
Workforce Ageing in the New Economy: A Comparative Study of Information Technology Employment

*A European summary report focusing on the
United Kingdom, Germany & the Netherlands*

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WORKFORCE  AGEING
IN THE NEW ECONOMY



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About the authors

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The Cambridge Interdisciplinary Research Centre on Ageing (CIRCA) is a network of researchers within the University of Cambridge who are engaged in innovative studies of the ageing process. CIRCA aims to advance knowledge in the field by an integrated, interdisciplinary approach which crosses the traditional boundaries of the humanities, natural, medical and social sciences. Website: <http://www.circa.cam.ac.uk/index.html>

Workforce Ageing in the New Economy: Executive Summary

1. The Workforce Ageing in the New Economy (WANE) project focuses on working practices in the Information Technology sector. Funded by the Social Sciences and Humanities Research Council of Canada, the project involves an international consortium of academics and Information Technology (IT) partners in Europe, Canada, the United States and Australia.
2. Workforces are ageing in each of the developed countries involved in this study. The WANE project is concerned with employment transitions and management approaches in the Information Technology sector, against a backdrop of rapid technological change, industry volatility and off-shoring trends.
3. This summary report brings together the key European findings of Phase One of the Workforce Ageing project. These findings are based on customised data from the European Union Labour Force Survey, allowing us to chart patterns in the employment of IT professionals in three European countries.
4. The IT labour market is a dynamic one: employment growth has been strong, despite the global IT recession. The timing and magnitude of the IT recession varied, though, between the three European case countries.
5. The IT profession is still male-dominated, despite policy interventions and educational initiatives to improve gender diversity. In the United Kingdom, skill shortages and surpluses in IT appear to be important factors in encouraging women to enter (and then leave) the IT profession: the number of female *computing professionals* doubled in the three years to 1999 and then declined sharply in the four years which followed.
6. The IT profession consists largely of people under the age of 45: around 80% of *IT practitioners* are below this age in the three European case countries, a level much higher than for their respective labour forces as a whole. Yet there are signs that the IT workforce is ageing, a trend with important implications for management practices and policies in organisations employing IT professionals.
7. IT work remains largely full-time. Short-hours working is uncommon, although proportions vary significantly between men and women, and across the three European case countries. The lack of part-time employment opportunities may pose significant difficulties for IT workers with caring responsibilities or with plans to retire gradually from paid employment.
8. There has been a significant increase in the proportion of IT professionals working as self-employed contractors in Germany and the Netherlands over the decade, and an associated decline in the proportions of IT professionals on permanent contracts in all three case countries.
9. In Phase Two of the Workforce Ageing project, teams of researchers in Europe, North America and Australia will be working in partnership with IT firms to examine how employers can harness, strategically manage and sustain their workforce as populations age. These will be small, medium-sized and large firms in the IT software and service sector. IT firms interested in being considered as part of the research consortium should contact Dr Kerry Platman, at the WANE Europe office, the University of Cambridge: kp277@cam.ac.uk.

Workforce Ageing in the New Economy: a European focus

Introduction: Setting the Scene

The ageing of the workforce represents an unprecedented challenge for businesses and economies in developed nations. Policy-makers argue that extensions to working lives are critical for the long-term sustainability of welfare systems and the profitability of industry. How we keep active, engaged and productive in the workplace as we age is an issue of growing concern in Europe and other advanced global economies¹.

Achieving longer working lives is far from easy, though, due to the economic restructuring which has taken place in a number of European Union Member States and the 'culture' of early retirement which has pervaded many occupations and industrial sectors in the European Union. Even more pressing for global industries reliant on advanced information skills is the need for new approaches to training and skills investments, given the speed and frequency of technological change.

The Information Technology sector

This report focuses on one industry at the forefront of these skills challenges: the Information Technology sector. Advances in programming languages, digital technologies and inter-operability between different systems and products are changing the nature of work for IT practitioners. Computing professionals trained even five years ago now have skills of diminishing market value. How is this sector approaching the challenges and opportunities of an ageing workforce? Are IT employers introducing policies and practices designed to ensure a competitive edge amid the changing demographics of the labour market?

The image of IT work is that it is carried out largely by people in their 20s and 30s. The personalities lauded at the height of the dot.com boom in the late 1990s were young entrepreneurs who were developing bold ideas and delivery them to the market in new ways. For instance, Martha Lane Fox and Brent Hoberman were both in their 20s when they co-founded 'lastminute.com', the online holiday bucket shop which was valued at £733 million at the height of the dot.com boom. When the online fashion retailer 'boo.com' launched in London in 1998, its co-founders Ernst Malmsten and Kajsa Leander were both in their late 20s.

Yet the computer industry is no longer young. Bill Gates founded Microsoft in 1975 and reaches his 50th birthday next year (2005). The lead-up to Year 2000 (Y2K) compliance forced organisations to reassess and modify their computer applications, placing a premium on veteran computing professionals with 'legacy' programming skills. Given the speed of technological change and software programming cycles, lifelong learning has become an issue for all ages, not only for those aged 40 and older.

Europe's information-led economy

Such skills issues are critical for the future of Europe as a world-leading information-led economy. European Union Member States have recognised that innovative IT solutions and advanced IT skills are essential if they are to compete in the global marketplace. This means a highly trained, entrepreneurial and indigenous workforce capable of exploiting the business opportunities of the 'new' informational economy. Such a workforce entails strategic investments in order to ensure that IT professionals have the skills, knowledge and opportunities to design and deliver competitive products and services in such a complex and demanding business environment.

European Governments and agencies have formed partnerships with trade organisations, sector bodies and academic institutions in order to encourage skills formations and IT-led ventures. The Cambridge Technopole Group, for instance, is a consortium of university, industry and government institutions supporting technology-driven enterprises to ensure that Cambridgeshire remains one of the world's leading high-technology business clusters². In London,

¹More information on the policy dimensions of an ageing workforce can be found in a themed section on Age, Employment and Policy in the journal *Social Policy & Society* (2004), volume 3, number 2, edited by Dr Kerry Platman and Dr Philip Taylor.

