to improving the quality and relevance of the broad school programme. In particular, a strong emphasis on Science and Mathematics in school programmes is advocated. The recommendations of the Task Force on the Physical Sciences are strongly endorsed and should be implemented in full, with immediate effect.

Recommendation 4: *Targets for Leaving Certificate Science*

The transition to the senior cycle merits particular attention. The Expert Group recommends that a quantitative national target should be established in relation to the proportion of students undertaking science at Leaving Certificate.

Recommendation 5: *Transition Year*

It has been observed that the activities undertaken by students during their transition year have a pronounced influence on their subsequent choices of subject at senior cycle. Therefore, it is recommended that:

- *the forthcoming pilot awareness campaign by the Irish Pharmaceutical & Chemical Manufacturers Federation (IPCMF), aimed at promoting science in transition year, be extended and expanded;*
- *business should sponsor work placement programmes specifically for transition year students to provide them with realistic experience of applications of science and technology in industry; and*
- *third-level institutions should introduce outreach programmes centred around active participation by transition year students in science and technology projects.*

Recommendation 6: *Promotion of Science*

The current efforts to promote Science and Technology based courses and careers should be intensified; business and industry should play a central role in this activity. The diverse and rewarding career paths (including, in particular, biotechnology) opened up by an education in the sciences should be highlighted.

Recommendation 7: *Public Service Broadcasting*

In the past, the coverage of Science and Technology on RTÉ has been poor, in terms of both news coverage and programming. RTÉ should address this shortcoming by the appointment of a science editor and a higher prioritisation of science and technology in its scheduling.

Recommendation 8: *Technicians/Higher Technicians*

The Expert Group recommends that a new emphasis should be put on the education and professional development of technicians and higher technicians relevant to biotech production by Institutes of Technology and Universities. Further education/conversion courses should be provided to enable mature life-science technicians to upgrade their skills to incorporate the latest technology and techniques. This could be done through existing full-time programmes and through a range of industry/Institute collaborative formats. It is imperative that such programmes should be delivered in a flexible manner in

order to maximise the uptake. This entails part-time courses, weekend tuition, distance learning, in-service development, etc.

Business and industry have a crucial role to play in this matter; the Expert Group believes they must adopt a more proactive role in promoting and facilitating training and professional development among their employees.

Recommendation 9: *Tertiary Education*

third-level institutions should be more cognisant of and responsive to, industry's needs; both parties should actively promote greater communication and closer collaboration in research and technology transfer.

Recommendation 10: *Third-Level Curricula*

While acknowledging that courses are being continually updated in many third-level institutions to reflect the rapid advances in this area and indeed that new courses such as an M.Sc. in Bio-informatics are being introduced, it is recommended that all institutions should be encouraged to adopt a proactive approach to course development. Also:

- *Curricula should be reviewed periodically, in conjunction with industry, to ensure their continued relevance;*
- *Current trends towards inter-departmental teaching multi-disciplinary research should be accelerated; and*
- *Third-level institutions should encourage and facilitate postgraduate students to take courses taught at other institutions in order to compensate for the relatively narrow focus of biotech expertise within individual institutions. This would also promote networking and foster collaboration between institutions.*

Recommendation 11: *Augmenting Scientific Skills*

There should be a strong emphasis in third-level education (full- and part-time courses) on the nurturing of business and enterprise skills to augment the core scientific skills. Modules encompassing non-traditional subjects such as business, marketing, law and regulatory affairs should be incorporated into science curricula. These courses should be tailored to the needs of the biotech sector with, for example, particular emphasis on intellectual property, technology transfer/commercialisation of research and securing venture capital.

Recommendation 12: *Promoting Complementary Activities*

The promotion of associated industries and technologies within the broader life sciences sector should be intensified by the relevant agencies. Medical Diagnostics, for example, is an important application area for biotechnology. Enabling or supportive technologies such as Bio-informatics are also worthy of consideration, in view of Ireland's established strengths in computing, mathematics and physics at third-level. The third-level institutions should support this initiative by promoting the appropriate skills in their curricula.

Recommendation 13: *Overseas Talent*

The Expert Group recommends that national research programmes, in addition to attracting and promoting indigenous talent, should also endeavour to attract high calibre individuals from overseas to undergraduate and postgraduate programmes, post-doctoral and lead research positions, relevant to the Biotechnology Sector. Ireland should actively promote itself as a desirable location for the pursuit of biotechnology-related study and research. In addition to raising the bar for post-graduate study and research, this would promote international networking by the Irish third-level institutes.

Recommendation 14: *Gender Balance*

The gender profile at entry-level in the biotech sector is well balanced. However, it becomes progressively more imbalanced the further one looks down the career path. Obstacles to long-term female participation in industry, ranging from child-care costs to structural issues, should be explored and addressed.

Recommendation 15: *Levering the Research Base and Achieving Critical Mass*

One of the shortcomings of the Irish research system has been the fragmented nature of research effort and the poor coordination of research activity among the various research and third-level institutions. As a result, it has failed to date to achieve its full potential, where the whole becomes greater than the sum of the parts. The Government established a Commission under ICSTI in 2002 to develop proposals for an oversight and review mechanism for the science and technology system in Ireland and this report was submitted to the Tánaiste and Minister for Enterprise, Trade and Employment in December 2002. It is recommended that the proposals of the ICSTI Commission be implemented to achieve greater cohesion in the science and technology system. The work of the Inter-Departmental Committee on Science and Technology to develop an Irish Action Plan to respond to the European Research Area initiative is also strongly endorsed in this regard.

5. The Demand and Supply of Engineers and Engineering Technicians

5.1 Introduction

Engineers and engineering technicians are employed across a wide range of industry sectors from telecommunications to medical devices. Within these sectors they fulfill a crucial role in the design, development, and production of, among others, new products, software, production processes, infrastructure, and construction projects. These are key roles that drive productivity improvements, innovation and improvements in competitiveness. Given their importance, a deficit in the supply of engineers and engineering technicians could constrain the development of key industries and the development of infrastructure that is socially or economically necessary.

The demand and supply of engineers and engineering technicians has been examined by the Expert Group in previous reports[24]; however on each occasion demand was addressed in the context of the IT industry only. Conscious that a number of other specific sectors are major employers of engineering graduates, the Expert Group decided to expand the focus of its next engineering study and undertake a more detailed sectoral breakdown. In 2002, the EGFSN commissioned McIver Consulting to undertake this study.

The main objective of the study was to examine how the future supply of engineers and engineering technicians in Ireland will match the requirements of industry and public bodies throughout the period 2003 to 2012, and to identify ways to bridge any gaps that are likely to be significant. The analysis includes: a survey of engineering employers; interviews with a range of industry organisations, development agencies, engineering academic staff and engineering students; an extensive literature review; and collation and examination of data from a wide range of sources. The projections are based on a vision of how Irish industry may develop, focusing on industries that appear to have the greatest potential for growth, and which are significant employers of engineers and engineering technicians. The demand projections indicate approx. how many engineers and engineering technicians will be required if this vision is realised.

Two main issues emerge from the analysis. Firstly, a fall in numbers entering electronic engineering has the potential to limit the growth of a range of ICT sectors once markets for ICT products and services recover from the current global economic slowdown. Secondly, there is a possibility of a general decline in numbers graduating in engineering, which may limit the potential of a much wider range of sectors.

5.2 Demand for Engineering Skills

For purposes of producing demand projections, the study divides the economy into a number of industry sectors, along with a residual "rest of economy" sector. The sectors covered are as follows:

- Software and IT Services;
- Electronic Systems and Hardware;
- Integrated Circuit Design;
- Telecommunications Services;
- Construction and Engineering Consultancy;
- Local Authorities;
- Medical Devices; and
- Pharmaceuticals and Chemicals.

24 The First Report of the Expert Group on Future Skills Needs, 1998, The Second Report of the Expert Group on Future Skills Needs, 1999, The Third Report of the Expert Group on Future Skills Needs, 2001.

Between them, these sectors employ more than 80% of engineers and engineering technicians who graduated in 2000. For each sector, demand was disaggregated by discipline.

A summary of the "total economy" demand projections, which represent the sum of the sectoral projections, is presented in Table 5.1[25] . Two projections (Projections 1 and 2) are presented for each level of qualification, based on the two different projections made for the ICT sector. The two possible trajectories are calculated for the sector based on assumptions concerning the timing of the upturn and its impact on employment. Projection 1 takes a relatively positive view of the future although by no means the most positive view that could be plausible, while Projection 2 assumes a recovery in IT markets to a growth rate that falls significantly short of that achieved in previous recoveries and is thus much less positive.

Three main assumptions underlie the results in Table 5.1. First, projections for the ICT sector are based on the assumption that demand for new graduate engineers and engineering technicians will be depressed in 2003, but will recover in 2004 and rise thereafter.

Second, it is assumed that the construction sector has come to the end of a period of very rapid growth, which was paralleled by a rapid rise in demand for engineers and engineering technicians. Hence, it is projected that demand for civil engineers and technicians from the construction and engineering consultancy sectors will stabilise.

Finally, it is assumed that the pharmachem and medical devices sectors will continue to grow strongly with a progressively greater emphasis on research and development work in Ireland. A significant part of this growth in both cases will be connected to the application of biotechnology. Continued growth will drive significant demand for chemical engineers in the pharmachem and engineering consultancy sectors, and for biomedical engineers[26] in the medical devices sector.

TABLE 5.1: TOTAL PROJECTIONS OF ENGINEERING GRADUATE DEMAND FOR WHOLE ECONOMY

	PROJECTION 1		PROJECTION 2	
	DEGREE	DIPLOMA & CERTIFICATE	DEGREE	DIPLOMA & CERTIFICATE
2003	866	1,190	866	1,190
2004	1,226	1,338	1,179	1,329
2005	1,320	1,365	1,214	1,345
2006	1,338	1,326	1,219	1,304
2007	1,374	1,296	1,243	1,271
2008	1,415	1,278	1,268	1,250
2009	1,468	1,312	1,304	1,281
2010	1,503	1,324	1,322	1,289
2011	1,530	1,318	1,333	1,279
2012	1,575	1,341	1,357	1,299

Note: Appendix 5 provides the breakdown of demand projections by discipline. The projections here differ slightly to those for ICT in Chapter 3. One important reason for this is that this analysis does not include computer engineers.

25 Appendix 5 provides the full range of projections by individual discipline.

26 Including materials scientists and mechanical engineers with a biomedical specialisation.

The steep rise in projected demand for engineering graduates early in the period (2004-2006) reflects a recovery in demand arising from a recovery in global ICT markets. The disciplines for which most demand is projected are civil engineering and electronic engineering, both at degree level and at diploma and certificate level. The demand for civil engineering graduates is driven mainly by construction activity, while the demand for electronic engineering graduates is driven by projections of a resumption of growth in ICT industries.

While the degree level projections do not distinguish between demand for primary degree graduates and that for higher degree graduates, other studies by the Expert Group have projected that there will be a major need for graduates with research degrees to staff many of the research and development positions that are expected to emerge. Also, the view of the future projected in this study is one in which there will be very much more product development work undertaken in Ireland. Across all sectors this will lead to a greater need for engineering graduates with research degrees.

5.3 Supply of Engineering Skills

Examination of past data shows that the number of students graduating in engineering has increased markedly since the 1980s, although general growth in graduate output in Ireland means that the share of graduates accounted for by engineering has fallen since around 1986.

Not all engineering graduates become available for employment by Irish industry. Many, particularly at certificate and diploma level, proceed to obtain a higher qualification, and thus do not enter the labour market at the level at which they graduate initially. Significant numbers also emigrate at degree level. However, the percentage of degree level engineering graduates remaining in Ireland has increased substantially over time.

Using data on the number of students in 2001/02 enrolled in full time undergraduate courses in engineering, together with historical data and information derived from interviews, we project that the number of students graduating is likely to increase over the period to 2004, and degree level output is likely to fall modestly in 2005. Over this period there will be a shift in the mix away from electronic engineering, with continued growth in civil engineering.

In the long-term, the supply of engineering graduates is in large part a function of the number and quality of applicants for engineering courses. As relatively few mature students applying for admission to third-level have a strong mathematical and scientific/technical background, this means that the supply of degree level graduates is mainly a function of the number and mix of school leavers applying to study engineering.

Both the number of college applications and the number of students in the school leaving age cohort peaked in 1998. Both have already fallen since, and are expected to fall further, with school leaving numbers falling to approximately 60,000 in 2006 and approximately 50,000 in 2012. All other things being equal, if the school leaver demographic trend were reflected in applications for engineering courses, degree output would fall from approx. 1,700 in 2002, to 1,441 in 2010 and 1,208 in 2016[27].

Based on interviews with engineering students and engineering academics, it was found that personal ability and personal interest were the main factors affecting individual decisions about applying to study engineering. Other factors affecting the level of interest in studying engineering were found to include:

- Perceptions of opportunities for engineering graduates;
- Subject choice at Leaving Certificate and Junior Certificate level; and
- Perceptions of engineering among school students.

27 The typical duration of a primary engineering degree course is four years (2010 and 2016 are four years after 2006 and 2012 respectively).

5.4 Skills Gap Analysis

The gap analysis is based on two scenarios that provide different indications of the future development of the supply of graduates in engineering.

Scenario 1 is based on the assumption that recruitment into engineering courses will fall in proportion to the falling size of the school leaving age cohort, and that this will have a proportionate impact on the number of graduates these courses will produce.

Scenario 2 takes Scenario 1 as its starting point, and further assumes that the fall in applications for engineering courses experienced in 2002 is maintained and has a persistent impact on the number of graduates produced.

Table 5.2 summarises the overall balance between supply and demand under each of the two scenarios, using the demand projection with the more optimistic view on software & IT services (i.e. Projection 1). It shows the balance between supply and demand shifting from surplus to shortage conditions under each of the supply scenarios.

TABLE 5.2 OVERALL BALANCE BETWEEN SUPPLY AND DEMAND UNDER TWO SUPPLY SCENARIOS

	DEGREE		DIP & CERT	
	SUPPLY SCENARIO 1	SUPPLY SCENARIO 2	SUPPLY SCENARIO 1	SUPPLY SCENARIO 2
2003	767	767	357	357
2004	411	411	172	11
2005	292	166	94	-62
2006	232	109	102	-50
2007	171	50	127	-25
2008	153	31	132	-18
2009	34	-83	18	-124
2010	-116	-224	-79	-212
2011	-210	-313	-94	-225
2012	-317	-416	-97	-230

Note: Calculations based on Demand Projection 1 for the ICT sector.

It is important to exercise some caution in interpreting the results. Even if the views on the future assumed in the analysis turn out to be fairly accurate, variations in demand, changes in course provision, and changes in the disciplines attracting the most applications, could overturn an overall over-supply or under-supply of hundreds of graduates. Also, an indication of an excess of supply over demand (in the short-term) does not in itself suggest that there is a problem. Where the numbers likely to do this are not overwhelming, an oversupply of graduates should be seen in a positive light.

When individual disciplines within engineering are considered, the following are the most important issues that arise.

- At both degree and diploma/certificate levels, the supply of electronic engineering and telecommunications engineering graduates is projected to exceed demand in the short-term, but there is potential for a severe shortage in the longer-term. As the availability of electronic engineers is a prerequisite for many of the industry developments envisioned, the degree level shortage could have significant negative industrial development implications. This shortage at both levels has the potential to be worse if interest in electronic engineering among college applicants does not recover.

- There is potential for a shortage of graduates with diplomas and certificates in civil engineering[28].

- There is a general issue across all disciplines and levels that the balance between supply and demand for graduates is projected to tighten significantly over the period to 2012.

- In very broad terms over the period addressed by the projections, and aside from an over-supply being likely in some disciplines in the short-term, there is no major discipline specific supply imbalance projected at degree level in other engineering disciplines (see Appendix 5).

In summary, the main areas where gaps are projected are in electronic engineering and degree level telecommunications engineering. In these areas, the main constraint is to do with the number and quality of college applicants wishing to apply for courses. The provision of further places will only become a significant policy issue if this can be resolved.

5.5 Ways to Address Skills Gap

The report does not recommend any programme to encourage new undergraduate courses or increased numbers on existing courses. In areas where shortages are most likely to occur, the most immediate problem is of insufficient applications for courses to fill the available places with high quality applicants. Thus, a major part of the challenge emerging from the analysis is to boost the number and quality of applicants for engineering courses, and make the best of the students attracted to study engineering through providing well-resourced courses using the best available approaches to learning.

5.6 Recommendations

In response to these findings, the Expert Group makes the following recommendations, focusing on boosting the numbers graduating in engineering from Irish education institutions.

Recommendation 1: *Expanding and Reviewing STEPS*

It is recommended that the extent of existing STEPS activities should be expanded so as to reach a significantly higher proportion of second level students. This will require a significantly greater commitment of funding from industry and from the Department of Education & Science. It will also require a greater commitment of time and effort from employers of engineers, from engineers and engineering academics, and from the IEI.

Recommendation 2: *Reviewing STEPS*

It is recommended that IEI should undertake a review of the operation of STEPS. Implementation of the other recommendations on STEPS here should not be delayed for this review.

28 For purposes of the current study, civil engineering includes structural engineering, construction studies and construction management.

