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Foreword by Dr. Danny O'Hare, Chairman, Expert Group on Future Skills Needs

This report is submitted by the Expert Group on Future Skills Needs to Mary Harney, T.D., Tánaiste, and Minister for Enterprise, Trade & Employment and to Dr. Michael Woods, T.D., Minister for Education and Science. It was prepared in response to recommendation in the Forfás Report "e-Commerce: The Policy Requirements" and presents the results of research into e-Business skills, and the education and training required to ensure an adequate supply of high quality skilled individuals in this area.

This report, which builds on the First and Second Reports of the Expert Group, is one of a series of single issue reports which the Group expects to publish over the next 18 months and which will complement an annual report by the Group. Each annual report will review progress on the implementation of earlier recommendations of the Group and will continue to monitor developments in the labour market and the implications of these for future skills needs. The next annual report of the Expert Group on Future Skills Needs will be published in Spring 2001.

It is recognised that e-Business will be one of the most significant drivers of enterprise development over the next three to five years. The Government recognises this and is making significant progress in meeting its objective of establishing Ireland as a leading global centre for e-Business. This is being achieved by putting in place the required telecommunications infrastructure and business environment, including a legal framework.

A number of critical challenges remain, however, and key among these is the need to develop e-Business skills. This report specifies the type of skills which will be vital to the success of e-Business related industry. One of the key features identified is that a mix of skills is required - in Information Technology, in Business and in the provision of content material, such as film, design and graphics.

The report proposes changes in the way e-Business skills are acquired in third level education and elsewhere and recommends the establishment of a partnership between the education, business and public sectors to facilitate programme changes in Business Schools, in Computing departments and in Art and Design. The involvement of business in the development of these education programmes is critical. There may also be potential for increasing the involvement of business in the delivery of programmes.

I would like to thank Mr Joe McCarthy of Arkaon, who chaired the sub-group, and the other members of that Group who contributed to the preparation of this report. I would encourage the speedy implementation of the recommendations to facilitate the education and business sectors in planning the future of e-Business in Ireland by ensuring an adequate supply of appropriate skills for that sector.

Dr D O'Hare

Chairman

Expert Group on Future Skill Needs

Executive Summary

1. Introduction

1.1 The Expert Group

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

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

The second report of the Expert Group took a broader focus than the first, looking at the labour market outlook, and at the balance between supply and demand for skilled construction craftspersons, chemical & biological sciences skills, researchers and information technology skills. As this report was published at the end of March 2000, it is too early to report on its implementation.

1.2 This Report

This report presents the results of research into e-Business skills, and the education and training required to ensure an adequate supply of good quality skilled people. The report follows on the recommendation of the Forfás policy document *Report on e-Commerce: The Policy Requirements*¹ that the Expert Group should “Examine the multi-disciplinary and e-commerce skills needs of major sectors”.

The main content of the research was:

- Secondary research, focusing particularly on research and policy documents from other countries relating to e-Business skills,
- A workshop attended by leading industry people,
- In-depth interviews with five companies with substantial e-Business activities,
- Postal surveys of Business Schools, Computing Departments and Design/Art/Multimedia Schools,
- A workshop attended by staff in relevant disciplines from all of the Institutes of Technology,
- Interviews with a number of key academics from the universities/NCAD,
- Interviews with IDA Ireland, Enterprise Ireland and FÁS, and with NCEA,
- Analysis of student and graduate statistics supplied by HEA, NCEA and colleges.

The report is based on and draws extensively from a study entitled “e-Business Skills Needs” commissioned by the Expert Group from Mclver Consulting.

1 Forfás, 1999

2. e-Business Skills

2.1 Demand

e-Business presents the country with important opportunities, and it is progressively becoming a prerequisite for staying in business in many industries. Skills shortages and deficiencies, however, potentially form the most difficult-to-overcome obstacle to Irish success in e-Business.

e-Business skills requirements are broad, encompassing management and creative skills as well as IT technical skills and IT literacy. While many companies are familiar with IT-related skills issues, there are also important issues to do with skills supply and quality in management and creative skills.

Three main types of skill are important to e-Business - business, creative and technical. e-Business predominantly needs people with a mix of types of skill, a proportion of them with a fairly even balance between two or all three types of skill.

Four main e-Business occupations are identified:

- i) Managers and Management Advisors
- ii) Designers (creatives, multimedia developers)
- iii) Technical (programmers, software engineers, systems specialists)
- iv) IT Literates (the many occupations where basic IT skills are required)

Key findings about skills demand are that:

- Business Studies programmes should have a significant Information Technology content,
- Business Studies programmes should have an e-Business orientation that permeates all subjects studied,
- There is a need for Business Schools to have a proportion of Information Systems programmes, with a fairly equal mix of business and information technology content,
- There is a requirement for the existing population of managers and management advisors to understand the business implications of e-Business,
- Every business with a web site will need a webmaster,
- e-Business has boosted demand for people with technical IT skills,
- There is a need to update the skills of technical people using dated technology,
- There is a major increase in demand for designers to work on web design, and for people with a strong mix of design and technical skills,
- Many of those already working in print design need to acquire web design skills,
- As available bandwidth increases, the requirement for people to produce live action and animated content will increase,
- Everyone entering employment should have IT skills,
- Third level graduates should ideally have an understanding of the business uses of information technology,
- Industry needs to make existing employees IT literate, perhaps at an overall rate of about 2% of employment per annum.

2.2 Supply of e-Business Skills

The disciplines that are most relevant to e-Business are:

- Business Studies
- Information Systems
- Computing
- Multimedia
- Fine Art
- Design

This report describes the supply of graduates in 1998, the most recent year for which it has been feasible to prepare a reasonably accurate statement of graduate numbers. The number of graduates in most of these disciplines is small compared to the number studying business. Numbers graduating in computing and information systems are significant, and are growing rapidly, but are still considerably lower than for Business Studies.

The report looks at the significant supply of qualified people from further education and FÁS and reviews continuing training. The main gap highlighted is in e-Business management programmes provided by third level institutions, which have developed strongly in the US, but have not developed significantly in Ireland. By comparison with other countries, there may also be scope for more for-credit part time technical education, aimed at IT professionals who wish to update or upgrade their skills.

2.3 Matching Demand with Supply

Combining labour market evidence with the analysis of demand and supply, the report identifies where gaps exist. The main gaps identified are summarised here.

	Intake and Conversion	Existing Workforce
Managers	<p>The extent to which e-Business has penetrated into the course content of many third level business programmes is fairly limited.</p> <p>The IT and design content of most mainstream Business Studies programmes is quite limited.</p> <p>Industry and graduates would benefit from a shift in mix in the programmes delivered by business schools, away from programmes with a low information technology subject matter content, towards programmes with a higher information technology content.</p> <p>In the US, there has been very rapid growth in demand (and supply) for programmes preparing people for management of technology companies, and for implementing e-Business in existing companies, which has not yet been reflected in Ireland.</p>	<p>The amount of e-Business education being undertaken is very low by comparison with the US. Lack of activity by most third level colleges appears to be the main constraint.</p> <p>The training available from private training companies is of variable quality, and tends towards being technically-focused, and lacking in business content.</p> <p>With Enterprise Ireland's e-Business development activities being directed primarily at manufacturing industry, there is potentially a gap in coverage of domestically traded service industries.</p> <p>There are significant gaps in the skills of providers of e-Business strategy and implementation services.</p>
IT Literates	<p>In spite of significant increases in the supply of people with software qualifications, there is still a shortage of labour.</p> <p>There is currently a particular issue with the shortage of supply of people with Internetworking skills, which are required for the many Internet data centres planning to locate in Ireland.</p> <p>Across most Computing programmes, the graphic design and communications content is very limited, in spite of the presence of a significant amount of technical graphics content.</p>	<p>To the extent that there is a gap in updating the skills of technical IT people, it is in the area of college-delivered continuing professional education.</p>
Designers	<p>While there is currently a shortage of web designers, the underlying supply of design and fine art graduates appears to be adequate.</p> <p>There is a more significant shortage of people with a strong mix of design and technical skills, and the analysis suggests that a significant number of additional multimedia graduates might be required to meet this need.</p> <p>There are deficiencies in the business knowledge of designers entering web design. This may reflect, in part, a deficiency in the business and communications content of some design programmes.</p>	<p>There is no shortage of technically-oriented courses. Interviews suggest that there is considerable variation in course quality between suppliers.</p>
Technical	<p>Many students still leave school without being able to use basic office software.</p> <p>While graduates from all disciplines will be the managers who need to understand e-Business in future, most graduates do not get any education or training in e-Business.</p>	<p>Greater home availability of PCs and lower cost Internet access might facilitate improvements in IT literacy among those already in the workforce.</p>

3. Recommendations

3.1 Third Level

3.1.1 Implementation Strategy

The recommendations that emerge from this analysis are very different to those, which have emerged from earlier Expert Group reports. Where earlier reports often focused on creating defined numbers of education and training places, this report focuses particularly on the content of the education and training covered in third level and elsewhere. Because this type of agenda is new, a new approach to implementation will be required.

The implementation strategy to be developed should have full regard for the freedom of academic institutions to develop their own academic programmes. However, the Expert Group believes that a national initiative would be of value, through adding to the impetus for change, and through bringing leading edge industry input to bear.

Recommendation 1

- **Forfás, the Department of Education and Science and the HEA, following consultation with the third level sector, should jointly develop an e-Business Skills Partnership mechanism to facilitate interaction between third level institutions and business/industry.**

Recommendation 2

- **The e-Business Skills Partnership should promote the development of third level e-Business education building on the agenda and proposals in the following areas, which are explored further in paragraphs 3.1.2 to 3.1.10:**
 - **Business School Programme Changes**
 - **Updating Business School Faculty Skills**
 - **Continuing e-Business Business Education**
 - **Computing Departments**
 - **Fine Art**
 - **Design**
 - **Disciplinary Areas that are becoming important**
 - **Supply of Teaching Staff**
 - **All Graduates**

3.1.2 Business School Programme Changes

Irish business schools should make a number of changes in their programmes to respond to the e-Business skills needs of the economy, and to improve their graduates' prospects with:

- an increased focus on information technology and e-Business related academic content across all business disciplines;
- an increase in the number of Information Technology subjects in most programmes;
- consideration of the possibility of an introductory design and communications subject into all business programmes.

For most colleges this should not involve an overall increase in undergraduate business school intake.

At primary degree level and higher, all colleges with a sufficient number of students to offer an additional specialisation should offer an Information Systems specialisation with an approximately 50% business, 50% information technology content.

Colleges with substantial postgraduate business activity should seek to expand MBS-style programmes in Information Systems and e-Commerce, and should consider the introduction of programmes in Management of Technology Enterprises².

Colleges with MBA programmes should increase the focus on information technology and e-Business, and should consider introducing specialist MBA programmes in Management of Technology Enterprises.

3.1.3 Updating Business School Faculty Skills

Given the speed at which e-Business is developing, it is important that course content should change on a regular basis and in some cases annually, based on recent and anticipated developments.

Business school faculties should undertake a significant volume of curriculum development across all business disciplines to address the changes in course content that arise from e-Business. Ideally, much of this work would be done collaboratively within and between colleges, and there should be improved contact and consultation on course content with international centres of business education and companies that are very active in e-Business

One aim in this would be to establish Ireland as an internationally recognised centre for e-Business education and research.

3.1.4 Continuing e-Business Business Education

Irish third level colleges are not active in continuing e-Business education to any great extent, and this is placing an obstacle in the way of updating the skills of managers and those moving into management.

While difficulties and constraints are being experienced by the colleges in this area, there is an urgent need to address the issue of continuing e-Business education, so that colleges can contribute to expanding and enhancing the knowledge and skills base of managers and other professionals in Ireland.

3.1.5 Computing Departments

The survey evidence suggests that most Computing departments are making reasonable efforts to keep their course content up to date in a climate of very rapid technological change, where a technology can move from being near-unknown to being highly commercially important in less than a year.

However, based mainly on industry input, the Expert Group has identified a number of areas that Computing departments should address. These are:

- **Internetworking** - Existing industry plans mean that there will be rapid growth in Internet data centre operations in Ireland. These operations will require Internetworking skills which are in short supply. It is essential and urgent that colleges should shift the focus of some Computing programmes to emphasise the operating system and networking skills required for Internetworking³. While the greater need will be at subdegree level, there will also be a requirement at degree level. Departments taking this course of action should evaluate the possibility of offering their students preparation and testing for industry qualifications in the area (e.g. Cisco Certified).

² It would be important for programmes in Management of Technology Enterprises to include one or more courses in project management.

³ The NCC are also of the view that the output of graduates with Networking/Internet Protocol (IP) Management skills requires to be increased.