²*Cambridge Technopole: An Overview of the UK's Leading High-Technology Business Cluster*, published by St John's Innovation Centre, Cambridge, 2004.

publicly-funded agencies are providing networking events which allow small and medium-sized IT software firms to reach new customers in the public sector³. Meanwhile, 'internationalgrowth.org' provides online business development advice and global industry information for UK software and computer services companies wishing to expand into overseas markets⁴.

These partnerships are designed to nurture local initiatives amid the volatile conditions which have depicted the IT software and services industry in recent years. The downturn in the IT economy from 2000 on led to a restructuring of the computer industry and the demise of a number of large and small enterprises. The IT recession is likely to have accelerated the trend towards the 'offshoring' of IT work to cheaper countries in the developing world. One recent industry report⁵ suggested that the United Kingdom is the largest European market for offshore IT services, mainly to India, and that this is likely to continue for the next five years at least.

An ageing IT workforce?

To what extent, then, will ageing IT professionals continue to be sought after in such a fast-changing global industry? Is it possible that the IT workforce will age as the industry matures, and as the total workforce ages in the European Union? Or will Europe's IT profession consist largely of young graduates operating from remote sites in the developing countries, or of young immigrants on temporary visas or short-term work contracts? If Europe becomes a magnet for highly qualified IT workers from non-Member States, how will the existing IT workforce manage to remain employable until retirement age?

The Workforce Ageing Project

These questions are being addressed by an international consortium of academics and IT industry partners in Europe, Canada, the United States and Australia. 'Workforce Ageing in the New Economy' (WANE) examines management approaches, working practices and employment in the Information Technology (IT) sector. Funded by a \$3 million (Canadian) grant from the Social Sciences and Humanities Research Council of Canada (SSHRC), the research is being conducted in three phases. It is directed by Dr Julie McMullin, Associate Professor at the University of Western Ontario, Canada.

The purpose of this summary report is to inform industry partners, sector bodies, policy-makers and media outlets of the key findings of the first phase of the research. In Europe, Phase One has involved a detailed study of trends in IT employment over the last decade, using the European Union Labour Force Survey. This has provided us with a unique portrait of employment trends, workforce composition and contractual conditions in one of the most dynamic of professions in developed and developing economies.

This publication builds on a number a special reports and presentations produced by members of the international research team. It draws particularly on WANE Europe's Country Report. We are especially grateful to Dr Ann Vogel and Francisca Florenzano for their work on the European Union Labour Force Survey data. More details of the WANE study, its working papers and online publications are to be found on our website: www.wane.ca.

We thank our industry partners for providing us with guidance and helpful comments on earlier versions of this report, in particular:

- Matthew Dixon, SEMTA Visiting Research Fellow at SKOPE, the ESRC's Centre on Skills, Knowledge and Organisational Performance
- Liz Addison, Andrew Harvey-Price and Peter Hounsom, members of the research team at e-skills UK, the Sector Skills Council for IT, Telecoms and Contact Centres.
- Michael Gubbins, Editor of Computing, the weekly magazine for the IT industry in the UK.
- Andy Watson, Department of Trade and Industry, UK.

We hope this research summary will encourage industry leaders and policy-makers to read the growing volume of publications produced by the 'Workforce Ageing in the New Economy' research group. We welcome comments, which should be directed to:

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³The 'Meet the Buyers' Public Sector 2004 event was held at the Oval Cricket Ground, south London, and sponsored by Business Link, the London Development Agency, the South London Partnership and the NHS.

⁴See <http://www.internationalgrowth.org/index.asp> for the 'one-stop shop' for the UK's Software and Computer Services sector, an initiative backed by the Department of Trade and Industry, UK Trade & Investment, and Intellect, the trade body for the UK-based information technology, telecommunications and electronics industry.

⁵Forrester Research, quoted by Glick, Bryan (2004) 'UK leads Europe's offshore push', Computing, p. 10.

⁶WANE Europe's Country Report (2004) Workforce Ageing and Information Technology Employment in Germany, the Netherlands and the United Kingdom. (International Report No. 4). London: The University of Western Ontario, Workforce Ageing in the New Economy.

Research boundaries and definitions

This report highlights the major findings of our detailed study of trends in the employment of Information Technology professionals in the European case study countries of the United Kingdom, Germany and the Netherlands over the last decade. By analysing customised data from the European Union Labour Force Survey, we have been able to present a detailed picture of IT work during the 1990s and into the first part of the 2000s. The design of this survey allows us to compare developments in the IT labour market across European countries, providing us with important insights into country-specific variations.

Although the Information Technology industry is generally regarded as a global one, comparative research into its workforce is hampered by a lack of systematic definitions and classifications. Even within Europe, there exist several different occupational frameworks to map the Information Technology profession. The design of the European Union Labour Force Survey, however, makes it possible to compare certain occupational groups across Member States. By focusing on two groups of IT workers, we can map trends in the core IT professions over time across our three case countries of the United Kingdom, Germany and the Netherlands. A more extensive analysis and set of tables is to be found in WANE Europe's Country Report.

This summary report focuses on four key features of IT work:

- a) The dynamic nature of the IT labour market.
- b) The gender profile of the IT profession.
- c) Age and IT employment.
- d) Working arrangements in IT occupations.

A note of terms

The findings reported here are restricted to the two core IT occupational groups of *computing professionals* and *computer associate professionals*. *Computing professionals* (ISCO 213) are defined by the International Occupational Classification System (ISCO) as having a high level of professional knowledge and experience. They conduct research, plan, develop and improve computer-based information systems and software; develop principles and operational methods; and maintain management systems of databases. They are system designers, analysts and programmers. *Computer associate professionals* (ISCO 312)⁷ are involved in more technical tasks, such as helping computer users, installing software systems and performing back-up work. Job titles include computer assistants and computer equipment operators.

In the text which follows, a third term is used, that of *IT practitioner*. This represents the codes 213 and 312 combined. Amalgamating the two codes allows us to increase cell values and achieve better reliability thresholds.

These three terms, that of *computing professional*, *computer associate professional* and *IT practitioner*, are italicised since they refer to specific concepts rather than general terms. They have distinct meanings within the International Occupational Classification System (ISCO), the European Union Labour Force Survey and among European researchers studying Information Technology employment patterns.

