

ICT

*Essential enabler
 for the knowledge
 economy*

The knowledge economy is critically dependent on information and communications technology (ICT). ICT drives productivity growth, and its influence pervades all industries and the service sectors of the economy. Unlike the rest of the world, however, the UK's research output in ICT has shown no growth since the major government initiatives in the 1980s and early 1990s. It is too important for this situation to be allowed to persist.

Realising the 'knowledge economy' is critically dependent on a sophisticated infrastructure provided by advances in information and communications technology (ICT). During the dotcom boom it was commonplace to describe the development of the internet (and everything associated with it) in terms similar to those used during the introduction of railway or electricity networks a century or so earlier. But with the popping of the share price bubble there is a risk that the UK has lost sight, at a most critical time, of the importance of ICT and of the need for the UK to have a strong skills and research base in it. Several countries (e.g. USA, Ireland and Australia to name but a random diverse few) have ICT as one of the declared government-level national priority areas for research and innovation. In contrast, in the UK, while admittedly there is

much emphasis on e-business, and the Office of Science and Technology has fostered a major e-Science initiative, the importance of ICT innovation more generally does not seem to have the profile it deserves. There is perhaps even a sentiment that ICT 'had its day in the sun' some time ago! Yet in fact we are more dependent now than ever on ICT.

The most productive parts of the economy are those which have embraced ICT and re-engineered their business processes to use its power to the full, while a recent *Computing* front page reports figures from UK Trade and Investment showing the IT sector as the largest growth area for attracting overseas investment into the UK. All areas of science, and all the high-tech industries reliant on them, now intimately depend on ICT. The biosciences and the pharmaceuticals industry are some of the most

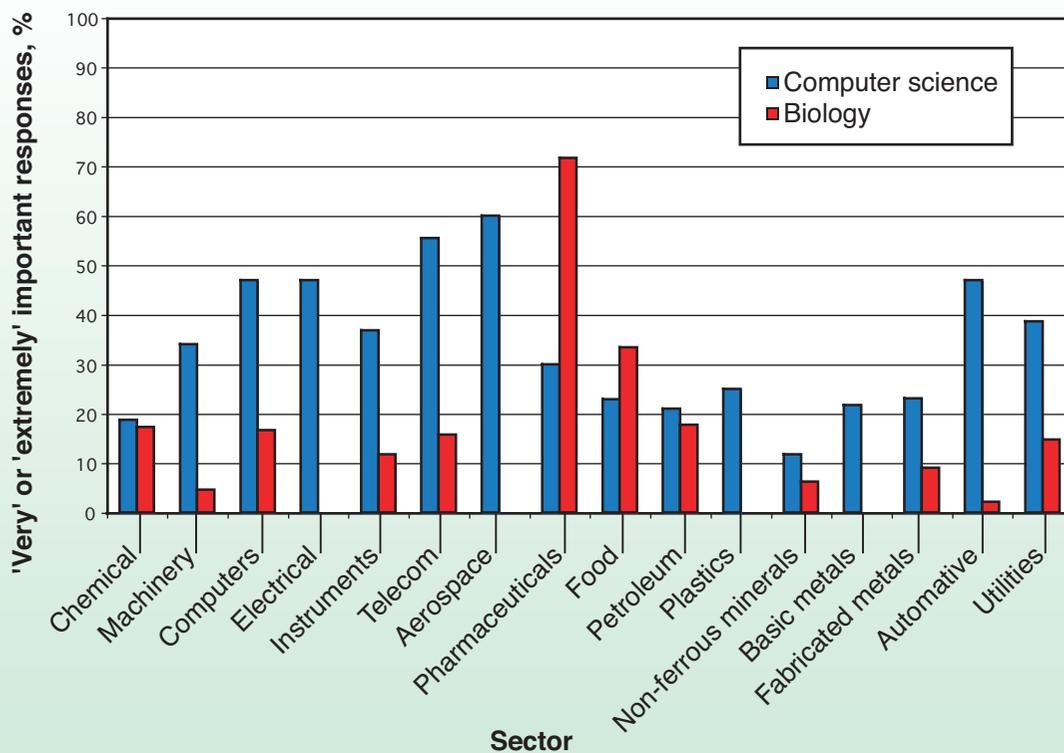


Figure 1 Importance of academic research in different fields for industrial R&D managers in different European industrial sectors

demanding users of ICT. Making sense of the human genome and the yet more complex world of proteins encoded by the genes can only be done using huge amounts of insightfully applied computer power. Major advances in, for example, weather prediction or protein folding depend on ICT. More prosaically, the whole business of government depends on the intelligent use of ICT, whether for running the NHS, keeping tax records or simply allowing easier access to public services.

Modern, productive, knowledge-based economies simply cannot survive (let alone prosper) without a strong commitment to an ICT infrastructure and to the research and postgraduate training needed to sustain it. In this article we review briefly some of the evidence for ICT's vital role and examine the UK's position compared to other countries.

So what is the evidence? The US economy showed remarkable productivity gains in the second half of the 1990s and most of this has been

ascribed to information technology (see, for example, the work of Harvard economist Dale Jorgenson: 'Information technology and the US economy', *American Economic Review*, **91**, 1–32, 2001; and the Federal Reserve Board's Stephen Oliner and Daniel Sichel: 'The resurgence of growth in the late 1990s; is information technology the story?', *Journal of Economic Perspectives*, **14**, 3–22, 2000). Furthermore, Oliner and Sichel (in 'Information technology and productivity; where are we now and where are we going?', *Federal Reserve Board of Atlanta Economic Review*, 3rd quarter, 15–44, 2002) have examined the robustness of their conclusions since the dotcom 'bust' and find the story still stands: '... namely, output per hour accelerated substantially after 1995, driven in large part by greater use of IT capital goods by businesses throughout the economy and by more rapid efficiency gains in the production of IT goods'.

