
Conor Moynihan
841119-p276
cjm1020s@gmail.com

School of Management
M.Sc. of Business Administration
Master Thesis
Contact Information

Author:
Conor Moynihan
Address: Corran, Waterfall, Near Cork, Ireland.
E-mail – cjm1020s@gmail.com

University Supervisor:
Philippe Rouchy
School of Management, BTH

Department of Business Administration
School of Management
Blekinge Institute of Technology
Box 520
SE-372 25 Ronneby
Sweden
Acknowledgements

I would like to begin by thanking my supervisor Mr. Philippe Rouchy for the choice of topic, and for his guidance throughout this thesis. The direction and motivation he gave me was invaluable for its completion. I am truly grateful for his feedback and literature review assistance.

Secondly I would like to thank Mr. Anders Nilsson, Dean of the School of Management for the working environment he provided for us at BTH and for the decisiveness he has shown at crucial stages of this student’s work process.

Finally I am thankful to all the staff at BTH and in particular the librarians whose help was immense during my time in Sweden.

Karlskrona, August 08
Conor Moynihan
Abstract

The case of the software industry in Ireland is particularly interesting as it is a unique example of a government led innovation in attracting and fostering the development of a knowledge based industry. Using a previous work of Eileen Drew (1994) as a starting point it tracks the growth of the industry in the 1990’s and into the 21st century during a boom period in the Irish economy known as the Celtic Tiger. Growth is measured by macro-economic factors such as employment and exports. In this 15 year period Ireland increased employment in the software industry from 8,000 to over 30,000 people and its software exports from 1 to 15 billion euro.

The government’s influence is examined through the National Development Plans, The Strategy for Science Technology and Innovation 2006-2013 and by investigating the roles of the state sponsored bodies.

Combining various secondary sources it gives a breakdown of the modern software industry in the areas of export, specialization, firm size and type. Ireland’s competitiveness and productivity environment is inspected. The thesis highlights industry problems including:

1. Lack of software graduates,
2. Over dependence upon foreign investment,
3. Inability of indigenous software companies to grow,
4. Loss of competitive advantage.

While influencing factors such as geography and demographics, which contributed to the software industry’s success story are impossible to replicate, there are lessons to be learned of how a government led, innovative, consistent and educational based policies combined, with a business friendly environment, can be used to transform a struggling economy into a modern knowledge based one.
# Table of Contents

Introduction 8

   Development of Information Technology in Ireland 13
   Software Industry Prior to 1989 14
   The Role of State Sponsored Organizations 19
   Education Setting the Seeds for Further Growth 22

   A Time of Change 24
   Growth of the Software Industry in the 1990s 25
   Contributory Factors to the Development of the Software Industry in Ireland 29
   The Software Industry in the 21st Century 32

3. Role of Government in the Software Industry 35-48
   The National Development Plans 36
   Restructuring of the State Bodies 38
   Government Influences in the Software Industry 40
   Industry Associations 46

4. The Software Industry in Detail 49-64
   A Break Down of the Irish Software Industry in 2005 50
   Exports of Computer Services by Location 2005 51
   Overview of Firms In the Software Industry 53
   Software Specialization 55
   Ireland’s Productivity and Competitiveness 60
5. Problems, Profiles and the Future of the Irish Software Industry 65-76

Industry Problems 66
Profiles of Companies in the Irish Software Industry 70
The Future of the Irish Software Industry 74

Bibliography 77

Appendices
Appendix 1: Abbreviations 81
Appendix 2: List of Websites 83
Appendix 3: List of HEA Funded Universities and Institutes 84
Appendix 4: List of ISA Registered Companies 85

List of Tables
Table 1.1: Growth of employment in the Irish Computing Industry between 1982-1988
Table 1.2: Irish Computing Industry: division of turnover 1986 in £IR
Table 1.3: Irish Computer Industry 1986 in £IR
Table 1.4: Overview of firms in the software industry at 1987
Table 1.5: Location of Irish software companies 1988
Table 1.6: Numbers trained on FAS electronics-related courses, 1983-1986
Table 2.1: Average annual change in GDP 1989-2006
Table 2.2: Employment in the software industry during the 1990s
Table 2.3: Exports of the software industry during the 1990s
Table 2.4: Export propensities of indigenous and foreign owned service firms 1995-1999
Table 2.5: Breakdown of Irish software goods exports by destination 1998
Table 2.6: Population of Ireland from 1991 to 2006
Table 2.7: Percentage population under 25 in the years 2010 & 2015
Table 2.7: Migration Trends 1987-2007
Table 2.8: Precentage of population that has attained at least tertiary education.
Table 2.9: Skilled workforce science and technology graduates per thousand in the 20-29 age group
Table 2.10: Employment in the software and computer hardware industry in Ireland 1996-2006
Table 2.11: Exports of the software industry from 1997-2005

Table 3.1: Programmes and policies from the ICT sector under the NDP 2000-2006

Table 4.1: The software industry in 2005
Table 4.2: Computer services exports by locations 2005
Table 4.3: OECD survey respondents classified by size of company (% of total respondents)
Table 4.4: OECD Survey respondents classified by nature of company (% of total respondents)
Table 4.5: OECD Survey - wholly Irish owned and foreign owned firms classified by size
Table 4.6: Areas of software development in Ireland 2002
Table 4.7: OECD survey respondents classified by core technologies (% of companies)
Table 4.8: OECD survey respondents classified by non-core technologies (% of companies)
Table 4.9: OECD Survey - Core and non-core technology companies classified by nature of investment (% of companies)
Table 4.10: OECD Survey - Small-sized core and non-core technology companies classified by nature of investment (% of companies)
Table 4.11: OECD Survey - Medium-sized core and non-core technology companies classified by nature of investment (% of companies)
Table 4.12: Innovative enterprises as a total number of enterprises 2004
Table 4.13: Patent applications to the EPO 2003
Table 4.14: Number of enterprises engaged in high-tech manufacturing and knowledge intensive services 2003
Table 4.15: Gross expenditure on R&D (GERD) as a percentage of GDP/GNP 1996-2006

Table 5.1: Labour cost per employee in private sector (% of increase) 2005-2008
Table 5.2: No. of honours bachelor degrees awarded and projected to be awarded 2002-2010

List of Figures
Figure 1.1: Regional map of Ireland
Figure 2.1: Education map of Ireland
Figure 3.1: Forfás, its sister agencies and advisory councils
Introduction

Software can be defined as

“both the instructions that direct the operation of computer equipment and the information, or data, that the computer manipulates”. (Schware, 1987)

It can exist in many different forms. US researchers of the Bureau of Economic Analysis (BEA) have differentiated software products into 3 categories:

1- Prepackaged software: Prepackaged on the shelves software such as Microsoft products
2- Custom Software: Such as SAP, software that are installed by consulting companies to clients.
3- Own-account Software: These are the software that are designed for specific purpose and work for only one thing, like software in an ATM machine, software for reservation of plane tickets (in one company), software for electronic guidance systems in combat planes, software platforms such as “smart mobile phone software platform”.

The story of the software industry in Ireland is unique in its success. A country 4 million, Ireland has become one of the major international players within the industry and software has become a key element of the Irish economy. This story is even more remarkable considering Ireland’s humble economic conditions during the majority of the 20th century. The growth of the industry coincided with Ireland’s economic awakening during the late 1980s and the 1990s, a period known as the Celtic Tiger. In the space of 10 years Ireland was transformed from one of Europe’s poorest countries to one of its richest.

Riding upon the crest of foreign direct investment into Ireland (particularly from the US), the software industry came to providence. The industry was targeted for growth and nurtured by the Irish government, who saw knowledge intense activities mainly Information Communications Technology and pharmaceuticals as their economic opportunity. Irelands low corporate tax rate and low labour costs initially attracted mainly manufacturing activity and clusters began appearing around Ireland’s major cities: Dublin, Cork, Galway and Limerick.
The Irish government continued to increase the skill levels of its population through investment in its education. The nature of activity in the industry became more knowledge intensive and skill orientated. Companies began to diversify out into more sophisticated areas such as supply chain management, localization, customer services, limited product development and engineering. Ireland became the natural choice for companies to locate their European headquarters and thus it has earned the nickname the “Silicone Valley of Europe”.

This thesis examines this development starting from 1989, when the software industry was still in its infancy and the Celtic Tiger had yet to roar, and follows it through to today’s striving example of state driven economic development. It draws from a number of fragment sources to piece together an overview of modern Ireland’s software industry. It finishes by speculating on the future of the software sector in Ireland.

Methodology
This thesis is based primarily upon secondary data retrieved from various sources such as government publications, software industry associate bodies, Central Statistics Office, Central Bank, European statistical databases, United Nations reports, Organisation of Economic Co-operation and Development (OECD) and any other relevant publication. The information was located and recovered using online searches. This information and statistics laid a solid foundation, while each source became another building block to construct the overview. Coupled with these online searches I also emailed various bodies with information and advice requests regarding the Irish software sector. This contact, while not providing a great deal of extra information, was immeasurable due to its allowance for interactions and clarifications which created a clearer more manageable view of the industry. On two occasions I travelled to Dublin to investigate the archives of the Dublin Business Library in Henry Street.
**Research Limitations**

The main problem encountered while constructing this thesis was the lack of precise and consistent records for the software industry. The figures for software are incorporated in computer services\(^1\) or incorporated as part of the larger definition of information communications technology in the national accounts of Ireland. While the National Software Directorate conducted detailed annual reviews of the industry during the 90s that organisation has been disbanded and the original reports were unavailable. Another problem with the measurement of software is that it may not always exist as a physical entity. Instead of constant and detailed information the thesis has been forced to draw from a patch work of various sources whose primary subject matter is not always the software industry of Ireland. This thesis attempted to weave these various treads together to form a clear picture of the overview and the development of the Irish software industry since 1989.

**Thesis Structure**

The thesis is broken down into 5 chapters:

1. **A Review of the Software Industry Context Prior to 1989:**
   Working mainly with a report called “Development of Information Technology in Ireland” by Eileen Drew (1994), this chapter reviews the development of the software industry prior to 1989, giving it’s historical development as well as macro-economic indicators such as turnover, software exports, the number of indigenous firms, the numbers of IT employees employed by the industry, the size of companies, their locations and government influences.

2. **Software in Ireland 1990-2005: The Celtic Tiger:**
   This chapter begins by illustrating the growth experienced by Ireland during the Celtic Tiger, followed by the growth of the software industry during this time. It then briefly examines the contributing factors to this growth. The chapter ends with the software industries growth in the 21\(^{st}\) century.

---

\(^1\) The computer services component consists of hardware and software-related services and data processing services.
3. Role of Government in the Software Industry:
The focus in this chapter is on the Irish government’s role in the software industry. It reviews the government’s National Development Plans and its state agencies. It then shows the various industry associations that affect the software sector.

4. The Software Industry in Detail:
This chapter pieces together scattered information from various sources to give an overview of the modern Irish software market. It presents a breakdown of the industry in 2005 and a breakdown of exports of Irish computer services by destination 2005. Followed by this, it presents some macro-economic indicators including size of firms, type of firms and software specialization in the industry. It draws a lot from an OECD mail survey completed in 2003 in Knowledge Intense Service Activities in the Irish Software Industry by Laura E. Martinez-Solano, Majella Giblin and Edel Walshe (2006). The chapter finishes by describing the current climate of productivity and competitiveness in Ireland by analyzing the 2008 Eurostat publication.

5. Problems, Profiles and the Future of the Irish Software Industry:
The chapter begins by raising some of the problems facing the Irish software industry. After this it profiles some of the companies operating in the sector. This more qualitative approach is aimed at giving the reader a better feel for the industry. This chapter and the thesis closes by speculating on the future of the Irish software Industry.
1 A Review of the Software Industry Context in Ireland Prior to 1989

Working mainly with a report called “Development of Information Technology in Ireland” by Eileen Drew (1994), this chapter reviews the development of the software industry prior to 1989 giving it’s historical development as well as macro-economic indicators such as turnover, software exports, the number of indigenous firms, the numbers of IT employees employed by the industry, the size of companies, their locations and government influences.
“Development of Information Technology in Ireland” .................................................................

In 1989 Eileen Drew was commissioned by the United Nations University/Trinity College Dublin to write a report on the “Development of Information Technology in Ireland”. This formed part of a larger study published by The United Nations University in 1994 entitled “Information Technology in Selected Countries”. The countries assessed in the report were Ireland, Ethiopia, Nigeria and Tanzania. In all, the study included 36 participants in its preparation under the guidance of Eileen Drew and the project director F. Gordon Foster. Eileen Drew was the sole author of the country report on Ireland.

In her report, after placing information technology (IT) in a historical and policy oriented perspective, notably in clarifying the Irish Government’s perspective, Drew examines a number of sub-areas of the information technology industry in Ireland:

1. The electronics industry.
2. The software industry.
3. The telecommunications infrastructure for IT.
4. Manufacturing applications of information technology.
5. IT applications in the service sector.

She also draws remarks related to the impact of Information Technology in the society at large. Notably, she looked at its impact on employment as well as on education and training of information technology around the country.

Drew’s work on the development of the software industry provided an interesting area to investigate further in this thesis. Firstly, the history of Information Technology has moved on very quickly since Drew’s work. Furthermore it is also worth considering further the actual stage of the information technology industry development in Ireland from today’s perspective. In her report Drew provides a comprehensive overview of the industry, its historical development, and provides a number of macro-economic indicators incorporating the industry’s turnover, software exports, the number of indigenous firms, the numbers of IT employees employed by the industry, the size of companies and their locations.
Prior to 1989 the software industry, and indeed the computing industry in Ireland was still in its infancy but the Irish government set out to create the condition for economic growth in the country by clearly pursuing goals whereby IT was on the top of the list. The government by means of organisations such as the Irish Development Authority had already been setting the seeds of growth through actively and aggressively pursuing major computer companies and by persuading/enticing them to locating in Ireland. During the 1980s various companies that were courted by the IDA into locating in Ireland: Apple (1980), Fujitsu (1980), Wang (1980), AT & T (1982), IBM (1983), Lotus (1984), Microsoft (1985), Oracle (1987), Claris (1988) and Corel (1989). One of the major baiting tools used by the government at the time was having the lowest rate of tax on manufacturing in Europe at 10%. This also applied to a defined range of internationally traded services and was introduced since 1980 after an E.E.C. challenge on tax relief on all export profits. Various grant incentives and other tax reliefs were offered to further encourage foreign direct investment, particularly in the area of high-tech industries mainly computers and pharmaceuticals.