- **Project Management** - Computing departments should consider increasing the project management content of their programmes.
- **Business Awareness** - Computing departments should evaluate the possibility of delivering a short business awareness subject to final year students, which would not necessarily be for credit. It would be desirable to obtain industry input into the content.
- **Design Content** - Computing departments with a significant web page design, animation and/or multimedia content to their programmes should consider offering an introductory design and communications subject.

3.1.6 Fine Art

Skills supply considerations should not lead to substantial changes in the course content and orientation of Fine Arts programmes. However, the employment prospects of Fine Arts graduates have not been as strong as for most other disciplines historically, but many graduates are now undertaking courses in web design after graduation. All Fine Art students should have the option of access to a web design subject before graduation which would not necessarily be for credit.

3.1.7 Design

Design schools should consider making a number of changes in their programmes. All design students in the disciplines most closely related to web design (industrial design and visual communications) should undertake at least one web design project. These students should ideally take a subject on the marketing and communications aspects of web design, and the interaction between web design choices and business process design.

3.1.8 Disciplinary Areas that are Becoming Important

While the main focus of this report is on qualifications in the broad business, IT and art/design areas, some other areas are also of significance for e-Business. These include logistics, information science, journalism and audiovisual production. Colleges should have regard to the importance of these in their planning.

3.1.9 Supply of Teaching Staff

Interview evidence suggests that the supply of new and junior academic staff in business studies and computing may be constraining course innovation in some areas.

A key part of promoting the agenda for third level e-Business education will be to involve business to a greater extent in the development of programmes, particularly in the university sector. There may also be potential for increasing involvement in the delivery of programmes.

In developing the implementation strategy outlined in section 3.1.1, further options will need to be considered in regard to the supply of teaching staff.

3.1.10 All Graduates

Colleges should consider making available a short subject in e-Business to students in all disciplines. The development and delivery of such a subject or subjects might be the subject of collaboration between colleges, which could involve web-based delivery.

3.2 Further Education

The Further Education sector is a significant source of skills relevant to e-Business, particularly through providing people with computing, web design and animation/multimedia skills. The NCVA is introducing a Level 2 Certificate in e-Business, which will prepare people for e-Business support roles.

Recommendation 3

- **Further Education colleges should implement the new NCVA e-Business course, and should promote it in line with the business importance of e-Business.**

3.3 School Leavers

The Expert Group believes that no student should leave school without skills in information technology sufficient to use common office software including word processors, spreadsheets, browsers and e-mail clients at a basic level.

Recommendation 4

- **The recommendation of the National Competitiveness Council⁴ that “a second level ICT skills common standard should be made compulsory for all transition year/fifth year students” should be implemented and the Department of Education and Science should develop proposals to ensure that all early school leavers have basic IT skills.**

3.4 Labour Force

Internationally, government policies to promote home PC use and Internet access are increasingly used to encourage the development of IT literacy among members of the labour force, as well as to encourage e-Commerce activity. The Expert Group concurs with the Information Society Commission's observation that there is great potential for the schools to allow outside groups to use their facilities for training in IT⁵.

Recommendation 5

- **The Government should further encourage competition to reduce the telecommunications cost constraints on home and educational Internet access. The proposals of the Information Society Commission to develop community access to IT should be implemented.**

3.5 Enterprise Ireland

Given the scale of the task to be achieved in educating managers about e-Business, it appears that an increase in activity is required. Enterprise Ireland may have a role to play in working with third level colleges on delivering short programmes in e-Business, and on programmes in management of technology enterprises.

Recommendation 6

- **Enterprise Ireland should continue and expand its e-Business programme. It should consider working with third level colleges on developing programmes relevant to e-Business.**

⁴ National Competitiveness Council, Statement on Telecommunications, e-Business and the Information Society, July 2000.

⁵ IT Access for All – Report of the Information Society Commission, March 2000.

3.6 FÁS

FÁS plays a substantial role in initial IT training, and in providing IT training to industry. The Agency has responsibility for promoting training in a range of service industries.

There is a significant requirement for managers and staff to acquire skills in e-Business strategy and in webmastering.

Recommendation 7

- **FÁS should take a high profile in promoting e-Business awareness to service industries, and should support businesses from these industries in gaining access to training in e-Business strategy and webmastering.**
- **FÁS should seek to develop its NetCollege as a key technical training resource for all industry sectors.**

3.7 Skillnets

The recently-created Skillnets programme supports groups of enterprises in establishing training networks.

Recommendation 8

- **Skillnets should encourage the formation of e-Business training networks.**

3.8 Professional Organisations

One of the consistent themes emerging from interviews and an industry workshop had to do with problems on the quality of professional services, in e-Business strategy and implementation, available in Ireland. This is not surprising, given the large numbers of professionals entering the area, and given the high rate of change in the body of knowledge required. It is also unsurprising in the light of international research. However, given the central role that professional service providers play in designing and implementing e-Business strategies for most companies, it is a significant problem.

Significant educational work is done by professional organisations (in areas such as accountancy, consultancy and marketing), but the Expert Group believes it is important that they should do more.

Recommendation 9

- Professional organisations whose members provide professional services in e-Business should move, primarily through continuing professional education, to upgrade and make more consistent, the quality of e-Business strategy and implementation services provided by their members.

3.9 Future Skills Supply Agenda

The research for this report has highlighted a number of areas of skills supply that should be addressed by the Expert Group in its continuing work. These include:

- **e-Business skills** - The supply and demand for these skills will be incorporated into the IT review by the Expert Group this year.
- **IT technical skills** - The Group is undertaking a further review of IT skills supply and demand this year.
- **Multimedia** - supply and demand for multimedia skills is being reviewed as part of the review of IT skills supply.
- **Internetworking** - supply and demand for Internetworking skills is being reviewed as part of the review of IT skills supply.
- **Other Areas** - The rapid pace of developments in e-Business is likely to create new skills requirements in areas such as audiovisual production. The Expert Group will keep these under review.

1. Introduction

1.1 The Expert Group

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

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

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

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

Membership of the group is broadly based and includes business people, educationalists, policy makers, public servants and members of the industrial promotion agencies. While the individual membership of the Group has changed since its inception, the same broad spread of views and expertise is represented in the group. The current membership of the Expert Group is listed in Appendix I.

1.2 First and Second Reports of the Expert Group

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

The second report of the Expert Group took a broader focus than the first, looking at the labour market outlook, and at the balance between supply and demand for skilled construction craftspersons, chemical & biological sciences skills, researchers and information technology skills. As this report was published at the end of March 2000, it is too early to report on its implementation.

1.3 Background to this Report

e-Business represents a key opportunity for Irish business, and for the Irish economy as a whole. Many of the potential barriers to success, including the legal framework and the telecommunications infrastructure, can be addressed and resolved fairly directly through action by the Government and its agencies. Much of this work has already been done, and the remaining work is well on track.

With infrastructural issues already addressed, the supply and quality of skills will be the major factors determining Irish success in e-Business. As the mix of skills required is complex, and as the extent of Government control over skills creation and development is limited, there is a need for research into skills requirements, and into how they can be addressed. The research is needed to inform Government and agency policy, and also to inform decisions by education and training institutions, by industry and by individuals.

This report presents the results of research into e-Business skills, and the education and training required to ensure an adequate supply of good quality skilled people. The report follows on the recommendation of the Forfás policy document *Report on e-Commerce: The Policy Requirements*⁶ that the Expert Group should “Examine the multi-disciplinary and e-commerce skills needs of major sectors”.

The report is based on and draws extensively from a study entitled “e-Business Skills Needs” commissioned by the Expert Group from Mclver Consulting.

1.4 Limit to Scope of this Report

The Expert Group has reported on Information Technology skills in its earlier reports, and a further report on Information Technology skills is planned for later in 2000. This report is not intended to duplicate or prejudge that other work. For this reason, the quantitative content relating to IT skills in this report is intentionally very limited.

1.5 Definition of Terms

There are variations in the terminology used by third level institutions to describe blocks of educational content. In this report, when referring to third level, the term “programme” is used to describe a full course of study leading to a qualification. The term “subject” is used to describe a block of study within this. Typically, there are several subjects in each year of a third level programme.

6 Forfás, 1999

2. The Significance of e-Business Skills

2.1 Introduction

e-Business is important to Ireland because it presents the country with significant opportunities, and because it is progressively becoming a prerequisite for staying in business in many industries. Skills shortages and deficiencies, however, potentially form the most difficult-to-overcome obstacle to Irish success in e-Business.

The two key types of opportunity are market opportunities and productivity opportunities.

2.2 Market Opportunities

e-Business has created many market opportunities for Irish businesses, and for overseas owned businesses that may wish to locate in Ireland. While on-line dot.com businesses have been the subject of most publicity, and have attracted the high profile stockmarket valuations, the opportunities are very much more diverse.

The following are the key areas:

- **Existing Industries** – e-Business is transforming most industries, creating opportunities for businesses to change the rules of the game and to restructure industries to their own advantage before competitors can react.
- **e-Business Enabling Products** – Ireland has become a major global centre for developing, localising and distributing software, and for manufacturing Information Technology hardware⁷. The trend is for most software and hardware to have some e-Business enabling function. Much of the Irish economy's growth in recent years can be traced to inward investment in hardware and software, and to the emergence of a strong indigenous software sector. Based on Ireland's record to date, it appears likely that most of the country's e-Business technology successes will be in enabling software.

The global market for IT and Telecomms products and services is projected to grow by 9.2% per annum from 1999 to 2002⁸, with e-Business being a major driver of growth.

- **e-Business Support Services** – Most companies find that they need to buy support services in order to engage in e-Business. The markets for these services are growing rapidly. While these services are often sourced locally, it is not unusual to source services from another country. Key service areas include:

Software services

Web development services

Web hosting services & Application Service Providers (ASPs)⁹

Logistics services

Strategy services

It is not unusual for a service provider to be active in more than one of these areas.

⁷ In 1998, Ireland was the world's leading software exporter, and was the fifth biggest exporter of computers. Information Technology Outlook, 2000, OECD.

⁸ European Information Technology Observatory, 2000

⁹ An ASP provides, hosts and maintains software applications, which are accessed over the Internet by client organisations.

- **dot.coms** (i.e. companies trading entirely on the Internet) – While these are highly visible, the number of opportunities for major successes is limited. However, there are increasing opportunities for SMEs in areas such as specialised IT services, travel services and specialty retailing. Currently, the most visible activity is in establishing Business-to-Business (B2B) exchanges.
- **Content Industries** – As higher bandwidth becomes available, and as digital TV develops, the volume of content required to service businesses and consumers is increasing. There will be a substantial need for skills in areas such as audiovisual production, journalism and content management, as well as the visual communication skills that are now required for web design.

2.3 Productivity Opportunities

The Irish economy is facing a major productivity challenge. If the economy is to continue to grow strongly in the face of labour shortages, and if real Irish incomes are to increase without undermining business competitiveness, it will be necessary to increase the rate of labour productivity. The need for accelerated productivity improvement is particularly strong in Irish-owned manufacturing, and in domestically traded services¹⁰. Productivity improvement in overseas-owned industry is already strong, reflecting high rates of productivity growth in high-tech industries internationally.

e-Business has the potential to provide a part of the solution. e-Business is not just about trading on-line. It is also about leveraging technology to reduce costs and waste¹¹, to improve customer value, and restructuring markets to make them more efficient. This means improved productivity.

Evidence has emerged from the US that adoption of information technologies, including e-Business technologies, may allow an economy to grow faster through increasing the rate of growth in labour productivity. According to the OECD "... trend labour productivity growth has probably doubled from the rate seen in the 20 years prior to the mid-1990s, helped by a surge in the capital equipment and software available for each worker. ... Advances in information technology have resulted in a sharp decline in the price of investment goods, boosting growth of the capital stock and thus of labour productivity in the high-technology parts of the economy. These gains appear to be spreading into other sectors, and ... may offer the possibility of maintaining, or even further boosting, the higher overall growth of labour productivity and hence of real incomes for some time to come."¹²

Thus, there is an opportunity for e-Business to have a significant positive macroeconomic impact. Taking advantage of this opportunity has two major practical implications for e-Business skills policy:

- It should be directed towards the whole economy – not just towards the attractive market opportunities described earlier.
- It should go beyond enabling companies to trade on-line, through giving them access to skills in leveraging technology to reduce costs and increase customer value.

2.4 Permission to Play

Many Irish companies are finding that they need to develop an e-Business strategy just to stay in business. E-mail is becoming ubiquitous. A web brochure is becoming as important as a print brochure.