These two core codes inevitably exclude a number of other occupational groups connected to the IT labour market, most notably IT managers, computer engineers, IT sales and marketing staff, technical writers and IT educators. The design of the EU LFS makes it difficult to extract reliable data on these categories. More details of the methodology are to be found in WANE Europe's Country Report (International Report No. 4)(2004), The University of Western Ontario, London, Ontario, Canada.

⁷Data for ISCO 312 for the UK became available from 2001 only, after a major change in the UK's standard occupational classification system (SOC90) at the end of 2000. In this re-classification (SOC2000), seven new *IT practitioner* occupations were created, replacing the five previous ones. This means that time series data on *computer associate professionals* (ISCO 312) is available for Germany and the Netherlands only.

Workforce Ageing in the New Economy: a European Focus – Key Findings

a) The growth in IT employment

A highly-skilled pool of IT professional labour is seen as critical to the knowledge-based economies involved in our 'Workforce Ageing in the New Economy' (WANE) study. Specifically in Europe, Member States are concerned to develop high-level IT skills among their own workforce in order to sustain the European Union as a world-leading economy. Industry reports suggest that the off-shoring of IT work to developing countries such as India has gathered momentum in recent years. The IT downturn lasted longer, and involved greater job losses, than had initially been predicted by many industry insiders.

We know little, however, about the impact of the IT downturn, and of industry re-structuring initiatives such as off-shoring and out-sourcing, on employment levels in core IT occupations across different European countries. There is a widespread assumption that the IT recession affected job opportunities in similar ways, and at similar times, across Europe and other advanced economies. It might also be assumed that Germany, with the largest population in the European Union, had the largest professional IT workforce.

Our data analysis revealed a number of interesting patterns. Of the three case countries, the UK has the largest *IT practitioner* workforce in absolute terms. In 2002, there were 607,600 *IT practitioners* in employment in the UK, compared to 581,900 in Germany and 230,800 in the Netherlands. As a proportion of the total workforce, however, the Netherlands had the largest pool of *IT practitioners*, as Table 1 below shows.

Table 1: Numbers of IT Practitioners in Employment and as a % of Total Workforce in Germany, the Netherlands and the United Kingdom, 2002

	Total Number of IT Practitioners	% Total Workforce
Germany	581,900	1.6
Netherlands	230,800	3.1
United Kingdom	607,600	2.2

Source: Eurostat customised data

It is important to stress the marked overall growth in the numbers of *IT practitioners* in employment over the past decade, in spite of the IT downturn. The scale of growth fluctuated from year to year, but the net result was an IT workforce far larger in 2002 than in the mid-1990s. This was the case not only in the three European case study countries of the United Kingdom, Germany and the Netherlands, but also in our partner countries of Canada, the United States and Australia.

The strong employment growth in the European case countries was most pronounced among *computer professionals*: between 1995 and 2002, numbers increased by 56 per cent in the UK, 97 per cent in the Netherlands and 135 per cent in Germany. Such gains in employment far exceeded growth rates for the labour force as a whole, as Table 2 below shows. A closer examination of numbers of IT professionals by year shows important differences in the magnitude and timing of

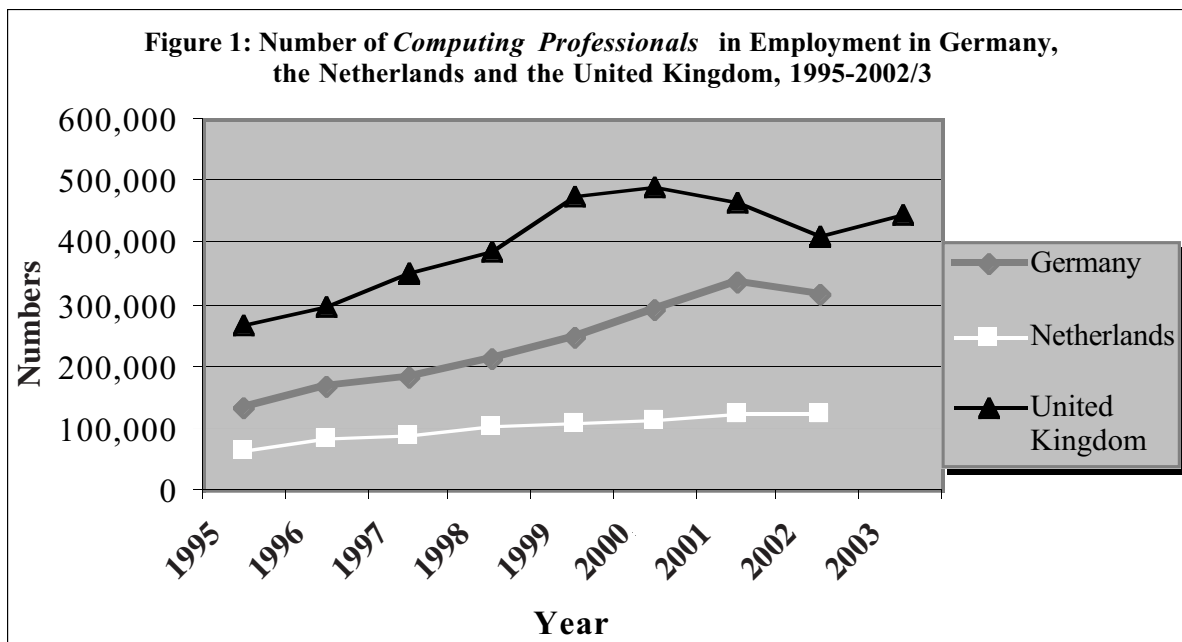
Table 2: Number of Computing Professionals in Employment Compared to Total Workforce in Germany, the Netherlands and the United Kingdom, 1995-2002/3

	Germany		Netherlands		United Kingdom	
	Computing Professionals	Total Workforce	Computing Professionals	Total Workforce	Computing Professionals	Total Workforce
1995	136,200	34,169,983	63,200	6,772,201	265,900	25,939,529
1996	168,100	35,531,196	83,800	6,920,739	296,100	26,231,770
1997	182,700	35,193,671	90,300	7,175,844	354,400	26,684,454
1998	214,500	35,434,741	105,800	7,387,607	385,900	26,985,461
1999	245,900	35,977,838	109,100	7,595,870	476,400	27,364,310
2000	290,800	36,180,622	113,100	7,201,607	492,500	27,804,039
2001	335,000	36,414,895	126,400	7,032,816	465,600	28,088,172
2002	319,400	36,126,843	124,700	7,336,206	414,000	28,273,414
2003					444,100	28,571,603
Change: 1995-2002	134.50%	5.70%	97.30%	7.96%	55.68%	10.15%