Information technology was identified as a key growth sector in the 1970’s by the IDA, which invested heavily in the training of IT individuals. Ireland saw a doubling of it’s employment in the computer services industry between the year 1982 and the year 1987. In 1986 there was a 17% increase in demand for software specialists and a 16% increase in demand for marketing specialists in the Irish computer industry (European Computing Services Association, 1987).
The whole computing industry had a turnover of IR£160 million (€203 million) in 1986 and of this the largest sector was the software industry with a turnover of €105 million. This accounted for 52% of the industry turnover in 1986. €40 million of this was generated from indigenous companies. Most exports of foreign computer companies were estimated to be in the area of software.

Irish computing industry: division of turnover 1986 in £IR,
Because of the limited size of the domestic market, Irish firms tend to seek overseas sales at an earlier stage of their development than their counterparts in larger economies. (Enterprise Ireland)

By 1988 there were 305 software companies registered with the IDA. Of these companies only nine had more than 50 employees. Of these nine, five were foreign-owned. Of the remaining 296 indigenous companies dominated. They accounted for 73.7% (218 firms).

**Overview of firms in the software industry at 1987**

<table>
<thead>
<tr>
<th>Size category</th>
<th>Irish companies</th>
<th>Foreign companies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Medium (50-199 employees)</td>
<td>4</td>
<td>44.4</td>
<td>5</td>
</tr>
<tr>
<td>Small (&lt;50 employees)</td>
<td>218</td>
<td>73.7</td>
<td>78</td>
</tr>
<tr>
<td>Total</td>
<td>222</td>
<td></td>
<td>83</td>
</tr>
</tbody>
</table>

**Table 1.3: Irish Computer Industry 1986 in £IR**

**Table 1.4: Overview of firms in the software industry at 1987**
As you can see from the IDA data table on the previous page the focal point of the software industry is located in Ireland’s east coast – i.e. the greater Dublin area. This cluster accounts for 77.8% of all sized medium firms and 70.3% of small firms in the total industry. It is also where the majority of foreign firms in the industry have chosen to locate. There are some smaller clusters to the mid-west, south west and west.

The IDA through its International Services Programme sought foreign direct investment in computer services, R&D services, healthcare, training services, and international financial
services. During the 1980s the IDA shifted their grant incentive schemes to endorse more labour intensive initiatives. Although grants were still made available for capital projects including machinery and plants, grant aid was now focused towards areas such as feasibility grants, employment and training grants. In order for a company to be entitled to this state aid it had to provide an internationally traded service and be able to export it. As a result of this new policy, and a realization of the growing market for computer services, there has been a rapid increase in the number of start-ups among software companies, which are the seed for further innovations. Of the above 305 companies listed by the IDA, 158 (52 per cent) were established since the beginning of 1980. Of these, 100 (approximately one-third of existing companies) came into existence only since the beginning of 1985. This represents a considerable achievement, particularly in the small company category (Drew 1994).

A quote from Nolan epitomises the feeling within the software industry at the time:

“The total value of Irish software exports is estimated to be around IR£100 million and this is expected to double within five years. The prevailing mood in the Irish software industry is one of optimism, despite some closures of software houses. It is predicted that a greater emphasis will have to be placed on marketing, rather than solely on product development.” (Nolan, 1987)
The Role of State Sponsored Organisations

Up to 1989 there were 3 major state-sponsored bodies contributing to growth in the Irish IT and software industry. These were the Irish Development Authority (IDA), The Irish Science and Technology Agency (EOLAS) and Foras Áisleanna Saothair (FÁS – The Training and Education Authority). These were separate entities and were not bound by one specific IT plan for growth, but each reported back separately to the government or government minister responsible.

The Industrial Development Authority (IDA)
IDA Ireland is an Irish Government agency with responsibility for securing new investment from overseas in manufacturing and internationally traded services sectors. It also encourages existing investors to expand and develop their businesses. It has existed since 1959 and is the oldest such organization in the world. (About Us: Irish Development Authority).

**IDA Ireland Mission Statement**

"We will win for Ireland, its people and its regions, the best in international innovation and investment so as to contribute to the continued transformation of Ireland to a world-leading society which is rich in creativity, learning and personal and social well-being.

We will work in partnerships with other organizations to enhance the best of Irish capabilities and talents and match them to the best of global investment.

We will carry out our mission with integrity, professional excellence and responsiveness to all with whom we work or are in contact."

Retrieved from About Us: Irish Development Authority 2008
During the late 70s it identified the Computer Industry as a target industrial growth sector. It aggressively sought out big multinational companies to first locate and then develop their European base in Ireland. It sought growth in skilled and sustainable labour areas. The IDA at the time had the power to provide various grant incentives (including capital grants, training grants and feasibility study grants) and also to undertake national and regional development plans which would then be government funded. The IDA could acquire large industrial sites to house further development and/or for the creation of business clusters.

**The Irish Science and Technology Agency (EOLAS)**

Established in 1977, EOLAS is a state-sponsored body, which since its inception has focused on the IT area. In 1981 it produced an extensive report into the Irish Computing industry entitled *Microelectronics: The Implications for Ireland*. It recommended active policies for the sustainability of the IT industry in general:

- the need to create awareness of IT among Irish industrialists and for expertise and facilities to be made available for this;
- funding at tertiary level of computer-related education and the extension of information technology appreciation into all secondary schools;
- pilot projects of IT applications in the public service. (National Board for Science and Technology, 1981)

In 1985 it published a further report intended to act as a brochure for potential IT investors. This was entitled “Innovation. A Guide”. In this report EOLAS outlined various ways in which potential investors could benefit from the current business environment in Ireland e.g. IDA grant and tax relief methods. EOLAS also had the responsibility:

1. To provide technical advisory services to support the continued efficient operation of industry.
2. To provide services designed to assist the growth and development of industry by the identification and provision of new technological investment opportunities.
Foras Áisleanna Saothair (FÁS)

Foras Aisleanna Saothair (it’s English name being The Training and Employment Authority) has been around in various forms since 1967. It has the stated aim of providing training in order to achieve national objectives. In 1987 FAS offered 8 various computer related training programmes. In 1986, 955 people received training through FÁS initiatives. The majority received training in electronic assembly. (see table below)

Numbers trained on FÁS electronics-related courses, 1983-1986


<table>
<thead>
<tr>
<th>Course</th>
<th>Year</th>
<th>1983</th>
<th>1984</th>
<th>1985</th>
<th>1986</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training Centres Division</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronic Assembly</td>
<td></td>
<td>426</td>
<td>504</td>
<td>530</td>
<td>604</td>
</tr>
<tr>
<td>Basic Electronics</td>
<td></td>
<td>91</td>
<td>147</td>
<td>120</td>
<td>62</td>
</tr>
<tr>
<td>Digital Electronics</td>
<td></td>
<td>16</td>
<td>39</td>
<td>51</td>
<td>70</td>
</tr>
<tr>
<td>AnCO Electronics</td>
<td></td>
<td>63</td>
<td>54</td>
<td>97</td>
<td>54</td>
</tr>
<tr>
<td>AnCO Microelectronics</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronic Servicing</td>
<td></td>
<td>14</td>
<td>48</td>
<td></td>
<td>33</td>
</tr>
<tr>
<td>Introduction to Electronics</td>
<td></td>
<td>65</td>
<td>45</td>
<td>26</td>
<td>57</td>
</tr>
<tr>
<td>Electronic Assessment</td>
<td></td>
<td>78</td>
<td>111</td>
<td>103</td>
<td>54</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>739</td>
<td>914</td>
<td>993</td>
<td>955</td>
</tr>
<tr>
<td>Total female</td>
<td></td>
<td>350</td>
<td>438</td>
<td>464</td>
<td>408</td>
</tr>
<tr>
<td>Exernal Training Division</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCB Design and Layout</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>Advanced Manufacturing Technology</td>
<td></td>
<td>18</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Hardware Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Component Research Technician</td>
<td></td>
<td>20</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro Maintenance</td>
<td></td>
<td>102</td>
<td>89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microprocessor System Design</td>
<td></td>
<td>21</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Communications</td>
<td></td>
<td>64</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computerized POS Technician</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Microprocessor/Electronics</td>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>245</td>
<td>348</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total female</td>
<td></td>
<td>9</td>
<td>38</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
There are a number of points which can be inferred from this table. The main areas of training are occurring in the manufacturing, services and the micro processing areas. It is male dominated with females only accounting for 34% of those trained in 1986 and 38% in 1985.

**Education: Setting the Seeds for Further Growth**

Education has always had a central role in society. The Irish Government was quick to realize that “knowledge is the primary resource for individuals and for the economy overall (see Drucker 1992)” and has invested heavily in its human capital. Second level education was made free in 1968 and compulsory in 1972.

“We must invest in and support our greatest asset – our people and their innovation and knowledge” (About Us: Irish Development Authority)

Third level universities and Institutes of technology are similar to second level education in being free. In the early 1970’s Ireland invested heavily in the creation of Regional Technical Colleges, which would later become Institutes of Technology to complement its university system. This saw a significant increase in the numbers of people attending a third level institution fulltime from 20,969 in 1965/66 to 69,988 in 1990/91 (CSO Statistics). Ireland’s human capital was one of the primary baiting tools in luring foreign direct investment and fueling growth in innovative industries.
This chapter begins by illustrating the growth experienced by Ireland during the Celtic Tiger, followed by the growth of the software industry during this time. It then briefly examines the contributing factors to this growth. The chapter ends with the software industries growth in the 21st century.
The Irish economy has undergone radical changes since the time that Drew’s report was published. Ireland is now one of the IT hubs of Europe. Many companies have chosen to center their European operations here including Intel, Yahoo, Oracle, Symantec, Adobe, Microsoft, HP, Apple, Google, Amazon.com and Palm. Ireland remains a favored area for investment for U.S. companies particularly in the area of IT. The case of Ireland’s economic growth in the last two decades is well documented. The country has gone through an unprecedented boom period in its history transforming its economic landscape. Over the past 15 years, Ireland has migrated from being an agriculture dependent economy to one which is firmly based on modern, knowledge based industries such as pharmaceuticals, electronics, information technology, financial services, shared services and so on (European Council Of American Chambers of Commerce). This boom period known as the “Celtic Tiger” began in the early 1990’s. Between 1990 and 1995 the economy grew at an annual growth rate of 4.8% and, between 1995 and 2000 it averaged 9.5% growth (Enterprise Ireland, 2006). Growth rates since then have remained in the 4-5% range until 2008. The Celtic Tiger has stopped roaring with the Ulster Bank Quarterly Update July 2008 predicting the economy to contract by 0.3% and to grow by only 0.5% in the following year. However in 2010 it is expected to be back on a par with the EU GDP average growth rate (Ulster Bank, 2008).

### Table 2.1: Average annual change in GDP 1989-2006

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>6.83</td>
<td>6.64</td>
</tr>
<tr>
<td>U.K.</td>
<td>1.96</td>
<td>2.76</td>
</tr>
<tr>
<td>European Union (15 members)</td>
<td>2.14</td>
<td>2.23</td>
</tr>
<tr>
<td>United States</td>
<td>2.53</td>
<td>2.83</td>
</tr>
</tbody>
</table>

*Source: OECD Economic Outlook December 1998, Eurostat General Economic Background April 2008*
The Growth of the Software Industry in the 1990s

Software development has been one of the most rapidly expanding sectors in Ireland over the last two decades (KPMG). During the 1990s the software industry underwent immense growth. The pace of this growth was unique even in a thriving economy. By 2000 Ireland had become the European manufacturing and distribution center for the software of the world’s top software vendors accounting for over 40% of all packaged software and 60% of all business software sold in Europe. Ireland was also ranked first worldwide of software services exported (Organisation for Economic Co-Operation and Development, 2002).

The rising cost base and education levels of Irish labour meant that the nature of investment and production in Ireland also became more sophisticated. Building upon Ireland’s previous competencies and skill levels, manufacturing became more advanced. Newer entrants such as Dell Computer Corp. moved into areas of supply-chain management and localization for the European market. Software localization is adapting software to the culture of the target country so it can reach a greater audience. Existing firms began to expand the scope of their operations into areas including supply-chain management, customer services, limited product development and engineering. In many cases the original core manufacturing facilities almost disappeared. For example, Apple Computers in Cork shrunk to 15% of facility activity, replaced by the company’s chief European software development and support center. Ireland’s increasing costs made survival more difficult for manufacturing activities that were not either capital-intensive or high added value. (Begley, Delany, & O’Gorman, 2005)

The high concentrations of ICT industries in Ireland also began to benefit from the cluster effect. Ireland has one of the highest concentrations of ICT activity and employment in the OECD. Clusters are located in Dublin, Cork, Limerick/Shannon and Galway. The growth of Ireland’s ICT sector is seen as a central driver in Ireland’s transition to a knowledge based economy.
In the time period between 1991 and 1999 the numbers of people employed in the Irish software industry grew over 300%. This was over 4 times the national average growth for industries in Ireland during this period. Ireland became known as the Silicone Valley of Europe.

Similarly, the export numbers for the software industry also grew by over 300% in the period between 1991 and 1999. Growth in exports had an annual average of approximately 30% (see table 2.3). Ireland is a small open economy and the software industry is geared to exporting, particularly in the computers and software sectors. Foreign owned companies are more export orientated than their indigenous counterparts as can be seen in the table 2.4. Between 1995 and 1999 they exported approximately 94% of their software development output compared to approximately 50% by indigenous companies.
Export Propensities of Indigenous and Foreign Owned Services Firms

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Indigenous Total Exports as a % of Output</td>
<td>33.7%</td>
<td>39.5%</td>
<td>33.2%</td>
<td>35.3%</td>
<td>32.5%</td>
</tr>
<tr>
<td>Indigenous Software Development</td>
<td>47.4%</td>
<td>46.9%</td>
<td>45.6%</td>
<td>51.9%</td>
<td>47.6%</td>
</tr>
<tr>
<td>Other Indigenous Computer Related Activity</td>
<td>84.1%</td>
<td>83.8%</td>
<td>78.1%</td>
<td>68.1%</td>
<td>65.6%</td>
</tr>
<tr>
<td>Foreign Owned Total Exports as a % of Output</td>
<td>87.9%</td>
<td>88.8%</td>
<td>87.5%</td>
<td>87.8%</td>
<td>91.7%</td>
</tr>
<tr>
<td>Foreign Owned Software Development</td>
<td>92.7%</td>
<td>93.7%</td>
<td>93.7%</td>
<td>94.1%</td>
<td>93.5%</td>
</tr>
<tr>
<td>Other Foreign Owned Computer Related Activity</td>
<td>96.3%</td>
<td>89.4%</td>
<td>73.6%</td>
<td>74.6%</td>
<td>94.8%</td>
</tr>
</tbody>
</table>

Table 2.4: Export propensities of indigenous and foreign owned service firms 1995-1999
Source: The Changing Nature of Manufacturing and Services, Forfás publication July, 06.