Many companies form a part of the supply chain for larger customers. These customers are using e-Business tools to make supply chain management and procurement more efficient and effective, forcing suppliers to participate. If B2B exchanges succeed as well as many expect, a significant part of the market for many companies will be accessible only through these exchanges.

¹⁰ Enterprise 2010, Forfás 2000

¹¹ For example, research by Goldman Sachs suggests that B2B electronic procurement may save 29% to 39% of the cost of electronic components, 10% of the cost of chemicals and 3% to 5% of the cost of food ingredients. E-Commerce/Internet, 1999, Goldman Sachs.

¹² Economic Survey of the United States, May 2000, OECD Policy Brief

As e-Business become the international norm, companies that do not take advantage of the opportunities it presents to improve their performance will be at a disadvantage.

2.5 Strategic Position of Existing Industries

Business-to-Business e-Business strategies (the strategies most relevant to most companies) usually go through four main phases. These are:

1. An Internet presence, with a brochure-style site
2. An Internet presence that can interact with, and add value for, customers
3. Trading online
4. Integrating e-Business throughout the organisation

For most companies, the benefits derived from the first stage are small. The benefits from the second stage are greater, but still quite limited. An effective approach to the third stage - trading online - starts to add real value to the company. It is only when a company integrates its e-Business systems with processes and systems throughout the company that the full operational value of e-Business can be realised.

Many Irish companies have not yet reached the first of these phases, and few have got beyond the first phase. Moving Irish industry to the fourth phase will require a substantial supply of skilled people.

3. Scope of e-Business Skills

3.1 Introduction

This chapter argues that e-Business skills requirements are broad, encompassing management and creative skills as well as IT technical skills and IT literacy. While IT-related skills issues are very familiar, there are also important issues to do with skills supply and quality in management and creative skills.

3.2 Industry Scope of e-Business

There are two types of e-Business industry:

1. User Industries - industries that use e-Business to create, transform or improve, and
2. Supporting Industries - industries that provide the services and products that others need for e-Business.

This report addresses skills needs in both types of industry.

e-Business User Industries

While the highest profile commercial use of the Internet has been by dot.coms – companies which operate solely or primarily through on-line channels – e-Business is now increasingly the domain of companies from existing industries.

Major types of dot.com include Business to Consumer (B2C), where the business provides services or products to consumers, and Business to Business (B2B), where the business provides services or products to other businesses.

Important types of online business include:

- e-Commerce retailers
- Content/infotainment development, management and distribution
- Online financial services
- Portals/communities
- B2B electronic marketplaces

e-Business presents existing industries with a strong imperative to change:

- One key impact for existing industries is that e-Business provides ways to eliminate costs while adding value. Over the last ten to fifteen years, much of the focus of management thinking has been on changing manufacturing and business processes for higher performance in terms of greater efficiency, higher quality and improved customer satisfaction. Since around 1990, there has been an increasingly strong emphasis throughout the economies of the developed world on using information and communications technologies to enable these process changes within companies, leading to substantial performance improvements. e-Business is taking this trend to the next logical step – transforming the business processes that take place between companies as well as within those companies.
- A second key impact for all industries is that it provides many opportunities for service innovation. As the service content of most product industries is now significant and increasing, these opportunities are important for all industries.

Supporting Industries

Existing industries cannot do all of e-Business for themselves – they need supporting industries. Thus, there is very considerable growth underway internationally in the industries providing support services. For Ireland, the single most significant area where this has impacted has been the software sector. It is one of Ireland's key industry sectors – a sector in which there has been considerable inward investment, and also very considerable commercial success and growth among indigenous companies. As the sector is oriented towards software for business use, very many companies have developed products and services to support e-Business. Thus, Ireland already has one substantial e-Business sector.

Internationally, a range of other industries are also growing to support e-Business. These include:

- **Internet data centres** – Many companies contract out the responsibility for hosting web sites, and often the systems behind them too.
- **Customer care centres** – Online businesses require customer care services, which typically offer support by phone, e-mail and/or live Internet-based chat.
- **Web site development** – There is very rapid growth in the web site development industry in Ireland and globally¹³.
- **Logistics** – There is a significant and growing international industry that manages the logistics of delivering products ordered online.
- **e-Business professional services** – Entering and conducting e-Business usually requires some use of professional services in areas such as strategy, marketing, accountancy, tax and law. Industries already providing services in these areas have grown and developed to provide them.
- **“Full service providers”** – These are companies that offer e-Business strategy, design, building, hosting and operations services.

3.3 Scope of e-Business Skills Highlighted by Other Countries

A review of policy documents on e-Business skills from other countries, including the US, the UK, Singapore and Australia, was undertaken on behalf of the Expert Group. The Group also reviewed documents from the OECD, the European Information Technology Observatory and the European Commission.

There are two main strands of thinking in these documents.

One strand identifies a shortage of IT professional¹⁴ skills as being a critical constraint on the adoption and exploitation of e-Business, and identifies a need for an increase in the supply of IT professionals.

The other strand, which is also generally a feature of Information Society policies, identifies a need for increased penetration of IT literacy among the working population and among the general population.

¹³ Web site development is often considered to form a part of the software industry in the Irish context.

¹⁴ In this context, “IT Professional” has a different meaning to that used in previous Expert Group reports. It encompasses people who were referred to as “Software Professionals” and “Software Associate Professionals”, but would exclude many “Hardware Professionals” and “Hardware Associate Professionals”.

3.4 Scope of e-Business Skills Relevant to Ireland

While there are now a number of programmes in Ireland at various levels with “e-Business” or “e-Commerce” in their titles, these represent a small minority of the programmes that prepare people to work in e-Business. Programmes with these titles are not necessarily more relevant to working in e-Business than those with more traditional titles. What matters is the content – not the title.

Other countries have highlighted the importance of IT skills for e-Business. The Expert Group’s research has confirmed the importance to e-Business of IT professional skills and general IT skills, but has identified two other broad types of skill as being important to the development of e-Business. These are:

- Management skills, and
- Creative skills.

3.5 Key Skill Requirements

The research undertaken has identified significant deficiencies in management skills relating to e-Business, ranging from the competence of senior managers and board members to make decisions about e-Business, to the competence of web consultants to advise on business aspects of e-Business.

The research has also identified rapid growth in demand for e-Business content developers, leading to shortages of people with relevant design and/or technical skills.

e-Business requires inputs from people with all of these types of skill. In many cases, it is important that people have a mix of skills from across two or even all three of these areas. For example, a web site designer should have a strong understanding of the business issues around company web site design, and will need some technical skills.

4. Demand for People with Skills in e-Business

4.1 Introduction

This chapter introduces an “e-Business Skills Triangle” framework, reflecting the importance to e-Business of three main types of skill – business, creative and technical. It argues that e-Business predominantly needs people with a mix of types of skill, a proportion of them with a fairly even balance between two or all three types of skill. It goes on to look in more detail at the skills and work content associated with the main types of skill.

Based on the analysis, four main e-Business occupations are identified, and the demand for new people and reskilling of existing members of the workforce is explored for each one.

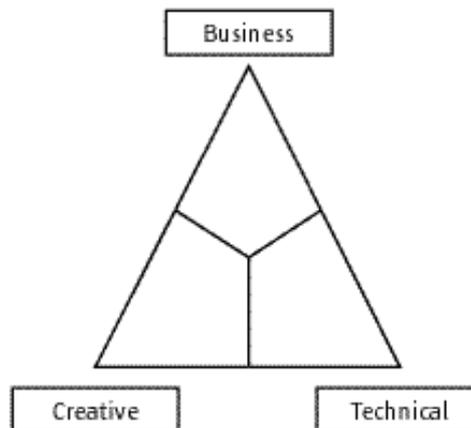
Key findings are that:

- Business Studies programmes should have a significant Information Technology content.
- Business Studies programmes should have an e-Business orientation that permeates all subjects studied.
- There is a need for Business Schools to have a proportion of Information Systems programmes, with a fairly equal mix of business and information technology content.
- There is a requirement for the existing population of managers and management advisors to understand the business implications of e-Business.
- Every business with a web site will need a webmaster.
- e-Business has boosted demand for people with technical IT skills.
- There is a need to update the skills of technical people using dated technology.
- There is a major increase in demand for designers to work on web design, and for people with a strong mix of design and technical skills.
- Many of those already working in print design need to acquire web design skills,
- As available bandwidth increases, the requirement for people to produce live action and animated content will increase.
- Everyone entering employment should have IT skills.
- Third level graduates should ideally have an understanding of the business uses of information technology.
- Industry needs to make existing employees IT literate, perhaps at an overall rate of about 2% of employment per annum.

4.2 e-Business Skills Triangle

The main skills required by managers and professionals working in e-Business are in business, in creativity and in technology. Different e-Business roles require different mixes of skills.

e-Business Skills Triangle



In addition, e-Business requires a very wide diffusion of basic IT familiarity skills throughout the working population.

4.3 Mixed Skills

One of the key features of e-Business, from a skills perspective, is that it predominantly needs people with a mix of skills of different types. For the foreseeable future, there will continue to be a strong requirement for people with fairly pure technology skills to fuel the software industry. However, for roles closer to the strategy and implementation of e-Business, and indeed for many software industry roles, a mix of skills is required.

The paragraphs below focus particularly on areas where a fairly balanced mix of skills is required. However, even where a person's main focus is in one area – business, technical or creative – they need a grounding in other areas if they are to be e-Business effective.

- Managers and other business professionals need an understanding of IT and some appreciation for design.
- Technical IT people need an understanding of the business implications of their work, and many also need an appreciation of creative and communications issues.
- Designers involved in e-Business need an appreciation for business and technical issues.

4.3.1 Mixed Business and Technical Skills

As e-Business is built on the interrelationship between business and technology, developing and implementing e-Business strategies requires a mix of business and technical skills. It is not possible to strategise meaningfully without a grasp of the technology and its implications. It is not possible to develop or install e-Business solutions well without a grasp of their business implications. For this reason, there are now very many roles for which a fairly balanced mix of business and software skills is required.

Because of the importance of e-Business, the proportion of business roles in which a knowledge of technology is required is increasing quickly.

4.3.2 Mixed Business and Creative Skills

Web sites form an important part of any enterprise's approach to e-Business. With less face-to-face or voice interaction than in traditional business – often with little or no such interaction – the look and functioning of the site carries a heavy selling, marketing, customer communications and customer support function. To the extent that it interacts with the design of business processes in the enterprise, and in customer enterprises, it may also have significant implications for the efficiency and effectiveness of operations.

Thus, web site design requires both business skills and design skills. It is strongly preferable for designers to have a good appreciation of the business function of their design, even where they have a knowledgeable business input from another source. In the many cases where they are doing web design without such an input (e.g. small web design service companies), it is a necessity for e-Business effectiveness.

4.3.3 Mixed Technical and Creative Skills

Many aspects of web site development involve a strong interaction between technical and creative design. While it is possible to develop a basic web site without strong technical skills, using a web site design package⁴⁵, adding the capability to interact with customers, and to trade on-line still requires significant technical skills. Multimedia content is becoming much more common, and, even facilitated by tools such as Flash, this still requires both creative and programming skills. Even a basic web site requires some technical skills to minimise download times, and to ensure that it will appear as anticipated in all likely browser formats.

Web site development requires a mix of technical and creative skills to achieve this. In a web development company, a project team typically includes both creative and technical specialists. Generally, the creative specialists have a good knowledge of the technical basics, while the technical specialists have some appreciation for good design. People who have a mix of strong technical and design skills are also required, particularly for multimedia work, and in small web design companies where there is limited scope to assemble a balanced team.

4.3.4 Mixed Business, Creative and Technical Skills

Some roles require strengths in business, creative and technical skills. There are two roles in which this is particularly important: Webmaster and Web Consultant.

Every business with a web presence needs a Webmaster to take the lead role in managing the web site. This role requires strong business skills, along with enough technical and design skills to manage web design work, and to update (or manage the updating of) the presence. In an SME this role is likely to be combined with another management role.

A company providing web consultancy services has to be strong in all three skills areas, if it is to provide a good service. This is a challenge for small providers of web consultancy services, where it may be necessary for one person to be expert in all three.

4.4 Content of e-Business Skill Types

The content of the major types of skill need is summarised below under the following headings:

- e-Business Technical and Design Skills
- e-Business Business Skills – Strategy and Implementation
- e-Business Familiarity Skills

¹⁵ Interview evidence is that Macromedia Dreamweaver is the package of choice at the time of the research.