Source: Eurostat customised data

the employment downturn between the three case countries. Figure 1 below focuses on *computing professionals* (ISCO 213) only, since time-series data for *computer associate professionals* (ISCO 312) are not available for the UK. In Figure 1, we can see the greater numbers of *computing professionals* employed in the UK compared to Germany and the Netherlands. But we can also see how the IT recession appeared to start earlier in the UK, and involve larger falls in employment. Numbers of *computing professionals* declined significantly in 2001 and 2002 in the United Kingdom. By contrast, numbers of *computing professionals* in Germany and the Netherlands were still increasing in 2001.

Figure 1



It will be interesting to monitor these levels in the next five years, to see whether the recovery in IT employment was experienced in differential ways across the three countries. It will also be important to monitor the effects of the acceleration of off-shoring to countries such as India and China; initially off-shoring involved low-skill work but this appears to be changing as employers cut costs further by off-shoring more complex projects and skills requirements.

The European Union Labour Force Survey contains cross-sectional data only, preventing us from tracking labour market flows into and out of employment. In addition, it was not possible to analyse trends in IT employment by firm size, leaving questions over whether the IT recession was felt most keenly in large, medium or small organisations. An important objective of **Phase Two** of the WANE project is to examine employment transitions among staff and contractors working for IT software and services organisations.

b) Gender and IT work

A number of industry reports have highlighted the under-representation of women in IT occupations. Educational initiatives designed to encourage more girls to study science, engineering and technology (SET), and to encourage more young women to opt for science-based careers, have been underway for some years. For instance, in 1999 the Athena Project ran an initiative on mentoring, networking and career development to advance women into top positions in the SET disciplines in UK higher education. The UK Government is currently providing nearly £1 million in funding for a national resource centre to boost the representation of women in SET⁸. Trade and skills bodies working in the IT sector have collaborated on a number of multi-media projects and workshops designed to attract more women into computing occupations. A recent European Union-funded research project highlighted the need for sufficient numbers of women to work in information and communication technologies so they could exert a ‘critical mass’ effect on working practices and product design⁹.

⁸The setting up of the UK Resource Centre for Women in Science, Technology and Engineering was announced in December 2003 with Department of Trade and Industry funding. The aim is to improve the participation and position of women in academic, industry and public life in these sectors.

⁹Sørensen, Knut H. (2004) Gender and Inclusion Policies for the Information Society, Document Number:D07_EC, downloaded 02/08/04, access: http://www.rcss.ed.ac.uk/sigis/public/displaydoc/full/D07_EC. Strategies of Inclusion: Gender and the Information Society (SIGIS) is funded by the European Union Information Society Technologies Programme.

The impact of such initiatives on computing occupations, rather than the more general sectors covered by SET (science, engineering and technology), has been uncertain to date. There is a lack of comparative research which examines gender representation in these core IT jobs over time in different European Union Member States. The expectation among the three case study countries of the United Kingdom, Germany and the Netherlands is for numbers and proportions of women to have risen in the IT workforce since 1995. It is possible, given industry-specific initiatives in recent years to target or encourage female recruits, that the IT downturn would have affected men more than women. Our findings from the European Labour Force Survey suggest a different picture.

The number of women working as *IT practitioners* is low and has remained so for the last decade in each of the case countries. In 2002, male *IT practitioners* outnumbered their female counterparts by 4 to 1 in the United Kingdom and Germany, and by 7 to 1 in the Netherlands. Table 3 shows the similar proportions of men to women in the workforce as a whole in the three case countries in 2002, at a ratio of roughly 54:46 for men to women. This is in contrast to the male:female ratios in *IT practitioner* occupations in the same year. In the United Kingdom, for instance, 80% of the *IT practitioner* workforce were men (compared to 55% in the labour force as a whole).

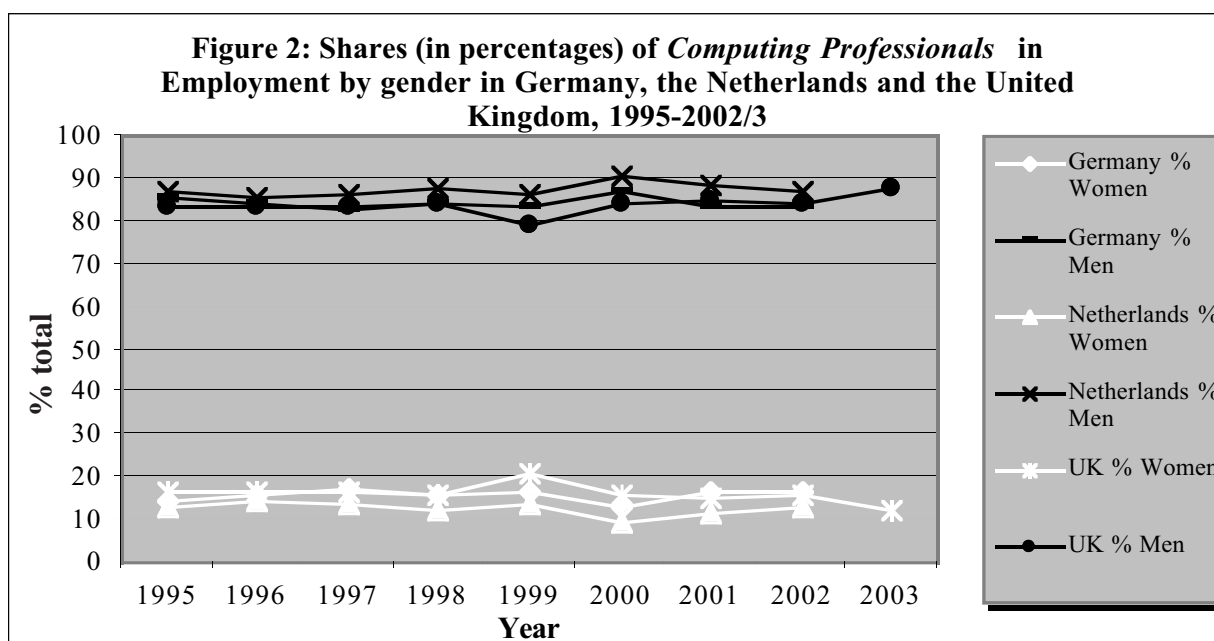
Table 3: Number and Share of *IT practitioners* in Employment by Gender, Compared to Total Workforce, in Germany, the Netherlands and the United Kingdom, 2002