Recommendation 3: *Taster Courses*

STEPS should become involved in engineering taster courses, through:

- *facilitating the sharing of expertise and experience between colleges;*
- *providing support materials; and*
- *developing, in co-operation with the colleges, an overall planning framework that ensures good coverage of the key target groups.*

Recommendation 4: *Research into Engineering Careers*

The IEI in association with Forfás should initiate an analysis of actual long-term career outcomes of people with third-level engineering qualifications. This will have potential use in future promotional activities.

Recommendation 5: *Marketing Resource for third-level Colleges*

It is recommended that the HEA and the Department of Education & Science should consider financing a marketing resource to support the engineering, science and computing faculties and schools in each third-level college.

Recommendation 6: *Guidance Counsellors*

The Department of Education & Science should develop and provide a labour market in-service training programme for guidance counsellors, placing emphasis on careers in engineering, science and technology and the industries that employ graduates in these disciplines. It should develop and revise regularly a suite of materials on the labour market to support guidance work.

Recommendation 7: *Review of Mathematics*

It is recommended that the review of mathematics recommended by the Task Force on the Physical Sciences should also address the number of students taking Higher Level Mathematics.
The review should take account of the evidence on marking and of the recommendation of the Task Force on the Physical Sciences that problems of this nature should be resolved.
The group should consider the possibility of offering bonus CAO points for mathematics for all college courses, both to give students at all levels an incentive to treat it as one of their core six subjects, and to compensate them for the perceived heavy workload associated with taking the subject seriously.
The review should also address the factors at primary level and at junior cycle second level that may limit the take-up of Higher Level Mathematics at Junior Cycle, thus limiting the size of the pool from which students taking Higher Level Mathematics to Leaving Certificate level can be drawn.

Recommendation 8: *Common Entry Options for College Entry*

It is recommended that colleges should move to increase the percentage of engineering degree students recruited through common entry mechanisms. The HEA should monitor trends in entry through these mechanisms.

Recommendation 9: *Labour Market Information for Engineering Academics*

It is envisaged that the Expert Group on Future Skills Needs and Forfás will communicate a thorough and balanced analysis of the labour market position and outlook to key engineering academics.

Recommendation 10: *Research Resources and Facilities*

The HEA should consult with colleges about the space and other resources they need for postgraduate engineering research, with a view to providing a separate fund for investment in additional space, and upgraded space, where sufficient suitable space cannot be sourced within the college.

Recommendation 11: *Funding for Postgraduate Research*

It is recommended that the Government and relevant funding bodies should ensure that sufficient funding for research by engineering postgraduates is made available so as to avoid making funding an important constraint on the number of well qualified people able to take up postgraduate research in engineering. Funding bodies should review the operation of funding cycles so as to ensure that it is possible for engineers to take up postgraduate studies as they become available for study, rather than necessarily waiting for the start of the next academic year. The HEA should monitor progress on this recommendation.

Recommendation 12: *Approaches to Learning in Engineering*

Engineering Deans and Heads of School in third-level colleges should form an ad-hoc taskforce to examine the potential benefits from, and obstacles to, moving towards a more project-based and problem-based approach to learning. A report should be prepared based on this examination for consideration by the Expert Group, the HEA and the Department of Education & Science.

Recommendation 13: *Pre-Engineering Courses*

It is recommended that, where sufficient demand exists from people with suitable levels of ability and commitment, institutions including further education colleges[29] and third-level colleges should run pre-engineering courses designed to bring mature students to a level in mathematics and the physical sciences equivalent to at least a higher level C3. Where such courses already exist, they should be continued. Forfás should monitor the provision of such courses.

Recommendation 14: *National Programmes*

The Institutes of Technology should continue the Industry Trainee Programme and Accelerated Technician Programme where there is sufficient demand from trainees and industry.

Recommendation 15: *Certification of People Up-skilled in Companies*

Engineering departments of third-level colleges, particularly of Institutes of Technology, should work with HETAC, industry and the IEI to develop more active systems of accreditation of prior and experiential learning, and also to provide tailored upskilling opportunities to bridge existing learning and the requirements of higher levels of qualification.

29 Colleges that were termed "PLC colleges" in the past are now generally termed "further education colleges".

Recommendation 16: *Promoting Immigration by Engineers*

It is recommended that the Government should take into account in future immigration policies the likelihood that there will be a need for immigration by engineers from within the EU and from beyond the EU. It should also allow flexibility to introduce targeted skills initiatives.

Recommendation 17: *Drawing Students from Overseas*

The Expert Group recommends that interested bodies should take positive action towards attracting engineering students from overseas, and that they should use the recent HEA study of the issue to inform their responses. Forfás and the HEA should monitor progress in this area.

Recommendation 18: *Systems of Statistical Classification*

The Expert Group recommends that Forfás should initiate a review of industry data sources. This should include its own data and that from other agencies including FÁS, HEA, Enterprise Ireland and IDA Ireland, and CSO data sources, in the context of the requirements of skills policy research, formulation, implementation and review. The review should make recommendations on industry classifications and survey coverage applicable across all relevant agencies.

6. Employment and Training Needs of the Construction Industry, 2003-2010

6.1 Introduction

In the *Third Report of the Expert Group on Future Skills Needs*, the Expert Group provided an analysis of the employment and training needs of the construction industry from 2001-2006. A follow-up study, looking to the period 2010, was undertaken by FÁS on behalf of the Group, under the guidance and direction of a special construction sub-committee established for this purpose, and chaired by the Department of Enterprise, Trade and Employment. The sub-committee consists of representatives of the social partners, government department and agencies, and many of the relevant professional associations. This chapter presents a summary of the main findings and recommendations.

The forecasts are based on a combination of quantitative statistics and qualitative information from the key stakeholders[30]. An extensive process of consultation with the main stakeholders including the Construction Industry Federation, relevant Government Departments and professional associations also informed the forecasts. This consultative approach should reflect the influences of factors such as legislation or technology.

The study focuses solely on skilled construction workers as opposed to those who are working in the construction industry, but who do not possess construction skills or who are unskilled. There are 24 skilled construction occupations identified and these are divided into eight occupation groups. The full report contains a profile of the current and future balance between skills demand and supply in respect of each group over the period 2003-2010.

6.2 Recent Trends in Output and Employment

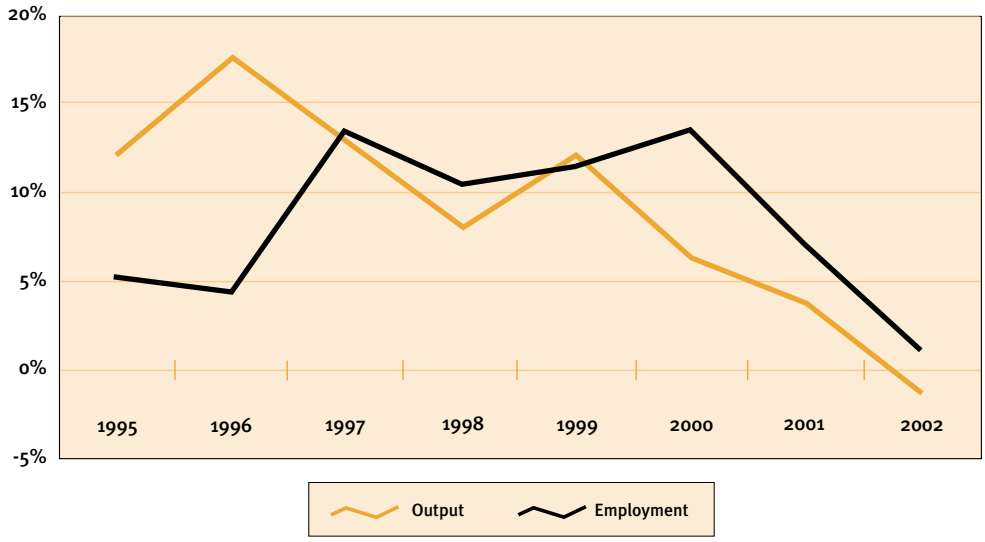
The construction industry has expanded rapidly and very significantly in recent years in terms of both output and employment. Output increased by over 75% in real terms between 1995 and 2002 and it is now equivalent to over €20 billion. Employment has increased rapidly from 96,600 in 1995 to 190,000 in the 3rd quarter of 2002, a doubling of employment in just 7 years.

Figure 6.1 charts the relationship between output and employment between 1995 and 2002[31]. It shows that the relationship is symmetrical; changes in the rate of employment growth follow changes in the rate of output growth quite closely, with a time lag of about 12 months. The graph also shows that the rate of growth has been declining significantly since 1997. It is estimated that the trend in output growth, which is 'driving' the employment growth, may have become negative in 2002, although it is anticipated that the magnitude of any decline will be modest.

30 The main sources of quantitative data are the Central Statistics Office Quarterly National Household Survey (QNHS), student participation data and outflows from the Higher Education Authority and the Department of Education and Science. Data are provided by the Department of Enterprise, Trade and Employment on inward migration under the Work Authorisation and Visas scheme. Some statistical techniques have been applied to the employment data to reduce the impact of sampling errors.

31 The output figures for 2002 are an estimate as the data for the year are not yet finalised.

FIGURE 6.1: RELATIONSHIP BETWEEN ANNUAL INCREASES IN OUTPUT VOLUMES AND AVERAGE EMPLOYMENT



Source: Department of the Environment and Local Government and CSO.

Figure 6.1 also shows that the amount of employment created by a given level of output is increasing over the last year or two, thus resulting in a decline in productivity. This is probably due to a number of factors. First, the most labour intensive sub-sector of the industry, residential development, has accounted for an increasing proportion of total output, especially in 2002. Second, the officially registered employed may not be as sensitive to changes in output as those who are not 'captured' in the official figures. There is a significant 'mobility' factor in the construction industry. Periods of expansion are characterised by significant inflows of workers from abroad and visa-versa. The current period of expansion is no exception; industry sources indicate that there has been a significant inflow of non-nationals to the industry in recent years. At least a proportion of these workers do not appear in the official employment figures because of their domicile arrangements[32]. However, it is reasonable to assume that any slowdown in activity in the sector will impact disproportionately on this group since they have fewer ties with the domestic economy. Thus, a proportion of any unemployment that occurs as a result of lower levels of growth will not be reflected in a downward adjustment in the official employment statistics. This will have the effect of apparently raising the labour intensity of employment and reducing productivity.

6.3 Forecasting Overall Output Growth

The employment forecasts are based on assumptions about output and the relationship between output and employment. The assumptions can be summarised under three categories: the future level of residential development; the future level of civil engineering; and the level of general contracting.

- **Residential Development:** This sub-sector accounts for 54% of total output from the construction industry. Thus, employment forecasts are strongly influenced by the assumptions on future trends in this area. It is assumed that the number of house completions will average just over 53,000 annually over the 8 year period, 2003-2010, representing a total increase in the housing stock of 425,000.

32 Persons who are travelling to work from, for example, Northern Ireland, would not be included in the National Household Quarterly survey, or indeed many persons who are in transitory 'hostel' type accommodation.

It is further assumed that most of this activity will occur in the first half of the forecast period, that roughly 180,000 houses will be built between 2003-2005 and that annual house completions will decline significantly after 2005.

- **Future Level of Civil Engineering:** It is assumed that the National Development Plan will be completed around 2008, but that a substantial level of civil engineering projects will continue beyond 2008, reflecting the need to address infrastructure deficits and additional civil engineering requirements under the National Spatial Strategy. It is assumed that the completion of the National Development Plan will require additional expenditure of almost €40 billion, with over €15 billion on the roads network alone.

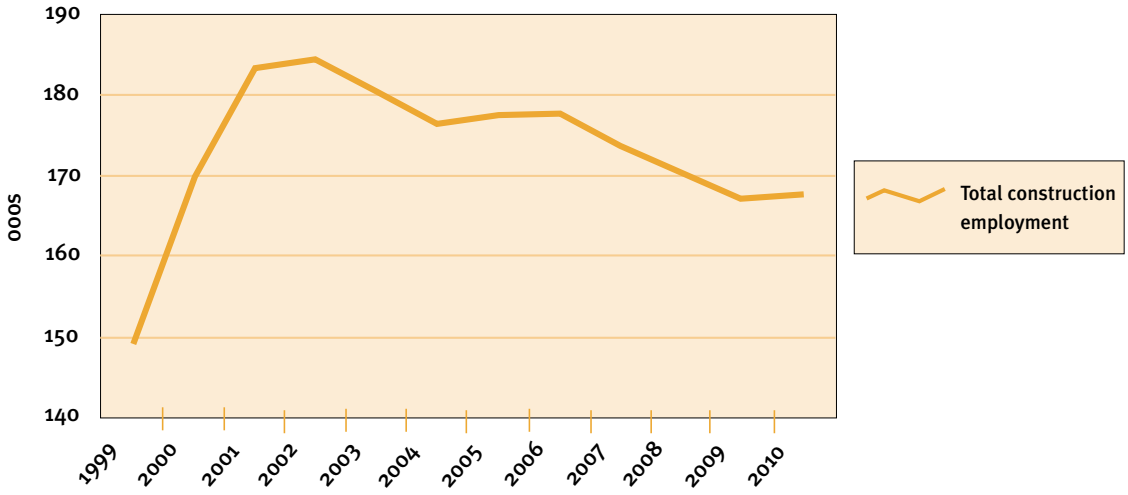
- **General Contracting:** It is assumed that the reductions in the Public Capital Programme, announced in 2002, will continue in 2003 and 2004. However, a modest increase is expected in 2005 and beyond. The current slowdown in non-residential development is expected to continue until 2005. Some positive growth is anticipated over the period 2006-2010.

6.4 Forecasting Overall Employment Growth

Trends in output are one of the key factors that influence the demand for skills; the other factor is productivity. Productivity, as measured by the official employment and output figures, is not expected to grow significantly. The contraction in activity is expected to result to some extent in a downward adjustment in hours worked. It is expected that a significant number of non-nationals currently employed in the industry may leave as activity contracts. Some of these workers are not counted among the official employment figures because of their domicile arrangements. For the purpose of this forecast, a minor increase in productivity is assumed.

On the basis of the assumptions about output and productivity, total employment is forecast to decline from an estimated average of 185,000 (in 3rd quarter 2002) to 175,000 in 2006 and this decline is expected to continue throughout the forecast period reaching 165,000 by 2010 - a decline of almost 11%. Were these forecasts to materialise, construction employment in 2010 would be still considerably higher than it was in 1999 and almost as high as the average employment in 2000 (see Figure 6.2).

FIGURE 6.2: FORECAST OF CONSTRUCTION EMPLOYMENT, 2003-2010



6.5 Forecasting Employment for Professionals Skills

The significant growth experienced by the construction industry between 1997 and 2001 gave rise to significant skill shortages in respect of virtually all skills[33]. These shortages were alleviated through a combination of immigration, longer working hours, and increases in the ratio between craft workers and apprentices. Table 6.1 illustrates the employment and skills requirements for the industry for the period 2003-2010.

TABLE 6.1: ANNUAL AVERAGE DEMAND AND SUPPLY BALANCE FOR PROFESSIONAL SKILLS, 2003-2010

SKILL-SETS	AVERAGE ANNUAL EXPANSION DEMAND[A]	AVERAGE ANNUAL REPLACEMENT DEMAND	AVERAGE ANNUAL INFLOW INTO SKILL	BALANCE BETWEEN DEMAND AND SUPPLY[B]	REQUIRED GROWTH RATE OF SUB-SECTOR TO ENSURE DEMAND AND SUPPLY EQUILIBRIUM[C]
Civil Engineers and Engineering Technicians	-30	300	420	+150	2%
Architects	-20	120	90	-10	0
Architectural Technicians	-25	70	80	+25	1%
Quantity Surveyors	-60	80	130	+110	6%
Building Surveyors	-20	70	35	- 15	0
Town Planners	+40	+30	70	0	0

Note a: *A negative sign in this column indicates a fall in demand for that skill.*

Note b: *A plus sign in this column indicates an overall excess supply.*

Note c: *This column shows the annual growth rate that would be required to eliminate the labour supply surplus in column 5.*

Civil Engineers and Engineering Technicians

According to the CSO, there were approx. 7,800 civil engineers and civil engineering technicians working in Ireland in 2002. These figures are amalgamated for the purpose of the forecast and compared to the outflows from the corresponding third-level courses[34].

There was a significant shortage of civil engineers during the recent construction boom and employers recruited almost 700 civil engineers from abroad under the Work Visas and Authorisation scheme between July 2000 and December 2002.

The demand for engineers is expected to decline modestly over the forecast period by an average of 4.5%. This may give rise to a small excess supply, equivalent to 2% of the employment stock (see Table 6.1). Two points, however, are critical. First, the 'excess supply' is expected to impact disproportionately on engineers who have been recruited from abroad. Thus, the impact of graduates from the Irish education system is expected to be quite modest. Second, the rate of decline will not be evenly spread throughout the period.

33 The only skill to experience a decline in demand throughout the boom period is that of 'draughtspersons' as a result of developments in computer-aided design technology.

34 The figure for technicians is much too low to correspond to those with appropriate Diploma or Certificate qualifications. The respondents to the CSO surveys are almost certainly using the Institution of Engineers classification of a professional engineer as a person with the appropriate third-level qualification.

The demand for civil engineers will be most weak in the first few years of the forecast period, reflecting a combination of an initial sharp decline in general contracting, both in office development and social infrastructure, and the adjustment to a lower than expected spend on public civil engineering projects in 2003 and 2004[35].