In 1997 seven of the world’s top ten independent software companies (Microsoft Computer Associates, Lotus, Oracle, Informix, Novell, Sap and Symantec) had facilities in Ireland. In 1998 foreign multinationals represented 120 of the 760 companies. However they accounted for 83.5% of revenues and 87.6% of the sector’s exports. There were 21,630 people employed by the industry. (Organisation for Economic Co-operation and Development, 2000).

Break Down of Irish Software Goods\(^2\) Exports by Destination 1998

Total : US$3,290 million

<table>
<thead>
<tr>
<th>Destination</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>12%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>21%</td>
</tr>
<tr>
<td>Germany</td>
<td>18%</td>
</tr>
<tr>
<td>Other EU</td>
<td>25%</td>
</tr>
<tr>
<td>Other OECD</td>
<td>11%</td>
</tr>
<tr>
<td>Non-OECD</td>
<td>8%</td>
</tr>
<tr>
<td>Japan</td>
<td>3%</td>
</tr>
<tr>
<td>United States</td>
<td>2%</td>
</tr>
</tbody>
</table>

Table 2.5: Breakdown of Irish software goods exports by destination 1998

\(^2\) Does not include service products for which statistic were not available.
On a note of caution, exports are overstated due to companies wishing to take advantage of Ireland’s low tax rate. Transfer pricing is another problem caused by this rate (Foley & McAleese, 1991). Transfer pricing is value placed on transfers within an organization, used as a means of allocating costs to various profit centres. Companies often abuse this to allocate profit to a lower tax region i.e. from the USA to Ireland. This abuse is illegal but inevitable as it is very difficult for a government to monitor.

The reasons for the intense growth rate in the Irish economy and the software industry during the 1990s will be discussed in the following section.
Contributory Factors to the Development of the Software Industry in Ireland

The development of the software industry in the 90s was not a fluke but the combination of a number of contributing factors. Some are natural and some are a product of government policies aimed to nurture its growth. (see Ryan 1997)

1. The English Language

English is the dominant language within IT giving Ireland a strong advantage over non-native speaking countries. As most of the major players in the software industry emanated from the U.S., Ireland held a natural advantage over many of its competitors for these investments.

2. A youthful population and a rapidly expanding labour supply

Between the census in 1991 and the census in 2006 the Irish population grew by 714,129 to 4,239,848 people. This increase of 20.25% in just 15 years has helped sustain the growth in the economy. Ireland has the youngest population in Europe and is projected to maintain this advantage for quite some time.

<table>
<thead>
<tr>
<th>Census Year</th>
<th>Males</th>
<th>Females</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>1,753,418</td>
<td>1,772,301</td>
<td>3,525,719</td>
</tr>
<tr>
<td>1996</td>
<td>1,800,232</td>
<td>1,825,855</td>
<td>3,626,087</td>
</tr>
<tr>
<td>2002</td>
<td>1,946,164</td>
<td>1,971,039</td>
<td>3,917,203</td>
</tr>
<tr>
<td>2006</td>
<td>2,121,171</td>
<td>2,118,677</td>
<td>4,239,848</td>
</tr>
</tbody>
</table>

Table 2.6: Population of Ireland from 1991 to 2006
Source: Central Statistics Office of Ireland.

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage population under 25 in the years 2010 &amp; 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>34.4 33.5</td>
</tr>
<tr>
<td><strong>Ireland</strong></td>
<td>34.1 33.2</td>
</tr>
<tr>
<td>France</td>
<td>30.4 29.7</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>30.4 29.5</td>
</tr>
<tr>
<td>Netherlands</td>
<td>29.6 28.6</td>
</tr>
<tr>
<td>Europe</td>
<td>28.0 26.4</td>
</tr>
<tr>
<td>Hungary</td>
<td>27.0 25.6</td>
</tr>
<tr>
<td>Portugal</td>
<td>26.6 25.8</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>26.1 24.3</td>
</tr>
<tr>
<td>Germany</td>
<td>24.9 23.4</td>
</tr>
<tr>
<td>Spain</td>
<td>25.1 24.7</td>
</tr>
<tr>
<td>Japan</td>
<td>23.3 22.1</td>
</tr>
</tbody>
</table>

Table 2.7: Percentage population under 25 in the years 2010 & 2015
Ireland has also seen a reversal in its migration patterns (see table 2.7) with non-nationals contributing to the economic drive. It has become a land of opportunity, with 419,733 non-national residents accounting for approximately 10% of the population. Many of the Irish graduates who left in search of work during the high emigration years of the 1980’s have returned when the economic conditions in Ireland allowed, bringing with them their experiences.

### Table 2.7: Migration Trends 1987-2007. Source: Central Statistics Office of Ireland Database

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Migration</th>
<th>Outward Migration</th>
<th>Inward Migration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>-1.4</td>
<td>5.4</td>
<td>4.0</td>
</tr>
<tr>
<td>1988</td>
<td>-6.8</td>
<td>10.2</td>
<td>3.4</td>
</tr>
<tr>
<td>1989</td>
<td>-4.2</td>
<td>7.6</td>
<td>5.8</td>
</tr>
<tr>
<td>1990</td>
<td>-1.7</td>
<td>4.4</td>
<td>6.1</td>
</tr>
<tr>
<td>1991</td>
<td>1.4</td>
<td>5.5</td>
<td>6.9</td>
</tr>
<tr>
<td>1992</td>
<td>-1</td>
<td>4.9</td>
<td>5.7</td>
</tr>
<tr>
<td>1993</td>
<td>-0.9</td>
<td>6.6</td>
<td>5.0</td>
</tr>
<tr>
<td>1994</td>
<td>1.2</td>
<td>6.8</td>
<td>8.0</td>
</tr>
<tr>
<td>1995</td>
<td>2.8</td>
<td>6.6</td>
<td>9.4</td>
</tr>
<tr>
<td>1996</td>
<td>1.7</td>
<td>5.6</td>
<td>9.7</td>
</tr>
<tr>
<td>1997</td>
<td>1.4</td>
<td>10.0</td>
<td>10.5</td>
</tr>
<tr>
<td>1998</td>
<td>-0.1</td>
<td>1.2</td>
<td>14.5</td>
</tr>
<tr>
<td>1999</td>
<td>-0.9</td>
<td>1.4</td>
<td>21.5</td>
</tr>
<tr>
<td>2000</td>
<td>-0.1</td>
<td>1.2</td>
<td>29.9</td>
</tr>
<tr>
<td>2001</td>
<td>1.2</td>
<td>2.8</td>
<td>27.2</td>
</tr>
<tr>
<td>2002</td>
<td>4.1</td>
<td>12</td>
<td>23.3</td>
</tr>
<tr>
<td>2003</td>
<td>11.8</td>
<td>21.4</td>
<td>19.4</td>
</tr>
<tr>
<td>2004</td>
<td>15.8</td>
<td>29.9</td>
<td>23.3</td>
</tr>
<tr>
<td>2005</td>
<td>15.8</td>
<td>21.4</td>
<td>25.7</td>
</tr>
<tr>
<td>2006</td>
<td>19.0</td>
<td>23.3</td>
<td>25.7</td>
</tr>
</tbody>
</table>

The government’s emphasis on education had been one of the decisive factors in the growth of the Irish economy and indeed the software industry.

### Table 2.8: Higher Educational Achievement: % of population that has attained at least tertiary education

<table>
<thead>
<tr>
<th>Country</th>
<th>% of population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>40.00</td>
</tr>
<tr>
<td>USA</td>
<td>39.00</td>
</tr>
<tr>
<td>France</td>
<td>38.00</td>
</tr>
<tr>
<td>Spain</td>
<td>38.00</td>
</tr>
<tr>
<td>Netherlands</td>
<td>34.00</td>
</tr>
<tr>
<td>UK</td>
<td>31.00</td>
</tr>
<tr>
<td>Germany</td>
<td>23.00</td>
</tr>
</tbody>
</table>

Source - IMD World Competitiveness Yearbook, 2007
Ireland has 7 universities and 14 institutes of technology\(^3\), which shows the emphasis the government places upon technology and fostering its development in Ireland.

The education system in Ireland produces over 35,000 graduates every year. Since 1992 there has been an increase of 35% in students studying third level engineering/ technology courses (Higher Education Authority of Ireland). 40% of the Irish population now attain at least a tertiary education. This is the highest rate within the E.U. Most of Ireland’s recent graduates have been in the areas of science and technology.

| Skilled Workforce Science and Technology graduates per thousand in the 20-29 age group. |
|-----------------------------------------------|----------------|
| Ireland                                      | 23.2 |
| France                                       | 19.6 |
| UK                                           | 16.2 |
| USA                                          | 10.2 |
| Germany                                      | 8.2  |
| Portugal                                     | 6.3  |
| Netherlands                                  | 5.8  |

Table 2.9 Skilled workforce science and technology graduates per thousand in the 20-29 age group.


Ireland produced over 48,000 graduates in 2004, and of these, almost 57% are graduates with a qualification in engineering, computer software, business studies and science (Enterprise Ireland, 2006).

4. *Attracting Substantial Inward Investment*

The Irish Development Authority has remained active and extremely successful in attracting foreign direct investment to Irish soil. This foreign investment has proved a catalyst for smaller indigenous ventures. The wave of investment continued from the late 1980s into the 1990’s.

Ireland has always been orientated toward US investments. Nearly 50% of all US software investment locates in Ireland (Shannon Development, 2007). In addition to first time investments from Intel, SAP, Sun, Novell, and Dell, Ireland’s existing FDI base – including

\(^3\) See appendix 3
Microsoft, IBM, Accenture, Ericsson, Motorola, Apple and EDS - began to expand their operations. Eight of the top ten software suppliers in the world have operations in Ireland and it continues to be a leading European location for technology companies, as demonstrated by recent investments, such as Siebel, SAP, Net IQ and Adobe (Irish Development Authority).

5. Business friendly taxation and incentive schemes

Ireland has continued its policy of low corporate taxes despite protests from its European neighbours. Its rate of 12.5% is among the most competitive in Europe and was introduced on all trading income commencing on the 1st of January 2003. This was as a response to protests against the previous 10% taxation rate on all manufacturing and most export goods. All those eligible for this rate as of 22nd of June 1998 were still able to avail of it until 2005 (financial services) and 2010 (non-financial services).

Ireland holds 44 double taxation agreements⁴ to ensure companies are not subject to tax twice on the same incomes. Ireland is also in negotiations to secure further double taxation agreements with the following countries: Argentina, Chile, Egypt, Kuwait, Malta, Morocco, Singapore, Tunisia, Turkey, Ukraine and Vietnam.

---

⁴ Australia, Austria, Belgium, Bulgaria, Canada, China, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Israel, Italy, Japan, Republic of Korea, Latvia, Lithuania, Luxembourg, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Poland, Portugal, Romania, Russia, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, the United Kingdom, the United States of America and Zambia.
The Software Industry in the 21st Century

Employment in the Irish ICT sector rose rapidly through the 1990s, peaking at over 80,000 in 2000. It fell to approximately 64,000 over the succeeding three years as Ireland continued its transition into the knowledge-based economy, and levelled off in 2004. It resumed growth in 2005 and 2006. Presently, the ICT sector employs 69,226 people representing around 8% of the Irish workforce – up 1% from the technology boom of the early 2000s. It has moved into higher value-added activities, and is again showing strong demand for people with high-level ICT skills. A greater share of ICT sector employment is now accounted for by people with high-level skills. (Expert Group on Future Skills Needs, 2008)

At the turn of the 21st century, Ireland’s now high cost levels saw many companies relocate manufacturing jobs to lower cost labour markets. The software manufacturing industry was going through a transition to higher-skilled, higher-value-added, innovative activities. Now new software investments in Ireland are more strategic, attracted by the higher education and adaptable work force, rather than their low cost. These new investments are characterised by Google, Yahoo Inc. and eBay setting up their European headquarters in Dublin. While attracting new investment, the Irish government is also trying to encourage existing operations to move up the value chain through various support and R&D grant schemes.

Employment in the Software and Computer Hardware Industry in Ireland

![Graph](image)

Table 2.10: Employment in the software and computer hardware industry in Ireland 1996-2006
Reproduced from Future Requirement for High-Level Skills in the ICT sector 2008
The following figures are related to agency supported enterprises only, however they represent the majority of the industry and are reflective of its makeup. In 2006, the software industry accounted for 27,411 jobs in Ireland; 15,866 of these were in foreign owned enterprise and the remaining 11,545 were in the indigenous software sub-sector (Expert Group on Future Skills Needs, 2008). The industry reached its peak in 2001 with approximately 32,000 employees. It also surpassed the then declining computer hardware sector as the single biggest employment component of the ICT industry. The industry declined in 2002 and 2003 back down to approximately 26,000 employees. However, in the following 3 years it grew by about 1.5% each year. This decline was a reflection of a global decline in ICT at the time.

<table>
<thead>
<tr>
<th>Year</th>
<th>Exports (million€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>5,436</td>
</tr>
<tr>
<td>1999</td>
<td>6,520</td>
</tr>
<tr>
<td>2001</td>
<td>10,000 approximately</td>
</tr>
<tr>
<td>2003</td>
<td>14,000 approximately</td>
</tr>
<tr>
<td>2005</td>
<td>15,000 approximately</td>
</tr>
</tbody>
</table>

Table 2.11: Exports of the software industry from 1997-2005

Source – National Software Directorate Annual Reports (97 & 99 figure)
Irish Software Association Pre-budget Submission (01 figure)
ICT Industry in Profile. Shannon Development 2004 (03 figure)
Speech of the Minister for Enterprise, Trade and Employment to the Irish Software Association Annual Conference 2006 (05 figure).