		<i>IT Practitioners</i>	% Total	Total Workforce	% Total
Germany	Female	108,577	18.7	16,118,583	44.6
	Male	473,395	81.3	20,008,261	55.4
	Grand Total	581,972	100	36,126,843	100
Netherlands	Female	28,379	12.3	3,134,289	42.7
	Male	202,385	87.7	4,201,917	57.3
	Grand Total	230,764	100	7,336,206	100
United Kingdom	Female	120,234	19.8	12,761,204	45.1
	Male	487,316	80.2	15,512,210	54.9
	Grand Total	607,550	100	28,273,414	100

Source: Eurostat customised data

Time-series data for the three European study countries shows a fluctuating but consistently low ratio of female to male *computing professionals* between 1995 and 2002/3. (Time series data for *computer associate professionals* is not available for the UK). Figure 2, below, shows the proportions of male and female *computing professionals* in the United Kingdom, Germany and the Netherlands. Of particular concern in the UK, given recent IT industry initiatives to reverse such trends, is the sustained decline in the proportions and numbers of women in this occupational group from 1999 to 2003, as is explained in the next section.

Figure 2



Gender & the IT recession in the UK

Numbers of women working as *computing professionals* in the **UK** have been declining since 1999, as shown in Table 4. Numbers peaked at 100,900 in 1999 (21 per cent of the UK workforce of *computing professionals*). By 2003, only 53,700 women were still remaining (12 per cent of total). Although the number of male *computing professionals* also declined, this started a year later (in 2001, rather than 2000) and had ended by 2003.

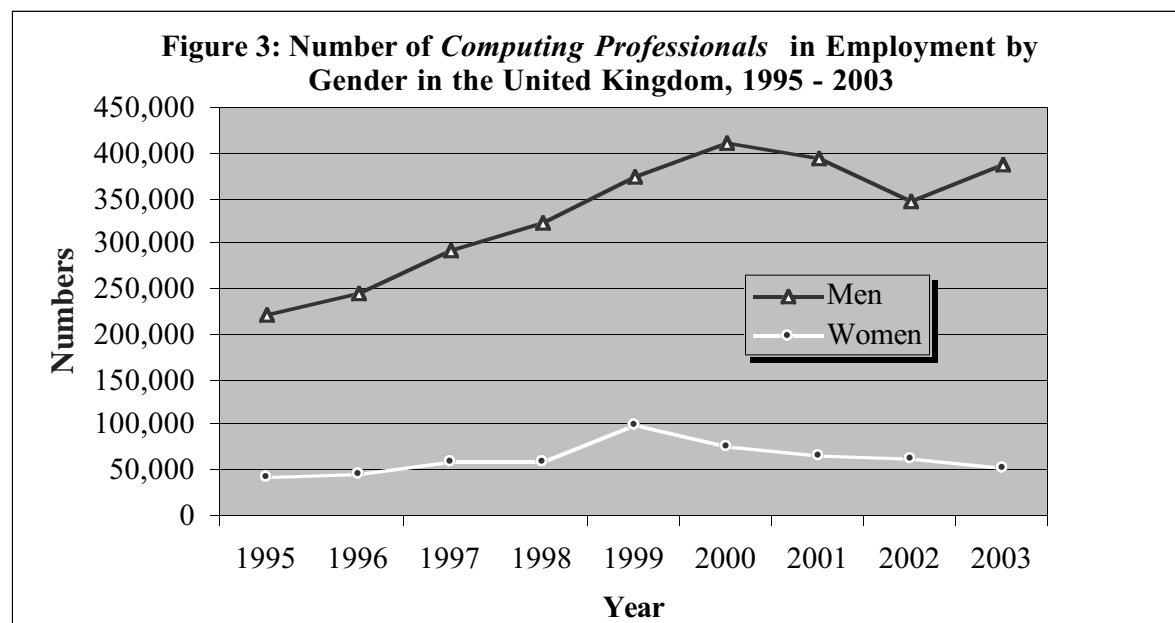
Table 4: Number and Share of Computing Professionals in Employment by Gender in the United Kingdom, 1995-2003

	Women	in %	Men	in %	Total	in %
1995	43,114	16.2	222,753	83.8	265,868	100.0
1996	48,605	16.4	247,485	83.6	296,089	100.0
1997	59,886	16.9	294,543	83.1	354,429	100.0
1998	60,954	15.8	324,903	84.2	385,857	100.0
1999	100,892	21.2	375,473	78.8	476,365	100.0
2000	78,887	16.0	413,609	84.0	492,496	100.0
2001	69,168	14.9	396,427	85.1	465,595	100.0
2002	65,593	15.8	348,377	84.2	413,970	100.0
2003	53,759	12.1	390,371	87.9	444,130	100.0

Source: Eurostat customised data

This is illustrated more graphically in Figure 3, showing the strong growth in employment among male *computing professionals* over this decade. The peak in female numbers appeared short-lived, followed by gradual losses in numbers after the IT downturn.

Figure 3



This is an especially worrying trend given industry and Government-led initiatives to attract more women into the profession. It suggests that market forces may play a greater role than has been acknowledged to date in shaping gender representation in the sector in the UK. In Germany and Netherlands, by contrast, the IT recession appeared to have less of an impact on the ratio of men to women working as *computing professionals*. The numbers and proportions of women employed in this occupational group dipped in both countries during the IT downturn, but this appeared confined to the year 2000 only¹⁰.

¹⁰See Tables 36 & 38, WANE Europe's Country Report (2004).