4.4.1 e-Business Technical and Design Skills

- **Development of e-Business tools and applications** – This is primarily software development work, which requires mainstream software skills. It is primarily undertaken by software product companies.
- **Technical development of e-Business sites / web sites / portals** – This is primarily to do with developing and integrating systems through tailoring software packages and writing some software. Some of the work requires mainstream software skills, while other work requires more specialist Internet-oriented skills.
- **Design development of e-Business sites / web sites / portals** – This is primarily to do with graphic design, animation and sound. It is mainly undertaken through standard software packages, such as Dreamweaver, although there is often an element of software programming.
- **Mixed technical and design development** – There is a major requirement for people with a mix of technical and design skills. The key technical skill area for these people is currently HTML, but other skill areas (including, inter alia, Javascript, Java and Flash) are also important.
- **Internetworking** – Establishing the technical side of a major e-Business operation requires substantial skills to do with networking. Areas within this include operating system skills – usually UNIX, LINUX or Windows 2000 – and networking skills in areas such as routers.
- **e-Business system operations** – Managing e-Business IT systems is an important discipline in its own right. IT departments have traditionally changed fairly slowly and deliberately, and have often been tolerant of system problems. e-Business systems, on the other hand, tend to change frequently. The standard of reliability required is also very high – “five nines” (99.999%) system availability is often quoted as a target.

4.4.2 e-Business Strategy Skills

Exploiting e-Business effectively requires a range of strategy skills that most managers in existing companies do not have. Many providers of support services who are strong from a technological and design perspective are also weak in this area. Many would-be e-Business entrepreneurs fail to attract support because they too are weak on strategy.

The following are some of the key skill areas within the overall strategy skill set:

- Business strategy
- Marketing strategy
- Logistics strategy
- Operations strategy and business process design
- Human resource strategy

4.4.3 e-Business Implementation Skills

Apart from the technical operation of e-Business systems, there is generally a need for ongoing work to keep the business going. Some of the key skill areas likely to be important are:

- Logistics – managing the flow of sourcing, processing and delivery.
- Marketing activities - including inter alia:
 - CRM (customer relationship management)
 - Control of business identity
- Content development and editorial control – Even non-media sites frequently carry a significant amount of changing content.
- Change management and training – preparing people in existing businesses for changes in business processes and working practices associated with e-Business
- Legal – privacy statements, compliance with law, avoidance of liability and other issues.

4.4.4 e-Business Familiarity Skills

Information technology is becoming so central to business practice that soon virtually all those in the workforce will require IT skills, at least to the extent of:

- basic skills in using common office software
- basic skills in web navigation and e-mail
- an appreciation of the uses of IT appropriate to their occupation.

4.5 e-Business Occupations

Taking a high level perspective, there are four types of e-Business occupation. These are:

- 1) Managers and Management Advisors
- 2) Designers (creatives, multimedia developers)
- 3) Technical (programmers, software engineers, systems specialists)
- 4) IT Literates (the many occupations where basic IT skills are required)

4.6 Demand Volume

For each e-Business occupation, there are two main types of demand:

- 1) Demand for new entrants into that occupation with appropriate skills
- 2) Demand for updating or upgrading the skills of people already in the occupation to meet the requirements of e-Business.

4.6.1 Managers and Management Advisors – New Entrants

The parts of the initial education system most directly focused on preparing people for eventual manager and management advisor roles are Business Studies and Information Systems programmes, both of which are usually within the Business Studies (or Commerce) faculty (or school) of a college. In 1998, there were 4,355 degree graduates in business studies, and 596 in information systems. At subdegree level the numbers were 3,765 and 188 respectively¹⁶.

¹⁶ See table of "Full Time Graduate Numbers and Supply", Chapter 5.

It is important that these programmes should have an adequate e-Business content. There are two main dimensions to this for general Business Studies programmes:

1. Adequate e-Business oriented information technology content.
2. General orientation towards e-Business, so that, for example, Marketing subjects address online and direct marketing, and the use of customer relationship management techniques; Human Resource Management subjects address managing teleworkers, and managing people in a project-based work environment; Strategy subjects address strategy in technology markets, and as a customer of technology markets. A corollary is that some traditional content must be removed from programmes.

Some programmes in this area should have a particular e-Business focus, directed towards people who will specialise in e-Business. At present, it is appropriate that Information Systems programmes should have a substantial e-Business content. It is also appropriate that a proportion of Business Studies programmes should have a substantial e-Business content.

Approximately 7,500 people per annum enter manager occupations, usually from other occupations.¹⁷ To the extent that they go through a significant education or training process (e.g. MBA) it is desirable that this should include a significant IT and e-Business content.

There is a substantial need for education and training of people moving into specialist e-Business manager and management advice roles. This need extends particularly to providers of e-Business support services and e-Business enabling software products, and to managers of dot.com companies. The requirement is difficult to quantify, but order of magnitude calculations suggest it might be 450 per annum.¹⁸

4.6.2 Managers and Management Advisors - Updating

There is a requirement for virtually the whole existing population of managers and management advisors to understand the business implications of e-Business. There are approximately 124,000 in this population.¹⁹

Every business with a web site will need a person to function as webmaster. Except for relatively large companies where it is possible to devote the whole of one person's time to the role, this typically involves training a manager (often a promising junior manager) to act as webmaster. The number of webmasters required is increasing at about 3,200 per year.²⁰

4.6.3 Technical - New Entrants

There is a very substantial requirement for additional people with software and other computing skills each year. The Expert Group has reported on this in both its First and Second reports (aggregated with hardware IT skills), and expects to address it again in another report at a future date. This report addresses the requirement qualitatively.

¹⁷ An increase of 40,000 Higher managers and Proprietors in service industries is forecast over period 1997 to 2005, for an average increase in numbers of 5,000 per annum (based on FAS/ESRI Manpower Forecasting Study No. 8, April 2000). We estimate that 2,500 replacements are required per annum in addition to this 5,000 (assumes annual attrition of about 2% of existing population).

¹⁸ Based on an industry with 30,000 employees (the software sector will account for most of this), growing at 15% per annum, with 10% of the increase in numbers requiring education and/or training.

¹⁹ Higher managers - 69,400; Proprietors in service industries - 40,400 (1997 data; FAS/ESRI Manpower Forecasting Study No. 8, April 2000); 3,100 Business Consultants; 21,100 Accountants (Census of Population, 1996).

²⁰ Currently, there are about 1.44 dot.ie domains registered for every entry in the most extensive Irish website directory (<http://swift.kerna.com/>), in which almost all entries are from businesses. Registrations increased by 4,595 between March 1999 and March 2000 (http://www.domainregistry.ie/statistics/domain_count.html), suggesting that the number of new business web sites requiring web masters was approximately 4,595/1.44.

Until the emergence of e-Business, the large requirement for people with software and computing skills was driven by two factors:

- Software sector employment increased rapidly, by an average of 3,300 per annum between 1995 and 1998.²¹
- There has been a requirement for more people in IT “user organisations”, although the tendency has been to increase outsourcing, rather than growing IT employment substantially.

e-Business has boosted demand for people with software and other computing skills. This has happened in four main ways:

1. e-Business has boosted overall demand for software products and services, increasing the size of the export and home markets for Ireland’s software product and service companies (both Irish and overseas owned)
2. e-Business has turned the web design services industry from being a small part of the software sector into a substantial and fast growing area.
3. e-Business has created entrepreneurial activity. Interview evidence suggests that there are in excess of 1,000 employed in web start-ups, many of them secretive and difficult to trace.
4. e-Business has created opportunities for inward investment (perhaps 7,500 people over the next 3 years) in areas that are fairly software intensive, which are likely to include:
 - Web hosting facilities
 - Customer care centres, offering support by phone, e-mail and live chat
 - e-Business software companies
 - “Full service providers” – companies that offer e-Business strategy, design, building, hosting and operations services
 - e-Commerce retailers
 - Content / infotainment development and management
 - Online financial services
 - Portals / communities
 - B2B electronic marketplaces

4.6.4 Technical – Updating

Year 2000 (Y2K) has brought to the fore a problem with updating of skills – that people skilled in old technologies eventually find that those technologies are out of date, and no longer make them employable. Many of those who worked on COBOL Y2K fixes have found that their existing technical skills are no longer useful, and that they have to retrain. Software development has changed so much since they were originally trained, that it is often difficult for them to obtain high level work, even after retraining.

The high rate of change in software development skills means that people still working on maintaining, or further developing, software and systems that represented current technology a very few years ago are falling behind in skill terms, and risk finding themselves in a similar position to that of COBOL programmers. However, there is no immediate pressure to upskill, as the companies concerned still need people with the skills that are going out of date. There is a significant training gap here.

21 National Software Directorate surveys

4.6.5 Designers – New Entrants

The web development services sector – the main employer of designers – is growing strongly. The National Software Directorate reported that there were 630 employed in Internet-related products and services in 1998. There are no statistics available on the current numbers employed in web design businesses, but a review of published lists in May 2000 yielded 194 names of companies apparently specialising in web design (some with related services)²², employing a roughly-estimated 3,800 people. It is certain that the review missed many micro businesses, and that the total numbers employed are increasing so fast that this estimate can be no more than a snapshot.

This suggests that employment in the area is growing by perhaps 1,600 per annum. About 20% of these should be primarily designers, and another 20% will require a strong understanding of both design and software. Another 35% will be primarily technical.²³ This suggests a demand for 320 people with strong design skills, and another 320 with a strong mix of design and technical skills.

While there is some uncertainty about these demand numbers, it is very likely that demand will continue to grow strongly. Key factors driving this are that:

- The number of businesses with web sites is increasing quickly.
- The functional complexity of web sites is increasing, as companies become more experienced with e-Business.
- Web sites require major updates periodically in order to avoid looking seriously dated.
- The introduction of WAP is increasing the number of formats for which design is required. The number of formats may increase again.
- Increasing bandwidth availability is likely to increase the design complexity of sites, with increased use of animation, video and sound.

4.6.6 Designers – Updating

Many of the designers already in the workforce need to acquire web design skills. This includes advertising creatives and print designers who will need to be able to design for the web, and who are increasingly likely to obtain cross-media²⁴ work. It also includes artists and designers who may decide on a change of career. In 1996, there were 5,666 Artists, Commercial & Industrial Artists, Graphic & Clothing Designers in Ireland.²⁵

As available bandwidth increases, the Internet will increasingly carry live action and animated content. Those working in production and postproduction will need their skills updated. In 1996, there were 1,996 Photographers, Camera, Sound and Video Equipment Operators in Ireland.²⁶

²² Systems integration and consultancy houses were excluded.

²³ These estimates are approximate, but are informed by interviews, and by a review of responses to the survey of the software sector undertaken for the Manpower, Training and Education Study of the Irish Software Sector, 1998, FAS

²⁴ Projects that require content to be presented in both print and electronic formats.

²⁵ Census of Population, 1996, CSO

²⁶ Census of Population, 1996, CSO

4.6.7 IT Literates - New Entrants

IT literacy is now so important to working life that everyone likely to enter employment should have IT skills. The main flows of people into employment are through the education system. The Expert Group believes that everyone leaving school should have the capability to use commonly-used office software. In 2000, 62,235 sat the Leaving Certificate, while 62,746 sat the Junior Certificate.²⁷

Everyone leaving third level education should also have IT skills appropriate to their likely future role in the economy. As many degree graduates and diplomates will enter managerial or other business professional roles, it would be desirable that they should have some understanding of the business uses of IT, as well as the capability to use commonly-used office software. In 1998, 14,549 primary degrees and 6,011 National and DIT Diplomas were awarded.

The other major sources of entrants to the workforce from within Ireland are further education, the unemployed and mature entrants to the labour market. In the main, further education programmes already have a significant IT content. Programmes aimed at the unemployed and mature entrants generally already have a significant IT content.

4.6.8 IT Literates - Making People in the Workforce IT Literate

We estimate that approximately 45% of the business workforce currently uses computers at work.²⁸ The survey evidence on which the 45% figure is based suggests that it increased by a little over 1% between 1998 and 1999. Interview evidence suggests that it is now increasing faster than this, with increasing investment in computer technologies by companies driven by the end to worries about Y2K, increasing interest in e-Business, and the increased need to improve productivity caused by labour shortages. This suggests that industry is now making perhaps 2% of its workforce, or 24,250 people, IT literate each year.²⁹

²⁷ Source: Department of Education and Science

²⁸ Based on interpreting results of Information Society Commission Business Research, 1999. Interpretation assumes that in businesses using computers where "up to a quarter" use computers, the average is 10%; where "up to a half", the average is 35%, where "up to three quarters", the average is 60%; where "more than three quarters", the average is 85%. Under this interpretation, average computer usage is close to 45% for all size categories of business.

²⁹ Total employment, excluding Public Administration, Defence, Health, Education, Agriculture, Forestry, Fishing, in December 1999 to February 2000 was 1,213,300. Quarterly National Household Survey, CSO.