At the turn of the century, the software sector in Ireland was responsible for nearly 8% of Ireland’s GDP, and nearly 10% of its exports (HotOrigin, 2001). In contrast to the rise and fall of employment figures, the exports have steadily increased reaching an estimated €15 billion in 2005. €1.6 billion of this was attributed to the growing indigenous industry. The key markets for the indigenous industry were: USA 33%, UK 27%, rest of EU 15% and rest of world 25%. In 2004, the export propensities of indigenous and foreign owned companies engaged in software development had increased to 62.5% and 97.4%.
The focus in this chapter is on the Irish government’s role in the software industry. It reviews the government’s National Development Plans and its state agencies. It then shows the various industry associations that affect the software sector.
This chapter is concerned with how Irish governmental policies affect the Irish software industry. For that matter, information is provided by the National Development Plans (NDP’s) of Ireland. The NDP of Ireland provides an outline of the government plans for economic and social development. It is a road map for the future with spending allocations, projects, goals and ambitions timetabled for development. The current NDP is entitled “Transforming Ireland – A Better Quality of Life for All” and is due to run from 2007 to 2013. It represents a total investment of €184 billion of public, private and EU funds invested within the following 5 key areas:

- Economic Infrastructure €54.7 billion
- Enterprise Science and Innovation €20.0 billion
- Human Capital €25.8 billion
- Social Infrastructure €33.6 billion
- Social Inclusion €49.6 billion

The plan is the largest and most ambitious investment programme ever proposed for Ireland. It is characterised by sustainable economic growth, greater social inclusion and balanced regional development (National Development Plan Office).

The previous plan from 2000 to 2006 saw an investment of €57 billion.

- Economic and Social Infrastructure €26.2 billion
- Regional Programs €9.1 billion
- Employment and Human Resources €14.5 billion
- Productive Sector €7.4 billion

Between 1994 and 1999 another plan known as the Community Support Framework (CSF) saw the investment of €5.62 billion of EU structural funds. A previous CSF plan ran from 1989-1993. The government listed the priorities of the CSF as:

- Priority No 1: The productive sector
- Priority No 2: Economic infrastructure
- Priority No 3: Human resources
Priority No 4: Local urban and rural development.

Each plan is not made independent of the others, but seeks to improve upon its predecessor. These plans are development policy blueprints, with which the government hopes to build Ireland’s future.

*Strategy for Science Technology and Innovation 2006-2013*

The Strategy for Science Technology and Innovation (SSTI) forms a key component of the current National Development Plan. As the first report of its kind produced in Ireland, it summarises the strategy for the technological future. Namely it proposes an increase in research, higher education capacity and R&D investments. It calls for:

- Sustained increases in support for: building research excellence in strategic areas; building research capacity to meet the medium-term requirements of enterprise; restructuring of post-graduate training; investment in technology transfer and commercialisation capacity in the third-level sector; and increased participation in trans-national research activity.
- Significant increases in the number of new doctoral awards in Science, Technology and Engineering and in Humanities and Social Sciences. It aims at roughly doubling the total number of students from 730 in 2005 to an estimated 1,312 in 2013. This increase will be matched by a sustained improvement in the quality of research output as measured by publications and citations. Each research organisation will also have specific targets in relation to research commercialisation and will be benchmarked against leading international institutions.
- Specific targets for doubling the numbers of indigenous and overseas companies in Ireland doing significant R&D. This will be done with a range of measures set out to increase the absorptive capacity for technology and research of the enterprise base. Specifically the strategy sets a target to double ‘the proportion of sales in indigenous
enterprises from innovative products and processes introduced in the most recent
two years' by 2013.

- Total government investment of €8.35 billion in research in the higher education and public sectors, and in support of enterprise R&D through Enterprise Ireland and IDA Ireland, over the period of the National Development Plan to 2013. This compares with €2.48 billion under the previous NDP 2000-2006. Of the additional investment proposed, 56% is being allocated for building research capacity in the third-level sector, 30% for support for enterprise R&D, and the remainder for additional research to support the public policy priorities of various government departments. (Forfas, 2006)

**Restructuring of the State Bodies**

In 1994, the Irish authorities restructured the governance of the Information Technology sector. Their action was a reflection of the growth in the ICT sector and it was a call for change in the way government had to work with the industry (notably to influence it in an incremental way). The general restructuring was dealing with all the various components of ICT including the software industry, but not exclusively. The reason for the change had to do with the efficiency of the policies. The government agencies needed to create one single entity that would co-ordinate and control ICT growth, rather than adopting the segmented approached. Before this date, all state administration bodies had the capacity to act totally independently of each other, which showed a lack of coherence in strategic matters, for example ICT, which demanded a clear articulation of a vision for the future.

This led to the formation of Forfás, a national policy and advisory board for enterprise, trade, science, technology and innovation. It is responsible for the co-ordination of national policies regarding ICT. It operates through the Office for Science and Technology (OST) of the Department of Enterprise, Trade and Employment. Under the SSTI, this office will also be responsible for chairing a group comprised of Forfás, IDA, Science Foundation Ireland and Enterprise Ireland. Known as Technology Ireland, it will be responsible for overseeing the implementation of SSTI schemes such as research in technology and innovation.
Figure 3.1: Forfás, its sister agencies and advisory councils
Source: Retrieved from Forfás website at www.forfas.ie
Table 3.1: Programmes and policies from the ICT sector under the NDP 2000-2006

Source: reproduced from Knowledge Intensive Service Activities in the Irish Software Industry 2002-2005 (OECD)

Abbreviations can be found in the appendix 1
Figure 3.1 depicts how the government, through the National Development Plan, co-ordinates and controls its efforts in the software industry. The two ministries, Education and Trade, work in different branches to serve the industry, and also produce an environment that is conducive to substantially build the business mass of Ireland in the ICT sector.

The state maintains a balance between industry and education. Initiatives and funding gets filtered down through the Department of Enterprise, Trade and Employment through various government agencies and state bodies directly serving the interests of industry. On the other hand, the government is constantly monitoring the context for higher education and research. Initiatives in this area are more long-term, targeted at up-skilling the labour market through education and research rather than direct financial support to specific industrial activities.

The Irish government has excelled in providing a unique infrastructure that allows the science and technology sectors to thrive. This is mainly based on the active work of the state in promoting and supporting entrepreneurship and education (not like for example on army funding in the US to support research and venture capitalism in Silicon Valley Ca.).

The following section examines some of the key components in this unique infrastructure, starting with the government agencies under the umbrella of the Department of Enterprise, Trade and Employment (Forfás, Enterprise Ireland, IDA and Science Foundation Ireland). Following that, this chapter considers the Higher Education Authority and the Irish Research Council for Science, Engineering and Technology, both operated under the Department of Education.
Forfás

Forfás provides the Department of Enterprise, Trade and Employment and other stakeholders with analysis, advice and support on issues related to enterprise, trade, science, technology and innovation; including the development and coordination of the enterprise development agencies, IDA Ireland, Enterprise Ireland, Science Foundation Ireland (SFI) and other bodies as the Minister may designate (Forfás).

For the first time, the Irish government became a truly active partner of the industry in coordinating its agencies for the achievement of innovative objectives. With a board composed of 12 members appointed from the industry and state agencies, they elaborate policies for the Minister for Enterprise, Trade and Employment. Since its foundation, Forfás has worked towards affecting the growth in the Information Technology sector in the following ways:


» The establishment of Science Foundation Ireland, recognizing the importance of scientific research for the long-term competitiveness of Irish enterprise as identified through the Technology Foresight process (1999),

» The instituting of a new system of governance for science (including the establishment of the office of the Chief Science Adviser to Government) to support the States’ increased scientific research investment,

» The development, launch and growth education through of the Discover Science and Engineering programmes,

» Informing Government actions to address skills deficits, stemming from Forfás’ support to the Expert Group on Future Skills Needs,

» Government measures to improve framework conditions for Irish enterprise, particularly in the areas of telecoms and transport and drawing from Forfás’ work and support to the National Competitiveness Council in highlighting issues affecting our
international competitiveness,

» Making changes in the tax system on Forfás’ advice especially regarding how the tax system could be used to support enterprise competitiveness,

» The management and delivery of the EMU Business Awareness Campaign,

» Strengthening the culture of evaluation and constant improvement in state agencies making their policy interventions relevant to support enterprise development.

(Forfás)

_Enterprise Ireland_

Enterprise Ireland is the government agency responsible for the development and promotion of the indigenous business sector (Enterprise Ireland). It focuses on helping Irish owned companies in:

a. Achieving export sales.

b. Investing in research and innovation – responsible for the allocation of NDP funds to Research in Technology and Innovation (RTI) to indigenous companies.

c. Competing through productivity.

d. Starting up & scaling up. – The Excellerator (EXC) programme targets high potential startup companies and supports them to achieve international sales capability quickly.

e. Driving regional enterprise.

Enterprise Ireland was formed in two parts during the 1990s. Firstly, the indigenous sections of the IDA were combined with EOLAS to form a new state body called Forbairt. Then, in 1998 Forbairt merged with the Irish Trade Board to form Enterprise Ireland. Through Enterprise Ireland partnerships between the software industry and third level institutes are developed in Programmes in Advanced Technologies (PAT). They help industry to access new technology; improve the competitiveness of existing production; move into new higher value areas. They also assist industry in attracting overseas and domestic investment in high technology areas that lead to the establishment of new technology based start up companies (Organisation for Economic Co-operation and Development, 2005).
Irish Development Authority (IDA)

Since 1994 the IDA is solely responsible for working with foreign companies. This includes attracting new investments and expanding investments already within the state. As discussed earlier in chapter 2, the IDA has been responsible for considerable FDI in the software industry of Ireland. It has continued to attract and expand international software companies. In 2007 alone some of its software investment highlights include:

- Blizzard Entertainment Inc., a global leader in the entertainment software industry, established its European customer support center in Cork City.

- DeCare Systems Ireland announced its decision to undertake a strategic expansion of its software development center in Cork to increase capacity and offer additional value added in consultancy and software development.

- IBM Corporation announced that it will expand its operations in Ireland at the IBM Tivoli software development labs in Cork and Galway.

- ACI Worldwide, a leading international provider of software for electronic payment systems, established a new global technical resource center in Limerick. The center will be a value added operation and will create 100 new high level positions in R&D, Software, Technical Support and Finance.

- Solarwinds, of Texas, US, a leading provider of network management software, established its EMEA® Headquarters in City Gate in Cork. The EMEA HQ, Solarwinds Software Europe Limited was set up to develop and support the company’s international growth.

- VMware, the global leader in software for industry-standard virtualized desktops and servers, expanded its EMEA Technical Support Center in Ballincollig Cork.

- Pramerica Systems Ireland Ltd expanded its software development and customer service center in Letterkenny, Co Donegal. With the expansion, Pramerica will continue to deliver high quality IT, project management, business and systems analyses, software development and quality assurance testing, call center and transaction services to all of Pramerica’s business groups. (IDA Ireland, 2008)

IDA Ireland in co-operation with Enterprise Ireland also works to increase companies’ research and development capabilities as well as allocating National Development Plan

® EMEA – European, Middle East and Africa
funds for research in technology and innovation.

**Science Foundation Ireland (SFI)**

SFI is responsible for investing in academic researchers and research teams who are most likely to generate new knowledge, leading edge technologies and competitive enterprises in the fields of science and engineering. SFI also advances co-operative efforts among education, government, and industry that support its fields of emphasis and promotes Ireland’s ensuing achievements around the world (Science Foundation Ireland).

Under the National Development Plan of 2000 to 2006 the SFI was responsible for an investment of €711 million, known as the Technology Foresight Fund. This fund targeted two areas, Biotechnology and ICT. At the time it was the single biggest investment made in the history of the state in research and development. It was designed to speed Ireland’s transition into the information age.

Science Foundation Ireland is a key organisation in the implementation of the NDP 2007-2013 and the Strategy for Science, Technology and Innovation 2006-2013. A sum of €8.2 billion has been allocated for scientific research under the NDP and SSTI of which SFI has responsibility to invest €1.4 billion.

**Higher Education Authority**

The Higher Education Authority is the statutory planning and policy development body for higher education and research in Ireland. The HEA has wide advisory powers throughout the whole of the third-level education sector. In addition, it is the funding authority for the universities, institutes of technology and a number of designated higher education institutions⁷. Under the National Development Plan and other initiatives, the HEA is nurturing a prominent role for research, in facilitating the generation and exploitation of new knowledge. Increasingly, the higher education sector is becoming the key player underpinning the national innovation system (Higher Education Authority, 2008).

---

⁷ Listed in appendix 3
The HEA is responsible for the Programme for Research for Third Level Institutes (PRTLI). Beginning in 1998, this saw an investment of €865 million into the research capabilities, the human capital and knowledge capital of Ireland. This fund encourages greater inter-institutional and institutional/industry collaboration. More specific to the software industry, the HEA also administers technology sector research. The HEA plays a vital role in servicing the needs of and shaping the Irish economy.

**Embark Initiative: Irish Research Council for Science, Engineering and Technology (IRCSET)**

IRCSET is an independent and autonomous body established under the aegis of the Minister for Education and Science. The members of the council are not representing their employing organisation; rather they are presenting their individual knowledge and experience and applying these to the advancement of research in Ireland. The Council is aided in its work by administrative support from the Higher Education Authority and by close collaboration with other funding agencies such as the Irish Research Council for the Humanities and Social Sciences (Irish Research Council for Science, Engineering and Technology).

The Embark Initiative is operated by IRCSET. Funded by the State under the National Development Plan, the Embark Initiative is aimed at knowledge creation for the long term benefit of society and the economy. Embark works as an incubator agency aiming to fund people and ideas, providing direct financial support for researchers & research students. Its programmes do not target research projects with an industrial or economic focus, but instead aim to support researchers in exploring ideas and bringing visions to reality. The emphasis is on innovative, original and exploratory research, aimed at generating new knowledge and energising Ireland’s future growth, development and national competitiveness (Irish Research Council for Science, Engineering and Technology).
Industry Associations....................................................................................................................................

Irish Business and Employers Confederation (IBEC)
The Irish Business and Employers Confederation (IBEC):

- provides a wide range of services to over 7,500 member businesses and
  organisations from all sectors and of all sizes;
- is the umbrella body for Ireland’s leading industry groups and associations;
- is the national voice of Irish business and employers.

IBEC works to shape policies and influence decision-making in a way that develops and
protects members' interests and contributes to the development and maintenance of an
economy that promotes enterprise and productive employment. IBEC offers a number of
direct services including providing expert information and advice on issues from
employment law to compliance with health and safety. IBEC represents its members'
interests to Government, state agencies, the trade unions, other national interest groups,
and the general public. Through its Brussels office, IBEC works on behalf of business and
employers at European level to ensure that European policy is compatible with its own
objectives for the development of the Irish economy (Irish Business and Employers
Confederation).

ICT Ireland
In 2001, following extensive consultation with industry leaders in the high-tech sector, IBEC
took a decision to establish a major new representative lobby group for the sector. ICT\(^8\)
Ireland was launched in May 2001 and brings together under one banner the following
organisations, each of which are active across this diverse sector.