Low female participation in core IT jobs also features strongly in the IT labour markets of our other WANE partner countries¹¹. In Australia, only 22% of workers employed in IT occupations in 2001 were women. In the United States for the same year, 27% of computer systems analysts and scientists, and 27% of computer programmers, were women. Figures for Canada in 2003 show that women made up approximately 25 per cent of the 21 IT occupations now coded in its Labour Force Survey.

Those women who were employed as IT practitioners in the three European case study countries tended to be concentrated in the age range 25 to 44 years. This pattern was common to both occupational groups in each of the case countries, with the exception of German *computer associate professionals*.

Table 5: Computing Professionals and Computer Associate Professionals in Employment by Gender and Age in Germany, the Netherlands and the United Kingdom, 2002

		Total Numbers (all ages)		Numbers aged 25-44		% of Total aged 25-44	
		Women	Men	Women	Men	Women	Men
Germany	Professionals	52,224	267,215	36,752	177,533	70.37	66.44
	Associates	56,352	206,181	37,797	138,750	67.07	67.3
Netherlands	Professionals	15,758	108,934	12,571	78,299	79.8	71.88
	Associates	12,620	93,450	10,545	62,848	83.56	67.25
United Kingdom	Professionals	65,593	348,377	49,527	248,295	75.51	71.27
	Associates	54,641	138,939	40,979	87,342	75	62.86

Source: Eurostat customised data

In the UK, for instance, 75% of women employed as *computer associate professionals* in the UK in 2002 were aged 25 to 44 years, compared to 63% of men. Among *computing professionals*, 76% of women were in these middle age bands, compared to 71% of men.

It will be interesting to see how the gender composition of these core IT occupations changes during the ‘recovery’ years. Despite low representation, women do have a presence in the profession, and **Phase Two** of the WANE research is designed to find out more about their work histories and future intentions. It is possible that women are to be found in much larger numbers in allied computing occupations, such as in IT sales and marketing, or IT education. It is also possible that women are clustered in certain types of firms or organisations, such as in the public sector or in firms with innovative approaches to flexible or family-friendly working. A recent IT industry report suggested that a culture of long working hours was an entrenched feature of the sector, and undermined attempts by workers to inject more control and flexibility into their working lives¹².

c) Age and IT employment

The workforce is ageing in each of the countries involved in the WANE study. This is especially pronounced in the three European case countries, where the demographic transition to an older labour force is already taking place. The proportion of younger people aged 15-24 is in decline, whilst that of older people aged 50 to 64 is increasing. Although the scale and timing of this transition varies, there is a widespread recognition by Governments of the need for radical changes in employment practices, approaches to training and retirement provision. Employment rates for the 50 plus age group – which had reached historically low levels during the 1980s and early 1990s – have been rising in the Netherlands and the United Kingdom.

There is a growing awareness of the implications of workforce ageing in the Information Technology sector. Increasingly, publications and industry leaders are highlighting the need for new policies and practices to encourage lifelong learning and extensions to working lives. One recent report stressed the need for flexible working arrangements in order to retain the oldest and most experienced IT professionals¹³. CEPIS, the Council of European Professional Informatics Societies, has developed a pan-European qualification which is designed to encourage IT professionals to develop their careers and continue updating their skills¹⁴. This qualification, the European Certification of Informatics Professionals (EUCIP), is branded as an independent, internationally-recognised initiative which allows IT professionals to document their competencies and skills sets, and which provides them with a vehicle for life-long learning in the profession.

¹¹Labour market participation rates in the United States, Canada and Australia are not directly comparable, since they are based on different clusters of IT occupations. Nevertheless, they provide a broad picture of gender representation in similar types of professional IT work.

¹²Department of Trade & Industry (2004) Flexible Working in the IT Industry: Long-hours cultures and work life balance at the margins?, a report to the Department of Trade and Industry and the Women in IT Forum, carried out by Flexexecutive.

¹³Department of Trade & Industry (2004) Flexible Working in the IT Industry: Long-hours cultures and work life balance at the margins?, see Forward by Rebecca George, p. 2-3.

¹⁴See <http://www.eucip.com/> for more details of the European Certification of Informatics professionals (EUCIP).

Research published in 2002 by CEPIS¹⁵ highlighted the relatively young age profile of core IT professionals in employment in a number of European countries. However, this study relied on labour force data up to the year 2000 only. Industry reports have suggested that older workers, especially self-employed contractors, were beneficiaries of the strong demand for knowledge of ‘legacy’ computer systems for Year 2000 (Y2K) compliance of computing applications. It is possible, if not highly likely, that employment levels for professionals aged 45 years and over may have dropped significantly after Y2K compliance, and once the IT downturn set in.

Younger workers & IT occupations

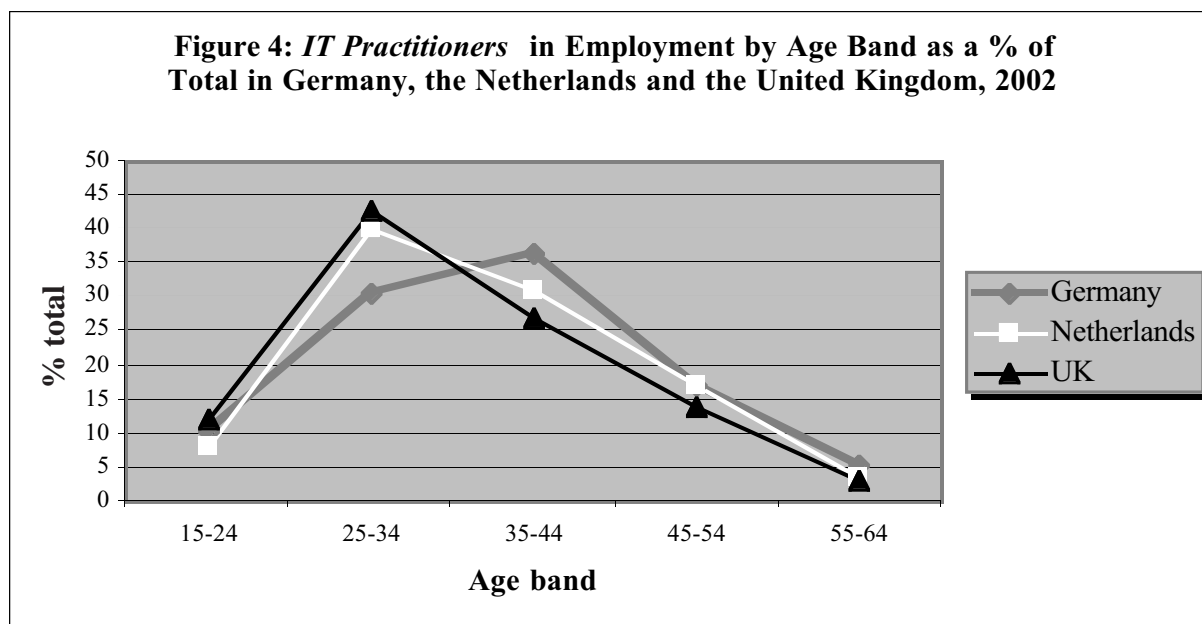
Our analysis of the European Union Labour Force Survey in our three case countries confirmed the findings of earlier studies. The overwhelming majority of *IT practitioners* in employment are still aged under 45 years. Figures for 2002, the latest year for which comparative data are available for the case countries, show that 82.2 per cent of UK *IT practitioners* were aged 44 and under, 77.5 per cent in Germany and 79.5 per cent in the Netherlands. The dominance of the 25-34 age band, in particular among *IT practitioners* in the UK and the Netherlands, can be seen in Table 6 and Figure 4 below.

