Seán ÓRiain

The Birth of a Celtic Tiger

Last St. Patrick's Day, traditional Irish musicians in Dublin, New York, and Paris were brought together in a concert transmitted live over the Internet to emigrants gathered in bars and halls around the world. The Paddynet, an Internet provider focused on Irish affairs, brought together musicians and audiences all over the world on what the organizers called a "digital island."

Meanwhile, a visitor to the Republic of Ireland might be surprised to see the Gateway Comanches, complete with Irish accents, struggling to overcome the softball skills of the Claris Crusaders in Dublin's Phoenix Park. Across the Atlantic in Silicon Valley, a prominent ex-Claris executive proudly displays a copy of the Irish language version of MacWrite on his shelf. These close local social ties, national identity, and international contacts combine to create the Irish information technology industry.

Despite gaining on the average GNP of countries in the Organizations for Economic Cooperation and Development (OECD) in the 1970s, Ireland fell behind the average growth rate again in the 1980s. From 1990 to 1994, GDP growth averaged 5.3%, surpassed only by the fastest growing Asian economies; the inflation rate was among the lowest in Europe and employment increased for the first time in years.

Ireland pursued a policy of industrialization-by-invitation since the late 1950s, offering substantial incentives to multinational companies to locate in Ireland and hoping to generate cash and employment through export-led development. High-technology investment, particularly from the U.S., has predominated since the 1970s. Electronics currently account for 30% of Irish exports with another 10% from software. While some attribute the recent success of information technology (IT) in Ireland to openness to the global economy and the presence of multinational corporations, the role of the Irish state in developing indigenous resources and organizations, by accident and by design, is all too often overlooked.

The Early Years: 1958–1973
The first computer in Ireland—an ICT 1201—was installed at the Irish Sugar Company in 1958. In 1962 the first university computer—an IBM 1620 Model 1— was installed in the School of Engineering at Trinity College in Dublin [10]. Computing was restricted to a small isolated community that was fragmented into fraternities of IBM, Honeywell and ICL devotees [14].

The economic decline and high emigration of the 1950s prompted the policy of industrialization-by-invitation. Some major U.S. high-tech companies arrived by the late 1960s, including Digital which began making minicomputers in

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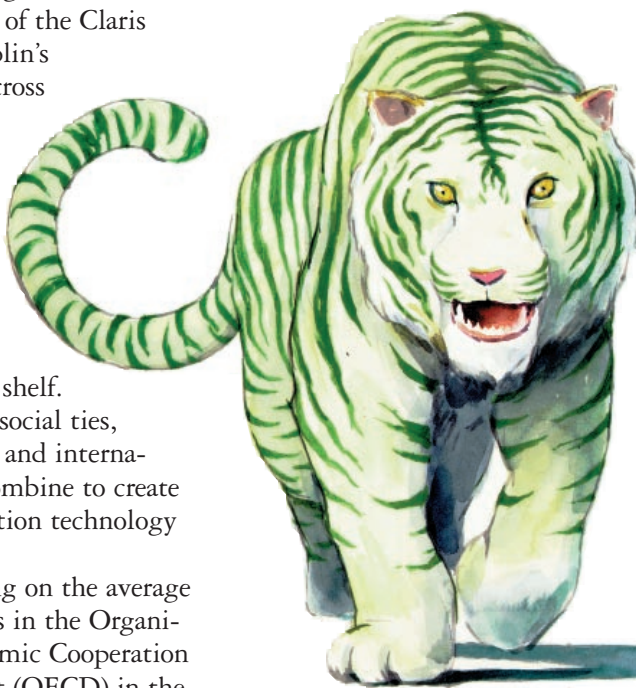
Galway in 1971. This policy's success is questionable as companies created mainly low-skilled jobs, developed few linkages to the local economy, and often left once their tax breaks ended.

To the dismay of Irish IT companies, customers in Ireland (even in the public sector) showed no great desire to buy from Irish companies [15]. Unlike other countries where state (especially military) spending on IT played a major role in developing local companies, public procurement policies were not used for this purpose.