Audiovisual Federation - AF
Consumer Electronic Distributors Association - CEDA
Irish Cellular Industry Association - ICIA
Irish Software Association - ISA

\(^8\) Information Communications Technology
ICT Ireland is the voice of the information and communications technology sector in Ireland (ICT Ireland).

Irish Software Association (ISA)
The Irish Software Association (ISA), which has represented the interests of software and IT service companies in Ireland since 1978, is the leading voice of software technology and service in Ireland. It promotes the interests of the software and IT services industry and provides member companies\(^9\) with access to a number of key stakeholders and services. The ISA assists software companies to start, manage and grow their companies with a view to enabling members to become successful internationally.

The ISA operates its strategy to benefit its members in four key areas: Scale Capabilities, Innovation/Commercialisation, Indigenous Procurement and Voice to Government. The ISA also provides training in association with Skillnets on relevant topics such as sales and marketing, product management and technical skills.

In 2006, the ISA in partnership with Momentum (the Northern Ireland ICT trade body) and InterTradeIreland launched the All-Island Software Network project. This is an initial two year project focusing on building the scale of the software industry across the island. The project focuses on collaboration between companies, existing groupings and networks to enhance their potential to build their businesses through extending their market scope (Irish Software Association).

\(^9\) ISA members listed in appendix 4
This chapter attempts to piece together scattered information from various sources to give an overview of the modern Irish software market. It presents a breakdown of the industry in 2005 and a breakdown of exports of Irish computer services by destination 2005. Followed by this some macro-economic indicators such as, size of firms, type of firms and software specialization in the industry are examined. This chapter draws a lot from an OECD mail survey completed in 2003 in Knowledge Intense Service Activities in the Irish Software Industry by Laura E. Martinez-Solano, Majella Giblin and Edel Walshe (2005). It finishes by describing the current climate of productivity and competitiveness in Ireland by analyzing the 2008 Eurostat publication.
A Break-Down of the Irish Software Industry in 2005

The Software Industry in 2005

<table>
<thead>
<tr>
<th></th>
<th>Indigenous</th>
<th>Foreign Owned</th>
<th>Total Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Enterprises</td>
<td>760</td>
<td>140</td>
<td>900</td>
</tr>
<tr>
<td>Numbers Employed</td>
<td>15,000</td>
<td>24,000</td>
<td>39,000</td>
</tr>
<tr>
<td>Exports</td>
<td>€1.6 Billion</td>
<td>€13.4 Billion</td>
<td>€15 Billion</td>
</tr>
</tbody>
</table>

Table 4.1: The software industry in 2005

In 2004, the Software Industry was estimated to have 900 enterprises. 140 of them were foreign multinationals employing 24,000 people (Shannon Development, 2004). Around 760 indigenous software companies employed over 15,000 people throughout Ireland. Turnover in the software industry was €15 billion in 2004. The indigenous sector produced around €1.6 billion of this total. 60% of all software sold in Europe originated in Ireland. The sector showed 12.1% sales growth from 2004 to 2005, and 13.9% export growth from 2004 to 2005. The market’s size constituted a significant barrier to growth; most companies produced revenues of between $1m and of $5m. The relatively small size of the domestic Irish market meant that the majority of indigenous software companies were small or medium enterprises (SMEs). Approximately 75% of indigenous firms had less than 25 employees (Irish Software Association, 2008). About 250 of these indigenous firms had significant international sales (Organisation of Economic Co-operation and Development, 2006).

---

References for the figures on which the table is based are given in the text.
Exports of Computer Services by Location 2005

The figures for software exports alone is not recorded in the Irish balance of payments but is recorded as part of “computer services”. The computer services component consists of hardware and software-related services, and data processing services. Included are hardware and software consultancy and implementation services; maintenance and repair of computers and peripheral equipment; disaster recovery services, provision of advice and assistance on matters related to the management of computer resources; analysis, design and programming of systems ready to use (including web page development and design), and technical consultancy related to software; development, production, supply and documentation of customised software, including operating systems made to order for specific users; translation and localisation services; systems maintenance and other support services, such as training provided as part of consultancy; data-processing services, such as data entry, tabulation and processing on a time-sharing basis; web page hosting services; and computer facilities management. Sales and purchases of software transmitted electronically are recorded under computer services. Excluded from computer services are the export/import of packaged (non-customised) software which is embedded in hardware or carried on other physical media. This software is classified as merchandise in the official foreign trade statistics. In valuing these services reporters are asked to include the value of software licence fees received (exports) or paid (imports). This is a conscious CSO departure from the international standards, which require that such licence fees be included under the service item royalties/licence fees. The treatment described was adopted in order to facilitate users in analysing the contribution of computer software producers to the economy.

From analyzing this figure (table 4.2) in the balance of payments section it is possible to get an idea of where Ireland exports its software to.
Europe is clearly the biggest destination for computer services exports from Ireland with approximately 90% of exports. Within Europe €12,802 billion of exports go to fellow EU members. The most significant markets are the UK €3,337, Germany €2,961 and France €1,470 billion. Outside of Europe, the developing markets of Asia are Ireland’s biggest computer services export destination worth €716 million. Although the US maybe Ireland’s biggest source of ICT investments, as a market it only represents 3.4% of computer services exports with €532 million. Africa accounts for €238 million.

### Table 4.2: Computer Services Exports by Locations 2005

<table>
<thead>
<tr>
<th>Region/Country</th>
<th>Exports 2005</th>
<th>Region/Country</th>
<th>Exports 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>14,068</td>
<td>USA</td>
<td>532</td>
</tr>
<tr>
<td>Of Which</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU25</td>
<td>12,802</td>
<td>Asia</td>
<td>716</td>
</tr>
<tr>
<td>UK</td>
<td>3,337</td>
<td>Africa</td>
<td>238</td>
</tr>
<tr>
<td>France</td>
<td>1,470</td>
<td>Not Geographically Allocated</td>
<td>-82</td>
</tr>
<tr>
<td>Germany</td>
<td>2,961</td>
<td>Total</td>
<td>15,755</td>
</tr>
<tr>
<td>Italy</td>
<td>919</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>1,157</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>559</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>542</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luxembourg</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>489</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Provided by request by the balance of payments division of the central statistics office of Ireland
Overview of Firms in the Software Industry

Currently there are approximately 900 (760 indigenous and 140 foreign) firms are in the Irish software industry. In 2003, a mail survey was conducted of 808 companies operating within the Irish software market for an OECD country report on knowledge intensive activity (see Martinez-Solano, Giblin, & Walshe, 2005). It had a total of 274 responses which if combined with the estimated population of 900 hundred companies means the survey represents a 30.4% of the entire software industry of Ireland. The report produced the following findings:

» The software industry consisted mainly of micro (less than 10 employees) or small-sized companies (between 10 and 49 employees) characterizing 86.1% of the sample

» Medium-sized companies (between 50 and 249 employees) represent 10.2%

» Large-sized companies (more than 249 employees) only 1.5%.

Table 4.3: OECD survey respondents classified by size of company (% of total respondents)

<table>
<thead>
<tr>
<th>Size of Company</th>
<th>% of Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro-Small</td>
<td>86.1%</td>
</tr>
<tr>
<td>Medium</td>
<td>10.2%</td>
</tr>
<tr>
<td>Large</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

In terms of company ownership:

» 73.7% of the survey respondents are fully Irish-owned,

» 10.9% are wholly foreign-owned,

» 9.9% foreign minority holders,

» 3.6% joint venture and

» 1.5% have other forms of investment. (Martinez-Solano et al.)
When the report combined the two sets of data it found that:

» 93.1% of the Irish owned firms are micro (54%) or small-sized, but none of them are categorized as large-sized.

» Foreign-owned firms have larger numbers of employees than their indigenous counterparts,

» 67% of the wholly owned foreign firms are micro (26.7%) or small, 26.7% are classified as medium and 6.6% as large. (Martinez-Solano et al.)
Software Specialisation

To pinpoint the exact activity that takes place in the Irish software sector is impossible, as this data is not recorded, but it is possible to piece together information from various sources that may give the reader an idea.

The Irish software industry spans a wide range of market segments due to the broad base of companies in the sector. It has particular strengths in system’s software and middleware; insurance and banking applications, telecommunications software, e-learning, and healthcare (Enterprise Ireland).

According to an OECD publication in 2002, Ireland’s software development was happening in the following areas (Organisation for Economic Co-operation and Development, 2002):

**Software Development In Ireland**

<table>
<thead>
<tr>
<th>Area</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Media/E-Learning</td>
<td>33%</td>
</tr>
<tr>
<td>Software Tools/System</td>
<td>26%</td>
</tr>
<tr>
<td>Software</td>
<td>26%</td>
</tr>
<tr>
<td>Banking and Finance</td>
<td>19%</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>13%</td>
</tr>
<tr>
<td>Internet</td>
<td>9%</td>
</tr>
</tbody>
</table>

Table 4.6: Areas of software development in Ireland 2002

Source OECD 2002

One third of software development was happening in Digital Media/E-Learning and one quarter in software tools/system software. There was also strong software development in banking and finance at 19%.

The mail survey conducted for the OECD in 2003 also sought to classify the type of software activity companies were involved in (see Martinez-Solano, Giblin, & Walshe, 2005). The following were again their findings.
They categorized the firms according to core (system’s software, programming languages and tools, data management/data mining) and non-core (software services and bespoke development, application’s software, localization services) software technologies. The core technology category is considered to be of the highest value to the Irish Software Industry by providing the potential to build internationally competitive firms in terms of their global positioning, market share and growth (Crone, 2002). The number of companies participating in the core technology sectors is significantly lower than that in the non-core technology sectors. Within the core technologies categorization, 21.9% of respondents developed system’s software while 6.2% engaged in data management and data mining and 4% of respondents develop programming languages and tools. However, it was observed that a higher percentage of firms engaged in non-core technologies, with 50% of companies developing applications software, 26.3% offering bespoke software development and services, and just 3.3% were engaged in localization activities. (Martinez-Solano et al.)

**Survey respondents classified by core technologies (% of companies)**

![Bar chart showing core technologies by percentage of companies]

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data management/mining</td>
<td>6.2%</td>
</tr>
<tr>
<td>Systems Software</td>
<td>21.9%</td>
</tr>
<tr>
<td>Programming languages/tools</td>
<td>4%</td>
</tr>
</tbody>
</table>

Table 4.7: OECD survey respondents classified by core technologies (% of companies)

Reproduced from Knowledge Intense Service Activities in the Irish Software Industry (2005)
Differences between the indigenous and foreign companies of the Irish software industry were observed when analyzing their core and non-core technology product and services. In general, the Irish firms surveyed provide both core and non-core technologies but are more heavily involved in non-core technology sectors. In the core technologies, 17.8% offer system’s software technology, 7.9% data management, and 4.5% programming languages. In the non-core technology, a significant number of Irish firms (51%) offer applications software but also 25.7% sell bespoke software, 21.3% software services, and 3% localization software. In contrast, foreign firms do not participate in the whole range of identified technology sectors. Within the core technology sector they specialize highly in system’s software technology (40%) but none of them sell the other two core technologies. However, within the non-core categorization foreign firms have some participation in all areas since 33.3% operate in the applications software sector, 26.7% in the bespoke software, and 6.7% in the localization software. (Martinez-Solano et al.)

Table 4.8: OECD survey respondents classified by non-core technologies (% of companies)
Reproduced from Knowledge Intense Service Activities in the Irish Software Industry (2005)
The report also observed that depending on a company’s size, it affected whether it was involved in core or non-core technology activities. Most of the Irish companies involved in the core technologies are micro and small-sized, while medium and large indigenous firms are mainly involved in the non-core technology sectors. However, in the case of foreign firms the results were slightly different. Foreign involvement in the core (system’s software) technology sector consisted of mainly small and medium-sized firms, while most micro and medium-sized companies were involved in non-core technology. In fact, 63% of foreign companies that participate in non-core (application software) technology were medium-sized. (Martinez-Solano et al.)

Small-sized core and non-core technology companies classified by nature of investment (% of companies)

Table 4.9: OECD Survey - Core and non-core technology companies classified by nature of investment (% of companies)
Reproduced from Knowledge Intense Service Activities in the Irish Software Industry (2005)
Medium-sized core and non-core technology companies classified by nature of investment
(% of companies)

Table 4.11: OECD Survey - Medium-sized core and non-core technology companies classified by nature of investment (% of companies)

Reproduced from Knowledge Intense Service Activities in the Irish Software Industry (2005)
Ireland's Productivity and Competitiveness in Knowledge Intense Industries

The context in which the software industry now operates has changed as much as the software industry itself. It is important that Ireland’s current economic situation, with regards to productivity and competitiveness in knowledge intense industries, is presented in order to gain a broader picture of the environment in which the software industry has been developed. An insight into Ireland’s productivity and competitiveness in knowledge intense industries can be gained by examining the latest Eurostat publication under the following four headings: innovation, patents, high-tech & knowledge services and research and development investment.

**Innovation**

Innovation is defined as a new or significantly improved product (good or service) introduced to the market or a new or significantly improved process introduced within an enterprise. Innovations are based on the results of new technological developments, new combinations of existing technology or utilisation of other knowledge acquired by the enterprise.

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage of Innovative Enterprises</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>65.1</td>
<td>65 896</td>
</tr>
<tr>
<td>Ireland</td>
<td>52.2</td>
<td>3 222</td>
</tr>
<tr>
<td>U.K.</td>
<td>43.0</td>
<td>36 629</td>
</tr>
<tr>
<td>France</td>
<td>32.6</td>
<td>28 170</td>
</tr>
</tbody>
</table>

Table 4.12: Innovative enterprises as a total number of enterprises 2004

Source Eurostat 2008

The Eurostat data is based on the work of the Community Innovation Survey (CIS) 2004. This is a survey conducted every 4 years by European member states to monitor Europe’s progress on innovation. Ireland has scored highly in innovation in recent CIS surveys, leading
the way with a 73% proportion of its manufacturing area being innovators, and a 58% proportion in the services area being innovators (European Commission, 1996). Ireland was ranked 3rd highest for the number of innovative enterprises in the 2004 survey, behind Germany with 65.1% and Austria with 52.5%. This represented 3,222 innovative enterprises in Ireland and a total of 282,268 employees. However, this is a negative trend for Ireland. For this reason Ireland is considered an innovation follower along with the United States, United Kingdom, Iceland, France, the Netherlands, Belgium and Austria. These countries are more innovation efficient then the EU 25 average, but their trend is declining.