Economists sometimes provide complex ways of illuminating simple

truths. An alternative means of gaining insight into the importance of different disciplines is to simply ask people who know. There have been a number of large surveys of R&D managers both in the USA and in Europe. The PACE survey (A. Arundel, G. van de Paal and L. Soete, 'Innovation strategies for Europe's largest industrial firms. Results of the PACE survey for information sources, public research, protection of innovations and Government programmes', *MERIT*, June 1995) asked R&D managers in some of Europe's largest manufacturing and industrial firms how important publicly-funded research over the previous ten years had been to the progress of their unit's technological base. The question was asked in respect of ten scientific fields ranging from biology through chemistry to branches of engineering. Figure 1 shows the percentage replying 'very' or 'extremely' important for a range of industrial sectors. For simplicity we have only shown two disciplines (computer science and biology), not to

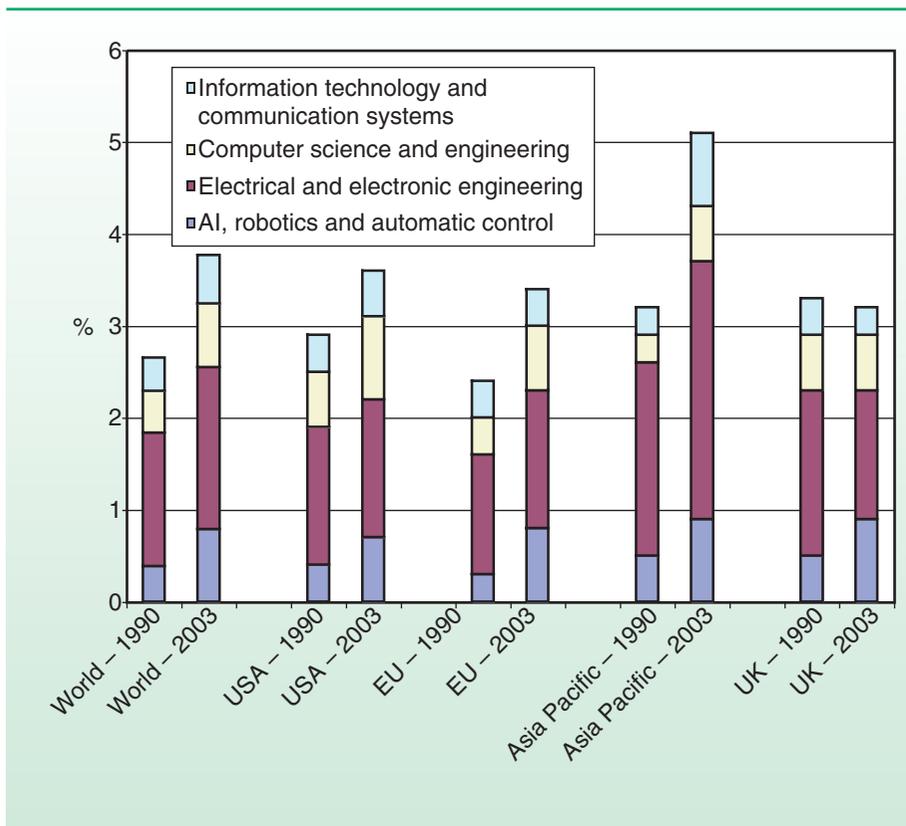


Figure 2 ICT publications as share of country/region publications

suggest that one is any more important than another but mainly to reveal the marked, distinctive pervasiveness of computer science across all the industrial sectors.

The PACE survey was undertaken in the mid-1990s (thus almost certainly underestimating the current importance and pervasiveness of computing) and related only to manufacturing industry. An alternative approach is to look at the changing pattern of employment of engineering and physical sciences postgraduates. The UK Labour Force Survey allows an insight into the fast-changing picture. Over just a four-year period (1998 to 2002) the proportion of engineering and physical sciences postgraduates employed in the service industries in the private sector increased from 35.8% to 41.2% (with concomitant falls in employment in the public and manufacturing sectors). The proportion in telecoms and computer-related parts of the private service sector increased from 10.6% to 14.2% (G. Crespi and P. Patel, 'Engineering

and physical sciences in the UK', *SPRU*, October 2003). The picture is simple. For the most highly trained engineers and physical scientists in the UK, employment is increasingly in the service sectors and most particularly in ICT-related private services.

Given the vital role of ICT in any modern economy, it is important to ask whether the UK places enough emphasis on research in it. Bibliometrics provides a partial answer. In Figure 2 we show the percentage of various regions' publications which are in sub-fields making up ICT. The sub-fields (defined by Thompson ISI, which provides the data) are: electrical and electronic engineering; AI, robotics and automatic control; computer science and engineering; and information technology and communications systems. The greatest emphasis on these fields is in the Asia Pacific area. The UK is generally on a par with the European Union as a whole and with other advanced economies such as the USA.

Figure 2 reveals one significant difference in the UK performance, however. The general pattern is one of substantial growth for most countries and regions between 1990 and 2003. By contrast, the UK shows none of this growth, only a small decline. After major government initiatives in the 1980s and early 1990s (e.g. the Alvey Programme and its successor JFIT) we seem rather to be resting on our laurels. But our competitors are not. There is much emphasis on major national ICT initiatives in the USA, Ireland, Australia and throughout Asia, and the UK cannot afford to stand still. ICT is too important for that. ■

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