Activity in general contracting is expected to resume modest growth beyond 2005 and this will be sufficient to provide employment for all graduates. From a policy perspective, any downward adjustment to student enrolment in response to the decline in activity in general contracting would be most unwise and could result in shortages from 2007 onwards.

Architects and Architectural Technicians

There was a significant shortage of architects during the construction boom of recent years. As a consequence, architects were placed on the special Work Authorisation/Visas scheme when it was introduced in July 2000[36]. Employers recruited approx. 270 architects under this scheme to the end of 2002. This figure is equivalent to the total number of graduates in architecture produced by the Irish education system during these three years and it illustrates the magnitude of the shortage during this period[37].

It is difficult to be precise about the number of architects and architectural technicians working in Ireland. The CSO estimate is an average of 4,700 architects and technicians in 2002, composed of 3,700 architects and 1,000 technicians[38]. Some students who study architectural technology pursue a degree in architecture on completion of their programme. Nevertheless, the figure of 1,000 technicians seems low and some respondents may be self-classifying themselves as architects in the CSO surveys without possessing the appropriate qualifications[39]. For the purpose of this study, it is assumed that about 3,000 of the 3,700 classified by the CSO as architects are qualified as such.

The supply of graduates to architecture differs from other construction professions in that the supply (estimated at 90 graduates annually) is not sufficient to replace those who leave the profession (estimated at 120 annually). To date, the industry has coped with this situation in ways:

- Some young Irish students, estimated at 70 a year by the Royal Institute of Architects of Ireland (RIAL), have emigrated to the United Kingdom to study architecture and have returned to Ireland on graduation; and

- Employers have recruited architects from other European Union countries and from non-EU countries under then Work Authorisation and Visas schemes.

The demand for the services of architects will decline over the next few years reflecting the expected contraction in construction activity. However, there are reasons for assuming that the demand for the services of architects will not decline as sharply as the overall decline in construction output for the following reasons.

35 This adjustment reflects the fact that completion of the design and construction phases on some road projects, which were due in 2002 and 2003, has been delayed.

36 This scheme was introduced by the Department of Trade, Enterprise and Employment to facilitate employers who were experiencing difficulties recruiting certain occupations from within Ireland or EEA countries.

37 It is not surprising that the recent construction boom should have created such a shortage of architects. There are only two schools of architecture in Ireland; University College Dublin and the Dublin Institute of Technology, and both have been in existence for over 30 years.

38 While there is no reason to doubt the total figure, the balance between architects and technicians is difficult to reconcile with current education trends. Specifically, the two schools of architecture provide about 90 graduate and post-graduate students every year. Also, there are three further schools of architectural technology in Limerick, Waterford and Cork, two of whom have degree status.

39 There are approximately 2,300 architects registered with the Royal Institute of Architects of whom around 400 could be retired. Many architects in the public sector and some in larger companies do not register with the RIAI and industry sources estimate that this could be equivalent to another 1,000.

First, the design component of construction work is expected to increase reflecting an increasing demand for more individualised and ecologically and aesthetically sensitive business premises and private dwellings. This trend will result in an upward shift in the relative demand for architects. Second, clients are, to an increasing extent, obliged to employ architects for legal and insurance reasons in respect of tasks that were traditionally carried out by non-professional or associate professional construction workers. Thus, there will be a relative shift in the demand for architects vis-à-vis less qualified persons within the associate professional categories. Third, the demand for the services of architects in the residential development area is as much a function of repair and maintenance as new house development and the levels of repair and maintenance is influenced by the stock of houses. The housing stock has increased dramatically in recent years, and this increase will continue for at least another decade.

Quantity Surveyors and Building Surveyors

There was a reasonably strong demand for quantity surveyors throughout the recent boom. Employment increased from about 1,700 in 1999 to around 2,500 in 2001 before declining modestly in 2002.

As with other professionals, the demand for quantity surveyors outstripped supply from the education system during the height of the construction boom[40]. However, employers did not recruit quantity surveyors from abroad to the same extent as architects or civil engineers and only 64 quantity surveyors were recruited under the Work Authorisation and Visas scheme since its inception in July 2000[41].

The demand for quantity surveyors over this period was strongly influenced by the very high level of activity in the non-residential sector in 1999 to 2001. The sharp decline in this sector in 2002, which is forecast to continue to 2005 at least, has resulted in a significant reduction in demand. However, the enrolment of students on quantity surveying courses increased quite significantly during the boom period as some colleges increased 'class size'. This unfortunate development has coincided with a contraction in commercial development and it may create a temporary excess supply of graduates in 2004 and 2005. The situation may resolve itself naturally beyond 2005 as colleges revert to a normal annual intake of between 25-50 students.

Employment of building surveyors increased gradually, from approx. 1,000 in 1999 to 1,600 in 2002. Building surveyors are involved in both commercial and residential development. The latter is forecast to experience a slight increase over the period before experiencing a decline in output. Consequently, we expect the decline in the demand for these skills will not be as significant as for quantity surveyors. Demand will exceed supply from the degree course in Dundalk Institute of Technology. The recent decision of the Institute to introduce an ab initio degree programme in building surveying is welcome and it should result in a better balance between demand and supply in the latter half of the forecast period.

Town Planners

Relevant professional institutes estimate there were about 550 persons employed as planners at the end of 2002. The work-load of the planner has increased significantly in recent years, particularly as a result of changes introduced under the Planning and Development Act, 2000. The professional institutes estimate that there will be a total market requirement for about 850 planners in the medium term.

There are two education programmes which produce graduates whose qualifications in town planning are recognised by the appropriate professional bodies; a masters programme in UCD and an undergraduate programme in the Dublin Institute of Technology. The course in DIT will produce approximately 30 graduate planners annually and a further 10 environmental managers.

40 There are two degree courses in quantity surveying; one in the Limerick Institute of Technology and the other in the Dublin Institute of Technology. These generally produce about 100 graduates every year. In addition, there are two diploma courses, one in the Waterford Institute of Technology and the other in Cork Institute of Technology. These courses normally produce about 50 graduates every year .

41 A forthcoming report by DKM consultants for the Expert Group suggests that about 10% of quantity surveyors are non-nationals.

The numbers attending the post-graduate programme in UCD increased significantly recently in response to a request from the Department of Education and Science, which was concerned about reports of acute shortages in this area. It is generally accepted that this substantial increase in student intake, combined with the recently introduced undergraduate programme in DIT, will be sufficient to meet the requirement for town-planners in the medium-term.

Analysis indicates that there continues to be a small number of vacancies for planners that are proving difficult to fill. There is evidence that there has been substantial recruitment of planners from abroad[42], although mainly from within the EU.

6.6 Forecasting Employment for Craft Skills

Table 6.2 shows the balance between demand and supply of construction craft skills for the period 2003-2010.

TABLE 6.2: ANNUAL AVERAGE DEMAND AND SUPPLY BALANCE FOR CRAFT SKILLS, 2003-2010

SKILL-SETS	AVERAGE ANNUAL EXPANSION DEMAND	AVERAGE ANNUAL REPLACEMENT DEMAND	AVERAGE ANNUAL INFLOW INTO SKILL	BALANCE BETWEEN DEMAND AND SUPPLY	REQUIRED GROWTH RATE OF SUB-SECTOR TO ENSURE DEMAND AND SUPPLY EQUILIBRIUM
Electricians	-300	700	1,600[A]	+600	3%
Plumbers	-130	300	620	+450	4%
Carpenters	-520	950	1,250	+820	5%
Bricklayers	-170	300	330	+ 200	6%
Plasterers	-160	300	150	0	0
Painters	-170	300	120	0	0

Note A: It is assumed that two-thirds (i.e. 1,000) enter the construction industry.

Electricians and Plumbers

Both of these occupations are designated apprenticeships and, consequently, the domestic supply of qualified persons is provided by the apprenticeship system. The number of electricians employed in the economy increased dramatically from 16,400 in 1998 to an average of 23,000 in 2002, an increase of 6,600 or 40% in just four years. The increase in employment coincided with a period of very strong growth in the construction industry. Forecasts indicate that output in the industry will decline by approx. 9% over the remainder of the decade. In the medium term, the demand for electricians will adjust to this lower level of output. A continuation of the levels of apprentice intake, which occurred between 1998-2002 will inevitably result in excess supply available to the industry. While one-third of electricians are employed outside the construction industry, the decline in the electronics sector (which is the largest employer of electricians outside of construction) means that the excess capacity may not be absorbed elsewhere in the economy.

The employment of plumbers increased from 8,700 in 1998 to 10,200 in 2002. However, the 3,100 persons who entered apprenticeship were sufficient to provide the additional needs of the sector. In the medium term, the requirement for plumbers will decline reflecting the 9% decline in output forecast for the industry.

42 A forthcoming study by DKM consultants shows that almost 30% of those employed as planners in the economy are non-nationals. Most of the recruits appear to have come from within the EU; figures from the Work Authorisation/Visas scheme show that only 35 persons were recruited as planners between July 2000, when the scheme was introduced, and December 2002.

If current apprentice intake levels continue, this will result in an average annual excess demand of approx. 450. Plumbers are not employed to any significant degree elsewhere in the economy and it is difficult to identify how this excess supply could be absorbed. However, the market for construction skills consists of the United Kingdom and Ireland. Currently, there is a shortage of qualified construction craft-persons in the United Kingdom, particularly for plumbers. It is most unlikely that the anticipated contraction in the construction sector will give rise to unemployment among craft-workers[43].

Carpenters, Bricklayers, Plasterers and Painters

Employment of carpenters increased from an average of 25,000 to 31,500 between 1999 and 2002, an average annual increase of approx. 1,600. Employment of painters increased from 8,500 to 10,000 over the same period, an average annual increase of about 400. The employment of plasterers increased from 6,500 to reach an average of 10,000 in 2002 or an annual average of 900. Employment for bricklayers, on the other hand, increased to a high of around 12,000 in 2001 from 9,500 in 1999, followed by a slight decline to the current (2002) level of 10,000, an annual increase of about 150.

In total, additional employment of 12,000 was observed in these trades between 1999 and 2002. Over the same period, approx. 9,300 persons entered apprenticeships, 6,250 in carpentry, 1,700 in bricklaying and 750 and 600 in plastering and painting respectively.

The outflow from the apprenticeship system was significantly below the market requirements, but particularly so in the case of plasterers and painters. These construction trades are predicted to increase for the first half of the forecast period due to the sustained growth in the housing market. However, employment levels will begin to fall from 2006 with the numbers of carpenters falling to below 30,000.

Floor and Wall - Tilers, Roofers, Glaziers and Scaffolders

Employment in these skills has been increasing since 1999 reflecting the strong performance of the residential construction sector. The exception is scaffolders, who are also extensively employed in both civil engineering and general contracting. Numbers in this category have been declining through 2002. There were approx. 1,000 scaffolders employed in 2002, similar to the employment level in 1999.

Employment of roofers has increased strongly from about 2,600 in the second quarter of 1999 to almost 4,500 by the third quarter of 2002. Employment of floorers and glaziers has increased modestly over the period.

The only skill in this group that is acquired through a formal apprenticeship is the floor and wall-tiler. This became an apprenticeship in 1998 and the numbers entering the system have increased from 10 in 1999 to 71 in 2002. The trade of 'glazier' has been designated as a formal apprenticeship, but it has not as yet entered the system. The occupations of 'scaffolder' and 'built-up felt-roofer' are included under the FÁS Construction Skills Certification Training Scheme and about 1,000 persons working in these occupations have received training to date.

As residential activity is forecast to continue for the next three years, the demand for roofers and floorers will increase in the short-term. The employment of scaffolders may remain more or less constant as commercial development continues to contract. There will be a decline in the market requirement for all of these skills beyond 2006, reflecting the fact that annual house completions are forecast to decline to around 50,000, having peaked at 60,000 in 2005. The decline in employment, however, should be relatively modest.

43 However, both electrical and plumbing apprentices could be vulnerable in a scenario in which current (i.e. 1998-2002) intake levels coincided with a contraction in the industry. Fortunately, there is evidence that employers are beginning to reduce their sponsorship rates, particularly in the case of electricians. A recommendation of this study is that the sponsorship rates of apprentice plumbers and electricians should be carefully monitored.

Crane Drivers, Operators/Drivers of Plant, Road and Rail Workers, and Construction Plant Fitters

There is no formal initial training programme for these trades and, consequently, the issue of excess supply does not arise. However, persons who are employed in these occupations receive formal training and certification under the FÁS Construction Skills certification scheme. This occupational training is mandatory. FÁS has significantly increased the level of provision of formal training and certification for manual skilled workers in the industry in recent years and this initiative is welcomed.

The market requirement of this group is strongly influenced by the levels of civil engineering and also major projects in the non-residential area and in social infrastructure. Employment in these skills increased during 1999-2001, but there is now evidence of a decline which is expected to gradually continue over the forecast period.

6.7 Emerging Skills Needs

There are four major areas of emerging skill needs: project management; construction demolition and waste disposal; environmental management; and safety.

The skill of project management has become both more critical and more complex in recent years. This development reflects two influences; the widespread diffusion of information technology throughout the industry, and the fact that the scale of many construction projects, especially in civil engineering, is significantly greater than projects traditionally undertaken by the industry in Ireland. These influences have created challenges for management across a wide range of issues including finance, logistics, procurement and staff relations. The education system, and the professional associations (e.g. Construction Industry Federation and the Institution of Engineers of Ireland) have responded positively to these developments and there are a wide range of up-dating/up-skilling programmes available to assist managers to develop their capabilities in these areas. However, it would appear that there is a continuing need to develop more effective project management skills in the industry.

FÁS and the Construction Industry Federation have developed a number of programmes, which are designed to develop management skills in the areas of construction demolition and waste and environmental protection. Also, over 200,000 persons have received the one-day Safe-Pass programme, which is managed by FÁS. It is anticipated that by the end of the programme, roughly 250,000 construction workers and site personnel will have received such training.

6.8 Recommendations

The Expert Group makes for the following recommendations.

Recommendation 1: *Provision of Civil Engineers*

There should be no adjustment to the current level of provision for civil engineers.

Recommendation 2: *Architecture Graduates*

The education system should provide approx. 45 additional places annually for students who wish to study architecture. This recommendation could be implemented through increasing capacity in the two existing schools. Both of these schools are located in Dublin city and it is possible that a 'gateway' regional location would be more consistent with the National Spatial Strategy.

Recommendation 3: *Quantity Surveyors*

There is a possibility that an excess supply of quantity surveyors may emerge in 2004 and 2005. The situation should be monitored carefully and this occupation may have to be excluded from the Work Authorisation and Visas scheme at least temporarily to improve the balance between demand and supply.

Recommendation 4: *Town Planners*

The current level of provision for town planners is sufficient for the needs of the sector in the medium and long-term, but it is not sufficient to meet the needs of the industry in the short-term. Employers should continue to utilise the Work Visas/Authorisation immigration scheme to meet their needs in the short-term.

Recommendation 5: *Electricians and Plumbers*

The level of sponsorship of apprentice electricians and plumbers in recent years is higher than the forecast market requirements. However, the level of sponsorship has begun to decline in 2002. This decline may mean that the market is beginning to adjust to the reality of lower levels of construction activity over the rest of the decade. The situation should be closely monitored as the output forecast in this study would not be sufficient to absorb a continuation of the 2001 sponsorship levels in respect of both electricians and plumbers.

Recommendation 6: *Sponsorship*

FÁS, on behalf of the Expert Group, should commission a study on the sponsorship levels in the construction trades of plasterer, painter and decorator and bricklayer.

Recommendation 7: *Project Management*

A study on the changing role of project management in the construction industry, first recommended in the Third Report of the Expert Group on Future Skills Needs, should be undertaken in 2003.

Recommendation 8: Skilled Manual Occupations

All persons involved in skilled manual occupations in the construction industry should have access to formal certified training.

Recommendation 9: *Data Classification*

A special expert group should be convened, including representatives of the CSO, with a view to exploring the possibility of including new construction skills, either through modifying or clarifying existing classifications or developing new ones, in the existing official nomenclature.

7. The Demand and Supply of Skills in the Food Processing Sector

7.1 Introduction

Internationally, Ireland is recognised as a strong food-producing nation with output from the food industry making a substantial contribution to national wealth and employment. In 2000, gross output of the Irish Food, Drinks and Tobacco industry amounted to €15.3 billion, while exports amounted to €7 billion (8.4% of total exports). According to latest data available, the industry provided direct employment in 2001 for some 47,000 people in addition to 280,000 indirect jobs on farms and in sub-supply industries and ancillary services. The food processing industry accounts for 85% of this employment, directly employing 40,100 people.

Given the rapidly changing landscape in which the industry operates, the sector is set to face significant challenges in the future. These challenges will include increasing market liberalisation, greater intensity of competition, changing consumption patterns, and rapid developments in food processing technology. Responding to such challenges will be demanding in terms of the skills and expertise that the industry will require. Against this background, the Expert Group commissioned PricewaterhouseCoopers (PwC) to undertake a study of the impact that changes in the food processing industry will have on the skills required to meet the challenges in Ireland to 2010.