Table 6: Numbers and Shares (in percentages) of IT Practitioners in Employment by Age Band in Germany, the Netherlands and the United Kingdom, 2002

Age band	Germany		Netherlands		United Kingdom	
	Numbers	%	Numbers	%	Numbers	%
15-24	60,329	10.4	18,863	8.2	73,593	12.1
25-34	179,394	30.8	92,404	40.0	260,660	42.9
35-44	211,438	36.3	71,861	31.1	165,483	27.2
45-54	99,557	17.1	38,972	16.9	85,711	14.1
55-64	31,180	5.4	8,502	3.7	19,429	3.2
Total*	581,971	100.0	230,764	100.0	607,550	100.0

Source: Eurostat customised data
 * Totals do not reflect the omission of the age group 65+

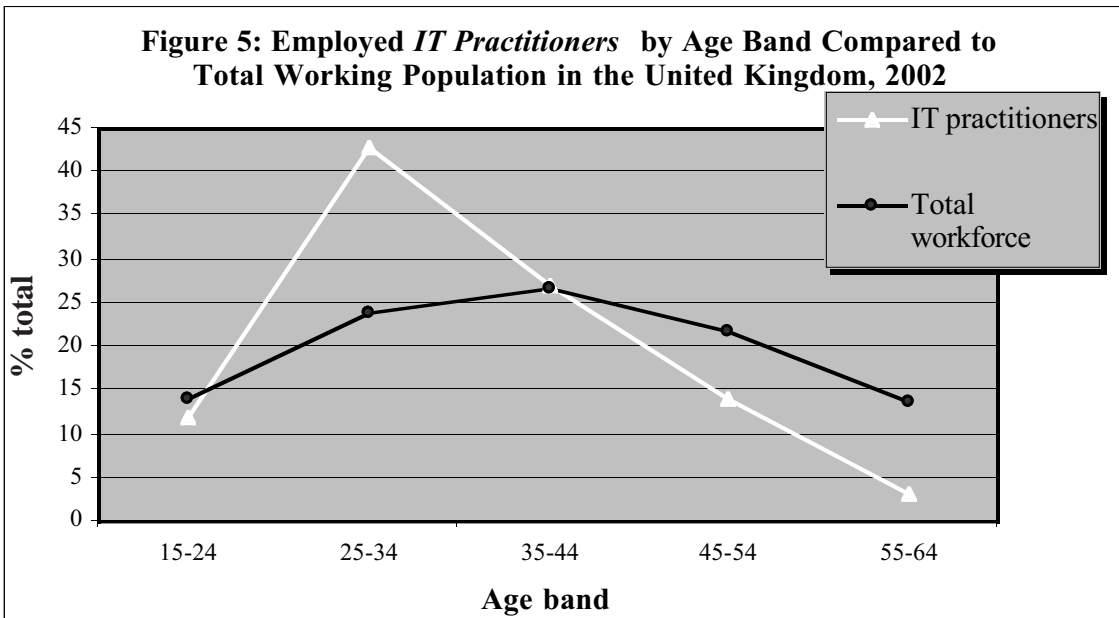
Figure 4



¹⁵Dixon, Matthew (2002) Information Technology Practitioner Skills in Europe, published by the Council of European Professional Informatics Societies, London.

These age profiles were significantly younger than for the workforce as a whole in each respective country. Figure 5 illustrates this well. As can be seen, 43% of *IT practitioners* in the United Kingdom were aged 25 to 34, compared to only 24% in the workforce as a whole.

Figure 5



An analysis of trends over time suggests the picture is changing, albeit slowly. In the United Kingdom, both the numbers and proportions of employed *computing professionals* aged 15 to 24 years declined between 1995 and 2003. In 1995, 11.7% of *computing professionals* in the UK were in this age group, compared with 6.7% by 2003. This is a worrying development for IT employers who see young graduates as supplying the energy, creativity and cutting edge IT skills essential to the survival of their enterprises. It is also a concern for the long-term future of the industry, which has tended to rely on a constant flow of younger workers (with or without IT qualifications) to meet skills needs.

In Germany, however, a different picture emerges among *computing professionals*. In 1998, for instance, there were less than 10,000 employed German *computing professionals* aged 15 to 24 years (4.4% of the total). By 2002, this had increased to more than 36,000 (11.4% of total). Research funded by the Anglo-German Foundation suggests this could be due to the success of policies to create IT-specific apprenticeship schemes in German companies¹⁶. The risk for the UK is that without such sector-embedded policies, companies may find it hard to attract the next generation of young, home-grown talent and so become increasingly dependent on the supply of graduates from abroad.