*Patents*

Patents reflect part of a country’s inventive activity. Patents also show the country’s ability to exploit knowledge and translate it into potential economic gains. In this context, indicators based on patent statistics are widely used to assess the inventive performance of the country or region (European Commission, 2008).

<table>
<thead>
<tr>
<th>Country</th>
<th>Patents per million Inhabitants</th>
<th>Total Patents</th>
<th>Foreign ownership in patent applications as a percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>312</td>
<td>25 728</td>
<td>16%</td>
</tr>
<tr>
<td>US</td>
<td>168</td>
<td>48 786</td>
<td>11%</td>
</tr>
<tr>
<td>EU 25</td>
<td>136</td>
<td>62 191</td>
<td>15%</td>
</tr>
<tr>
<td>UK</td>
<td>121</td>
<td>7 217</td>
<td>36%</td>
</tr>
<tr>
<td>Ireland</td>
<td>77</td>
<td>306</td>
<td>39%</td>
</tr>
</tbody>
</table>

*Table 4.13: Patent applications to the EPO 2003*

*Source Eurostat 2008*

Ireland lags behind for the number of patent applications to the European Patent Organization (EPO) with 77 per million inhabitants compared to the EU 25 average of 136. It also has a rate of foreign ownership of domestic inventions in patent applications to the EU
that is more than twice the EU average at 39%. Both these figures reflect the nature of industry in Ireland. It is heavily weighted with foreign owned companies and investments.

High-tech and Knowledge Services

High-Technology sectors are key drivers for economic growth, productivity and welfare and are generally a source of high value added and well-paid employment (European Commission, 2008).

As of 2003, Ireland had 309 enterprises engaged in high-tech manufacturing and 4,971 enterprises engaged in high-tech, knowledge intense services. Ireland has a larger proportion of enterprises engaged in knowledge intense services to enterprises engaged in high-tech manufacturing than the EU average ratio of these two.

<table>
<thead>
<tr>
<th>Economic Statistics on High-Tech Sectors 2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of enterprises engaged in high-tech manufacturing</td>
</tr>
<tr>
<td>EU 27</td>
</tr>
<tr>
<td>Ireland</td>
</tr>
<tr>
<td>UK</td>
</tr>
<tr>
<td>Germany</td>
</tr>
</tbody>
</table>

**Table 4.14: Number of enterprises engaged in high-tech manufacturing and knowledge intense services 2003**

Source Eurostat 2008

In Europe, the average production value of an enterprise in all high-tech industries was €1.9 million. Ireland led the way with €7.5 million per enterprise. This was noted by the Eurostat report as being influenced to some extent by foreign ownership of enterprises, outsourcing of activities and accounting practices of international companies (European Commission, 2008).

---

\(^{11}\) Missing Data From Greece and Malta

\(^{12}\) Missing Data From Greece and Poland
Research and Development Investment

Historically Ireland has had poor commitments to research and development with a fluctuating trend in R&D investments. However, it has been improving in recent times (see table 4.15). As of 2004, Ireland now has a tax relief system specifically designed to stimulate research and development on the island in which portions of the research and development costs can be written off against taxes. This is partly a response to Ireland’s previous low levels of R&D, which were below EU and OECD averages.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD</td>
<td>2.10%</td>
<td>2.15%</td>
<td>2.34%</td>
<td>2.24%</td>
<td>2.25%</td>
<td>2.26%</td>
</tr>
<tr>
<td>EU 25</td>
<td>1.68%</td>
<td>1.70%</td>
<td>1.77%</td>
<td>1.79%</td>
<td>1.77%</td>
<td>1.77%</td>
</tr>
<tr>
<td>GERD/GNP</td>
<td>1.46%</td>
<td>1.41%</td>
<td>1.32%</td>
<td>1.36%</td>
<td>1.48%</td>
<td>1.56%</td>
</tr>
<tr>
<td>Ireland GERD/GDP</td>
<td>1.29%</td>
<td>1.24%</td>
<td>1.12%</td>
<td>1.11%</td>
<td>1.25%</td>
<td>1.34%</td>
</tr>
</tbody>
</table>

Table 4.15: Gross expenditure on R&D (GERD) as a percentage of GDP/GNP 1996-2006
Reproduced from (Roche, 2006) Sources: Derived from the survey of business expenditures on R&D 2005/06 (Forfás); survey of R&D in the higher education sector, 2004 (Forfás); State expenditure on science & technology and research and development 2005 and 2006 (Forfás) and the main science and technology indicators, 2002 and 2006 (OECD).

Despite Ireland’s poor R&D record, figures for R&D within the software industry were strong. 39% of R&D by indigenous and 22% of R&D by foreign firms was carried out in the area of software in 2001 (Inter Departmental Committee on Science, Technology and Innovation,

---

13 GDP data in Ireland are inflated by the transfer pricing policies of large multinationals, therefore, the use of GNP as a base is the more relevant measure of economic activity for international benchmarking purposes.
In 2006 software was the largest sector of business related expenditure on R&D. It accounted for 30.4% of the total, or €404.1 million (Forfas, 2006). This is a high proportion considering available data shows that in 2006 only 8% of R&D by foreign firms outside the EU was in the area of software (European Commission, 2008).
This chapter begins by raising some of the industry problems facing the Irish software industry. After this it profiles some of the companies operating in the sector. This more qualitative approach is aimed to giving the reader a better feel for the industry. The chapter and the thesis closes by speculating on the future of the Irish software Industry.
Industry Problems........................................................................................................................................................................

Lack of software graduates

The pace of growth within the software industry and ICT in general has outstripped Ireland’s ability to produce the skilled graduates it needs. Coupled with this, the numbers studying computing have fallen dramatically following the downturn in the ICT industry. As can be seen in Table 5.1, graduate numbers peaked in 2002 and 2003 and then dropped considerably over the next few years.

No. of Honours Bachelor Degrees Awarded and Projected to be Awarded 2002-2010

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Computing</td>
<td>2,145</td>
<td>2,100</td>
<td>1,989</td>
<td>1,587</td>
<td>1,212</td>
<td>1,217</td>
<td>1,033</td>
<td>1,117</td>
<td>1,236</td>
</tr>
<tr>
<td>Total Electronic Engineering</td>
<td>873</td>
<td>804</td>
<td>574</td>
<td>531</td>
<td>456</td>
<td>398</td>
<td>403</td>
<td>466</td>
<td>389</td>
</tr>
</tbody>
</table>

Source: Analysis and modelling by Publica Consulting and McIver Consulting, based on data extracted by the Skills and Labour Market Research Unit of FÁS, and on microdata provided by CAO.

Table 5.1: No. of honours bachelor degrees awarded and projected to be awarded 2002-2010

Reproduced from Future Requirements for High-Level ICT Skills in the ICT Sector 2008

The downturn in the ICT market that occurred from 2000/01 had a major impact on the labour market in the ICT sector. While the impact was greatest among relatively low skilled people, particularly those employed in the electronics hardware subsector, people with high-level ICT skills were also affected. There were substantial net job losses in software and a number of other areas. Even in subsectors where there were no net job losses, career prospects often appeared diminished. There was a significant level of job turnover as new graduates continued to enter the sector, and as some job losses were offset by gains in other companies. Many of those employed in the sector went from great optimism about job prospects to being worried about job and career security. While school leavers and their parents were probably influenced in part by newspaper headlines relating primarily to the loss of low skilled ICT sector jobs, the likelihood is that word of mouth about current labour market realities seen by high-level ICT staff also had a major impact on choices made by school leavers, and by graduates who might otherwise have undertaken graduate diploma conversion courses. (Expert Group on Future Skills Needs, 2008) The lack of graduates will lead to a skills gap that will threaten the future of the industry if not addressed.
Over Dependence upon Foreign Investments

The Software Industry in Ireland is for the most part not very Irish. As with most of the Irish economy it is very heavily dependent upon investments from outside its borders. Foreign owned companies account for approximately 90% of exports and 60% of employment in the sector. Ireland attracted €2.3 billion worth of FDI through the Irish Development Authority in 2007. This dependence on foreign investment is unavoidable for a small open economy like Irelands, but it does bring with it a number of negatives:

» Profits will get repatriated to the parent company’s home country.

» These foreign investments can lead to a crowding out effect of indigenous software companies. New companies will find it difficult to compete with already established multinationals.

» If there is a global market downturn for FDI then Ireland will be one of the heaviest losers. For instance in 2007, Ireland recorded a drop of 5% in new Foreign Direct Investment projects. The corresponding fall for jobs created was 40% (EconomyWatch, 2008). Ireland and its software sector is particularly dependent on US investment.

US Investment in Ireland – The Facts

Nearly 33% of all manufacturing inward investment in Ireland originates from the US. Nearly 50% of all US software investment locates in Ireland.

Over 60% of all R&D centers established in Ireland emanate from US companies.

75% of all customer contact centers in Ireland emanate from US companies.

Over 60% of shared services projects emanate from US companies.

The majority of ICT and Pharmaceutical/Medical Technologies investments in Ireland originate from US companies.

The current climate of the weakening US dollar represents trouble for the Irish software sector.

Inability of Indigenous Software Companies to Grow.

The single biggest challenge for indigenous software companies is the ability to create the scale necessary to compete successfully in global markets (Irish Software Association, 2006).

14 Source the Shannon Development Authority website at www.shannonireland.com
Due to the relatively small size of the Irish market, indigenous software firms have to target entering foreign market places from their inception.

“We have a small domestic market for software so you have to internationalize at very early stage, at about €1 million or even less.” - Bernie Cullinan, chairwoman of the Irish Software Association - quoted from the Sunday Business Post September 4th, 2005.

This represents a major obstacle when it comes to the company’s funding. To grow a software company outside of Ireland you need to invest heavily at the start-up phase and not many institutions are willing to invest that type of money in such high risk startup companies.

Loss of Competitive Performance.

<table>
<thead>
<tr>
<th>Country/year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008(forecast)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro area</td>
<td>1.2</td>
<td>1.8</td>
<td>2.4</td>
<td>2.8</td>
</tr>
<tr>
<td>France</td>
<td>3.1</td>
<td>3.4</td>
<td>3.3</td>
<td>3.1</td>
</tr>
<tr>
<td>Germany</td>
<td>-0.1</td>
<td>1.3</td>
<td>1.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Ireland</td>
<td>5.1</td>
<td>5.0</td>
<td>4.4</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Source: OECD Statistical Database

Table 5.2: Labour cost per employee in private sector (% of increase) 2005-2008

Ireland has experienced a loss of international price competitiveness, reflecting higher price inflation and an appreciation of the Euro against currencies of our trading partners. Ireland is now the second most expensive location for consumers in the EU-15 and has the 3rd highest inflation rate. Non-pay costs in Ireland compare poorly with other countries across a range of cost types. These include: property costs (both purchase and rental), utilities costs (from electricity to water and waste), mobile communications costs and a range of domestic services, such as accountancy, information technology and legal services. (National Competitiveness Council, 2007)
A number of factors have contributed to this (see Cassidy & O'Brien, 2007):

- Over the period 1999-2006, Irish consumer prices (HICP) increased by around 28%, compared to just over 15% for the EU-15.

- Service prices are over 20% above the EU-15 average, with particularly high prices for utilities, hotels and restaurants, and some locally-traded business services including industrial and commercial rents, energy costs, some legal and professional fees and waste disposal charges. Electricity prices for industrial users, for example, are now the third highest in the EU-25.

- Labour costs have also been increasing at a faster rate than in our trading partners over the past eight years (see table 5.2).

- Economy-wide productivity growth on a GNP basis declined from 5.6% in 2000 to 0.7% in 2005. The corresponding decline in productivity in the manufacturing sector was from 11.5 per cent to 4.6%.

- Unfavorable exchange rate developments in the recent past have also contributed to competitiveness difficulties. (Cassidy & O'Brien, 2007)

Unless costs are controlled, Ireland faces a further loss of competitiveness and or the foreign direct investment which is the driver of the Irish economy. Ireland has already seen large numbers of jobs lost to the emerging lower cost economies of Eastern Europe. Ireland’s high living expenses also have the effect of deterring needed foreign labour.
Profiles of Companies in the Irish Software Industry

Microsoft

Microsoft is the largest software company in the world. It develops, manufactures, licences and supports a wide range of software operational systems, applications and developer tools for home, business and entertainment markets. Products include Windows, Word, Excel, xbox, hotmail, mobile devices, SQL Server and SME business applications. Ireland is home to:

Microsoft’s operations and development centres for the EMEA region. It employs 1,600 and is Microsoft’s fiduciary, tax and legal hub for this region. It also services internal and external customers in 70 different EMEA countries.

Microsoft’s investment in Ireland has come in several stages:

European Operations Centre - Established in 1985 this operation has responsibility for revenue, accounting controls, shared services, outsourcing, channel and supply chain management and a data centre operations within the EMEA.

European Product Development Centre - This centre localizes over 100 Microsoft products into 27 languages. It also has the mandate for engineering and innovation within the EMEA which involves design, development, testing and release of EMEA specific Windows components.

Microsoft R&D Centre - Microsoft announced in March 2005 that it is to establish a new R&D centre in Ireland. The new centre will be responsible for research, design and development of core features that will become part of the company’s global product offerings.

EMEA Datacentre - Microsoft Corporation has selected Ireland as the location for its new European data centre. The 51,000sq meters state-of-the-art data centre will be located in Grange Castle Business Park in Dublin. It will deliver Windows Live services and store data for the company’s online services businesses such as MSN and Windows Live. The new facility, is the latest development in Microsoft’s software and services strategy and as such will provide support to Microsoft’s growing online services to the millions of Microsoft users throughout Europe, the Middle East and Africa.

15 Information gathered from IDA case study on www.idaireland.com
Pramerica Systems Ireland Ltd.\textsuperscript{16}

Pramerica Systems Ireland is a wholly owned Irish subsidiary of Prudential Financial, Inc. It provides software, technology skills and customer support services to the parent company. Based in Letterkenny, Co. Donegal, it employs 550 people. Software Development: Established in July 2000 this division develops and maintains leading edge technology solutions to support administration, marketing and sales for consumer based financial products. The Irish operation allows its parent company to bridge the gap between its legacy systems and emerging technology systems. This has created operation efficiencies through the creation of efficient structures for meeting internal business requirements with the development of technology-based solutions. Software Quality Assurance Centre of Excellence: This is one of only two such centers in the corporation worldwide servicing business groups in the parent company based in the United States. Software Expansion: In 2001, the operation was expanded to a customer support operation. Activities include a call centre, technical support, post insurance policy processing, claims handling and web chat and e-mail response. In 2007 it announced further expansions expected to create 70 software development and testing, operations, call centre and financial services specialists’ positions with added capacity to recruit an additional 80 personnel.