As part of this study, extensive consultations were held with all relevant state and semi-state organisations together with a series of one-to-one personal interviews with leading food company executives. In addition, an extensive industry survey was conducted which obtained a company response rate covering 40% of all employees involved in the food sector. To examine and validate these survey findings, a workshop comprising leading players from the food sector, third-level education, state and semi-state training organisations and training providers was held.

The Expert Group concluded that although the food processing sector is expected to experience a decline in employment over the period to 2007, it will continue to represent a significant sector in Ireland, both as employment provider and as a major exporter. For this reason, it is all the more important that those continuing to work within the sector are well equipped with the education and skills needed to deal with an increasingly competitive environment. The main findings and recommendations of the study are presented in the following sections.

7.2 Demand for Education and Training in the Sector

While employment levels in overall industry in Ireland remained relatively constant between December 1998 and June 2002, employment in the food processing industry decreased by nearly 6% over. Although not possible to quantify, results of the industry survey indicate that immigrant workers as a proportion of employees in the Irish food processing industry have been increasing since 1999. Of all food processing sub-sectors[44], the meat processing industry sub-sector is currently most significantly dependant on immigrant workers as a source of labour.

44 There are eight main sub-sectors in the food processing industry: meat; dairy; prepared consumer foods; food ingredients; biscuits, sugar, chocolate and sugar confectionary; bread; fruit and vegetable processing; and grains and starches processing.

Recently, the ESRI projected that output will continue to rise in the food processing industry, albeit at a moderate declining growth rate. However, employment levels are forecast to remain static in the period to 2005 and are expected to decline thereafter[45]. Research for this study confirms the overall direction of the ESRI results.

Despite the projected decline in employment levels in the food processing industry, within this overall decline, fundamental changes are expected to occur in both the profile of employees entering the sector and the skill sets required by the industry. This is due to a variety of significant challenges set to face the food processing industry over the coming decade. These challenges are arising as a result of the interaction of a number of significant drivers of change which can be grouped under the following common themes:

- changing consumer lifestyles and eating preferences;
- trade purchasing developments;
- evolution in industry structure;
- policy and regulatory factors;
- technology and bio-technology developments; and
- developments in the domestic and international economy.

As a consequence, the food industry of the future is forecast to be characterised by:

- a greater degree of market liberalisation;
- higher levels of food regulation;
- greater intensity of competition;
- more consolidation across all sectors;
- market-led rather than production-driven;
- increasing sophistication of both trade buyers and consumers;
- higher levels of technology; and
- more demanding and greater fragmentation among consumers.

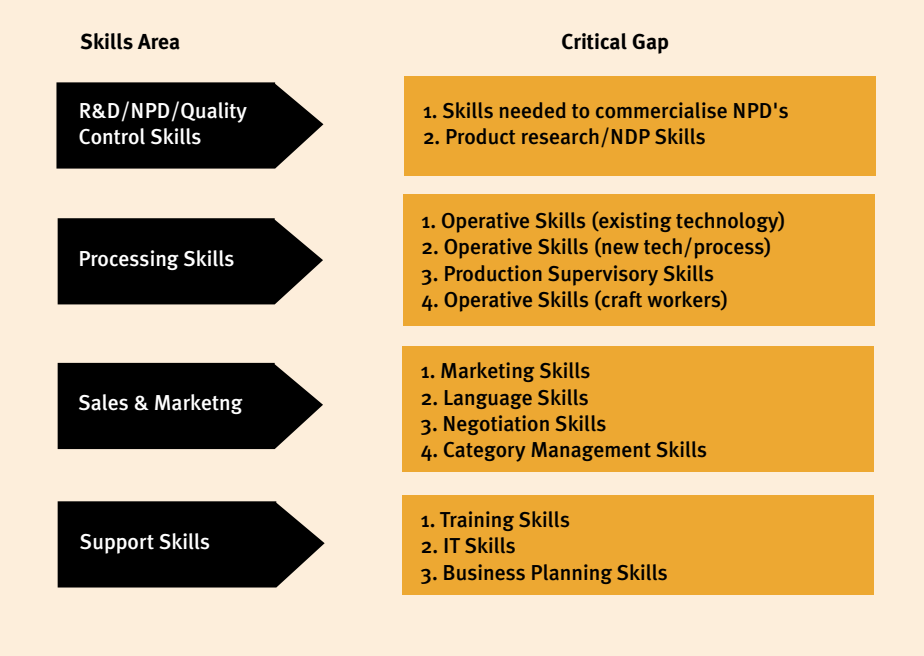
Two areas where these changes are likely to be most apparent are in the skills profiles of both production/operative staff and graduate entrants. First, the industry survey indicates that while the demand for overall operative staff is set to remain constant or in slow decline, the demand for immigrant labour, the majority of which are employed in low-skilled jobs, is likely to increase due to competitive pressures and the difficulty in securing local labour.

Second, while it was found that there is no current or likely shortfall in graduate numbers to the food processing industry over the next five years, analysis of survey respondents and the views expressed by industry confirm that the skill-sets of graduates will need to evolve to reflect changes in the market

45 ESRI, Medium Term Review 2001-2007.

environment and industry structure. Specifically, research identified the key skills important for future business development and also, the strength and weakness of Irish food processors in these respective areas. A summary of the critical skills gaps identified in the analysis is presented in Figure 7.1.

FIGURE 7.1: SUMMARY OF CRITICAL GAPS IDENTIFIED IN THE FOOD PROCESSING SECTOR



7.3 Supply of Education and Training to the Sector

Educational Courses

23 undergraduate third-level courses at certificate, diploma and degree level of direct relevance to the food industry were identified and profiled. These courses typically produce between 500 and 600 graduates annually. In addition, some 19 courses at postgraduate level were examined. These undergraduate and postgraduate courses can be categorised into three broad areas of study: Food Technology/Science; Food Business; and Food Processing/Engineering. Student destinations, in terms of first jobs upon graduation, were also studied. Arising from this process, and noting the industry survey and workshop findings, the following key points emerged.

- In 2000, only 40 of 189 agri- and food-related graduates who responded to a HEA[46] survey of graduates' first destination of employment, indicated that they entered the food, drink and tobacco sector. In total, less than three percent of graduates from all disciplines entered this sector. The remaining graduates from this discipline were employed across a range of industry sectors such as financial services, retail distribution and the pharmaceutical sector.

46 Higher Education Authority, First Destination of Award Recipients in Higher Education, 2000.

- There is a heavy Science/Technology orientation to third-level education with virtually all courses being organised along functional specialist lines. There are no broad-based agri/food courses that span the three key areas of the food industry, namely, Food Technology/Science, Food Business, and Food Processing/Engineering. In addition, while the technical knowledge of food graduates was acknowledged as a strength, their people skills were considered poor and the need for this to be addressed in future curricula developments was highlighted.

- The popularity of food-related courses, as measured by student CAO preferences, is declining. This is also reflected in declining entry point requirements for these courses. It suggests a negative perception by students of employment conditions and prospects in the food processing industry.

Training Courses and Services

110 training organisations were identified as being involved in providing specific training programmes for the food sector. Approximately six percent of these are public sector bodies with the balance being private sector companies. Virtually all of the training courses available are short (1-3 day type) courses and workshops, as opposed to certificate or diploma programmes. It was found that there is a generally low level of availability and interest in training in many strategically important skill areas such as new product development, operations management and customer relationship management. This reflects the industry's short-term operational focus.

7.4 Skills Gap Analysis

Based on the demand and supply analyses, no evidence was identified to suggest that the number of places on the food related third-level courses needs to be increased or decreased. However, given the significant challenges that the industry is facing, strong management and commercial/technical skills will be required in the future. Since such skill-sets are typically found in those with third-level qualifications, the industry's ability to attract such graduates needs to be enhanced.

Given the drivers of change and likely future direction of the food industry, overcoming those skills deficits identified in Figure 7.1 is critical to the future development of the sector. However, the Irish food industry has traditionally been characterised by a low propensity to invest in training; a view which has been confirmed by the survey undertaken for this study.

A number of potential barriers at company or organisational level have been identified. Chief among these are managements' understanding of the role of training, the direct and indirect costs of training and perceived lack of clarity in regard to grant aid allocation criteria. The disruption to business caused by staff unavailability as a result of them attending training courses is a major barrier as most food companies are SMEs and accordingly, do not have spare staff capacity to cover for such absences.

There are also certain inherent features pertaining at sectoral level that influence the extent to which training is undertaken. Principal among these are the short-term operational focus of the industry, intertwined with its acknowledged weakness in strategic planning. In general there is no clear link between strategic plans and their HRD implications. Given the commodity orientation of the sector, management focus is on cost control and efficiencies, with little emphasis being placed on the strategic development of the business. This militates against investment in staff development and training.

7.5 Ways to Address Skills Gap

In order to address the skills gap, the following two key messages need to be considered.

- The traditional short-term operational focus of management within the sector, while understandable, will no longer be adequate to counter the threats facing the industry. Management within the sector needs to adjust without delay if it is to meet, and anticipate, the constantly evolving marketplace requirements.

- The quality of the industry's liaison with the education sector needs to be improved, in order to respond effectively to the kinds of curricula changes and industry placement arrangements that are now required if we are to equip future employees with the skills and knowledge that they will need to make the industry prosper. Most of the specific recommendations reflect these two underlying issues.

7.6 Recommendations

Given the drivers of change in the international food industry, there is an increasing business imperative to invest in training. However, despite these measures, there is a low level of commitment to training across the Irish food processing industry, with some notable exceptions.

Five strategically important areas of initiatives are critical to the future skills requirements of the food industry. These areas are:

- *Demand-side Initiatives - Employer focused;*
- *Demand-side Initiatives - Employee focused;*
- *Supply-side Initiatives - third-level education;*
- *Supply-side Initiatives - Training; and,*
- *State Support /Training Infrastructure.*

Within these five areas, the Expert Group makes the following recommendations.

Employer Focused

Recommendation 1: *Strategic Approach to Human Resource Development (HRD) by Management*

- *The food industry needs to adopt a more strategic approach to its corporate development and, accordingly, to recognise the importance of strategic HRD in underpinning and delivering on business plans.*
- *Companies need to be better informed on the importance of the HRD - strategy link. This is a key role for Enterprise Ireland Development Advisors.*
- *An Executive programme for senior management, concentrating on strategic management in the food industry, should be developed in consultation with Enterprise Ireland and FÁS.*
- *A co-ordinated communication programme needs to be developed, by Enterprise Ireland, FÁS and IBEC, to inform and convince management of the importance of training in moving their business forward.*

Recommendation 2: *Senior Management Training*

An awareness campaign should be undertaken to promote the value of senior management training within companies.

Recommendation 3: *Development of the HRD Function by Companies*

Individual companies should work, in consultation with ICTU, to bring about:

- *Greater resource commitment to the HR function;*
- *Formalisation of the recruitment process;*
- *Development of precise job specifications;*
- *Formalised induction programme; and*
- *Continuous appraisal and assessment to facilitate career development.*

Recommendation 4: Employer of Choice

IBEC, in conjunction with Teagasc and third-level colleges, should initiate an image development programme for the food sector, communicating its attractiveness as a career opportunity. It should have a particular focus on (a) attracting second level students into relevant third-level food courses and (b) attracting graduates into food sector employment.

Recommendation 5: *Graduate Food Fast Track Programme*

A Graduate Food Fast Track Training Programme, centred on in-company experience, complemented by formal, external modules on critical topics, e.g. food safety and team-working, should be developed by the relevant education and training providers for the full range of food companies and sectors. The programme should highlight the benefits at employer level.

Employee Focused

Recommendation 6: *Partnership Approach*

IBEC and ICTU should jointly undertake the promotion and encouragement of life-long learning to employees, with better communication of both training needs and expected benefits.

Recommendation 7: *Employee Focused Communication Initiative*

A promotional campaign on the benefits of training and accreditation, targeting employees, should be undertaken by ICTU.

Third-Level Education

Recommendation 8: *National Innovation in Education Exchange*

A National Innovation-in-Education-Exchange (IIEE), consisting of members drawn from the third-level sector and industry, should be established to ensure that college curricula development takes industry requirements more fully into account.

Recommendation 9: *New Undergraduate Approach*

third-level colleges should ensure that:

- *At undergraduate level, all food-related courses include modules on food hygiene and food safety; and*
- *In science and technology subjects, interpersonal/people/team-working skills should be enhanced via teaching methods used.*

Recommendation 10: *General Management Undergraduate Course*

Consideration should be given by third-level colleges, to supplying graduate intake into the food sector possessing general management skills, covering the three main functional areas of food science, business and engineering.

Recommendation 11: *Formally Defined Work Placements*

A structured, formally defined programme of activities for work placements should be developed as a central, examinable element of certain undergraduate programmes. The IIEE should initiate this recommendation. Elements of this would be:

- *A code of practice for work placements;*
- *Domestic and overseas work placements to be further developed, in partnership with industry, to enhance student experience; and*
- *Grading/examination of such placements to be introduced, cognisant of the difficulties of validating in-company experience.*

Recommendation 12: *Specialist Postgraduate Programmes*

- *Existing postgraduate programmes, where appropriate, should be adapted by the third-level colleges, to include core modules on commercialisation of Food NPD and Food Sales/Marketing.*
- *A course should be developed in functional foods/nutrition/medicine.*

Recommendation 13: *Build Advanced R&D Capabilities and Skills*

Science Foundation Ireland (SFI) should be requested to explore a Food Technology/Biotechnology/Medicine/Nutrition R&D programme, possibly as an element within the Biotechnology Programme.

Recommendation 14: *Review R&D Dissemination*

The Department of Agriculture and Food and Teagasc, in conjunction with IBEC, should review the approach and methods used to disseminate State and EU sponsored food industry research, with a view to improving communications with industry, technology transfer and industry responsiveness.

Recommendation 15: *Second Level Development Options*

The IIEE should seek to stimulate debate on:

- *The introduction of a programme at Applied Leaving Cert level focusing on basic/elementary management principles; and*
- *Programme(s) focusing on food science/processing with significant practical focus.*

Recommendation 16: *third-level Development Options*

The IIEE should seek to stimulate debate on the introduction programmes (cert/diploma) at IT level which would focus on the practical/theory/business skills associated with the craft sectors of the food industry, such as meat and dairy (cheese) processing.

Training

Recommendation 17: *Training Initiatives*

In response to the skills gaps identified, the enterprise development agencies (FÁS, Enterprise Ireland) in conjunction with Teagasc and third-level institutions, should, as appropriate:

- *Develop, expand and promote courses for beginner/intermediary/advanced companies on R&D Innovation Management, HACCP for HRD and Commercialisation of Ideas, such as those run by the various Teagasc Centres and UCC courses;*
- *Develop Best-in-Class Production Efficiency Programmes, particularly for commodity sectors. Dedicated sales, marketing food safety management and customer relationship management courses, specifically for SMEs should also be introduced; and*
- *Prioritise IT skills acquisition, in particular those skills underpinning supply chain management/efficiency and logistics competencies.*

Recommendation 18: *Immigrant Induction Programmes*

Specialist induction programmes for immigrant workers should be further developed by FÁS, in consultation with Enterprise Ireland and the FSAI, and delivered in various languages to immigrant workers.

Recommendation 19: *Expansion of "Train-the-Trainer" Model*

The existing FÁS model for in-company training and accreditation, approved by regulatory bodies and industry, and currently operating in the industrial meat sector, should be rolled out to other food sub-sectors.

Recommendation 20: *National Centres of Training Excellence*

National Centres of Training Excellence should be developed for meat, dairy, consumer foods and biotechnology, building on current funding supports and the existing training and research centres such as Moorepark (dairy research and training); the National Food Centre (meat/consumer foods research and training) and the UCC Food Training Centre and Food Service Technology Faculty (food biotech research and training). These centres should work with Enterprise Ireland in the area of commercialisation of the results of research.

State Support / Training Infrastructure

Recommendation 21: *Client Communications Campaign*

The roles of the state agencies involved in training and company development need to be more clearly defined, in particular those of FÁS and Enterprise Ireland. Following from this, a focused trade communication campaign should be undertaken, to outline the roles of the various state agencies in this area and to explain various training/HRD supports available to companies.

Recommendation 22: *Further Development of FÁS / EI Executives on Skills Assessment*

Within the context of the significant drivers of change, FÁS executives and Enterprise Ireland's Development Advisors should undergo a focused, specific training programme on identifying skills weaknesses and assessing training needs.

Recommendation 23: *National Centralised Database*

A national, centralised data source of all accredited education and training information, including both accredited trainers and training programmes, should be established by FÁS and Enterprise Ireland, in consultation with Teagasc.

Recommendation 24: *Food Industry Induction*

An induction qualification for the industry should be introduced, to cover such areas as employee health and safety in the workplace, food safety, hygiene, basic numeracy, etc.

Recommendation 25: *Expansion of Skillnets*

The Department of Enterprise, Trade and Employment should undertake to ensure that:

- *The Skillnets initiative, which is considered a good example of a practical, company-focused solution to training needs, is further expanded and promoted; and*
- *There is better communication and promotion of the initiative to industry.*

Recommendation 26: *Evaluation of In-Service Training*

Formal evaluation and publication of the effectiveness, relevance and quality of in-service training programmes provided using state grants, should be undertaken by FÁS and Enterprise Ireland, in conjunction with IBEC.