5. Supply of People with Skills Relevant to e-Business

5.1 Introduction

This chapter describes the supply of entrants into the labour force with skills that are specifically relevant to e-Business. It highlights the disciplines that are most relevant, positioning them on the e-Business Skills Triangle.

It describes the supply of graduates in 1998, the most recent year for which it has been feasible to prepare a reasonably accurate statement of graduate numbers. It can be seen from the analysis that the number of graduates in most of these disciplines is small compared to the number studying business. Numbers graduating in computing and information systems are significant, and are growing rapidly, but are still considerably lower than for Business Studies.

No analysis of future computing or information systems graduate numbers is presented, as this will be the subject of another report by the Expert Group during 2000. However, likely changes in graduate numbers arising from changes in the Institutes of Technology are addressed.

The chapter also looks at the significant supply of qualified people from further education and FÁS.

The chapter concludes by reviewing continuing training. The main gap highlighted is in e-Business management programmes provided by third level institutions, which have developed strongly in the US, but have not developed significantly in Ireland. By comparison with other countries, there may also be scope for more for-credit part time technical education, aimed at IT professionals which wish to update or upgrade their skills.

5.2 Skill Mixes and Disciplines Relevant to e-Business

The main academic disciplines relevant to e-Business are:

- Business Studies/Commerce
- Computing
- Multimedia
- Information Systems (combinations of Business Studies and Computing)
- Design³⁰ & Communication Studies
- Fine Art³¹

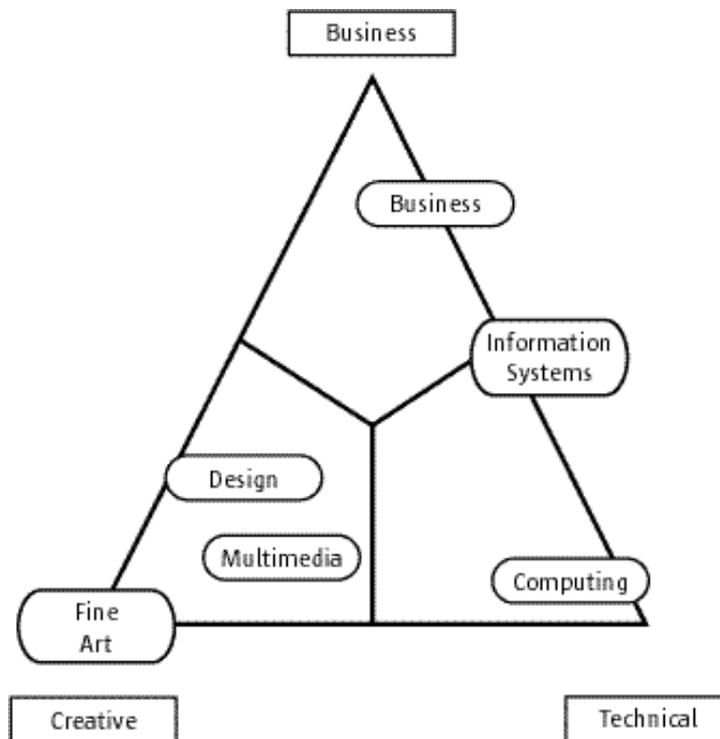
Other disciplines that will become increasingly important include:

- Librarianship and Information Science
- Journalism
- Film Studies/TV/Video
- Photography

³⁰ The disciplines within design that are most relevant to e-Business are visual communications / graphic design and industrial design. However, other areas of design also give a fairly good preparation.

³¹ Many fine art graduates are now taking up web design.

e-Business Disciplines



5.3 Supply of Graduates

Graduate statistics have been analysed and programmes in relevant areas have been categorised into the six principal e-Business related disciplines. The statistics are presented at two levels of qualification – subdegrees (certificates and diplomas) and degrees (primary degrees and postgraduate conversion programmes).

Not all of the graduates in these totals are available for e-Business work. Many certificants proceed to study for a diploma, and many diplomates proceed to a degree. Some degree graduates undertake a conversion programme. Some graduates emigrate or pursue programmes of study (particularly teaching) that make them unavailable to industry. The “Supply of Graduates” numbers take these factors into account. Graduates proceeding to further study in the same discipline are treated as being available for employment, as they will become available at a later date.

The Information Systems and Computing disciplines, along with degree level Multimedia, fall within the scope of Information Technology Professional and Associate Professional qualifications described in earlier Expert Group reports.

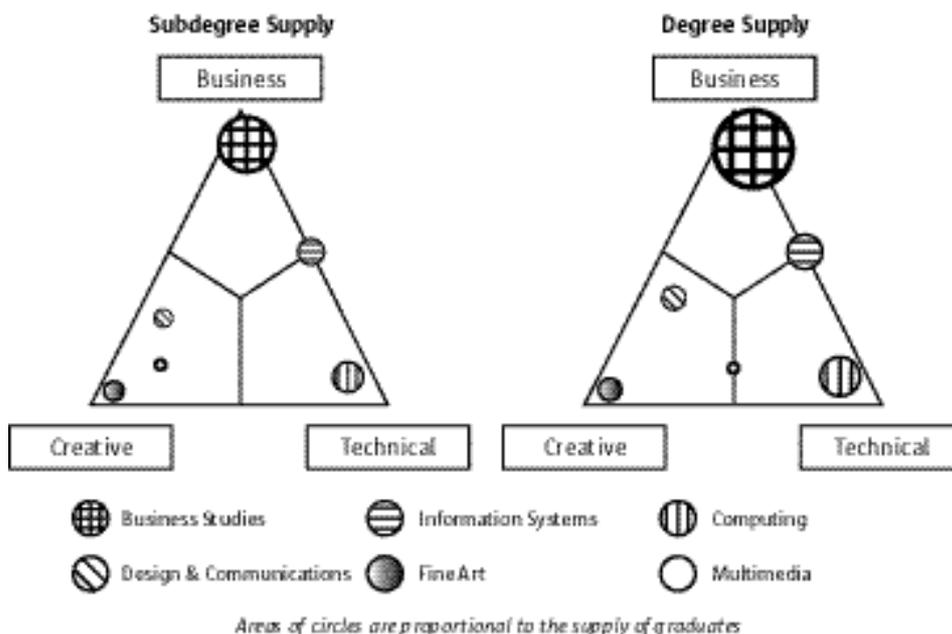
1998 Full Time Graduate Numbers and Supply

	Certificates & Diplomas		Primary Degrees & Postgraduate Conversion	
	Number of Graduates	Supply of Graduates*	Number of Graduates	Supply of Graduates*
Business	3,246	1,423	4,313	3,707
Information Systems	188	81	570	513
Computing	1,211	502	758	678
Multimedia	74	44	50	45
Fine Art	173	53	129	109
Design & Communications	235	105	289	256
<hr/>				
Journalism	16		57	
TV / Video / Film	39		19	
Photography	20			
Library Studies			50	
Office Information Systems	490	234		

* The actual supply of graduates available to industry is less than the total number of graduates. The supply figures here take account of the fact that some graduates will emigrate, that some certificant will undertake diplomas, that some diplomates will undertake degrees, and that some degree holders will undertake postgraduate conversion programmes. Degree holders continuing their studies in the same discipline are treated as being available to industry.

Sources: Based on data from First Destination of Award Recipients Survey, 1998. For a number of DIT programmes, graduate numbers from 2000 have been used instead, but it is not believed that this distorts the picture significantly. There is not enough detail available in the database to allow all Computing degree graduates to be identified. A 1998 report³² made projections, which, when converted into the terms of this report, were equivalent to projecting that there might be 969 Computing primary degree and postgraduate conversion graduates in 1998. This may be a better estimate than that which emerges from analysing the survey database.

Supply of Graduates in the Main e-Business Disciplines



32 Manpower Education and Training Study of the Irish Software Sector, 1998, FÁS

5.4 Trend in Supply of Graduates

There are three major changes underway affecting the supply of graduates in disciplines relevant to e-Business. These are:

1. Following on from the report of the Interim Skills Group, and the earlier reports of the Expert Group on Future Skills Needs, a large number of additional third level places have been created in Computing and Information Systems, along with some additional places in Multimedia.

The most significant change is at degree level – a large number of additional places were made available in 1997, more in 1998, and more again in 1999. This additional intake should lead to a substantial increase in output over the years 2001, 2002 and 2003.

In addition, there was a substantial increase in the number of places on Graduate Diploma programmes in the academic year 1999/2000. The Accelerated Technician Programme has also had a significant number of students studying information technology. The researchers noted increased numbers on some other subdegree programmes.

The future computing or information systems graduate numbers will be the subject of another report by the Expert Group during 2000.

2. There has been a significant amount of new course development activity in the Institutes of Technology in the multimedia and design area, which has continued into 2000. To the extent that this has already impacted on student numbers, it is possible to estimate the impact on future graduate numbers.

Trends in Multimedia and Design Graduates in Institutes of Technology

	Certificates & Diplomas	Primary Degrees & Postgraduate Conversion
	Change in Number of Graduates	Change in Number of Graduates
Multimedia	+5	
Fine Art	+35	+30
Design & Communications	+70	+60

Source: Based on analysis of NCEA exam registrations, 2000.

A further eight multimedia programmes have either been approved by, or at least submitted for approval to, the NCEA. Five of these are at degree level, and three at subdegree level. It is not yet possible to estimate reliably what the impact on graduate supply will be. Not all programmes approved by the NCEA are eventually approved for funding.

3. There is an increasing trend towards the provision of business programmes with “e-Business” or “e-Commerce” in the programme title. The key programmes of this type started to date are M.B.S. programmes at four universities aimed at recent business studies graduates. In the sense that these programmes combine business studies with information technology, they can be seen as information systems programmes with a particularly heavy bias towards e-Business.

A number of Institutes of Technology are also introducing programmes at sub-degree level with “e-Business” or “e-Commerce” in the programme title. Again, these can be seen as information systems programmes with a bias towards e-Business.

5.5 NCVA Qualifications

The further education sector is a significant source of skills relevant to e-Business. Typically, courses are NCVA certified at Level 2.

Level 2 and Level 3 NCVA Certificates in Relevant Disciplines, 1999

Discipline	Awards
Art / Craft / Design	182
Graphic Design	26
Other Design	164
Business and Administration	2,762
Information Technology	347
Applied Language and Information Technology – International Teleservices*	138
Networks and Software Systems*	69
Media Engineering	22
Media Production	159
Print Journalism	19
Total	3,898

* Level 3 courses. All others are Level 2. There is some limited flow of Level 2 graduates into Level 3 courses, but it has not been quantified.

Source: Based on information provided by NCVA

NCVA is currently introducing a Level 2 Certificate in e-Business. This will have mandatory subjects in e-Business Studies, Web Authoring, the Internet and General Studies (including Communications). There will be a choice of two electives out of ten options. There will also be a work experience component.

It is not yet known how many colleges will deliver the programme in 2000/01, but the NCVA reports considerable interest.

Within the Further Education sector, Ballyfermot College of Further Education is a significant provider of education in areas relevant to e-Business – particularly in animation, media and computing. Many of its programmes are certified by bodies other than NCEA.

1999 Student Numbers (all years) at Ballyfermot College of Further Education

	Duration (Years)	Computing	Design/ Communications	Multimedia	Fine Art	Film/TV/ Radio
NCVA Certificate	1 / 2*	20		233		
BTEC National Diploma	2			44		
NCVA National Diploma	2	120				
BTEC HND	2 / 3*		48	155	18	129
Add-on Degree				36		

* NCVA Certificate in Animation Studies (classified as Multimedia) with 64 students is 2 years long. HND in Classical Animation (also classified as Multimedia) with 95 students is 3 years long.

Source: Based on Information from Ballyfermot College of Further Education

5.6 FÁS Courses

Following on the first report of the Expert Group, FÁS greatly increased information technology training places. In 1999, FÁS trained a total of 3,414 trainees in information technology skills. Of these, 366 attended courses in multimedia, web design and Internet services. In addition, FÁS had 1,642 people trained in IT Skills on contractual external training programmes, including 124 on courses in Webmaster Skills.

FÁS is undertaking a major review of the structure and content of its information technology courses. This will involve:

- development of National Standards,
- the use of industry-recognised qualifications (e.g. Microsoft Certified), and
- the reorganisation of courses into three levels, allowing course participants to enter at a level consistent with their existing skills, and with opportunities to progress from basic skills to advanced skills.

Courses will be organised into five broad areas. Of these, the three most directly relevant to e-Business will be Web Design, Networking and Software Development.

In addition to the training for the unemployed described above, FÁS is also an active provider of IT training to industry on a commercial basis.