The Arrival of the Multinational Corporations: 1973—Late 1980s
The Irish government, through the Industrial Development Authority (IDA), attracted mobile IT investment using Digital's example and Irish entry to the European Economic Community in 1973. Among the new companies were Analog Devices (Limerick, 1977), Amdahl (Dublin, 1978), and Apple (Cork, 1981). They received very generous grants and financial incentives—most attractive being a 15-year full tax exemption on export sales for companies that located in Ireland between 1960 and 1981. In 1981 this was replaced by a 10% corporation tax rate, guaranteed until 2010, for all manufacturing companies and many export-oriented service companies.

Ireland provided a low-cost, English-speaking workforce within Europe. Free, universal, secondary schooling, introduced in 1967, laid the foundations for the development of a technically sophisticated workforce over the coming decades. The Regional

Technical College system was formed in the late 1960s, offering certificate and diploma courses. Two technically focused National Institutes of Higher Education were formed in 1972 and 1980, and received full university status in 1989. This heavy investment in education was controversial (particularly as engineers flooded out of the country in a brain drain during the 1980s). However, in the long run, it proved perhaps the most successful government policy of the last 30 years.

By the 1980s Ireland had attracted quite a number of mainframe, minicomputer, integrated circuit makers and data processing bureaus. The skill profile in the Irish electronics industry fell somewhere between that of the U.S. and the South East Asian industries [9]. The Telesis report in 1982 was severely critical of the contribution of these companies to the national economy, citing the high costs of government incentives, the low level of skills, and lack of R&D within the plants, the weakness of linkages to local suppliers, and the tendency of companies to move out once tax deals ran out. However, some managers (who were mainly Irish-born) were able to win a range of nonassembly functions for their plants. Many managers, lead by those at Digital, saw themselves as working for the national development of the Irish economy, albeit within the confines of corporate strategy set abroad.

Apart from some ill-fated personal computer companies in the early 1980s, the main Irish IT companies were a small number of component suppliers and a small indigenous software sector

developing applications mainly for Irish and British markets. The initial hope that multinational firms would help develop a national system of innovation and spin off Irish-owned firms was not being fulfilled.

Efforts were made to increase linkages between multinationals and local companies, to grow local firms through marketing support and management development, and to encourage R&D and innovation. However, the policy focus remained to attract foreign investment. The recession of 1990 and the downturn in the mainframe and minicomputer industries hit Ireland particularly hard. A spate of job losses culminated in 600 layoffs at Amdahl and 760 at Digital. The power of the multinationals was shown by the failure of senior government ministers to reverse the closures, despite flying to Boston to plead with Digital executives.

Multinationals in Ireland Today
However, these disastrous losses were followed by Irish IT's most successful era. In the early 1990s the unification of the European market, a boom in IT industries, and growing executive awareness of the potential of international markets combined to create favorable conditions for Ireland's strategy of industrialization from without. The high-quality workforce, a huge investment in telecommunications, and the developing supplier base in a number of industries have been crucial. The rapidly improving public finances and the sacrifices made by employees and their unions through the social partnership agreements instituted in

1987 also helped stimulate growth. Ireland's advantages have gone beyond the delights of the tax shelter and the ability to manage cash flow to minimize tax payments, although these remain important.

The IDA claims that Ireland attracted 40% of U.S. electronics investment in Europe since 1988. Dell, Gateway and AST Research joined Apple in the PC sector; HP, Keytronic, and Seagate were among those making peripherals while 3Com and Motorola strengthened the networking sec-

manufacturing, logistics, and distribution through these centers.

An Irish IT Industry?

Given the perils of development based on foreign investment, it is encouraging that a healthy Irish-owned IT sector has emerged. The heavy investment in education and telecommunications was originally designed to attract multinational investment. However, it also provided an infrastructure that supported the unanticipated growth of Irish firms.

The increasing reliance on sub-

were easier to enter than the increasingly concentrated desktop software markets. Early firms specialized in software development while others such as Kindle and CBT Systems emerged in the 1980s to supply such vertical markets as banking and training. The industry came into its own after the late 1980s with a new generation of start-ups that created sophisticated systems software products for world markets. Companies such as Iona Technologies have become world leaders in these markets. The 1996 Object

IF IRELAND CAN MARRY ITS TECHNICAL STRENGTHS IN software with the design and creative skills of its writers, artists, animators, and film makers, it may have a bright future in multimedia.

tor. Forty percent of Europe's packaged software is now supplied from Ireland (Microsoft and Lotus since the mid-1980s; more recently Claris, Symantec, Oracle, and Novell, manufacturing and localizing their products in Ireland). ICL, Ericsson, IBM, and Digital carry out software development.