Recommendation 27: *Review of HRD Grant Procedures*

Enterprise Ireland should review the qualification criteria and application processes involved in its grant aid for HRD, with a view to both ensuring their relevance to the sector and streamlining of the application process.

8. Education and Training Requirements of the Logistics Sector, 2002-2006

8.1 Introduction

A report by FÁS on the skills needs of the logistics sector to 2006 is the first comprehensive study of the training and education requirements of all those working in logistics occupations throughout the economy. The findings are based on a census of all 250 companies providing logistics services in Ireland representing 15,600 workers, and a sample of manufacturing companies representing a further 100,000 workers in logistics-related occupations. The study also includes a survey of all those involved in providing education and training to persons working in this area to establish the quantity and quality of current education and training provision, including the professional institutes, the Universities and the Institutes of Technology, FÁS, and the Post Leaving Certificate sector.

8.2 Employment

There were approx. 86,400 people working in specific logistics occupations in Ireland in 2002. These occupations included: those involved in the transport function such as managers and drivers; documentation and import/export specialists in freight forwarding; managers, inventory control specialists and operatives in warehousing and distribution; and purchasing officers, logistics planners and supply chain managers.

Approximately 15,500 were working in specialist (third-party) logistics service providers; the remainder were working in the logistics departments of firms in the manufacturing and services sector throughout the country.

A key feature of the structure of employment in this sector is the extent to which it is still dominated by what are traditionally referred to as 'blue collar workers'. As shown in Table 8.1, most of the workforce was employed in transport and warehousing. While the latter include some managers and inventory control specialists, the majority were employed as operatives or drivers. The full report therefore, addresses their skill requirements in some detail.

TABLE 8.1: ESTIMATED TOTAL EMPLOYMENT IN LOGISTICS ACTIVITIES IN 2002

LOGISTICS ACTIVITIES	EMPLOYMENT
Transport	40,300
Distribution	30,100
Purchasing	4,500
Freight forwarding	3,800
Supply Chain management	7,700
All functions	86,400

8.3 Supply Chain Management in Ireland

In addition to information on employment, the study provides a profile of the 'third party' sector and its customers in terms of their activities, level of technological usage and future investment plans. The picture that emerges is of a traditional 'fragmented' approach to logistics activity. There were of course, a number of companies both in the third-party sector and in manufacturing, which were applying 'best international practice' to the management of their supply chain. In general however, companies regarded the 'movement of goods' as an activity separate and distinct from the other core activities of the firm such as marketing and production, and unfortunately, subservient to these functions. A frequent complaint from the supply-chain managers interviewed during the study was that production related issues were invariably given priority in terms of the allocation of the firm's resources.

There was very little appreciation of the potential of supply chain management to significantly reduce costs through a more effective integration of the functions of transport, distribution, production, procurement and marketing. Little evidence was found of cross-functional teams, although there was a general consensus that the development of team-working across a number of different traditional functions was highly desirable.

The general absence of integration between the different components of the supply chain was reflected in both the utilisation of technology by manufacturing companies and the extent to which they contracted out services to third-party providers. Thus, while most of the companies surveyed had their own web sites and computerised inventory systems, only one in four companies had integrated electronic networks with customers or suppliers which might have allowed them to reduce the high costs associated with holding risk inventory, while improving the quality of their response to the customer. The use of 'integrated' information technologies between the customer and supplier was strongly related to company size. The large companies, particularly the multi-nationals, had quite sophisticated electronic integrated network and tracking systems. However, the use of integrated technology by small to medium sized companies was quite low. The survey found that the electronics and computer sectors had the highest level of integrated supply chain management systems.

It is difficult to identify any one single obstacle which is hindering the transition to an integrated approach to supply chain management in Ireland. Cost was a factor in developing the appropriate technologies in-house, particularly for the smaller companies. However, where cost was a constraint to developing an integrated system in-house, there was a general reluctance to avail of the expertise of third-party companies. In general, companies were sceptical of the capacity of third-party providers to offer a quality, integrated supply chain management service. Five key capacities which manufacturing companies were demanding of their logistics suppliers were identified:

- Reliability and consistency in quality of service;
- Good customer service and prompt feedback systems;
- A high level of technical knowledge in relation to business management, materials and product handling, and quality assurance;
- A high level of information communications technology competency – this is becoming a major criterion in the award of contracts, particularly by the multi-national manufacturing companies; and
- The capacity and willingness to engage in long-term collaborative partnerships where mutual interests are explicit and a high level of commitment to the relationship is evident from all parties in the chain.

Another key factor cited by logistics managers as responsible for the slow development of integrated supply chain management in manufacturing was the difficulty in finding people with the required expertise. Many companies complained that the education and training systems were not providing persons with the degree of 'multi-skilling' necessary to manage an integrated supply chain. Managers compared the required skills profile to the shape of a 'T'; the stem reflecting the in-depth expertise required (often in industrial engineering) and the horizontal line of the 'T' reflecting the fact that, in addition to specialist knowledge in a specific discipline, the supply chain manager (in their view) also requires at least a working knowledge of other disciplines such as project and financial management, and computer programming.

8.4 Employment Forecasts and Implications for Skills Needs

The annual recruitment requirements for logistics skills to 2006 are provided in Table 8.2. Forecasts are based on the 'worst case' economic scenario published recently by the Economic and Social Research Institute (ESRI), in light of several economic global factors and the tragic events of September 11th in the United States.

Irish industry will require approx. 4,000 new recruits annually across a range of logistics skills, and the full-time education and training provision will only provide for approximately 25% of this requirement. When the annual outflow of graduates from part-time courses is taken into consideration, the supply increases significantly, although it is not sufficient to meet the recruitment need.

However, most of the part-time training and education programmes on offer are designed primarily for persons already in employment, and there are substantial training needs in this area. Generic skills, such as computer appreciation, health and safety and customer relations feature prominently, but there is also a significant demand for training in specific occupational skills such as transport management and forklift driving.

The quality of the education and training provided is as important as the numbers completing the programmes. The study found a number of issues of concern to industry in this regard. A key finding is that the inherent multi-disciplinary nature of current logistics occupations is often not reflected in the course curricula. Modules on information technology, for example, are absent on some programmes although a knowledge of computers is now an essential requirement for everyone working in a logistics function, from the warehouse operative to the supply chain manager, albeit at different levels of proficiency. In addition, the study identifies a multiplicity of different accreditation systems (16 in total) while some regions in the country are poorly represented in respect of the range of logistics courses on offer. In some cases, logistics courses have developed in an ad hoc manner with relatively little formal progression between many of them or formal recognition across the different accreditation systems although there have been improvements in this area in recent years. All of these factors militate against promoting logistics as a desirable career choice for Irish school-leavers.

TABLE 8.2: ANNUAL RECRUITMENT REQUIREMENTS FOR LOGISTICS SKILLS TO 2006

SKILLS	TOTAL EMPLOYED	ANNUAL RECRUITMENT
Transport managers	3,600	200
HGV drivers	36,700	1330
Warehouse managers	1,800	120
Stock, inventory control	5,700	250
Warehouse operatives	18,600	920
Forklift drivers	4,000	400
Purchasing managers	900	60
Purchasing officers	3,600	180
Freight forwarding managers	860	60
Freight forwarding specialists	860	80
Other clerks	1,700	100
Importers and exporters	400	10
Supply chain managers	2,830	140
Logistics planners	4,200	170
Logistics assistants	700	30
Total	**86,450**	**4,050**

The poor image of logistics is another key issue. It forms the basis for one of the core recommendations; the State, and specifically the educational and training sector, should initiate an intensive campaign to promote logistics as a desirable career for young job-seekers. It is recognised that this campaign will only succeed if fundamental changes are made to the structure of current education and training provision. The need to build a recognisable career path within the industry to attract the best students should be the main focus.

While the full report contains a number of recommendations on structures and strategy, the majority of the recommendations are designed specifically to increase the number of young people obtaining qualifications in logistics. Significant increases in current education and training provision in all occupations from warehouse operatives to documentation specialists, involving a range of different delivery systems including full-time and part-time education and training, traineeships and in-company training is recommended. The creation of a substantial 'training of trainers' programme is also proposed.

8.5 Summary of Recommendations

The recommendations are divided into two sections. The first section includes those which are designed to address the fundamental strategic weakness in the sector in respect of the current provision of education and training; for example the fact that the education and training provided is in the context of individual disciplines or skills, whereas the requirements of the sector is increasingly for workers with a multi-disciplinary capability. The second section includes recommendations that are designed to address the specific skill deficits.

Strategic Recommendations

It is recommended that a National Training and Education Framework be established to oversee the introduction of an integrated multi-skill dimension to the education and training system, with established career structures embodying both vertical and horizontal integration and mutually recognised accreditation.

Recommendation 1: *Standards for Logistics Occupations*

The National Training and Education Committee should work with the social partners and the relevant education and training institutions to develop agreed standards for all occupations within the logistics industry, and these standards should be submitted for approval for certification by FETAC/HETAC within the NQAI framework.

Recommendation 2: *Exchequer Funding of NITL*

Exchequer funding of the activities of the National Institute of Transport and Logistics should be extended to incorporate the training in integrated supply chain business applications to small and medium sized companies in the third-party logistics sector and the non-manufacturing sectors[47].

Recommendation 3: *FÁS Subsidies*

It is recommended that FÁS provide financial subsidies to small and medium sized companies in the third-party sector and in the services sector to support the updating of skills in the logistics and transport areas.

Recommendation 4: *Awareness Campaign*

An intensive promotional campaign to enhance the status and attractiveness of careers in logistics and transport to school-leavers and other potential job-seekers should be initiated.

Recommendations to Increase Provision of Skills

Recommendation 5: *Transport*

- *Consideration should be given to the introduction of a new full-time diploma course in transport management.*
- *Additional transport management courses at VEC level should be provided.*
- *FÁS should provide financial support for distance learning in transport management.*

47 Currently, the National Institute of Transport and Logistics receive funding from Enterprise Ireland to provide such training to manufacturing firms.

- *It is recommended that FÁS provide 'updating skills of managers' training programmes to small to medium-sized transport firms.*
- *There should be an increased provision by FÁS of HGV driving courses.*
- *Consideration should be given by FÁS to a training programme in advanced HGV driving skills.*

Recommendation 6: *Warehousing and Distribution*

- *It is recommended that there be an extension of the FÁS course on logistics and distribution to other locations.*
- *The introduction of New PLC courses on inventory and materials management should be considered.*
- *A certificate/diploma level course on inventory and materials management should be provided.*
- *The part-time courses in the Institutes of Technology, currently accredited by IPICS, should be modified to incorporate HETAC level of accreditation.*
- *New FÁS warehouse operative courses should be introduced.*

Recommendation 7: *Freight Forwarding and International Trade*

- *It is recommended that the FÁS freight forwarding traineeship be extended.*
- *Consideration should be given to a new course in international trade and e-commerce by the Institutes of Technology.*
- *The development and extension of international trade PLC courses should be examined.*
- *A new customs clearance course by FÁS should be introduced.*
- *FÁS should run a part-time advanced training programme in freight forwarding.*

Recommendation 7: *Purchasing and E-Procurement*

- *Inclusion of modules on e-procurement on degree and diploma courses in industrial purchasing in the Institutes of Technology is recommended.*
- *Full-time certificate and diploma courses in purchasing by the Institutes of Technology should be considered.*
- *It is recommended that accreditation on purchasing courses by FÁS should be provided.*

Recommendation 8: *Supply Chain Management*

- *Consideration should be given to the inclusion of supply chain management and logistics modules on engineering and finance programmes provided by the Institutes of Technology.*
- *FÁS should introduce a new traineeship on supply chain management and logistics planning.*
- *There should be an extended provision of part-time courses in logistics planning at medium/certificate skills level.*
- *A major initiative to increase the number of trainers qualified to provide instruction in supply chain management should be considered.*

9. Education and Training Needs in the Financial Services Occupations, 2003-2010

9.1 Introduction

As part of its remit to monitor skills within key sectors and occupations, the Expert Group undertook an analysis of skilled occupations within the financial services area. The aim was to examine the current and future education and training needs associated with the main occupations for 2003-2010. The analysis focused on the following sub-set of financial occupations:

- Treasury and company financial managers;
- Bank managers;
- Other financial managers;
- Accountants;
- Actuaries, economists, statisticians;
- Taxation experts;
- Underwriters, claims assessors, brokers;
- Credit controllers;
- Accounts clerks, bookkeepers, other financial clerks; and
- Cashiers, bank clerks.

In 2002, there were 123,000 persons employed in these occupations. This represents an increase of 30 percent on the level recorded in 1998. When compared with the overall employment growth for this period of 16 percent, this is a remarkable expansion. Of total employment in financial occupations in 2002, 40 percent was employed directly in the financial sector, while the remaining 60 percent was employed elsewhere in the economy. High employment growth for the financial occupations recorded in recent times is reflected in the overall performance of the Irish economy, as well as some specific developments associated with the financial services sector. Specifically, this refers to the expansion of the Irish Financial Services Centre (IFSC) and the establishment of Dublin as a globally recognised centre for financial intermediation.

With faltering growth prospects for the Irish economy in the short run, the expansion in employment in all sectors is likely to be modest, including financial occupations. However, the provision of high-level financial skills has been and will remain instrumental in attracting foreign investment and central to the preservation of Ireland's reputation in the global financial domain.

The demand forecasts in this study are based on historical trends, most recently published sector employment forecasts (FÁS/ESRI Manpower Forecasting) and consultations with the industry representatives. The latter source provided information on the likely implications of the changes in regulatory, fiscal and technological areas on future demand. In the short run, sector employment forecasts were adjusted downward using the most recent employment forecasts published by the ESRI (McCoy et al., 2003). This was to account for the economic slowdown that occurred since the FÁS/ESRI forecasts were generated.

Expansion demand for each occupation is generated through combining sector and occupational effects[48]. Future employment forecasts take into consideration demand arising from the projected growth in sectors employing financial skills. They also account for the future change in the occupational structure of the financial sub-sectors. Sector effects are based on the FÁS/ESRI employment forecasts for the relevant sectors of the economy, while the occupational effects are inferred from the historical data provided by the CSO. Within the banking/insurance sector, the distinction is made between the expected performances of the sub-sectors: the forecasts were adjusted to account for the expected faster employment growth of the insurance sub-sector, and the expected below average employment growth of the financial services sub-sector in the short run. For each occupation, the total future recruitment demand is derived by summation of the projected replacement and expansion demand.

On the supply side, the analysis includes examination of trends in student enrolments in finance-related courses, the results from the first destination survey focusing on the graduates with finance backgrounds and the demographic structure of the population[49]. Further, the forecasts are based on the supply of financial professionals, the data supplied by the professional institutions which are a major provider of financial education and training.

A numeric estimate of the skills gap is provided where it is possible to quantify supply. For skills where there is no identifiable source of supply, the results are based on an examination of vacancies and salary trends[50].

9.2 Factors Affecting Future Demand

Principal drivers of the future demand for financial skills include overall economic growth, regulation, technological change and the globalisation of the financial services sector.

Given the integration of financial skills across all sectors of the economy, future macroeconomic performance is particularly important for the future employment of those skills. In the short run, current forecasts of the international, as well as Irish economic growth are less favourable than anticipated in 2002 forecasts. It is expected that employment growth across financial occupations will be slower in the next two years. The recovery is expected to occur beyond 2004.

Not all occupations will be affected in the same manner by the general economic performance. Structural changes within the financial services sector, as well as in the rest of the economy will result in some occupations experiencing higher employment growth than average and vice versa.
Another key factor determining future performance of the sector and the associated demand for financial skills is the regulatory environment. An important development in this area is the recent establishment of the Irish Financial Services Regulatory Authority (IFSRA). This new body is the single regulator for all Irish financial institutions and is responsible for both prudential and consumer protection issues across the whole sector.

The creation of the IFRSA will have implications for the employment of financial skills. On the one hand, it is possible that the regulator could introduce mandatory qualifications affecting some financial occupations. In the short run, this would impose rigidity in the labour market. The supply of persons previously sourced for work in regulated occupations would be reduced to those holding the required qualification. On the other hand, the regulatory changes are likely to produce demand for new financial skills such as compliance

48 Inter-sector and intra-sector occupational mobility (i.e. between the financial sector and the rest of the economy, as well as within the financial sector), was examined. However, due to a small sample size no significant patterns were identified.

49 The enrolment figures into finance related courses are collected at certificate, diploma, degree, postgraduate and professional level. The institutions covered included post-leaving cert institutions, institutes of technology and universities.

50 Ernst and Young, Remuneration Guide (1998-2002) and the CSO data on financial services sector salaries.

officers and accountants with legal backgrounds. Regulation of the financial services industry will provide increased protection for consumers and it is likely to enhance confidence, stability, competitiveness and status for the industry overall.

The financial services sector is expected to continue to respond to the advances in technology, especially ICT. The impact of these developments on the skills demand has been, and will continue to be, significant in the future. The responses to increased automation (new products, new forms of selling, process re-organisation) are all likely to impact upon the number and types of jobs on offer in the sector. Most of the developments are designed to raise productivity and reduce the number of employees required per unit of output, which affect employment negatively. However, it is expected that a greater synergy of financial and IT skills will be needed for professional as well as clerical financial occupations to meet the requirements of future technological changes which would include the design, maintenance and use of the information systems and the product innovations required in the new market conditions. Therefore, although direct selling over the internet and process automation is expected to continue to reduce the demand for relatively unskilled clerical operatives (telesales persons, data entry operatives), it is expected to increase the demand for professional and IT staff to maintain the expert systems. In some activities, such as banking with its extensive retail branch network, the impact is also expected to be felt in the form of reduced demand for bank managers.