FÁS is developing a NetCollege, based at Loughlinstown Training Centre. This offers a wide range of IT skills inclusive of Web-Based Training, technical and application skills. A tutorial service is provided. The NetCollege's services are available to industry and individuals on a commercial basis. FÁS course participants in relevant skill areas are also encouraged to use the service free of charge.

5.7 Continuing Education and Training

5.7.1 Business Education and Training

The main sources of business-oriented continuing training in e-Business include:

- Enterprise Ireland (EI) – EI is active in promoting e-Business, and in educating Irish managers. Tools used include publicity, a web site, seminars and funding for feasibility studies. EI is preparing to co-ordinate and support a training service to teach existing managers to function as webmasters. The recently-announced e-Business Acceleration Fund will provide a base from which EI can demonstrate successful use of e-Business to senior managers.
- Chambers of Commerce of Ireland (CCI) – CCI's EU-funded ADAPT Prism programme has assisted and educated managers from a range of companies in developing e-Business. CCI has published a report based on 16 case studies of participants in the programme.³³
- Professional Organisations – A number of the major professional organisations are providing training in e-Business for members.
- Some of the providers of technical e-Business training also provide business-oriented training. However, the overall take-up of this training does not appear to be as strong as for technical training.

³³ Doing e-Business: the needs and experiences of Irish SMEs.

By comparison with the US, the main global centre of e-Business, there is one major gap. Many US universities have very strong graduate business schools offering a mix of full time, part time and short course programmes. These are growing strongly. One of the areas of strongest growth, across all three types of programme, is in e-Business education. There are now hundreds of e-Business programmes aimed at people with post-graduate work experience.

Aside from fairly standard MBA programmes, Ireland does not have much activity at this level, and has almost none specifically focused on e-Business.

5.7.2 Technical and Design Education and Training

There is a very active market in continuing training in technical computing and multimedia skills. There are many providers, and demand is strong. The market for updating the skills of designers is effectively a part of the IT training market. It gives some idea of the scale of activity to note that one high volume provider of IT training indicated that it had trained 3,000 people last year, about half of them in skills specifically relevant to web development.

The supply of graduates and other qualified people from further education and FÁS is being supplemented strongly by people taking short courses in technologies such as HTML and Flash. Some of these are already working in graphic design, and are adding web design to their existing skills. Others are sponsored by their employer to acquire the skills they need to be a webmaster, or an assistant to a webmaster. Many are using the skills they have acquired to start micro businesses offering low-cost web site development services.

The Institutes of Technology have a significant amount of activity in providing short technical courses in areas relevant to e-Business.

By comparison with other countries, there may be scope for more part time technical education for credit, aimed at IT professionals who wish to update or upgrade their skills.

5.7.3 IT Literacy Training

There is a significant industry concerned with developing basic IT skills, and there is no real shortage of provision.

6. Matching Supply with Demand

6.1 Introduction

This chapter combines labour market evidence with the analysis in earlier chapters to identify where gaps exist. The main gaps identified are summarised here.

	Intake and Conversion	Existing Workforce
Managers	<p>The extent to which e-Business has penetrated into the course content of many third level business programmes is fairly limited.</p> <p>The IT and design content of most mainstream Business Studies programmes is quite limited.</p> <p>Industry and graduates would benefit from a shift in mix in the programmes delivered by business schools, away from programmes with a low information technology subject matter content, towards programmes with a higher information technology content.</p> <p>In the US, there has been very rapid growth in demand (and supply) for programmes preparing people for management of technology companies, and for implementing e-Business in existing companies, which has not yet been reflected in Ireland.</p>	<p>The amount of e-Business education being undertaken is very low by comparison with the US. Lack of activity by most third level colleges appears to be the main constraint.</p> <p>The training available from private training companies is of variable quality, and tends towards being technically-focused, and lacking in business content.</p> <p>With Enterprise Ireland's e-Business development activities being directed primarily at manufacturing industry, there is potentially a gap in coverage of domestically traded service industries.</p> <p>There are significant gaps in the skills of providers of e-Business strategy and implementation services.</p>
Technical	<p>In spite of significant increases in the supply of people with software qualifications, there is still a shortage of labour.</p> <p>There is currently a particular issue with the supply of people with Internetworking skills, which are required for the many Internet data centres planning to locate in Ireland.</p> <p>Across most Computing programmes, the graphic design and communications content is very limited, in spite of the presence of a significant amount of technical graphics content.</p>	<p>To the extent that there is a gap in updating the skills of technical IT people, it is in the area of college-delivered continuing professional education.</p>
Designers	<p>While there is currently a shortage of web designers, the underlying supply of design and fine art graduates appears to be adequate.</p> <p>There is a more significant shortage of people with a strong mix of design and technical skills, and the analysis suggests that a significant number of additional multimedia graduates might be required to meet this need.</p> <p>There are deficiencies in the business knowledge of designers entering web design. This may reflect, in part, a deficiency in the business and communications content of some design programmes.</p>	<p>There is no shortage of technically-oriented courses. Interviews suggest that there is considerable variation in course quality between suppliers.</p>
IT Literates	<p>Many students still leave school without being able to use basic office software.</p> <p>While graduates from all disciplines will be the managers who need to understand e-Business in future, most graduates do not get any education or training in e-Business.</p>	<p>Greater home availability of PCs and lower cost Internet access might facilitate improvements in IT literacy among those already in the workforce.</p>

6.2 Labour Market Evidence

Evidence of the labour market outcomes of third level education throws some light on the relationship between supply and demand for graduates from different disciplines. As can be seen from the table of initial salaries, the prime qualifications are in Information Systems and Computing, at degree and graduate diploma levels. In spite of generally being within the same faculties, there is a substantial difference in salaries between Information Systems and Business graduates at degree and graduate diploma levels.

Median Initial Salaries after Graduation, 1998 Graduates

	Diploma	Degree	Graduate Diploma
Business	£11-£13k	£11k-£13k	£13-£15k
Information Systems	£11k-£13k	£17k-£19k	£17k-£19k
Computing ³⁴	£15-£17k	£17k-£19k	£15k-£17k
Fine Art	£9k-£11k	£9k-£11k	
Design & Communications	£11k-£13k	£11k-£13k	£15k-£17k

Source: Based on new analysis of data from First Destination survey of full time 1998 graduates for degrees and NCEA subdegrees, using the same disciplinary definitions as elsewhere in this report. In some cases, programmes are classified differently here than in the HEA's published report.

A similar pattern is visible in the statistics about the first destinations of graduates. Graduates in Information Systems and Computing are the most likely to enter employment immediately after graduating. There is some slack in demand for graduates in design and fine art.

First Destinations of 1998 Graduates - Degrees

	Business	Information Systems	Computing	Fine Art	Design	Communications
Employed Full Time	67%	79%	83%	41%	58%	72%
Employed Part Time	2%	1%	0%	18%	12%	4%
Work Experience	0%	0%	0%	8%	5%	0%
Further Study	18%	12%	12%	12%	6%	13%
Vocational & Professional						
Training*	5%	1%	1%	6%	3%	1%
Teacher Training	1%	7%	0%	6%	2%	0%
Unemployed	2%	0%	2%	4%	9%	1%
Not Available	4%	0%	2%	6%	4%	7%

* Primarily graduate diplomas

Source: Based on analysis of data from First Destination survey of 1998 graduates for degrees and NCEA subdegrees, using the same disciplinary definitions as elsewhere in this report.

³⁴ Most software companies say they do not have difficulty in recruiting new graduates. They say that the shortage is of people with two or three years experience.

6.3 Managers and Management Advisors – New Entrants

6.3.1 Initial Education Business Programmes

There are three main dimensions to the e-Business relevance of a Business Studies programme:

- The extent to which e-Business has penetrated the content of all disciplines within the programme
- The amount of information technology content
- The extent to which technologies are used to facilitate learning

While the last of these influences the extent to which students gain a deep familiarity with the use of e-Business technologies, the main focus of the Expert Group's analysis is on content, rather than delivery.

A workshop with staff from the Institutes of Technology, interviews with university staff, and a survey of third level colleges undertaken all show that the extent to which e-Business has penetrated into the course content of many third level business programmes is fairly limited. It is clear from the research that the Business Studies faculty from every college and every discipline will need to go through a substantial research and learning process to bring their programmes up to date.

Average Percentage of Subject Time Devoted to e-Business / e-Commerce in 1999/00 Final Year Subjects among Colleges Responding to Survey

	Business				Information Systems			
	Business Strategy etc.	Marketing	MIS/IT	Operations /Logistic	Business. Strategy etc	Marketing	MIS/IT	Operations /Logistics
Certificate	4%	7%	20%	2%				
Diploma	21%	12%	19%	8%	20%	0%	42%	0%
Degree	9%	10%	11%	4%	13%	13%	32%	3%
Postgraduate Diploma	2%	2%	8%	2%	9%	3%	53%	3%
Masters	12%	15%	15%	2%	7%	25%	42%	10%

Source: Survey of Third Level Colleges for Expert Group. Analysis based on 8 questionnaires (32% response) covering 23 certificate, 27 diploma, 29 degree, 8 postgraduate diploma and 24 masters programmes (only a total of 13 of these are under the Information Systems heading).

Percentage of Programmes that will have Subjects with "Internet", "e-Commerce" or "e-Business" in the Title in Academic Year 2000/01 among Colleges Responding to Survey

	Business		Information Systems	
	Core	Elective	Core	Elective
Certificate	17.6%	5.9%		
Diploma	18.8%	18.8%	66.7%	0.0%
Degree	33.3%	23.8%	50.0%	33.3%
Postgraduate Diploma	0.0%		66.7%	0.0%
Masters	5.0%	35.0%	33.3%	100.0%

Source: Survey of Third Level Colleges for Expert Group. See earlier table for details of response rate.

The IT and design content of most mainstream Business Studies programmes is quite limited.

Average Number of Subjects in IT and Design Undertaken on Business School Programmes by Students Graduating in 2000 among Colleges Responding to Survey

	Business		Information Systems	
	IT Strategy/MIS /Computing	Design	IT Strategy/MIS /Computing	Design
Certificate	1.88	0.03		
Diploma	1.00	0.03	3.67	0.33
Degree	2.19	0.05	10.00	0.17
PG Diploma	0.60	0	2.33	0.00
Masters	1.10	0.02	3.67	0.00

Source: Survey of Third Level Colleges for Expert Group. See earlier table for details of response rate.

The labour market evidence suggests that, within the overall limits of an Irish economy where the supply of labour is a constraint, there is no overall shortage of Business Studies graduates, but that there is a shortage of Information Systems graduates. It suggests that industry and graduates would benefit from a shift in mix within the activities of business schools, away from programmes with a low information technology subject matter content, towards programmes with a higher information technology content. It suggests that Business Studies students should have a choice between a programme with a predominantly business content, and one that is approximately 50% business and 50% IT. The number of programmes that currently offer the latter option at undergraduate level is not large.

6.2.2 Management Entry Programmes

It is estimated that approximately 7,500 people per annum enter manager occupations, usually from other occupations. In 2000 approximately 330 completed Irish MBA programmes (full time and part time), and approximately 15 completed the Master of Technology Management programme.

The volume of provision at this level may be adequate for current needs – not everyone needs an MBA to move into management. However, by comparison with the US, this is a very traditional mix of management-preparation degrees. In the US, there has been very rapid growth in demand (and supply) for programmes preparing people for management of technology companies, and for implementing e-Business in existing companies. These are skills that are required in Ireland too.

6.4 Managers and Management Advisors - Updating and Conversion

In the US, e-Business is now one of the main areas in which managers undertake continuing education programmes. By comparison with the US, the volume of continuing management education undertaken is low, and the volume of continuing education in e-Business is very low. Lack of activity by most third level colleges in the area appears to be an important constraint.

The requirement to update the skills of Irish managers is being addressed by a number of organisations, including Enterprise Ireland and the Chambers of Commerce of Ireland. It is important that this work should continue.

The training available from private training companies is of variable quality, and tends towards being technically-focused, and lacking in business content. Enterprise Ireland's webmaster training initiative is welcome, both in itself, and because it should assist in setting de-facto standards for webmaster training.

As Enterprise Ireland's activities are directed primarily at manufacturing industry, there is potentially a gap in coverage of domestically traded service industries. This is already being covered by FÁS to some extent.