Intel's two wafer fabrication plants near Dublin replaced Digital as the flagship for IDA efforts to attract other companies. Employing 2,800, Intel makes systems and motherboards under contract as well as running the wafer fabrication operation. It has few links to local industry as it brought almost all its established suppliers—mostly U.S. and Japanese firms—with it.

Many companies are forming their European regional operations in Ireland and managing their

contracting by the multinationals prompted the development of sophisticated Irish-owned parts and components suppliers. The software-manual printing industry grew rapidly from $9 million to $135 million in five years [6, 7]. The shift from the manufacture of complex computer systems to sub-supply and contract manufacturing was worrying since the skill profile of the components supply sector was lower than the systems manufacturers. However, some Irish firms have been able to use the commercial opportunities provided by outsourcing of manufacturing and logistics as a springboard toward a more independent and technically sophisticated business.

The Irish-owned software industry grew as new markets emerged in distributed computing and data communications that

World West show in San Jose featured Iona's day-long Orbix-World, displaying their CORBA standard object request broker.

Ireland has avoided relying on contract programming or bodyshopping (although the high levels of emigration among programmers do create a somewhat similar dynamic). Nonetheless, with over two-thirds of companies producing products and exports increasing from 41% of total revenues in 1991 to 58% in 1995 [8], the indigenous software sector is well-poised to become Ireland's most technically dynamic sector. If Ireland can marry its technical strengths in software with the design and creative skills of its writers, artists, animators, and film makers, it may have a bright future in multimedia.

Links to the global economy provide commercial opportunities

for Irish firms. Employees' experience working abroad or for multinationals in Ireland was important to Irish firms. Yet free trade and the presence of IT multinationals, two constants in the Irish economy since the 1960s, do not explain the emergence of an indigenous IT sector. With the labor force well trained and the commercial opportunities available, potential entrepreneurs had to be supported in their entry to and growth in the new challenging industries [5].

State education and telecommunications policy contributed to the growth of Irish firms, albeit unintentionally. Gradually and quietly a range of state-sponsored programs was created, often with European Union funding that will dry up in 1999. Firms are supported through guidance and funding with R&D, marketing consultancy, management development, and business networking. The process for gaining this support is highly competitive and firms are held to rigorous international standards. The state is also active in developing a network of institutions to deepen communication and innovation in IT industries. This network includes the National Software Directorate, three technology centers located in the universities, and a range of industry and professional bodies.

Ireland's IT sector has shifted somewhat from an export enclave dominated by multinational corporations toward a regional complex of IT industries with significant local contracting opportunities and upgraded skills and organizational capacities of local firms and workers [13]. Although multinationals still dominate, there is significant local economic development. Nonetheless, IT in Ireland faces three major challenges: the persistent dilemmas of multinational-led development; the deeper integration of successful Irish companies into the global economy; and the danger of creating an information elite.

Multinationals in Ireland— Sustainable Development?

The Irish debate about foreign investment has focused on the high costs of the incentives given to industry and the tax income foregone through the 10% corporate tax rate. Ireland can offer such incentives because income levels are below 80% of the EU average and essentially gives up the tax revenues in order to attract the jobs to Ireland, creating some tension with its European partners. Furthermore, the tax revenue lost to the EU as a whole because of the competition among its member states results in a transfer of income from the public to the corporate sector within Europe.

Foreign investment accounts for most employment growth in Ireland in recent years. Employment in Irish-owned manufacturing has been relatively stable in the 1990s whereas international manufacturing and all sectors of financial services and software have expanded rapidly. Unemployment is approximately 13% (although there is considerable controversy over the figures). Emigration has decreased substantially, however. In response to a perceived vulnerability to changing world markets and corporate strategies, government and development agencies have targeted a range of sectors with a high-technology focus. For example, they have pursued networking firms in light of a perceived over-reliance on the PC sector.

More important, however, it is more difficult for national governments and local communities to bargain with companies who are organized on a global scale and whose core capabilities are located elsewhere. Incorporating these companies into a social project and guiding the economy to create a specific social impact becomes difficult. Competition between countries to offer multinationals the best financial incentives weakens the European tax base. Furthermore, most U.S. high-tech companies are nonunion, in contrast to non-U.S. companies [4] and even many U.S. companies of the 1970s, weakening the accountability of employers to their employees. The use of temporary and contract workers contributes to a new and weakened social contract being put in place between employer and employee in Ireland. Ireland has built economic success in recent years on making itself a world-class investment location but has been less able to generate social development from that success.