As globalisation continues, countries experience pressure to open up their domestic service markets to international competition and the growth of cross-border services provision. Many countries have opened up their financial system to foreign competition. Financial liberalisation has progressed through a range of EU (creation of the single market for financial services) and non-EU measures (the financial services provisions of the World Trade Organisation's (WTO) General Agreement on Trade in Services (GATS) launched in 2000). These measures have increased the openness and competitiveness of the international financial sector. Globalisation will continue to increase. This will have implications for employment changes for the financial services sector. For example, there will be increased competition for the management of funds on an international level. Irish funds managers will continue to compete with other countries overseas for the management of funds. Ireland will have to sustain its competitiveness as a location for the management of funds in order for employment levels in the fund management sub-sector of the financial services sector to increase.

Increased competition in the market for financial services has spawned a series of mergers and acquisitions between financial institutions as they seek economies of scale, access to new markets or both. Examples of this response are evident in the banking sector internationally. These structural changes are likely to continue in the future and the employment implications arising from them will lead to the loss of a significant number of jobs as part of the restructuring process.

In the Irish economy, high level skills are required in order to meet the demands of the financial services sector. This is a direct result of creating higher value-added products and services in response to the need for Ireland to remain competitive on an international level in the provision of financial services and products.

Overall, the demand for the financial skills is expected to be low in the short run and to recover beyond 2004.

9.3 Factors Affecting Future Supply

In 2002, there were 60,000 persons undertaking at least some level of financial training. This figure encapsulates provision of training across all educational institutions in the country at all educational levels. In terms of professional training, there were 21,000 persons registered in accounting, 3,300 in insurance, 2,000 in banking, 1,900 in investment management, 1,500 in financial services, 950 in taxation, 500 in actuary and 100 in treasury courses. There were 1,800 students registered in economics and statistics related courses. The remaining 27,000 persons were enrolled in general finance, business or commerce related courses which contain finance related modules.

There has been a significant response to demands for particular skills by some educational institutions. In particular, DCU and UCD have introduced programmes in response to specific labour market demands of the financial services sector. Some private colleges, Dublin Business School in particular, which are likely to respond more readily to market signals, have already introduced in their curriculum some specialist financial training. The professional institutions have been and are expected to continue to respond to the specific skills needs. An important development in this respect is the establishment by the National College of Ireland (NCI) of a new financial education and training institute. The International Financial Institute of Ireland is a response to market demand and it is an effort to enhance co-ordination and integration between the existing education system and industry. Finally, FÁS has introduced two traineeship programmes to meet the requirements of the insurance sector for qualified financial advisers.

In forecasting future supply of skills, three difficulties have been encountered. First, for most of the selected occupations, no mandatory qualifications are required. This holds for professional and assistant professional, as well as managerial and clerical occupations. The only exception is the actuarial profession. Second, almost all of the professional financial skills studied are acquired through continuous rather than the initial education process. Data on enrolment figures, class sizes and dropout rates is scarce, which creates difficulties in forecasting future supply flow. Third, the education process associated with professional qualifications does not have a fixed duration. For many people, it takes several years before they are fully qualified bankers, accountants, tax experts or actuaries. For these reasons, it is difficult to forecast the supply flow in quantitative terms. However, in terms of the provision of financial skills, the market appears to be responding to demand. The institutions that most notably have responded to market developments include universities, private colleges, professional institutions and FÁS.

9.4 Skills Gap Analysis

Treasury and Company Financial Managers

No mandatory qualifications are required to work as a treasury or company financial manager. As a result, it is impossible to identify sources of labour supply for these occupations and future supply flows. However, data on vacancies and salaries suggests that no excess demand has been experienced in recent times. Interviews with treasury and company financial managers revealed it is unlikely that there will be any shortages of treasury and company financial managers in the foreseeable future, given that persons currently working in both the treasury and financial areas can be promoted to management level after a number of years of experience. In terms of skill evolution, management will be increasingly required to have more pronounced dynamic leadership skills to adapt to the rapidly changing economic, regulatory and technological environment.

Bank Managers

As with other managers, no mandatory qualifications are required to obtain employment as a bank, building society or post office manager. Training can take the form of on-the job/in-house training or completing professional banking exams after the leaving certificate or third-level qualification. Data on notified vacancies suggest that no excess demand has been experienced in recent times. Consultations with financial sector representatives indicate that there are unlikely to be shortages of bank managers. In fact, it is argued that many branches have been closed and others are likely to close in the future. This reflects a process of structural change in the banking sector, which is resulting in decreased demand for bank managers.

Other Financial Managers

The qualitative data reveal no shortages of financial managers over the projection period 2003-2010. However, it is expected that there will be an increasing demand for managers with strong business awareness and dynamic leadership skills in response to increased global competition in an ever changing environment. In line with the expected trend for higher level educational qualifications for all occupations in the economy, it is expected that the educational level of managers will also increase. This is likely to be strongly reinforced by the ongoing growth in demand from employers for more highly educated workers in response to technological innovations and global competition.

Accountants

The average number of persons emerging with accounting qualifications annually is higher than the forecast demand in the short-term. Assuming 1,450 persons qualifying annually, there will be excess supply in the short run of 500 annually for 2003 and 2004. With an economic recovery, demand will increase beyond 2005. However, no shortages are envisaged, partially because the short-run excess supply, which is expected to be available at least to some extent over the medium to long run, is more than sufficient to compensate for any shortage that may occur from 2005. Further, a qualification in accountancy is much sought after and professional bodies have demonstrated their ability to increase supply should the need arise, as evidenced in the late 1990s.

In general, the analysis indicates that current levels of supply are sufficient to meet demand. However, there are some indications that accountants with specific skills, such as those necessary for the management of revenue streams associated with particular aspects of the company business (e.g. hedge funds), referred to as project accountants, are expected to be in short supply. This finding is supported by the fact that in recent times, salaries for project accountants have been increasing above the sector average. Thus, the supply of accountants with additional expertise, risk analysis and compliance issues in particular, are areas to be targeted in the future.

The introduction of the International Accounting Standard in 2005 may potentially create difficulties should sufficient numbers of accountants not be trained in the new reporting methods.

Actuaries, Economists and Statisticians

The annual outflow from the professional course for actuaries, estimated at 40, should be sufficient to meet the market requirement. However, there are some indications that the number of new actuaries who are available to industry is significantly below the total number that qualify. Although vacancy and salary data does not suggest a shortage of actuaries, feedback from key representatives indicates that some areas, particularly the public sector, are experiencing difficulties recruiting actuaries. This may reflect the relatively high level of earnings associated with this occupation. The public sector has been obliged to introduce a special rate for actuaries to attract them.

There is also a problem of attracting and retaining senior actuaries within and outside the financial sector. For example, 32 percent of the members of the Society of Actuaries are employed in England. Many actuaries qualified in Ireland are employed with large corporations world-wide, which offer very high salaries. There is a concern that supply, particularly at the senior level, is likely to become a concern in the future.

The outflow of graduate economists is far greater than the projected market requirement for persons to work as economists (as strictly defined). However, this is not surprising as economics graduates are employed in many different occupations in the economy, and the occupations that graduates work in may not necessarily be titled economist.

It is not possible to measure the difference between demand and supply in respect of statisticians because there is no information available on the numbers employed.

Taxation Experts

Comparison of the projected annual recruitment demand and the projections of the numbers completing professional taxation exams suggests that no shortages of taxation experts can be expected in the coming years. This finding is supported by information provided by the Institute of Taxation.

Underwriters, Claims Assessors and Brokers

Given the large number of occupations grouped together in this code, it is impossible to identify sources of supply and thus quantify any skills gaps. Overall, the total number of vacancies for this occupational group is high, which suggests that there are shortages of at least some skills within this occupational code. However, it is likely that the number reflects high turnover rates associated with some of the occupations, as commonly stated by the industry. Analysis of the annual growth in salaries suggests that there have been no shortages of skills in recent times. This is confirmed by industry.

Two main issues arise with this occupation group. First, with the changing financial environment, there is an increase in the demand for new financial products. For example, in the insurance industry, it is predicted that there will be growth in areas such as insuring directors and officers (as a result of recent financial scandals) and insurance and employment practices liability. This is not an immediate concern however, as the sector is capable of providing extensive in-house training.

Second, it is expected that the IFSRA will target these occupations in the near future. It is likely that it will soon be mandatory for persons employed in these occupations to have the qualified financial advisor or equivalent qualification. The implementation of this requirement may create difficulties, particularly for smaller firms.

FÁS has been running a traineeship scheme for insurance broking officials in Dublin. The scheme has been extended and FÁS has also introduced a scheme for financial advisor assistant for foundation insurance broker development (mainly for the life assurance sub-sector) in Dundalk.

Credit Controllers

Qualitative analysis reveals that there are no shortages of skills for credit controllers. Industry representatives of the sector propose there is no high skill required for work in this area and that relatively short on-the-job training is sufficient to prepare an individual with good generic skills to work as a credit controller.

Accounts Clerks, Book-keepers and Other Financial Clerks

Over the period August 2002 to April 2003, there were 2,957 identified vacancies (53 notified to FÁS and 2,904 advertised in the Irish Times) for the positions corresponding to this occupational group. This high number of vacancies is likely to be associated with the high turnover rates characteristic of the occupational group. During 2002/3, there has been a significant recruitment activity originating from a very small number of large employers (e.g. Merrill Lynch and Citibank). A slowdown or a reverse of recruitment activity by one or all of them could create a significant swing in demand, leading to excess supply.

Interviews with financial sector representatives suggest that there are no shortages of skills for the accounts clerk, book-keeper and other financial clerk positions. Along with the general rise in the educational level for all occupations in the economy, it is envisaged the educational level of clerks will increase. The set of generic skills necessary for these positions will expand to include a wider range of IT skills. It is expected that the proportion of degree holders among this occupational group will increase, given the overall raise in the national education levels.

Cashier and Bank Clerks

The evidence from the quantitative analysis and interviews with financial sector representatives it that no future shortages are envisaged, given that jobs in this occupation require relatively low skill levels.

9.5 Conclusions

In the short run, the supply of skills appears to be sufficient to meet demand. Employment growth is not predicted to be significant in the short run; thus, demand for the ten financial occupations studied should not increase significantly. Redundancies in London and New York have further increased the available pool of workers with financial skills.

Nevertheless, the analysis indicates some occupations are proving more difficult to source, such as actuaries, project accountants and quantitative modellers. Only a small number of persons with these skills are required, but they are highly skilled positions and supply is limited. In some cases, it is the combination of particular skills that is lacking, for example, accountants with specific business knowledge, quantitative modellers who have both mathematical and business/financial skills, and compliance officers with legal and financial skills.

In the short to medium term, some shortages may exist as a result of regulations. There is a possibility that the Qualified Financial Adviser (QFA) qualification or similar qualifications likely to be introduced by IFSRA will become mandatory across a widening range of occupations. If obtaining these qualifications involves a significant investment in time and money, there may be some shortages in the short run.

There is an increased demand for compliance officers in the financial sector, due to concerns caused by recent financial scandals and subsequent regulations. As the scope of regulations increases, the demand for compliance officers will rise correspondingly. A new Association of Compliance Officers in Ireland (ACOI) was established in November 2002, which reflects the growing presence of this new occupation.

In the long run, the economic outlook is favourable. While no acute shortages are predicted, an area that warrants attention is the increasing demand for persons with combinations of specific skills.

9.6 Recommendations

In general, the analysis shows that there are no major shortages forecast for financial skills. However, specific skills need to continue to be monitored. As a result, the Expert Group makes the following recommendations.

Recommendation 1: *Regulatory Environment*

The Expert Group should closely monitor changes in the financial regulatory environment and their implications on supply of skills. The SLMRU financial skills monitoring reports could be used for this purpose.

Recommendation 2: *FÁS Traineeship for Junior Financial Advisors*

The Expert Group recommends that the FÁS Traineeship for junior financial advisors in the insurance industry be extended to other regions in Ireland.

Recommendation 3: *Actuaries*

The occupation of actuary should continue to be monitored carefully by the SLMRU.

Recommendation 4: *Combined Skills in NCI Programmes*

The portfolio of courses, offered by the proposed new financial services institute at NCI, should reflect the need to develop combined skills among those working in financial occupations.

10. Soft Skills for Organisations

10.1 Introduction

Traditionally, the word 'skill' has been associated with a range of technical, job-specific, abilities which require training and instruction for a worker to become proficient or skilled within a particular job or occupation. In recent times, there has been growing interest in a range of abilities which are variously referred to as 'generic', 'personal', 'behavioural' or 'soft'. These skills relate to a person's ability to operate in the workplace, either alone or with others[51]. The need for this class of skills is not new, but contemporary changes in the organisation of work, the focus on team-working, and the growth in the services sector have increasingly meant that they are now emerging as a critical factor for organisational success.

In light of this, FÁS on behalf of the Expert Group, commissioned a study with the aims of: identifying the role, nature and importance of soft skills in the workplace; establishing an Irish employers viewpoint on soft skills; establishing the current Irish education and training provision with regard to soft skills; and proposing recommendations to ensure the development of soft skills. This chapter presents the main findings and recommendations.

10.2 Defining Soft Skills

There is no common definition for the term 'soft skills'. In general, they are seen as people-oriented skills and self-management skills. The following 4-competence type framework[52] provides an understanding of the full range of competences and skills required in the world of work. This also includes technical skills (Column 1).

SPECIALISED COMPETENCE	***METHODOLOGICAL COMPETENCE***	***SOCIAL COMPETENCE***	***PARTICIPATORY COMPETENCE***
DELIVERS CONTINUITY KNOWLEDGE, SKILLS AND ABILITIES	**DELIVERS FLEXIBILITY** PROCEDURES	**DELIVERS SOCIABILITY** MODES OF BEHAVIOUR	**DELIVERS PARTICIPATION** STRUCTURING METHODS
Occupation Specific: • Extended vertical and horizontal knowledge about the occupation Enterprise Specific Experience Specific	Variable Working Methods: • Situated Solutions • Problem Solving solutions • Independent thinking and working • Planning, assessing and executing work • Adaptability	Individual Social Skills: • Willingness to achieve flexibility and adaptability • Willingness to work Interpersonal Skills: • Willingness to co-operate • Honesty • Fairness • Willingness to help • Team Spirit	• Co-ordination skills • Organisational skills • Combination skills • Persuasion skills • Decision making skills • The ability to assume responsibility • Leadership skills

Source: ESF Programme Evaluation Unit Report, Education & Training for New Forms of Work Organisation, 2000.

51 These skills are also of relevance to non-working life. However, the focus of this study is on skills for work.

52 Based on the work of Bunk, "Teaching Competence in Initial and Continuing Training in the Federal Republic of Germany", *European Journal of Vocational Training*, Jan. 1994, CEDEFOP, and used by the ESF Evaluation Unit within an Irish perspective.

In a limited survey of Irish employers undertaken for the study to assess their understanding of the meaning of the term soft skills, responses were highly compatible with the skills identified in the above framework.

Taking account of the Bunk framework, the Irish employers' definitions and other research[53], a suggested definition for soft skills is the *inter-personal and intra-personal skills required to be effective in the workplace.* This encompasses:

- *inter-personal skills,* including the ability to work on a team; communication and influencing skills; and leadership and coaching skills; and
- *intra-personal skills,* including self-management; orientation to learning, creativity and flexibility; motivation and perseverance and problem-solving.

10.3 The Need for Soft Skills in the Workplace

High performance work practices such as team working, performance related pay, and job rotation or TQM have become more common in the workplace with implications for employee skills. Soft skills become increasingly important, both to cope with the level of change being introduced, and to work with a more participatory management style. Meantime, the increasingly higher educational level of a significant number of new entrants to the Irish labour force, and their expectations of opportunity and development, are forcing organisations to demonstrate high levels of soft skills in order to manage and retain such employees. The growth in employment in the services sector, both in Ireland and internationally, has also resulted in an increasing need for soft skills as these skills are core to success in services industries. The increasing emphasis on customer care has further emphasised this.

Changes such as more family-friendly arrangements and intercultural diversity have led to different ways of working in many organisations, underpinned by equality legislation, which provides protection against discrimination and harassment across the workplace. All employees require the skills to interact in a positive manner so as to create and maintain a safe and dignified working environment.

10.4 Demand for Soft Skills in Irish Companies

For a number of reasons, there is a lack of statistical information regarding demand by employers for the need for soft skills in employment. Soft skills are difficult to quantify and describe precisely, which makes their identification and assessment difficult. While intrapersonal and interpersonal skills are required in every facet of life, the level of skill required in employment varies in relation to the individual's position and occupation. Until recently, many occupations did not require highly developed levels of such skills, and therefore demand for them was limited.

The following are the key findings of the employers survey undertaken for this study.

- Most employers were broadly satisfied with the current level of soft skills possessed by most employees, but recognised that such skills would become more important in the future.

- Many felt that the level of soft skills possessed by graduates entering the workforce was quite satisfactory.