While a number of professional organisations are quite active in assisting their members to acquire e-Business skills, the interview and workshop evidence is that there are significant gaps in the skills of providers of e-Business strategy and implementation services. This is not surprising in the light of rapid change in skills requirements, and in the light of international research. According to Forrester Research, reviewing the best international service providers:

“Firms depend on eCommerce Integrators (eCIs) for strategy, marketing, design, and technology. But no eCI can do it all, forcing clients to fill in the gaps.”³⁵

6.5 Technical – New Entrants

In spite of significant increases in the supply of people with software qualifications, from sources such as subdegree Computing programmes, FÁS courses and graduate diploma programmes, there is still a shortage of labour. This is clear from industry interviews, and from a review of research by recruitment agencies.³⁶

However, some key technical skills interventions have yet to impact on the labour market. The substantial number of degree level places in Computing created in response to the report of the Interim Skills Group led to major increases in intake in 1997, again in 1998, and again in 1999. The first output from this additional intake will appear in 2001, and there should be further increases in graduate numbers in 2002 and 2003.

A survey of Computing departments undertaken for the Expert Group shows that most programmes at Diploma level and higher now have a significant Internet-relevant content. The survey responses suggest that there is still scope for a higher level of focus on e-Business relevant skills. It is likely that colleges are already moving further in this direction, with classes that will graduate in future years.

Percentage of Computing Programmes in which a Student Graduating in 2000 will have Completed a Project in Each of a Number of e-Business Relevant Areas among Colleges Responding to Survey

	Certificate	Diploma	Degree	PG Diploma	Masters
Responses	6	11	26	7	7
HTML	50%	73%	73%	71%	71%
XML	17%	27%	50%	14%	43%
Java	17%	64%	73%	71%	86%
Web Development Tools	33%	64%	69%	29%	86%
Secure Transactions	0%	9%	62%	71%	71%
Internet Middleware	17%	18%	62%	57%	43%
Animation	0%	18%	19%	14%	43%
Business Plan	50%	36%	42%	29%	43%

Source: Survey of Third Level Colleges for Expert Group. Based on 9 questionnaires (36% response rate).

The number of Internet-oriented theses and major projects undertaken is very substantial.

³⁵ Forrester Weekly Research e-mail circular, 27 June 2000.

³⁶ CSR reports that 93.5% of software development companies are experiencing difficulties in recruitment, with 10% outsourcing development work overseas. (CSR Technology Salary & Skills Survey, 1999). NewMediaCV, which specialises in new media / e-Business skills, reports increases of up to 25% in the salaries at which they are placing staff between October 1999 and April 2000, with a very strong increase in demand from January 2000.

Average Percentage of Theses / Major Projects that were Internet-Oriented in 1999/2000 among Colleges Responding to Survey

	Computing	Information Systems
Certificate	0%	48%
Diploma	33%	68%
Degree	41%	48%
Postgraduate Diploma	22%	38%
Masters	58%	19%

Source: Survey of Third Level Colleges for Expert Group. Based on 9 questionnaires (36% response rate). These covered 31 Computing programmes and 16 Information Systems programmes.

The fairly limited number of business-oriented subjects taken on Computing programmes means that graduates from these programmes are likely to be most suited to technically-oriented work of the sort required by the software industry. As there is very substantial software industry demand, this disciplinary mix within Computing appears to be reasonable.

Information Systems programmes have a greater management content. These programmes are likely to be more suited to e-Business strategy and implementation than are Computing programmes.

Average Number of Subjects in Management and Design Undertaken on Computing Department Programmes by Students Graduating in 2000 among Colleges Responding to Survey

	Computing			Information Systems		
	Management Business	Business Process Design	Design Graphic Comms	Management Business	Business Process Design	Design Graphic Comms
Certificate	1.75	0.50	0.50	0.5	0.5	0.5
Diploma	1.78	0.22	0.22	6	3	3
Degree	2.18	0.68	0.68	9.75	2.75	2.75
Postgraduate Diploma	0.67	0	0	0.5	0	0
Masters	1.00	0	0	1	0	0

Source: Survey of Third Level Colleges for Expert Group. Based on 9 questionnaires (36% response rate).

Across most programmes, the graphic design and communications content is very limited, in spite of the presence of a significant amount of technical graphics content (HTML, Java applets, use of web development tools, animation).

In summary:

- While there is still a shortage of IT professionals, skills interventions already implemented will continue to increase supply in 2001, 2002 and 2003. The Expert Group plans to undertake more research into supply and demand for IT skills.
- Computing programmes, and Information Systems run by Computing departments, are reasonably well focused on e-Business relevant skills, but there is scope to move further in this direction.

6.6 Technical – Updating

There is no gap in availability of short update courses for technical staff, and these cover most of the training needs. There are many providers, offering a wide range of courses. Technology-enabled training is well developed, and the trend is for courses to be available over the web.

To the extent that there is a gap, it is in the area of college-delivered continuing professional education. An increase in the availability of continuing professional education might be an effective means to address the need to update the skills of people working on out-of-date technology.

6.7 Designers – New Entrants

The demand analysis identified a current annual requirement for 320 people with strong design skills, and another 320 with a strong mix of design and technical skills for web development. One reasonable scenario for the future would be that demand continues to grow at the current estimated rate.

Under this scenario, the demand for people with strong design skills can be met partly through the current supply of design graduates (allowing for the fact that many are required in other sectors of the economy), partly through conversion of Fine Arts graduates, and partly through an increase in student intake that has already taken place. Once these sources are taken into account, the excess of estimated demand over supply is 140 per annum. The Expert Group believes that this requirement can be addressed adequately from the output of existing further education courses and FÁS courses, and from less formal acquisition of skills.

The demand for people with a strong mix of design and technical skills is a more substantial issue, particularly because higher growth scenarios are also very plausible. The skills required are primarily those covered by a Multimedia programme. The current supply is approximately 90 from these programmes. On the assumption that these 90 are required by non-Web multimedia businesses, it is estimated that the excess of demand over supply is 320 per annum. In higher growth scenarios, the gap would be significantly greater. While this gap can be bridged in the short term by people taking sub third level courses, over the longer run it will require a preponderance of people with diploma and degree level qualifications.

Interview and workshop evidence suggests that there are some deficiencies in the business knowledge of designers entering web design. In many cases, they do not understand the communication conventions of the web, and they often do not understand well the business function of the web page they are designing. They may produce work that is visually strong, but functionally less than optimal³⁷. This may reflect, in part, a deficiency in the business and communications content of some design programmes.

Average Number of Subjects in Graphics, Management and Computer Programming Undertaken in Art & Design Programmes by Students Graduating in 2000 among Colleges Responding to Survey

	Design & Communications			Fine Art		
	Graphic Comms/Web Design/ Animation/ Multimedia	Management/ Business	Computer Programming	Graphic Comms/Web Design/ Animation/ Multimedia	Management/ Business	Computer Programming
Diploma	3.00	2.00	0.22	2	0	0
Degree	3.10	1.20	0.68	4.2	0.2	0

Source: Survey of Third Level Colleges for Expert Group. Based on 4 questionnaires (33% response) covering 20 programmes.

³⁷ This is not unique to Ireland. Internationally, it is a regular subject of editorial on web development.

Percentage of Art and Design Programmes in which a Student Graduating in 2000 will have Completed a Project in Each of a Number of e-Business Relevant Areas among Colleges Responding to Survey

	Diploma Design, Communications & Multimedia	Degree Design, Communications & Multimedia	Fine Art
Web Page Design	75%	55%	20%
Full Web Site Design	50%	0%	0%
2 D Computer Animation	75%	64%	100%
3 D Computer Animation	25%	9%	20%
Multimedia Production	75%	36%	60%
Film / TV / Video Production	25%	0%	80%
Business Plan	75%	55%	0%

Source: Survey of Third Level Colleges for Expert Group. Based on 4 questionnaires (33% response) covering 20 programmes.

Average Percentage of Theses / Major Projects that were Internet-Oriented in 1999/2000 among Colleges Responding to Survey

	Diploma	Degree
Design & Communications	26%	5%
Fine Art	0%	7%

Source: Survey of Third Level Colleges for Expert Group. Based on 4 questionnaires (33% response) covering 20 programmes.

6.8 Designers – Updating

While designers face a significant need to update their skills for e-Business related work, there is no shortage of technically-oriented courses being provided by private sector organisations, and by State-sponsored organisations such as Arthouse and FÁS. Interviews suggest that there is considerable variation in course quality between suppliers. However, as this problem is probably rooted in the recent explosion in demand for short courses in using tools relevant to the web, it may well resolve itself over time.

6.9 IT Literates – New Entrants

Many students still leave school without being able to use basic office software. Interview evidence suggests that the problem is particularly prevalent among students from disadvantaged backgrounds who are most likely to have literacy problems, and who are least likely to have access to a computer at home.

While graduates from all disciplines will be the managers who need to understand e-Business in future, most graduates do not get any education or training in e-Business.

6.10 IT Literates – Existing Workforce

While there is a very substantial requirement for IT training for the existing workforce, there is no shortage of training service providers. IT training for the general population of employees is now the basis of a substantial industry.

However, a review of actions taken in other countries shows that many companies are now going beyond this. They are seeking to improve their employees IT skills by giving them, or subsidising, computers with Internet capability for use at home.

7. Recommendations

7.1 Introduction

This chapter makes recommendations based on the assessment of skills supply and demand presented earlier.

7.2 Third Level

7.2.1 Implementation Strategy

This report highlights the fact that e-Business has a major impact on the skills required by industry. Internationally, a shortage of IT skills is the main focus of policy interventions, but Ireland has already moved to greatly increase its supply. For this reason, and because the Expert Group plans further research into IT skills volume, the focus of this report is more qualitative. It asks what type of skills will be needed by those entering employment and those already in employment, and whether there is a good match between these requirements and current education and training activities. It also highlights areas where the requirement for education and training exceeds the amount being undertaken, but where it is not possible to specify in an exact way the extent of the gap.

The recommendations that emerge from this analysis are very different to those which have emerged from earlier Expert Group reports. Where earlier reports often focused on creating defined numbers of education and training places, this report focuses particularly on the development of existing provision. Because this type of agenda is new, a new approach to implementation will be required.

The implementation strategy to be developed should have full regard for the freedom of academic institutions to develop their own academic programmes. However, the Expert Group believes that a national initiative would be of value, through adding to the impetus for change, and through bringing leading edge industry input to bear.

Recommendation 1

- **Forfás, the Department of Education and Science and the HEA, following consultation with the third level sector, should jointly develop an e-Business Skills Partnership mechanism to facilitate interaction between third level institutions and business/industry.**

Recommendation 2

- **The Partnership would promote the development of third level e-Business education building on the agenda and proposals in the following areas, which are explored further in paragraphs 7.2.2 to 7.2.10:**
 - **Business School Programme Changes**
 - **Updating Business School Faculty Skills**
 - **Continuing e-Business Business Education**
 - **Computing Departments**
 - **Fine Art**
 - **Design**
 - **Disciplinary Areas that are becoming important**
 - **Supply of Teaching Staff**
 - **All Graduates**

7.2.2 Business School Programme Changes

Irish business schools should make a number of changes in their programmes to respond to the e-Business skills needs of the economy, and to improve their graduates' prospects.

The changes in the content of initial education programmes required to address changing business needs are:

- An increased focus on information technology and e-Business related academic content across all business disciplines;
- An increase in the number of Information Technology subjects in most programmes;
- Colleges should look at the possibility of introducing an introductory design and communications subject into all business programmes.

At primary degree level and higher, all colleges with a sufficient number of students to offer an additional specialisation should offer an Information Systems specialisation with an approximately 50% business, 50% information technology content. For most colleges, this should not involve an overall increase in undergraduate business school intake. Colleges should seek to avoid constraining the proportion of students that can opt for the Information Systems stream, thus allowing market forces to determine the number of Information Systems graduates.

Colleges with substantial postgraduate business activity should seek to expand MBS-style programmes in Information Systems and e-Commerce, and should consider the introduction of programmes in Management of Technology Enterprises.³⁸ Within the limits of the capabilities available within institutions, it would be desirable to avoid placing limits on the number of well-qualified applicants that are accepted onto these programmes.

Colleges with MBA programmes should increase the focus on information technology and e-Business, and should consider introducing specialist MBA programmes in Management of Technology Enterprises.

³⁸ It would be important for programmes in Management of Technology Enterprises to include one or more courses in project management.

7.2.3 Updating Business School Faculty Skills

The content of business studies disciplines is constantly growing, and there has always been a need to add new content, and prune dated content, from subjects on a regular basis. The arrival of e-Business has increased the pace of change, introducing important new content into all academic disciplines within business studies, and making the content of many existing subjects quite dated. Given the great relevance of e-Business knowledge to the economy, it is appropriate that some of what is currently taught should be modified with reference to e-Business, and that some other parts should be displaced by e-Business content that is now more relevant. Given the speed at which e-Business is developing, it is important that course content should change regularly and in some cases annually, based on recent and anticipated developments.