Sage Ireland Ltd.\textsuperscript{17}

Sage has been in operation since its inception in Newcastle, England 24 years ago and it now has more than 4 million customers worldwide. Sage is a leading supplier of business management software and services providing businesses with solutions from payroll and accounting software to CRM and industry specific solutions, whatever your business size or industry. Sage Ireland was established in 1999 with five people, it now employs over 220 in its Dublin offices serving over 50,000 customers in Ireland. Its software is specifically designed for the Irish market. In 2005 it expanded its operations in Ireland with the opening

\textsuperscript{16} Information gathered from IDA case study on www.idaireland.com
\textsuperscript{17} Information gathered from Sage Ireland website on www.sage.ie
of Sage’s Localization Center. The Localisation Centre is an integral part of Sage’s worldwide activities and serves customers in Europe, the US, Asia, South Africa and Australia. The Centre will employ 40 knowledge intensive jobs, over 80% of which require third level qualifications in software, engineering, localisation and/or IT networking.

FINEOS
FINEOS is a privately funded Dublin based software company. Founded in 1993 by Michael Kelly, who leveraged his extensive background in the insurance industry to set about developing solutions based on a component-based business model that would help insurance institutions improve their businesses. FINEOS is a now global provider of innovative enterprise software solutions for insurance, bancassurance and government. FINEOS provides end-to-end core business solutions that enable revenues and streamline operations, accelerating time to market, delivering flexibility and increasing efficiency. The company now employs around 250 people in its headquarters in Dublin and its other offices in North America and Australia.

Havok
Havok was established in a Trinity College, Ireland incubation lab 1998, and is the premier provider of interactive software and services for digital media creators in the games and movie industries.
Havok works in partnership with the world’s best known game developers - including Sony, Nintendo, Microsoft, EA, Ubisoft and Pandemic Studios. Havok’s cross-platform, professionally supported technology is available for the Xbox360™, PLAYSTATION®3, PlayStation®2, PSP™, Wii™, and the PC.
Havok products have been used to drive special effects in movies such as Harry Potter and The Order of The Phoenix, 10,000 BC, Poseidon, The Matrix, Troy, Kingdom of Heaven and Charlie and the Chocolate Factory.
Havok has offices in Dublin, San Francisco, San Antonio, Calcutta, Munich, and Tokyo.

18 Information gathered from FINEOS website on www.FINEOS.com
19 Information gathered from Havok website on www.havok.com and Game Developers Ireland website at www.gamedevelopers.ie
employs approximately 100 people with 30 in its Dublin offices. Intel Corp. purchased Havok in 2007 for a rumored $110 million.

Google

Google's innovative search technologies connect millions of people around the world with information every day. Founded in 1998 by Stanford Ph.D. students Larry Page and Sergey Brin, Google today is a top web property in all major global markets. Google's targeted advertising program provides businesses of all sizes with measurable results, while enhancing the overall web experience for users. Google is headquartered in Silicon Valley, Ca. with offices throughout the Americas, Europe and Asia.

Google first located in Ireland in 2003. Google's EMEA headquarters officially opened in October 2004 in Dublin. The Dublin operation serves customers in over 35 countries using their local time zones and languages. In 2006 it announced the creation of 500 new jobs to go with the 800 already present as it expanded its Dublin operations.

Dell

Established in Ireland in 1990, Dell is Ireland's largest exporter, largest technology company and its second largest company overall. Dell has two locations in Ireland - a European manufacturing facility, based in Limerick and a European Business Campus, based in Cherrywood, Co Dublin. While manufacturing is the main activity of Dell’s operations in Ireland, it also carries out a number of other functions.

Dell’s EMEA Centre of Competency for Communications and Network Product Development:
This Centre has R+D capability and will operate as a centre of competency for communications and network product development for use in Dell products worldwide. The team will also be responsible for the development of innovative software solutions to provide increased functionality and productivity in Dell's manufacturing sites worldwide.

Dell’s EMEA Applications Solution Centre: A "proof of concept" laboratory where corporate customers from across EMEA can simulate complex networked applications on Dell server

---

20 Information gathered from IDA website at the www.idaireland.com
21 Information gathered from Dell website at the www.dell.com, from IDA the website at www.idaireland.com, from Department of Enterprise, Trade and Employment at www.entemp.ie
22 Irish Exporters Association
23 Irish Times and Business and Finance Top 1000 List 2006
and storage equipment in advance of purchase. Highly skilled consultants help customers design and road test optimum solutions for their business. Among the areas of focus are: System sizing and capacity testing, Scalability, Business continuity, High availability computing and High performance computing

*Dell’s EMEA Enterprise Command Centre in Limerick:* This centralised base of operation in Limerick enables Dell’s technical support experts to visually track and manage service delivery from beginning to end while helping to reduce reaction time and customer down time during critical situations.

Dell employs about 4500 in Ireland with about 1650 of these jobs located in Dublin. In April 2008 it announced the loss of 250 jobs in Ireland. Manufacturing is widely expected to be downsized in Ireland following the opening of a second factory in Lodz, Poland.

**Cúram Software**

Founded in Ireland in 1990, Cúram is headquartered in Dublin with offices in Washington DC, New York, UK, Australia, New Zealand and India. The company employs over 600 people and is rapidly expanding to meet the growing needs of its customers and partners. Cúram Software is the leading provider of enterprise software solutions for social services agencies worldwide. Cúram Software pioneered the Social Enterprise Management (SEM) marketplace and uniquely enables social enterprises to achieve successful outcomes for its citizens through a comprehensive suite of SEM business applications. Its main customers are public sector bodies.

Cúram claims to be the only company in the world developing systems for unemployment and welfare agencies. It has an eight-figure deal with the Department for Work and Pensions in Britain and deals in Australia, New Zealand and the US. One deal, with the state of Wisconsin, is understood to be worth $30 million over several years. In 2004 it recorded profits of $30 million (Daly, 2006).

---

When considering the future of the industry it is important to keep in mind the Irish government’s commitment to driving Ireland as a knowledge based economy and its previous responsiveness in its development. This dedication is underpinned by the investment of €8.2 billion in the Strategy for Science, Technology and Innovation 2006.

Despite a global FDI slowdown, Ireland has still managed to increase its inward investments, chiefly in ICT. While it can be claimed that the importance of Ireland as a strategic location for ICT investment in the past was exaggerated for promotional reasons there is no denying that investments gradually became more sophisticated. The rising cost base means that companies in the sector have to operate at the higher end of the value chain with technology driven innovations. Employment levels have been recovering since the drop in 2002/3, and export levels have constantly grown despite losses in manufacturing output to Eastern Europe’s emerging lower cost markets. Ireland and particularly Dublin, has emerged from the Celtic Tiger as a key location for the European software industry.

One area which the government has earmarked in Ireland is R&D in the Strategy for Science, Technology and Innovation 2006. R&D is essential in an innovative sector, such as software, and is vital for its long-term success to keep ahead of the software curve. It is seen as a fundamental element for the continued up-skilling and advancement of the Irish labour force. While Ireland can no longer compete on a wage level, it must offer greater talent to appeal to software companies.

In the short term, Ireland is suffering from a skills gap. It is currently unable to support the demand of the ICT sector with the quantity of graduates it needs. Attracting migrant labour can only temporarily fill this gap, but in the long term the government has to act to eliminate this problem. More work has to be done to communicate the career opportunities that exist within ICT. Both educational institutes and students should be offered more incentives to generate a greater output of people with the required skill sets that the industry needs. One suggested option it to offer bonus points to students who take the science and...
mathematical subjects at Leaving Certificate level.

In 2008, the Expert Group on Future Skills Needs forecast 3 possible scenarios for the ICT sector in Ireland over the period to 2013:

1. The base “continuing recovery” scenario is based on a continuation of the employment growth experienced between 2005 and 2006, adjusted so that the growth rate in web-based operations falls over time, growth in electronic hardware moderates, and employment in semiconductors remains constant.

2. The relatively optimistic “accelerating recovery scenario” assumes a higher rate of growth, but still a rate that falls far short of that experienced in the latter half of the 1990s.

3. The “loss of competitiveness” scenario assumes that growth rates fall, and (for most subsectors) turn negative by 2013, due to a loss of competitiveness.

It is the belief of this author that the continuing recovery scenario is the most likely, but issues of competitiveness need to be tackled.

On the whole, the future of the software industry seems bright, but there are some dark clouds on the horizon. Once again Ireland’s policy makers have to ensure she continues to meet the needs of a competitive, innovative and dynamic software industry. While influencing factors, such as geography and demographics that contributed to its success story are impossible to replicate, there are lessons to be learned as to how government led, innovative, consistent and educational-based policies, combined with a business friendly environment, can be used to transform a struggling economy into a modern knowledge based one. As a new chapter in the Irish software story begins, it is left to the policy makers to decide what will be written.


Science Foundation Ireland. (u.d.). *About Us: Science Foundation Ireland.* Retrieved from Science Foundation Ireland Website:
http://www.sfi.ie/content/content.asp?section_id=207&language_id=1 on 17 6 2008


### Appendix 1: Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSF</td>
<td>Community Support Framework</td>
</tr>
<tr>
<td>CSO</td>
<td>Central Statistics Office</td>
</tr>
<tr>
<td>DETE</td>
<td>Department of Enterprise, Trade and Employment</td>
</tr>
<tr>
<td>EGFSN</td>
<td>Enterprise Group on Future Skills Needed</td>
</tr>
<tr>
<td>EI</td>
<td>Enterprise Ireland</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>EXC</td>
<td>Excellerator Programme</td>
</tr>
<tr>
<td>FAS</td>
<td>Foras Aiseanna Saothair (Training and Development Authority)</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
</tr>
<tr>
<td>FP6</td>
<td>Sixth Framework Programme</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GNP</td>
<td>Gross National Product</td>
</tr>
<tr>
<td>HEA</td>
<td>High Education Authority</td>
</tr>
<tr>
<td>HICP</td>
<td>Harmonised Indices of Consumer Prices</td>
</tr>
<tr>
<td>IBEC</td>
<td>Irish Business and Employers Confederation</td>
</tr>
<tr>
<td>ICSTI</td>
<td>Irish Council for Science, Technology and Trade</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communications Technology</td>
</tr>
<tr>
<td>IDA</td>
<td>Irish Development Authority</td>
</tr>
<tr>
<td>IRCSET</td>
<td>Irish Research Council for Science, Technology and Trade</td>
</tr>
<tr>
<td>ISA</td>
<td>Irish Software Association</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>NDP</td>
<td>National Development Plan</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OST</td>
<td>Office of Science and Technology</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>PAT</td>
<td>Programmes in Advanced Technology</td>
</tr>
<tr>
<td>PRI</td>
<td>Public Research Institute</td>
</tr>
<tr>
<td>PRI</td>
<td>Public Research Institutes</td>
</tr>
<tr>
<td>PRTLI</td>
<td>Programmes for Research in Third Level Institutes</td>
</tr>
<tr>
<td>R&amp;D Cap</td>
<td>Research and Development Capabilities</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
</tr>
<tr>
<td>RTI</td>
<td>Research Technology and Innovation</td>
</tr>
<tr>
<td>SAP</td>
<td>Strategic Action Plan</td>
</tr>
<tr>
<td>SFI</td>
<td>Science Foundation Ireland</td>
</tr>
<tr>
<td>STI</td>
<td>Science Technology and Innovation</td>
</tr>
<tr>
<td>SSTI</td>
<td>Strategy for Science Technology and Innovation</td>
</tr>
<tr>
<td>TFF</td>
<td>Technology Foresight Fund</td>
</tr>
<tr>
<td>UNI</td>
<td>Universities</td>
</tr>
</tbody>
</table>
Appendix 2: List of Websites

Irish Development Authority www.idaireland.com
Central Statistics Office www.cso.ie
Enterprise Ireland www.enterprise-ireland.com
Department of Enterprise, Trade and Employment www.entemp.ie
Science Foundation Ireland www.sfi.ie
Forfás www.forfas.ie
FAS www.fas.ie
National Development Plan Website www.ndp.ie
Higher Education Authority www.hea.ie
Irish Software Association www.software.ie
Irish Business and Employers Confederation www.ibec.ie
Organisation for Economic Co-operation and Development www.oecd.org
Shannon Development Authority www.shannon-dev.ie
Central Bank of Ireland www.centralbank.ie
Central Bank of Europe www.ecb.int
Irish Exports Association www.irishexporters.ie
ICT Ireland www.ictireland.ie
The Irish Research Council for Science, Engineering and Technology www.ircset.ie
Appendix 3 - List of funded Universities, Institutes and Other Higher Education Institutes

Universities

- University College Cork (UCC)
- University College Dublin (UCD)
- National University of Ireland (NUIG)
- National University of Ireland (NUIM)
- The University of Dublin (TCD)
- The University of Limerick (UL)
- Dublin City University (DCU)

Institutes of Technology

- Athlone Institute of Technology
- Institute of Technology, Blanchardstown
- Institute of Technology, Carlow
- Cork Institute of Technology
- Dundalk Institute of Technology
- Dún Laoghaire Institute of Art, Design and Technology
- Galway-Mayo Institute of Technology
- Letterkenny Institute of Technology
- Limerick Institute of Technology
- Institute of Technology, Sligo
- Institute of Technology, Tallaght
- Institute of Technology, Tralee
- Waterford Institute of Technology
- Dublin Institute of Technology

Designated Institutions

- Royal College of Surgeons Ireland (RCSI)
- National College of Art and Design (NCAD)
- Royal Irish Academy (RIA)

The HEA also funds

- Mater Dei Institute of Education
- Mary Immaculate College, Limerick
- St Patrick’s College, Drumcondra
- St. Angela’s College of Education, Sligo
Appendix 4 – Registered Members of the Irish Software Association (ISA)

A
A & L Goodbody www.algoodbody.ie
ABN AMRO Bank NV www.abnamro.ie
Accenture www.accenture.com
Accuris Ltd www.accuris.ie
ACT Venture Capital www.actventure.com
Activision Publishing Ireland Ltd www.activision.com
AIB Bank www.aib.ie
AIB Corporate Finance Ltd www.aibcf.ie
Aircraft Management Technologies www.flightman.com
Airtel ATN Ltd www.airtel-atn.com
Alcatel-Lucent www.lucent.com
Allfinanz www.allfinanzinc.com
AMT Sybex (I) Ltd www.amtsybex.com
AOL Technologies Ireland Limited www.aol.com
Apple www.apple.com
Aran Technologies www.arantech.com
Ark Life Assurance Co Ltd www.arklife.ie
Arthur Cox www.arthurcox.com
Atlantic Bridge Ventures Services Ltd www.abven.com
Automsoft www.automsoft.com