- It was pointed out that different jobs, occupational grades and levels require varying degrees of soft skills capability.

53 The OECD classification of the key skills and attributes relevant to human capital is broadly similar to this definition, although it includes literacy, numeracy and IT skills.

- Companies invest heavily in soft skills development, mainly using personal development programmes and formal training courses.
- When it comes to managing people, soft skills were the most important differentiator of effectiveness.
- Good practice involves the use of a range of HR practices to instill and support a team-working culture; recruitment, use of competency models, performance management processes, training and development, reward for skill development, etc.

Concerns were expressed with regard to new entrants in certain sectors (e.g., the hotel and hospitality sector) where the quality of soft skills is inextricably linked to the service dimension of the business and to the skills of older employees. The level of soft skills possessed by managers or supervisors was identified in a number of cases as being unsatisfactory.

For many organisations, particularly those in the traditional indigenous manufacturing sector, the emphasis on increased flexibility and equality of opportunity is presenting a significant challenge to the way these organisations operate, their management style and the skills of their employees.

The demand for the development of soft skills is also being driven by developments in the EU and by government labour market and education policy (see Appendix 6). The skills implications of these for both managers and employees in working effectively to set up and operate partnership agreements, is quite significant. Possession of the required soft skills will be a prerequisite for success.
In Ireland, unlike some other EU countries, there is no formal statement of policy regarding soft skills which would provide a focus of attention and direction to education/training providers.

10.5 Soft Skills Provision in the Education and Training Systems

Second Level Education

Second-level education policy is set out in the 1995 White Paper on Education, *Charting our Education Future*. However, explicit references to what are commonly called key or core skills (which include soft skills) are relatively few in Ireland's statements of purposes and aims at all levels[54].

The Junior Cycle

The development of soft skills in the Junior Cycle is most directly addressed through the Social, Personal and Health Education (SPHE) programme[55]. This programme aims to promote self-esteem and self-confidence, enable students to develop a framework for responsible decision-making and provide opportunities for reflection and discussion. Not all students take this programme. While 80%[56] of schools provide the programme for first year students, this is reduced to 66% in third year. There is no formal national assessment framework (either formative or summative) for recognising student achievement in SPHE. While this is now being considered, the lack of recognition has tended to undermine the importance given to the programme, compounded by the fact that there is no specific teaching qualification for the subject.

Transition Year Programme

The Transition Year is an additional year which students may follow before proceeding to the Leaving Certificate cycle. In the 2001-2002 academic year 75% of schools were offering the programme. Among the skills promoted during the Transition Year are a range of soft skills such as communications and presentation skills. Students are also given opportunities for community and work experience. However, as

54 Developing Senior Cycle Education: Consultative Paper on Issues and Options, NCCA, 2002.
55 Soft Skills are also addressed, although to varying degrees, in other subjects such as CSPE and Physical Education.
56 The Junior Cycle Review. Progress Report: Issues and Options for Development, NCCA, 1999.

the schools who provide the Transition Year programmes are responsible for deciding their own curricula, the quality of programmes varies between schools. Research[57] carried out on the performance of Leaving Certificate students found that the Transition Year appears to have a positive impact on student progress between Junior and Leaving Certificate, but the degree of impact varies considerably between students and between schools.

The Leaving Certificate (Established)

The focus of the established Leaving Certificate is primarily academic and is assessed by formal examination. Its main emphasis is on providing students with the necessary education required for entry into higher education. It is followed by the majority of Irish upper-secondary level students and it enjoys a high level of public confidence.

However, some criticism has been levelled at the programme. It has been suggested that the emphasis on the points system (from within the school, combined with the pressure from students and parents) conflicts with the personal development of the student. During the consultative process of the research conducted by the Commission on the Points System[58], a number of damaging effects were identified. The NCCA's recently published Consultative Paper[59], recognises that these concerns need to be addressed in reforming the programme both as an examination and as an educational programme[60].

The Leaving Certificate Vocational Programme (LCVP)

The Leaving Certificate Vocational Programme is based on combinations of Leaving Certificate (established) subjects and three activity-driven Link Modules - Enterprise Education, Preparation for Work and Work Experience. These Link Modules help to develop soft skills such as team-working, listening, decision-making and autonomous learning. The number of students availing of the LCVP continues to increase; in 2001 they accounted for 21% of all Leaving Certificate students.

Given that the LCVP largely comprises Leaving Certificate (established) subjects, the criticisms made of that programme can equally be made of the LCVP. The Link Modules, which form an important part of the programme, are not equally recognised across Higher Education institutions for points purposes. The Institutes of Technology (IoTs) award more points for these modules than do the universities. This stance by the universities conveys an important and negative message about the skills at the heart of the LCVP and their value[61].

The Leaving Certificate Applied

The curriculum and approach of the Leaving Certificate Applied (LCA) focuses on preparing students for the transition from school to adult and working life. The programme is more practical, community-based, work-oriented and task-centred than the traditional Leaving Certificate. Continuous assessment is used as the basis of about two-thirds of the final result.

The 1998 NCCA review of the programme[62] highlighted a number of issues that negatively impacted on the programme. These include the inability to combine elements of the LCA with subjects from the more

57 From Junior to Leaving Certificate. A Longitudinal Study of 1994 Junior Certificate Candidates who took the Leaving Certificate Examination in 1997, NCCA, 1999.

58 The Commission on the Points System, Final Report and Recommendations, 1999.

59 ibid

60 "...in the broader contexts of lifelong learning and developments in teaching and learning, relatively little attention has been given to the total experience of students within the programme, addressing areas such as time spent in different learning modes, access to different sites, the role of basic and key skills, the role of homework and study, etc."

61 This issue was noted by the Commission on the Points System who recommended that "the universities consider giving higher points (the same as those that are currently awarded by the IoTs) to the Link Modules in the LCVP, as recommended by the Department of Education and Science as soon as possible".

62 Review of the Leaving Certificate Applied: Report on Programme Structure, NCCA, 1998.

academic Leaving Certificate and the public perception of the programme as being one for 'weaker students'. This drawback is exacerbated by lack of recognition of the programme by employers and education and training institutions.

Further Education and Training (FET)

In the FET sector, in general, programmes run in the education system integrate training for vocational skills in particular disciplines and the development of personal skills. They also incorporate work experience to give relevance to the skills learned and an appreciation of working life. Accreditation is provided by FETAC and, depending on the programme, certification is provided at mainly (former NCVA) Foundation Level, and Level 1, Level 2 and Level 3 awards. Some programmes lead to awards under the Junior or Leaving Certificates.

At Foundation Level and Level 1, eight modules are required for a full award, including three mandatory modules in communications, maths and personal effectiveness/personal and interpersonal skills. Communications and a Work Experience module are mandatory for a full Level 2 award. A progression scheme enables holders of FETAC (NCVA Level 2) awards to progress to designated certificate/diploma courses in Institutes of Technology, the DIT and, under certain conditions, the National University of Ireland.

There is limited provision of teaching and learning for trainers in the Further Education sector. A report[63] by Dublin City University School of Education Studies, indicates that around one-third of full-time staff, and more than one-half of part-time staff, do not have a teaching/training qualification. The report recommends that there should be a minimum level of teaching/training qualification for such educators, with a strong emphasis on person-centred learning, including guidance and counselling, group and interpersonal skills and facilitation and communications skills.

FÁS

FÁS is the national body charged with training the unemployed and job-seekers. Accreditation of FÁS' courses is mainly through FETAC. FÁS courses aim to develop trainees' technical skills. While there is currently no explicit policy for assessing the attainment of soft skills, a number of initiatives have been undertaken which specifically deal with them.

The Integrated Assessment System (IAS) was established in the 1980s as an inter-agency[64] joint-initiative which targets the disadvantaged. The IAS concentrates on the development of soft skills, using practical skills as a vehicle by which to develop and assess them. There are currently 160 training and assessment modules. The modules are not a curriculum; rather they identify training outcomes against laid-down standards. The core skills assessed in each module include communications, planning, teamwork, safety, quality awareness and hygiene. A mutual agreement with the NCVA, at foundation level, was established in respect of a certain number of modules. This is now recognised by FETAC.

A Certificate in Core Skills has been developed for participants on the Community Employment Programme based on the core skills identified in the IAS. Currently, a new Certificate in Core Skills has been piloted and will be available as a national award under FETAC for a wide range of activities. The Core Skills Modules of the Certificate are followed and assessed in the context of Core Themes. The Modules detail some of the knowledge and skills needed to manage effectively in work, daily and civic life. Core Themes are general topics which are relevant to people as individuals and also as members of society.

The Certificate has been developed at two levels; Introduction/Foundation and Continuation Level. To access the IAS and Core Skills, trainers must attend a one-day assessor briefing session.

63 An Analysis of the Training Needs of Trainers in the Further Education Sector in Ireland, Dublin City University, School of Education Studies, 2000.

64 FAS, CERT and Teagasc.

CERT[65]

CERT is the national body responsible for training and development in the Irish tourism and hospitality industry, providing training services for second-level, PLC, and apprentice-level students, for adults and for the industry generally. As highly-developed soft skills are a requirement for many jobs/occupations in this sector, most courses include them in the curriculum either in an integrated way or as separate modules. In many instances, these skills are explicitly accredited by FETAC.

third-level Education

third-level institutions have a role to play, not only in developing technical and professional skills, but also in developing the personal, interpersonal and enterprise skills that are now required for the workplace. Universities have their own discretion to decide what emphasis should be given to soft skills; consequently this varies across colleges and across courses. Until recently, little formal recognition of the importance of soft skills has been acknowledged by the universities.

In 1998, the Irish Universities Training Network (IUTN) held a seminar on University Teaching and Learning: Policy and Practice. Key recommendations were made relating to what key skills (cognitive, social and personal effectiveness skills) should be identified as part of all degree programmes. The HEA noted that this was not a matter for either the Department or the HEA, but for universities themselves, whether through the Conference of Heads of Irish Universities (CHIU) or independently.

While the recent report on Irish universities by Professor Malcolm Skilbeck[66] does not deal explicitly with the area of soft skills, it does highlight a number of areas which affect their development (see Appendix 5).

10.6 Skills Provision - The Future

Second Level System

A number of factors are hindering the development of soft skills among second-level students. These include:

- the lack of an explicit policy at national level for the development of soft skills;
- the lack of formal recognition for a wide range of non-academic skills in the established Leaving Certificate examination;
- the unequal recognition of these skills for points purposes by the universities (LCVP) and the lack of parity of esteem for the LCA, conveying a negative message about the importance of these skills; and
- the need to ensure that second-level teachers are adequately trained in order to develop these soft skills in their students.

The NCCA has taken cognisance of the views of the Commission on the Points System[67] (and others) in its 2002 Report, which addresses the totality of the senior cycle education system, and includes a major treatment of soft skills. Relevant Issues papers, for instance on 'Basic and Key Skills,' are to be published and discussed at invitational seminars. A National Forum on Senior Cycle Education will take place in the autumn of 2003 to report on the findings of the consultation process and signal the direction that the emerging 'policy paper' on senior cycle education is taking.

65 Since May 2003, CERT has become absorbed into a new organisation, Failte Ireland.

66 The University Challenged: A Review of International Trends and Issues with Particular Reference to Ireland, HEA, 2001. (Commissioned by the HEA and CHIU).

67 The Commission on the Points System suggests a way forward for some of these issues. "The Commission is of the opinion that while a broad senior cycle education should be provided, and students' attainment in that senior cycle assessed and certificated, in some instances the certification might be of the nature of a record of participation and involvement rather than a grading of achievement. Some elements of the certification might not count for points purposes, but would be a pre-requisite for entry to third-level education".

Further Education and Training System

The extent of soft skills development in FET varies between programmes and between providers. In view of the growing significance of such skills, there is a need to ensure that soft skills are explicitly incorporated into all programmes.

All FET participants (be they young school-leavers or mature adults) are at post-compulsory level and therefore require a more learner-directed, person-centred approach to training/education. Appropriate training of trainers is extremely important to ensure that they have the required skills to deliver their programmes effectively using this approach.

third-level Education

The development of soft skills is an increasingly important part of third-level education. Some examples of good practice are as follows.

- The Careers Services in Trinity College Dublin, Waterford Institute of Technology and Dublin City University published a study in July 2003 identifying the transferable skills *("also known as 'generic', 'soft', 'key' or non-technical')* that Irish employers look for in Irish graduates. The survey found that a range of transferable skills were very important during recruitment. Oral communication, teamwork, customer service, time management, written communication, and the ability to cope with multiple tasks were particularly valued transferable skills. These skills were rated more highly than academic record or relevant work experience when recruiting graduates.

- The Centre for Teaching and Learning in UCD has developed a website that is a resource and research centre for the study and support of teachers, with web pages on generic and transferable skills, lifelong learning and self-directed learning. These pages are complemented by a section on Good Practice in Student Assessment.

This trend in developing such initiatives needs to be encouraged and supported

10.7 Recommendations

While the continued emphasis on developing core technical skills is essential for the Irish economy, the need for complementary soft skills is increasing and requires attention to prevent a gap arising in the future. The shortage of technical and professional skills, e.g. nurses and engineers, is often more visible, but the lack of soft skills will impact on the effectiveness of organisations, and ultimately the economy, over the long term. The Expert Group makes the following recommendations to enhance the development of soft skills in Ireland.

Recommendation 1: *Development of Soft Skills in National Policy Agenda*

The development of soft skills should form an explicit and integral part of the national policy agenda, both in respect of enterprise development and of education/training.

Recommendation 2: *NQAI, HETAC and FETAC*

The National Framework of Qualifications can help to establish the importance of soft skills through the promotion of outcomes descriptors that acknowledge soft skills acquisition more explicitly, as articulated in the April 2002 policies and criteria published by the NQAI. Specifically, HETAC and FETAC should ensure that qualifications standards set by them provide for recognition of soft skills in terms of outcomes.

Recommendation 3: *NCCA*

The Expert Group welcomes the current review by the NCCA of the curricula and assessment systems for the Leaving Certificate, particularly in relation to the development of soft skills. The acquisition of soft skills should be more explicitly incorporated into all Leaving Certificate programmes. Currently, it is included in the Vocational and Applied programmes only.

Recommendation 4: *Support for Commission of the Points System Recommendation*

In order to endorse the value of the link modules in the LCVP, the Expert Group supports the Commission of the Points System recommendation that "the universities consider giving higher points to the link modules, (the same as those that are currently awarded by the Institutes of Technology), as recommended by the Department of Education and Science as soon as possible".

Recommendation 5: *Transition Year*

Currently, the Transition Year aims to give a high priority to the development of soft skills. However, not all students undergo the Transition Year, and the quality and effectiveness of the Transition Year is quite variable. The Expert Group believes that it is desirable that second-level students undertake a well-structured Transition Year as a means, inter alia, of improving their soft skills.

Recommendation 6: *World of Work Module*

Consideration should be given to developing the world of work module in Transition Year in consultation with the social partners and local industry. Curricula material for teachers in respect of soft skills elements in the Transition Year might also be usefully developed, or, where it already exists, better communicated to Transition Year teachers/leaders. Similar modules on the world of work might also be usefully developed for other groups of students/trainees e.g. third-level students on co-operative work experience.

Recommendation 7: *Learner-Centred Pedagogy*

A culture of life-long learning recognises the need for a successful early start to learning; this applies equally to the acquisition of soft skills. The learner-centred pedagogy in primary schools seems to be more conducive to soft skills development. It is recommended that the responsible authorities should seek to have more of the positive elements of this approach incorporated into second-level schools and further education/training.

Recommendation 8: *Stand-Alone Modules*

The Expert Group favours the integration of soft skills development into all curricula and learning processes of normal programmes. However, it is recognised that there can be a value in having stand-alone modules for specific purposes. It is recommended that the relevant education and training authorities consider the need for the development of nationally-certified stand-alone modules at different levels for various elements of soft skills.

Recommendation 9: *Teacher Assistance*

Teachers should be assisted to identify how best to move the development of soft skills such as problem-solving and team-working into the conscious learning of students. This will require reviewing the learning that has taken place, the processes used and the analysis/thinking/interpersonal skills being developed as a side-product of the main subject.

Recommendation 10: *Soft Skills Development at third-level*

The importance of soft skills as a means to ensure that individuals can work effectively in the workplace also needs to be addressed in higher education. In particular higher education institutions, should in the development and review of curricula, have regards to the need to address soft skills development for students. The work undertaken by TCD, DCU and WIT, and highlighted in this report, may assist all institutions in this regard.

Recommendation 11: *Importance to High Performance Management*

The increased importance of soft skills reflects the development of 'high performance working organisations' more widely across manufacturing, services and the public sector. Such organisations have been shown to be more successful, whether measured in terms of productivity, profits or public service. The National Centre for Partnership and Performance is currently examining how best to promote such modern work practices. The Expert Group recommends that the enterprise development agencies, along with the National Centre, continue to promote and provide assistance to organisations in furthering this approach to working. Soft skills development and application is a key component of moving to 'high performance work organisations'.