There are a number of obstacles to this happening:

- the large amount of work involved in course research and redevelopment,
- inadequate academic contacts with international centres of business education,
- lack of contact between some Business School faculty and companies that are very active in e-Business, and
- the tendency of reward systems for academics to value research to the exclusion of teaching.

Areas where increased activity may be desirable include the following:

- Undertaking a significant volume of course development work across all business disciplines to address the changes in course content that arise from e-Business. Ideally, much of this work would be done collaboratively within and between colleges, in order to spread the load, and in order to facilitate the diffusion of knowledge.
- Improving contacts with international centres of business education through:
 - Extended working visits by senior academic staff to major centres of business education
 - Visits by senior business school professors from overseas to teach subjects and run faculty workshops.
- Consulting with companies that are very active in e-Business on course content.

One aim in this would be to establish Ireland as an internationally recognised centre for e-Business education and research.

7.2.4 Continuing e-Business Business Education

In the US, one of the main areas where e-Business programmes have been developed is in continuing education – particularly in part time higher degrees and certificates, and in short programmes. Reflecting the strong and rapidly growing position of distance education in the US, many e-Business programmes are delivered through distance learning techniques and technologies.

Irish third level colleges are not active in continuing e-Business education to any great extent, and this is placing an obstacle in the way of updating the skills of managers and those moving into management.

In the absence of a strong response by Irish third level colleges, it is possible that the opportunity will be seized by US or UK colleges that are active in the area, some of which already have a presence in Ireland. These colleges will be in a position to offer distance learning opportunities to firms in Ireland.

While difficulties and constraints are being experienced by the colleges in this area, there is an urgent need to address the issue, so that colleges can contribute to expanding and enhancing the knowledge and skills base of managers and other professionals in Ireland.

7.2.5 Computing Departments

The survey evidence suggests that most Computing departments are making reasonable efforts to keep their course content up to date in a climate of very rapid technological change, where a technology can move from being near-unknown to being highly commercially important in less than a year.

The Expert Group does not see any need for a substantial change in the direction of Computing programmes. The mainly technical focus of these programmes is appropriate to the Software sector's needs. The need for more programmes with an approximately even balance of business and technical content should be addressed by adding IT content to business programmes, rather than displacing technical content from Computing programmes.

However, based mainly on industry input, the Expert Group has identified a number of areas that Computing departments should address. These are:

- **Internetworking** – Existing industry plans mean that there will be rapid growth in Internet data centre operations in Ireland. These operations will require Internetworking skills which are in short supply. It is essential and urgent that colleges should shift the focus of some Computing programmes to emphasise the operating system and networking skills required for Internetworking.³⁹ While the greater need will be at subdegree level, there will also be a requirement at degree level. Departments taking this course of action should evaluate the possibility of offering their students preparation and testing for industry qualifications in the area (e.g. Cisco Certified).
- **Project Management** – It is understood from industry interviews that there is a shortage of people with skills in managing IT projects. Project management skills will be relevant to most Computing graduates. Computing departments should consider increasing the project management content of their programmes.
- **Business Awareness** – It is understood from industry interviews that many Computing graduates lack an understanding of the operations, markets and economics of the software industries in which they are likely to work. Computing departments should evaluate the possibility of delivering a short business awareness subject to final year students, which would not necessarily be for credit. It would be desirable to obtain industry input into the content.
- **Design Content** – While many Computing programmes cover the technical aspects of web page, animation and multimedia design, most do not have significant content on the creative and communications aspects of using the technologies effectively. Computing departments with a significant web page design, animation and/or multimedia content to their programmes should consider offering an introductory design and communications subject.

7.2.6 Fine Art

The strong creative focus of Fine Art programmes is culturally important. It is also important to the innovative capability of the economy that a strong creative strand of activity and education that is not commercially constrained should exist. The Expert Group believes that skills supply considerations should not lead to substantial changes in the course content and orientation of Fine Arts programmes.

However, the employment prospects of Fine Arts graduates have not been as strong as for most other disciplines historically, but many graduates are now undertaking courses in web design after graduation. It would be desirable for all Fine Art students to have the option of access to a web design subject before graduation which would not necessarily be for credit. Colleges should review the relevance and content of the subject annually, to reflect changes in mainstream industry practice.

³⁹ The NCC are also of the view that the output of graduates with Networking/Internet Protocol (IP) Management skills requires to be increased.

7.2.7 Design

Design schools should consider making a number of changes in their programmes to respond to the skills needs of the economy, and to improve their graduates' prospects. They should ensure that all design students in the disciplines most closely related to web design (industrial design and visual communications) undertake at least one web design project. These students should ideally take a subject on the marketing and communications aspects of web design, and the interaction between web design choices and business process design.

7.2.8 Disciplinary Areas that are Becoming Important

While the main focus of this report is on qualifications in the broad business, IT and art/design areas, some other areas are also of significance for e-Business. These include logistics, information science, journalism and audiovisual production. Colleges should have regard to the importance of these in their planning.

7.2.9 Supply of Teaching Staff

Interview evidence suggests that the supply of new and junior academic staff in business studies and computing may be constraining course innovation in some areas.

Competition from the private sector is affecting colleges' capability to attract and retain the best people. The problem affects all business disciplines, and is particularly severe for information systems and also for computing. This is making it more difficult for colleges to deliver good quality information technology programmes.

A key part of promoting the agenda for third level e-Business education will be to involve business to a greater extent in the development of programmes, particularly in the university sector. There may also be potential for increasing involvement in the delivery of programmes.

In developing the implementation strategy outlined in section 7.2.1, further options will need to be considered in regard to the supply of teaching staff.

7.2.10 All Graduates

As many graduates, particularly those with diplomas and degrees, will move into management positions, there is a case for all diploma and degree students to have access to education in e-Business. Colleges should consider making available a short subject in e-Business to students in all disciplines. The development and delivery of such a subject or subjects might be the subject of collaboration between colleges, which could involve web-based delivery. Oscail, the National Distance Education Centre could potentially play a role here.

7.3 Further Education

The Further Education sector is a significant source of skills relevant to e-Business, particularly through providing people with computing, web design and animation/multimedia skills. The NCVA is introducing a Level 2 Certificate in e-Business, which will prepare people for e-Business support roles.

Recommendation 3

- **Further Education colleges should implement the new NCVA e-Business course, and should promote it in line with the business importance of e-Business.**

7.4 School Leavers

Every student leaving school should have skills in information technology sufficient to use common office software including word processors, spreadsheets, browsers and e-mail clients at a basic level.

Recomendation 4

- **The recommendation of the National Competitiveness Council⁴⁰ that “a second level ICT skills common standard should be made compulsory for all transition year/fifth year students”, should be implemented and the Department of Education and Science should develop proposals to ensure that all early school leavers have basic IT skills.**

7.5 Labour Force

Internationally, government policies to promote home PC use and Internet access are increasingly used to encourage the development of IT literacy among members of the labour force, as well as to encourage e-Commerce activity. The Expert Group concurs with the ISC’s observation that there is great potential for the schools to allow outside groups to use their facilities for training in IT.⁴¹

Recomendation 5

- **The Government should further encourage competition to reduce the telecommunications cost constraints on home and educational Internet access. The proposals of the Information Society Commission (ISC) to develop community access to IT should be implemented.**

7.6 Enterprise Ireland

Enterprise Ireland has taken a high profile in informing companies in all sectors of the economy about e-Business, and in educating managers in indigenous manufacturing industry in e-Business strategy.

However, given the scale of the task to be achieved, it appears that more activity is required.

Enterprise Ireland may also have a role to play in working with third level colleges on delivering short programmes in e-Business, and on programmes in management of technology enterprises.

Recomendation 6

- **Enterprise Ireland should continue and expand its e-Business programme. It should look at working with third level colleges on developing programmes relevant to e-Business.**

7.7 FÁS

FÁS plays a substantial role in initial IT training, and in providing IT training to industry. The Agency has responsibility for promoting training in a range of service industries.

There is a significant requirement for managers and staff to acquire skills in e-Business strategy and in webmastering.

Recomendation 7

- **FÁS should take a high profile in promoting e-Business awareness to service industries, and should support businesses from these industries in gaining access to training in e-Business strategy and webmastering.**
- **FÁS should seek to develop its NetCollege as a key technical training resource for all industry sectors.**

40 National Competitiveness Council, Statement on Telecommunications, e-Business and the Information Society, July 2000.

41 IT Access for All – Report of the Information Society Commission, March 2000

7.8 Skillnets

The recently-created Skillnets programme supports groups of enterprises in establishing training networks.

Recommendation 8

- **Skillnets should encourage the formation of e-Business training networks.**

7.9 Professional Organisations

One of the consistent themes emerging from interviews and an industry workshop had to do with problems with the quality of professional services in e-Business strategy and implementation available in Ireland. This is not surprising, given the large numbers of professionals entering the area, and given the high rate of change in the body of knowledge required. It is also unsurprising in the light of international research. However, given the central role that professional service providers play in designing and implementing e-Business strategies for most companies, it is a significant problem.

Significant educational work is done by professional organisations (in areas such as accountancy, consultancy and marketing), but the Expert Group believes it is important that they should do more.

Recommendation 9

- **Professional organisations whose members provide professional services in e-Business should move, primarily through Continuing Professional Education, to upgrade and make more consistent, the quality of e-Business strategy and implementation services provided by their members.**

7.10 Future Skills Supply Agenda

The research for this report has highlighted a number of areas of skills supply that should be addressed by the Expert Group in its continuing work. These include:

- **e-Business skills:** The supply and demand for these skills will be incorporated into the IT review by the Expert Group this year.
- **IT technical skills** – The Group is undertaking a further review of IT skills supply and demand this year.
- **Multimedia** – supply and demand for multimedia skills is being reviewed as part of the review of IT skills supply.
- **Internetworking** - supply and demand for Internetworking skills is being reviewed as part of the review of IT skills supply.
- **Other areas** - The rapid pace of developments in e-Business is likely to create new skills requirements in areas such as audiovisual production. The Expert Group will keep these under review.

Appendix 1 - Current Membership of Expert Group

Current Membership of Expert Group on Future Skills Needs:

Dr. Danny O'Hare (Chairperson)	President Emeritus, Dublin City University
Mr. Roger Fox (Joint Secretary)	FÁS
Mr. Séamus Gallen	Enterprise Ireland (National Software Directorate)
Ms. Una Halligan	Hewlett Packard-IBEC
Mr. John Hayden	Higher Education Authority
Mr. David Lowe	Goodbody Stockbrokers
Mr. Joe McCarthy	Arkaon
Mr. Paddy McDonagh	Department of Education & Science
Dr. Sean McDonagh	Director, Skills Initiative Unit
Mr. Michael McGrath	Conference of Heads of Irish Universities
Mr. Michael McKenna	Department of Enterprise, Trade & Employment
Mr. Niall O'Donnellan	Enterprise Ireland
Mr. Séamus Ó Moráin	Department of Enterprise, Trade & Employment
Mr. Lorcan Ó Raghallaigh (Joint Secretary)	Forfás
Mr. Dick Ryan	IDA Ireland
Mr. Eugene O'Sullivan	Department of Finance
Mr. Colm Regan	Forfás
Mr. Peter Rigney	Irish Congress of Trade Unions
Professor Frances Ruane	Trinity College Dublin

Alternates:

Mr. Ned Costello (Alternate to Mr Séamus Ó Moráin)	Department of Enterprise, Trade & Employment
Mr. Peter Lillis (Alternate to Mr Dick Ryan)	IDA Ireland
Mr. Pat Maher (Alternate to Mr Niall O'Donnellan)	Enterprise Ireland
Ms. Margo Monaghan (Alternate to Mr Michael McKenna)	Department of Enterprise, Trade & Employment
Mr. Sean Ó Foghlú (Alternate to Mr John Hayden)	Higher Education Authority
Mr. Gerry Pyke (Alternate to Mr Roger Fox)	FÁS

In attendance:

Mr. Séamus Bannon	Forfás
Dr. Noel Gillatt	Forfás
Ms. Kay Hallahan	Forfás
Ms. Brenda Gannon	Forfás

Appendix 2 – e-Business Skills Subgroup Membership

e-Business skills Subgroup Membership:

Mr. Joe McCarthy (Chairperson)

Ms. Brenda Gannon (Secretary)

Ms. Una Halligan

Dr. Sean McDonagh

Mr. Peter Lillis

Mr. Seán O’Foghlu

Ms. Margo Monaghan

Mr. Declan Hughes

Arkaon

Forfás

Hewlett Packard-IBEC

Director, Skills Initiative Unit

IDA

Higher Education Authority

DETE

Forfás