B
Bank of Ireland Group www.bankofireland.ie
Bard na nGleann www.bardnangleann.com
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beckinridge Training Ltd</td>
<td><a href="http://www.beckinridge.com">www.beckinridge.com</a></td>
</tr>
<tr>
<td>BMC Software Europe</td>
<td><a href="http://www.bmc.com">www.bmc.com</a></td>
</tr>
<tr>
<td>BT Ireland</td>
<td><a href="http://www.btireland.ie">www.btireland.ie</a></td>
</tr>
<tr>
<td>Business Objects Software Ltd</td>
<td><a href="http://www.businessobjects.com">www.businessobjects.com</a></td>
</tr>
<tr>
<td>C A Ltd</td>
<td><a href="http://www.ca.com">www.ca.com</a></td>
</tr>
<tr>
<td>Cadcoevolution</td>
<td><a href="http://www.cadcoevolution.ie">www.cadcoevolution.ie</a></td>
</tr>
<tr>
<td>Calyx Data Ltd</td>
<td><a href="http://www.calyx.ie">www.calyx.ie</a></td>
</tr>
<tr>
<td>Calyx Software Ltd</td>
<td><a href="http://www.mentec.com">www.mentec.com</a></td>
</tr>
<tr>
<td>Campbell Informatics Ltd</td>
<td></td>
</tr>
<tr>
<td>Campus IT Ltd</td>
<td><a href="http://www.campusit.net">www.campusit.net</a></td>
</tr>
<tr>
<td>Care Works Limited</td>
<td><a href="http://www.careworks.ie">www.careworks.ie</a></td>
</tr>
<tr>
<td>Celtech Software International Limited</td>
<td><a href="http://www.celtech.ie">www.celtech.ie</a></td>
</tr>
<tr>
<td>Ceva Inc</td>
<td><a href="http://www.ceva-dsp.com">www.ceva-dsp.com</a></td>
</tr>
<tr>
<td>Changing Worlds Ltd</td>
<td><a href="http://www.changingworlds.com">www.changingworlds.com</a></td>
</tr>
<tr>
<td>CI3</td>
<td><a href="http://www.comit.ie">www.comit.ie</a></td>
</tr>
<tr>
<td>Citrix Systems International GmbH</td>
<td><a href="http://www.citrix.com">www.citrix.com</a></td>
</tr>
<tr>
<td>Clarigen</td>
<td><a href="http://www.clarigen.com">www.clarigen.com</a></td>
</tr>
<tr>
<td>Cognotec Ltd</td>
<td><a href="http://www.cognotec.com">www.cognotec.com</a></td>
</tr>
<tr>
<td>Columba Global Systems</td>
<td><a href="http://www.columba.com">www.columba.com</a></td>
</tr>
<tr>
<td>Compliance and Risks Ltd</td>
<td><a href="http://www.complianceanrrisks.com">www.complianceanrrisks.com</a></td>
</tr>
<tr>
<td>Conduit Plc</td>
<td><a href="http://www.conduit.ie">www.conduit.ie</a></td>
</tr>
<tr>
<td>Connection2 Limited</td>
<td><a href="http://www.connection2.com">www.connection2.com</a></td>
</tr>
<tr>
<td>CR2 Group</td>
<td><a href="http://www.cr2.com">www.cr2.com</a></td>
</tr>
<tr>
<td>Creative Labs Irl Ltd</td>
<td>ie.europe.creative.com</td>
</tr>
<tr>
<td>Curam Software</td>
<td><a href="http://www.curamsoftware.com">www.curamsoftware.com</a></td>
</tr>
<tr>
<td>Company</td>
<td>Website</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Cybertrust Ireland Limited</td>
<td><a href="http://www.betrusted.com">www.betrusted.com</a></td>
</tr>
<tr>
<td>Cylon Controls Ltd</td>
<td><a href="http://www.cylon.ie">www.cylon.ie</a></td>
</tr>
<tr>
<td>Datakraft</td>
<td><a href="http://www.datakraft.net">www.datakraft.net</a></td>
</tr>
<tr>
<td>DeCare Systems Ireland Ltd</td>
<td><a href="http://www.decaresystems.ie">www.decaresystems.ie</a></td>
</tr>
<tr>
<td>Deecal International Ltd</td>
<td><a href="http://www.deecal.com">www.deecal.com</a></td>
</tr>
<tr>
<td>Deloitte &amp; Touche</td>
<td><a href="http://www.deloitte.com">www.deloitte.com</a></td>
</tr>
<tr>
<td>Delphi Technologies</td>
<td><a href="http://www.delphi.ie">www.delphi.ie</a></td>
</tr>
<tr>
<td>Delta Partners</td>
<td><a href="http://www.delta.ie">www.delta.ie</a></td>
</tr>
<tr>
<td>DKG Group</td>
<td></td>
</tr>
<tr>
<td>Doubleclick International Technology</td>
<td><a href="http://www.doubleclick.com">www.doubleclick.com</a></td>
</tr>
<tr>
<td>EDS Ireland Limited</td>
<td><a href="http://www.eds.com">www.eds.com</a></td>
</tr>
<tr>
<td>Electricity Supply Board</td>
<td><a href="http://www.esb.ie">www.esb.ie</a></td>
</tr>
<tr>
<td>EMC Ireland Ltd</td>
<td><a href="http://www.uk.emc.com">www.uk.emc.com</a></td>
</tr>
<tr>
<td>Enterasys</td>
<td><a href="http://www.enterasys.com">www.enterasys.com</a></td>
</tr>
<tr>
<td>Enterprise Equity (Irl) Ltd</td>
<td><a href="http://www.enterpriseequity.ie">www.enterpriseequity.ie</a></td>
</tr>
<tr>
<td>Ernst &amp; Young</td>
<td><a href="http://www.ey.com">www.ey.com</a></td>
</tr>
<tr>
<td>ESBI Computing Ltd</td>
<td><a href="http://www.esbic.ie">www.esbic.ie</a></td>
</tr>
<tr>
<td>Escher Europe Ltd</td>
<td><a href="http://www.eschergroup.com">www.eschergroup.com</a></td>
</tr>
<tr>
<td>FINEOS Corporation</td>
<td><a href="http://www.FINEOS.com">www.FINEOS.com</a></td>
</tr>
<tr>
<td>Firecrest Clinical Ltd</td>
<td><a href="http://www.firecrestclinical.com">www.firecrestclinical.com</a></td>
</tr>
<tr>
<td>Fujitsu Services Limited</td>
<td><a href="http://www.ie.consulting.fujitsu.com">www.ie.consulting.fujitsu.com</a></td>
</tr>
</tbody>
</table>
G
TGE Money www.gecapital.com
GOA Games Services Ltd www.goa.com
Goodbody Stockbrokers Ltd www.goodbody.ie

H
Helix Health Limited www.syssol.ie
Hewlett Packard (Manufacturing) Ltd www.hp.com/ie
HID Global www.aontec.com

I
IBI Corporate Finance www.ibicf.ie
IBM Ireland Ltd www.ie.ibm.com
IBM Rational Software
IE Domain Registry Ltd www.iedr.ie
Informatica www.similaritysystems.com
Information Mosaic Ltd www.informationmosaic.com
Input Systems Ltd www.input.ie
Inpute Technologies www.inpute.com
Insight Group www.insight-test.com
Intec Billing Limited www.adc.com
Intel Ireland Ltd www.intel.ie
Ion Equity Ltd www.ionequity.com
Iona Technologies Plc www.iona.com
Irish Medical Systems Ltd www.imsmaxims.com
J
J & E Davy www.davy.ie

K
KBS Solutions www.kbs.ie
KPMG www.kpmg.ie

L
L K Shields Solicitors www.lkshields.ie
Lafferty Design Studio Ltd www.laffertydesign.com
LM Ericsson Ltd www.ericsson.com
LSI Storage Ireland Limited www.enganio.com

M
Macalla Software Limited www.macalla.com
Mapflow www.mapflow.com
Martin Dawes Systems Ltd www.martindawessystems.com
Mason Hayes & Curran www.mhc.ie
Matheson Ormsby Prentice Support www.mop.ie
McCann FitzGerald Solicitors www.mccannfitzgerald.ie
Mediateam
Mentor Graphics (Ireland) Limited www.mentor.com
Merrion Corporate Finance Limited www.merrion-capital.com
Micros Fidelio (Ireland) Ltd www.micros.com
Microsoft Ireland Operations Ltd www.microsoft.com/ireland
Misys Banking Systems
ModusLink Kildare www.moduslink.com
Moneymate www.moneymate.com
MTLD Top Level Domain www.dotmobi.mobi
Murex Advanced Technologies Ltd  www.murex.com
Murgitroyd & Company  www.murgitroyd.com

N
NCB Group Ltd  www.ncbdirect.com
Norkom Technologies Ltd  www.norkom.com
Nortel Networks Ireland Ltd  www.nortel.com
Novell Ireland Software Ltd  www.novell.com

O
Ocuco  www.ocuco.com
Openet Telecom Ltd  www.openet-telecom.com
OpenMIND Networks Limited  www.openmindnetworks.com
Oracle Corporation  www.oracle.com
Oracle EMEA Limited  www.siebel.com
Orbiscom Ireland Limited  www.orbiscom.com
Original Solutions Ltd  www.originalsolutions.ie

P
ToPercana Group  www.percana.com
Phoenix Technology Group Ltd  www.phoenix.ie
PILZ Ireland Industrial Automation  www.pilz.ie
PMI Software Ltd  www.pmisoftware.com
Polarlake Ltd  www.polarlake.com
PopCap Games International
Prameria Systems Ireland Limited  www.prameria.ie
PricewaterhouseCoopers
Prospectus Strategy Consultants  www.prospectus.ie
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>PutPlace Ltd</td>
<td><a href="http://www.putplace.com">www.putplace.com</a></td>
</tr>
<tr>
<td>Q</td>
<td></td>
</tr>
<tr>
<td>QAD Ireland Limited</td>
<td><a href="http://www.qad.com">www.qad.com</a></td>
</tr>
<tr>
<td>Quest Computing Ltd</td>
<td><a href="http://www.quest.ie">www.quest.ie</a></td>
</tr>
<tr>
<td>Qumas Ltd</td>
<td><a href="http://www.qumas.com">www.qumas.com</a></td>
</tr>
<tr>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Riverdeep Interactive Learning Ltd</td>
<td></td>
</tr>
<tr>
<td>Rockall Technologies</td>
<td><a href="http://www.rockalltech.com">www.rockalltech.com</a></td>
</tr>
<tr>
<td>S</td>
<td></td>
</tr>
<tr>
<td>S A P SSC Ireland Ltd</td>
<td><a href="http://www.sap.com">www.sap.com</a></td>
</tr>
<tr>
<td>Sage Ireland</td>
<td><a href="http://www.sage.com">www.sage.com</a></td>
</tr>
<tr>
<td>SAS Institute</td>
<td><a href="http://www.sas.com">www.sas.com</a></td>
</tr>
<tr>
<td>Select Strategies</td>
<td><a href="http://www.ascend.ie">www.ascend.ie</a></td>
</tr>
<tr>
<td>Servecast Limited</td>
<td><a href="http://www.servecast.com">www.servecast.com</a></td>
</tr>
<tr>
<td>Service Source Europe Ltd</td>
<td><a href="http://www.servicesource.com">www.servicesource.com</a></td>
</tr>
<tr>
<td>SFDC Ireland Ltd</td>
<td><a href="http://www.salesforce.com">www.salesforce.com</a></td>
</tr>
<tr>
<td>Silicon &amp; Software Systems</td>
<td><a href="http://www.s3group.com">www.s3group.com</a></td>
</tr>
<tr>
<td>Smurfit Kappa Group plc</td>
<td><a href="http://www.smurfit.ie">www.smurfit.ie</a></td>
</tr>
<tr>
<td>Soft-Ex Communications Ltd</td>
<td><a href="http://www.soft-ex.net">www.soft-ex.net</a></td>
</tr>
<tr>
<td>Sogeti Ireland Limited</td>
<td><a href="http://www.sogeti.com">www.sogeti.com</a></td>
</tr>
<tr>
<td>Somers &amp; Murphy</td>
<td><a href="http://www.somersandmurphy.ie">www.somersandmurphy.ie</a></td>
</tr>
<tr>
<td>Sophis Technology (Ireland) Ltd</td>
<td><a href="http://www.sophis.net">www.sophis.net</a></td>
</tr>
<tr>
<td>Storm Technology Limited</td>
<td><a href="http://www.storm.ie">www.storm.ie</a></td>
</tr>
<tr>
<td>Sun Life Information Services Ire Ltd</td>
<td><a href="http://www.sunlife.ie">www.sunlife.ie</a></td>
</tr>
<tr>
<td>Sun Microsystems Ireland Ltd</td>
<td><a href="http://www.sun.ie">www.sun.ie</a></td>
</tr>
</tbody>
</table>
Sureskills www.sureskills.com
Symantec Ltd www.veritas.com
Synopsys International Limited www.synopsys.com
System Dynamics Group Ltd www.systemdynamics.ie
Systimax Solutions www.commscope.com

T
Tata Consultancy Services www.tcs.com
Tellabs Limited www.tellabs.com
ThirdForce EP Irl Ltd www.electricpaper.ie
Transware Ltd www.transware.com
Travelers Insurance Company Ltd www.stpaul.com/ireland
Trinity Venture Capital www.tvc.com
Trojan Hardware Sales Ltd www.trojan.ie

U
Ulster Bank Ireland Ltd www.ulsterbank.com

V
Valista Ltd www.valista.com
Vallent Technologies (Ireland) Ltd www.vallent.com
Vero Solutions www.vero-sol.com
VistaTEC Ltd www.vistatec.ie

W
Web Reservations International Ltd www.webresint.com
Websense www.websense.com
WeDo Technologies www.capetechnologies.com
West Global Limited www.westglobal.com
WhitneyMoore www.wmk.ie
William Fry Solicitors www.williamfry.ie
Wincor Nixdorf Ireland

Y
Yellowstone Communications Design

Z
Zarion Ltd www.zarion.com
Zeraphina www.zeraphina.com
Zing Technology www.zing.ie