APPENDIX 1

Membership of the Expert Group on Future Skills Needs

Name	Agency/Organisation
David Barry	Department of Enterprise, Trade & Employment (DETE)
Brian Cogan	Forfás
Enda Connolly	IDA Ireland
Roger Fox	FÁS
Jack Golden	Cement Roadstone Holdings/ Institution of Engineers of Ireland
Una Halligan	Hewlett Packard/IBEC
John Hayden	Higher Education Authority (HEA)
David Lowe	Goodbody Stockbrokers
Joe McCarthy	Arkaon
Kevin McCarthy	Department of Education & Science (DES)
Dr. Sean McDonagh	Skills Initiative Unit
Ann Nolan*	Department of Finance
Peter Rigney	Irish Congress of Trade Union (ICTU)
Dr. Catherine Kavanagh	Forfás
Aisling Penrose (Secretary)	Forfás

** Mr Eugene O'Sullivan retired with effect from April 2003 and was replaced by Ms Ann Nolan.*

APPENDIX 2

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

Construction Sector

David Barry	(Chairperson) DETE
Fergus Whelan	ICTU
John McGrath	FÁS
Martin Donnelly	HJ Lyons
Paddy Purcell	Institution of Engineers of Ireland
Paddy Sweeney	Department of Environment and Local Government
Peter McCabe	Construction Industry Federation
R Dunwoody	Dunwoody Dobson
Robert Byrne	FÁS
Dr. Sean McDonagh	Skills Initiative Unit
Tony Smith	Society of Chartered Surveyors
Vincent McCarthy	Limerick Institute of Technology

Engineering Professionals

Dr. Catherine Kavanagh	(Chairperson) Forfás
Professor Gerald Byrne	University College Dublin
Roger Fox	FÁS
Jack Golden	Cement Roadstone Holdings/Institution of Engineers of Ireland
Patrick Purcell	Institution of Engineers of Ireland (IEI)

Labour Market

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

Food Sector

Kay Hallahan	(Chairperson) Forfás
David Barry	DETE
Martine Brennan	Food Safety Authority of Ireland
Derek Breen	Enterprise Ireland
Pat Daly	National Food Centre, Teagasc
Sean Faulkner	Enterprise Ireland
Declan Fennell	Bord Glas
Con Lucey	Irish Farmers Association
Tara McCarthy	Bord Bia
Mary McCarthy Buckley	University College Cork
Richard McCormick	Bord Iascaigh Mhara
John McGrath	FÁS
Pat Moynihan	FÁS
Seamus O'Donoghue	Irish Co-operative Organisation Society

Dr. Tony Smith	Dept. of Agriculture, Food and Rural Development
Dr. Catherine Stanton	Teagasc
Mary Ena Walsh	CERT
Andrea Wood	IBEC

ICT

Una Halligan	(Chairperson) Hewlett Packard
Anne Carthy	IBM
Adrian Devitt	Forfás
Maria Ginnity	Forfás
Alastair Glass	Science Foundation Ireland
David Hanna	IDA Ireland
Dr. Catherine Kavanagh	Forfás
Peter Lillis	IDA Ireland
Joe McCarthy	Arkaon
Áine Mc Donagh	Forfás
John McGrath	FÁS
Patricia McLister	Enterprise Ireland (NSD)
Peter McManamon	Parthus Ceva
Denis Molumby	IDA Ireland (SBG)
Pat O'Connor	HEA
Niall O'Donnellan	Enterprise Ireland
Séan Ó Riain (Remote Member)	University of California
Raomal Perera	Network 365
Shane Quinlan	Forfás
Kathryn Raleigh	IBEC
Frank Turpin	Intel
Jim Whelan	IDA Ireland

Life Sciences and Biotechnology

Dr. Sean McDonagh	(Chairperson) Skills Initiative Unit
Eamon Sheehy	IDA
Pat McGovern	IDA
Garry Forde	Enterprise Ireland
Dr. P.J. O'Mahony	Food Safety Authority of Ireland
Matt Moran	IBEC
Sharon Higgins	IBEC
Eucharia Meehan	HEA
Matt Corcoran	Wyeth
David Lowe	Goodbody Stockbrokers
Dr. Gerry Clarke	Medtronics
Professor Dermot Diamond	Dublin City University
Dr. Andy Robertson	UCD
Dr Imelda Lambkin	ELAN
Roger Fox	FÁS
Michael Delaney	Cork Institute of Technology
Ann Chandler	ARK Management Consultants

Professor Noel Lowndes	Department of Biochemistry, NUI Galway
Professor Tim O'Brien	NUI Galway
Seamus Bannon	Forfás
Dr. Catherine Kavanagh	Forfás

Skills and Labour Market Research Unit (SLMRU)

David Lowe	(Co-Chairperson) Goodbodys
Joe McCarthy	(Co-Chairperson) Aarkon
Jasmina Behan	FÁS
Dr. Eamonn Cahill	Forfás
Padraig Cullinane	Department of Enterprise, Trade and Employment
Roger Fox	FÁS
Dr. Catherine Kavanagh	Forfás
Aine McDonagh	Forfás
John McGrath	FÁS
Joane McNaboe	FÁS
Roisin Sen	FÁS
Caroline Shally	FÁS

Soft Skills

Roger Fox	(Chairperson) FÁS
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Una Halligan	Hewlett Packard
Denis Colger	DETE
Kay Hallahan	Forfás

APPENDIX 3

Reports Published by the Expert Group on Future Skills Needs

Report	Date of Publication
The First Report of the Expert Group on Future Skills Needs - Responding to Ireland's Growing Skills Needs	December 1998
Business Education and Training Partnership Report on the Inaugural Forum, Royal Hospital Kilmainham	March 1999
The Second Report of the Expert Group on Future Skills Needs - Responding to Ireland's Growing Skills Needs	March 2000
Business Education and Training Partnership 2nd Forum, Dublin	March 2000
Report on E-Business Skills	August 2000
Report on In-Company Training	August 2000
Benchmarking Mechanisms and Strategies to Attract Researchers to Ireland	July 2001
The Third Report of the Expert Group on Future Skills Needs - Responding to Ireland's Growing Skills Needs	August 2001
Labour Participation Rates of the over 55s in Ireland	December 2001
The Irish Labour Market: Prospects for 2002 and Beyond	January 2002
National Survey of Vacancies in the Private Non-Agricultural Sector 2001/2002	March 2003
National Survey of Vacancies in the Public Sector 2001/2002	March 2003
The Demand and Supply of Skills in the Food Processing Sector	April 2003
The Demand and Supply of Engineers and Engineering Technicians	June 2003
Skills Monitoring Report - Construction Industry 2003/10	July 2003
Benchmarking Education and Training for Economic Development in Ireland	July 2003
The Demand and Supply of Skills in the Biotechnology Sector	September 2003

APPENDIX 4

Reconciliation of ICT Skills Forecasts with the Third Report

Table A.1. compares the demand projections for ICT skills in the Third Report with the current report. Demand for *computing professionals* projected in this report to 2005 is lower than that projected in the Third Report primarily because slow growth in global ICT markets has greatly reduced demand for new graduates from software companies, and because the anticipated market recovery is unlikely to lead to growth as strong as that experienced in the late 1990s.

TABLE A.1 DEMAND FORECASTS FOR ICT SKILLS IN THE THIRD AND FOURTH REPORTS

	Average Demand 2001-2005 Third Skills Report	**Demand 2003** Fourth Report	**Demand 2004** Fourth Report	**Demand 2005** Fourth Report
Computing Professionals	4,383	870	2,016	2,208
Engineering Professionals	2,459	795	1,305	1,378
Computing Technicians	1,623	170	325	352
Engineering Technicians	839	1,065	1,449	1,460

Similar underlying factors have reduced demand for electronic engineers and production engineers from hardware and microelectronics design companies, and will continue to affect demand, thus limiting overall demand for *engineering professionals* to a level less than that projected in the Third Report.

The very substantial change in projected demand for computing technicians reflects a combination of factors.

- As with computing and engineering professionals, the actual demand outcome has been affected by the ICT sector downturn.
- Growth in the output of people with computing qualifications from sources other than full-time computing diploma and certificate courses has filled much of the demand that many employers would see as being technician level. The scope of the demand projection has thus been narrowed to reflect that part of the demand that is directly relevant to graduates with diplomas and certificates.
- Employers do not always perceive a significant difference between a computing degree and a computing diploma qualification, and there is a proportion of roles that can potentially be filled by either. In an industry downturn, the better availability of graduates means that the roles are more likely to be filled by degree level graduates.

The projection of demand for *engineering technicians* to 2005 in the Third Report was lower than in this current report. While there has been a significant downturn, demand is supported by an ongoing move by many of the major companies in the hardware and systems sub-sector to have almost all of their production staff qualified to at least certificate level, often with a preference for diploma level qualifications.

Table A.2 compares the forecasts of supply in the current report with those in the Third Report. The difference between the projections for the supply of *computing professionals* is driven primarily by a fall in the uptake of computing graduate diploma places, following the onset of the ICT sector downturn. Projected numbers for 2005 are depressed by a downturn in student intake in 2001, partially compensated for by the projected start of a recovery in graduate diploma numbers.

TABLE A.2 SUPPLY FORECASTS FOR ICT SKILLS IN THE THIRD AND FOURTH REPORTS

	Average Supply 2001-2005 Third Skills Report	**Supply 2003** Fourth Report	**Supply 2004** Fourth Report	**Supply 2005** Fourth Report
Computing Professionals	2,770	2,254	2,244	2,134
Engineering Professionals	1,580	1,883	1,985	1,840
Computing Technicians	523	443	372	271
Engineering Technicians	1,099	1,690	1,686	1,680

Note: The supply projections in this table reflect the "Recovery in Student Confidence" scenario, as distinct from the "No Recovery in Student Confidence" scenario

The projected *engineering professional* supply in the Fourth Report is less than that in the Third Report. Three main factors have driven this reduction.

- Over the initial period, efforts to increase the number of students taking courses in electronic engineering met with only limited success.
- A sharp fall in graduate output in electronic engineering is projected for 2005, along with a lesser fall for production and mechanical engineering.
- A definitional change accounts for a part of the difference. Graduates in quantity surveying, buildings surveying and construction economics were included in the engineering supply numbers in the Third Report but have been excluded from the current report.

The lower supply projections for *computing technicians* reflect a combination of an increased propensity to continue studies to degree level, with a downturn in student intake that will affect graduate numbers from 2003 to 2005.

The Third Report projected a supply of 1,099 *engineering technicians*. It is now expected that the supply will be very substantially greater than this level; an average of 1,635 between 2001 and 2005. This is largely due to strong growth in courses relevant to the construction sector, primarily in civil engineering and construction studies.

APPENDIX 5

Demand for Engineering Skills Projections by Discipline

TABLE A3. PROJECTION OF DEMAND FROM TOTAL ECONOMY FOR ENGINEERING DEGREE GRADUATES, BY DISCIPLINE

	BIOMEDICAL	BUILDING SERVICES	CIVIL	CHEMICAL / PROCESS	COMPUTER	ELECTRONIC	ELECTRICAL	MECHANICAL	MECHATRONIC	OTHER	PRODUCTION / MANUFACTURING	TELE-COMMUNICATIONS	TOTAL
BASED ON SOFTWARE & IT SERVICES PROJECTION 1													
2003	37	13	211	84	*	129	18	156	15	25	164	14	866
2004	38	14	249	92	*	372	18	169	19	25	197	33	1,226
2005	40	14	264	95	*	430	18	170	20	24	206	39	1,320
2006	41	13	256	97	*	456	18	168	20	23	205	41	1,338
2007	41	13	255	100	*	486	18	167	21	22	208	43	1,374
2008	43	13	256	104	*	513	18	169	21	22	211	45	1,415
2009	45	13	266	108	*	539	18	172	22	22	216	47	1,468
2010	46	13	269	110	*	565	18	171	22	21	219	49	1,503
2011	47	13	272	113	*	588	18	168	22	20	219	50	1,530
2012	46	14	285	117	*	608	18	168	24	19	224	52	1,575
BASED ON SOFTWARE & IT SERVICES PROJECTION 2													
2003	37	13	211	84	*	129	18	156	15	25	164	14	866
2004	38	14	242	91	*	345	18	167	18	25	189	32	1,179
2005	40	14	246	93	*	371	18	164	18	24	189	37	1,214
2006	41	13	235	95	*	390	18	161	18	23	186	39	1,219
2007	41	13	232	98	*	412	18	160	19	22	187	41	1,243
2008	43	13	230	102	*	431	18	160	19	22	187	43	1,268
2009	45	13	237	105	*	449	18	162	19	22	190	44	1,304
2010	46	13	237	107	*	464	18	161	19	21	190	46	1,322
2011	47	13	236	111	*	477	18	156	20	20	187	48	1,333
2012	46	14	245	114	*	489	18	154	21	19	188	49	1,357

TABLE A4. PROJECTION OF DEMAND FROM TOTAL ECONOMY FOR ENGINEERING DIPLOMA AND CERTIFICATE GRADUATES, BY DISCIPLINE

	BIOMEDICAL	BUILDING SERVICES	CIVIL	COMPUTER	ELECTRONIC	ELECTRICAL	MECHANICAL	MECHATRONIC	OTHER	PRODUCTION / MANUFACTURING	TELE-COMMUNICATIONS	TOTAL
BASED ON SOFTWARE & IT SERVICES PROJECTION 1												
2003	8	55	451	*	327	26	127	35	58	103	0	1,190
2004	8	56	477	*	407	26	142	39	57	124	2	1,338
2005	8	56	477	*	424	26	145	39	58	130	2	1,365
2006	9	53	450	*	420	25	143	40	56	128	2	1,326
2007	9	51	441	*	414	23	137	38	52	128	3	1,296
2008	10	49	433	*	411	22	136	37	49	128	3	1,278
2009	10	50	448	*	421	22	140	38	50	130	3	1,312
2010	11	50	448	*	427	22	140	39	51	133	3	1,324
2011	12	49	447	*	426	21	139	38	48	134	4	1,318
2012	13	50	469	*	424	21	139	38	47	136	4	1,341
BASED ON SOFTWARE & IT SERVICES PROJECTION 2												
2003	8	55	451	*	327	26	127	35	58	103	0	1,190
2004	8	56	476	*	401	26	141	39	57	123	2	1,329
2005	8	56	474	*	412	26	143	39	58	127	2	1,345
2006	9	53	446	*	408	25	141	40	56	124	2	1,304
2007	9	51	437	*	399	23	135	38	52	124	3	1,271
2008	10	49	428	*	395	22	134	37	49	123	3	1,250
2009	10	50	444	*	401	22	137	38	50	126	3	1,281
2010	11	50	443	*	405	22	137	39	51	128	3	1,289
2011	12	49	441	*	402	21	136	38	48	128	4	1,279
2012	13	50	462	*	399	21	136	38	47	129	4	1,299

APPENDIX 6

Soft Skills – EU and National Labour Market Policy Perspective

The Final Report of the European High Level Task Force on Skills and Mobility, December 2001, stated that the EU objective of achieving a dynamic, knowledge-based economy, capable of sustainable economic growth with more and better jobs and greater social cohesion, will depend on a labour force which has the necessary skills as well as the capacity to adapt and acquire new knowledge throughout working life. The Commission's Action Plan which followed the Report identified a range of areas for action which include *"Providing all citizens with free access to the acquisition of the following skills; literacy and numeracy, maths, science, languages, learning to learn, social/personal skills."*

In line with EU policy, Ireland's National Employment Action Plan (2002) sets out the key objectives of Ireland's labour market policy. Areas where the National Employment Action Plan will have specific implications for soft skills development include the areas of partnership, adaptability and flexibility: *"Partnership at the level of the firm is particularly important in the context of adaptability. This includes a shared understanding of; organisational goals, the need for and purpose of change, and the necessity for an open, participative approach to addressing the needs of the organisation."* The National Centre for Partnership and Performance has been established to work with relevant Government, and employer and trade union bodies to develop guidelines for partnership arrangements. It has identified the following topics as likely to be subject to Partnership Agreements:

- competitiveness, adaptability, flexibility and innovation;
- better systems of work organisation;
- training and personal development linked to lifelong learning; and
- equality of opportunity and family friendly working arrangements.

Extract from The University Challenged

The following is the extract referred to from *The University Challenged: A Review of International Trends and Issues with Particular Reference to Ireland,* HEA, 2001 (Commissioned by the HEA and CHIU).

Professor Skilbeck looks at the need for the universities to strengthen partnerships with industry and community organisations *"… there is a need for universities to demonstrate a greater responsiveness to the rapidly changing economic environment through outreach schemes in all subjects and fields of study – and not only those with business/employment links. These could include work and community experience as a normal component of all degree programmes, closer integration of university career guidance and community liaison programmes into academic work, business-university fora…".*

Regarding the area of university lecturers and their teaching/ learning role, Skilbeck states *"There are very serious challenges to appoint new staff with aptitude for a broad range of entrepreneurial as well as academic roles and to provide professional development opportunities for the present staffs of the institutions… Good teaching needs encouragement and appreciation including fuller recognition in recruitment and promotion procedures. The examination-bound conventions of the 'right answer' and the fostering of rote learning have long been signalled as*

potential weaknesses. They become all the greater in a modern society where emphasis is given to problem-solving, team work, oral communication, the search for information from multiple sources and self and group-directed initiative. University teaching does not always respond to these requirements whose focus is 'learning how to learn, to know and to do'. There is often in educational practice a weak linkage among declared goals, assessment practices and the content and process of teaching. Staff development should focus more on improving each of these and their inter-relationships and not only on teaching methods and the uses of technology."