Irish Firms on the Way Up

The integration of the emerging Irish firms into the global economy also poses two distinct challenges. Local competition with multinationals for labor, particularly in software, may hinder Irish firms although the numbers of software designers and programmers are being increased. Irish firms must also compete with the

allure of international labor markets. Between 10% and 20% of computer science graduates emigrate within one year of graduating. Anecdotal evidence suggests that 50% to 70% emigrate at some stage of their careers, creating a highly significant brain drain from Ireland.

receive major funding or go public in the U.S.

Development for the Whole Society

Ireland faces the challenge of turning its competitive strength in IT into the basis of a new mode of development for the whole society

medium for disseminating a narrow form of consumer culture. Irish servers have one of the fastest growth rates for new Internet sites (more than 21,000 sites now end in the .ie suffix).

The diffusion of IT outward and downward into Irish society is also affected by the structure of

MANY OF THE MOST SUCCESSFUL IRISH SUPPLIER

and software firms have cashed in on their success through acquisition by larger international companies with fewer links to the Irish economy.

While emigration among graduates is apparently falling as the economy grows, it remains high for computer professionals as emigration becomes an accepted part of career patterns and as developers in the U.S., Japan, and Europe spot opportunities for their friends back home. Reducing emigration is one challenge. Making the most of business contacts and technical expertise of the emigrants already abroad by fostering contacts between these emigrants and those working in the IT industry in Ireland is another.

The success of Irish firms may also pose a problem for national development, if not for their owners. Many of the most successful Irish supplier and software firms have cashed in on their success through acquisition by larger international companies with fewer links to the Irish economy. Moreover, successful Irish firms may rely less and less on their home base and develop closer ties to dominant regions of the industry—particularly if companies

[2]. The gap between the dynamic IT sector and the diffusion of IT into Irish business is shown in the 1993 finding that Ireland ranked fifth in the OECD in employee computer literacy while it was only 14th in the strategic exploitation of IT by business [11]. The weakness of the IT-using community in Ireland contrasts with other small but dynamic countries [3]. Policies promoting inter-industry linkages with the IT sector and deepening the use of IT in schools should be pursued as a matter of urgency.

There is a danger that economic growth will create an information elite who create or use the new technologies extensively while most of the population has little access to IT and experience it as a controlling force in their lives. This is of course a threat worldwide—reflected in the debates whether the Internet will become a truly interactive medium with relatively equal access and speech rights or whether it will become simply a

Irish society itself. Education has been the driving force behind the informational economy in Ireland, along with a network of institutions promoting information flows and connections within the industry. However, class inequalities in Irish education are prevelant with restricted opportunities for working-class students [1]. The focus on education, one of Ireland's greatest competitive advantages, may create even greater barriers to social mobility into IT. Sex segregation in employment is high and the proportion of female computer science graduates has stayed at 25% during the 1990s. The close social ties that characterize the industry are also, as everywhere, segmented by social background—the area where you grew up, the school you attended, and your past jobs. Opening educational opportunities and social networks in the IT sector is crucial if the benefits of the IT era in Ireland are to extend to the whole society. Regional inequalities have been exacerbated by the concen-

tration of IT growth in the major urban centers.

Ireland has developed a strong IT sector in recent years and has great potential in software, multimedia, and manufacturing. In the U.S. such growth has been associated with rising income inequality [12]. Whether Ireland can realize this potential and extend the benefits to the whole society will depend largely on how it governs its links to the international economy. From the 1920s to the 1950s, Ireland remained closeted behind protectionist barriers. Then it turned 180 degrees and offered practically an open invitation to the companies of the world. Realizing sustainable economic development requires not simply rejecting international ties (pre-1958) or embracing them with little reservation (post-1958); Ireland must make choices about which international relationships are worthwhile and how their benefits can be distributed throughout society. The state has begun to play a critical role in mediating these relationships. However, time will tell if the political will exists to extend the benefits to the whole society. **c**

Follow-up
Readers are encouraged to send comments, suggestions, anecdotes, insightful speculation, raw data, and articles on subjects relating to international aspects of IT to:

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