Mature workers & IT occupations

Although the core IT occupations are largely the preserve of younger generations, a substantial number of people in their late 40s and early 50s are still working in the IT profession. In the United Kingdom, for instance, we see from Table 6 that more than 85,000 *IT practitioners* aged 45-54 were in work in 2002. This represented 14 per cent of the total UK *IT practitioner* workforce. In Germany, this age group formed an even larger proportion of the total number of employed *IT practitioners*: there were nearly 100,000 *IT practitioners* (17.1% of total) in paid work in 2002.

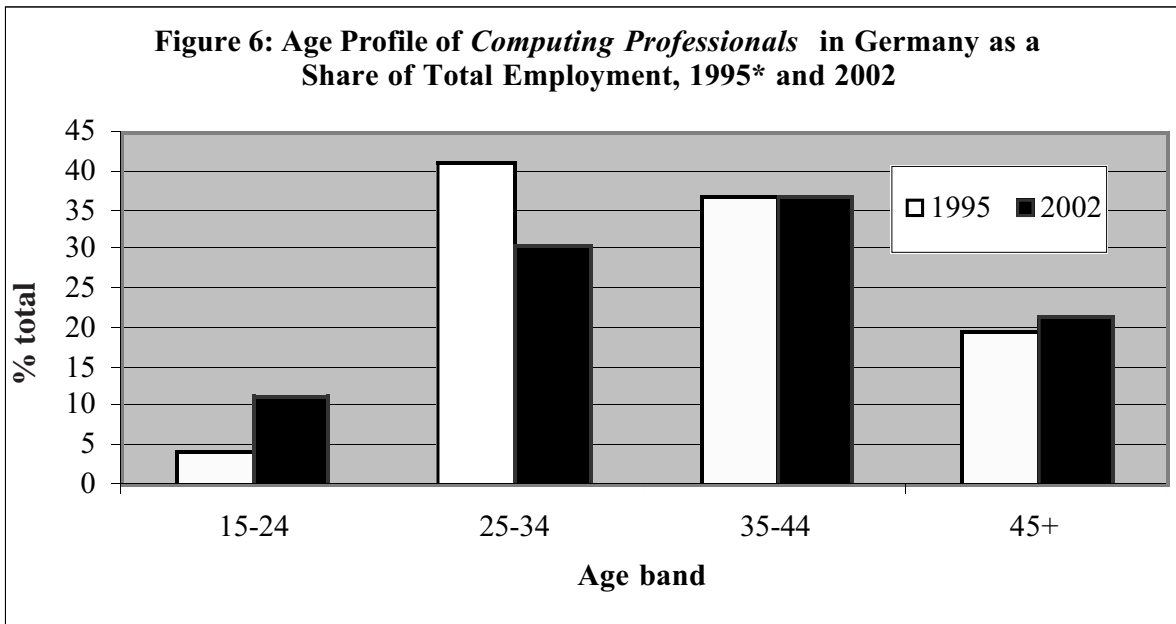
Looking at patterns over time for *computing professionals* only¹⁷, we see that the 45 plus age group grew as a proportion of the total workforce. Figures 6, 7 and 8 below show the age profile of *computing professionals* in 1995 and in 2002/3 in our three case countries¹⁸.

¹⁶Steedman, Hilary, Wagner, Karin, Foreman, Jim (2003) ICT skills in the UK and Germany: How companies adapt and react, London: Anglo-German Foundation.

¹⁷Time series data on computer associate professionals (ISCO 312) is available for Germany and the Netherlands only, as explained in an earlier footnote.

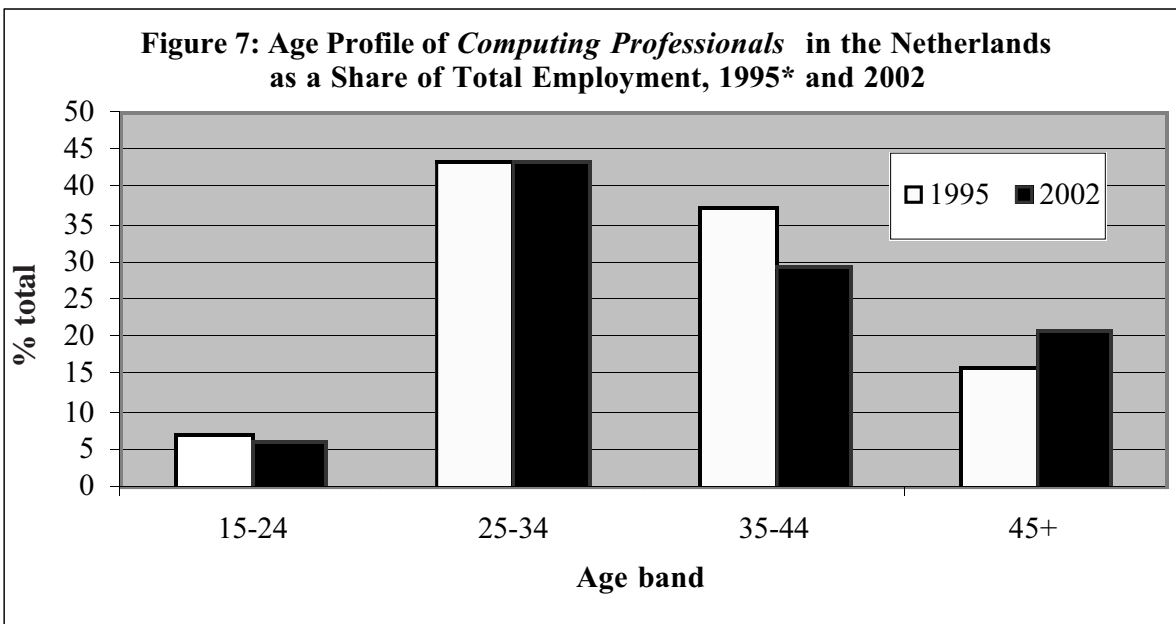
¹⁸Cell sizes for employed IT practitioners in the 15 to 24 age group fell below reliability thresholds in 1995 and 1996 in the Netherlands, and in 1995 through to 1997 in Germany. Thus, the bar for 15-24 year olds shown in Figure 6 (Germany) is for 1998, not 1995; in Figure 7 (the Netherlands), this bar is for 1997, not 1995.

Figure 6



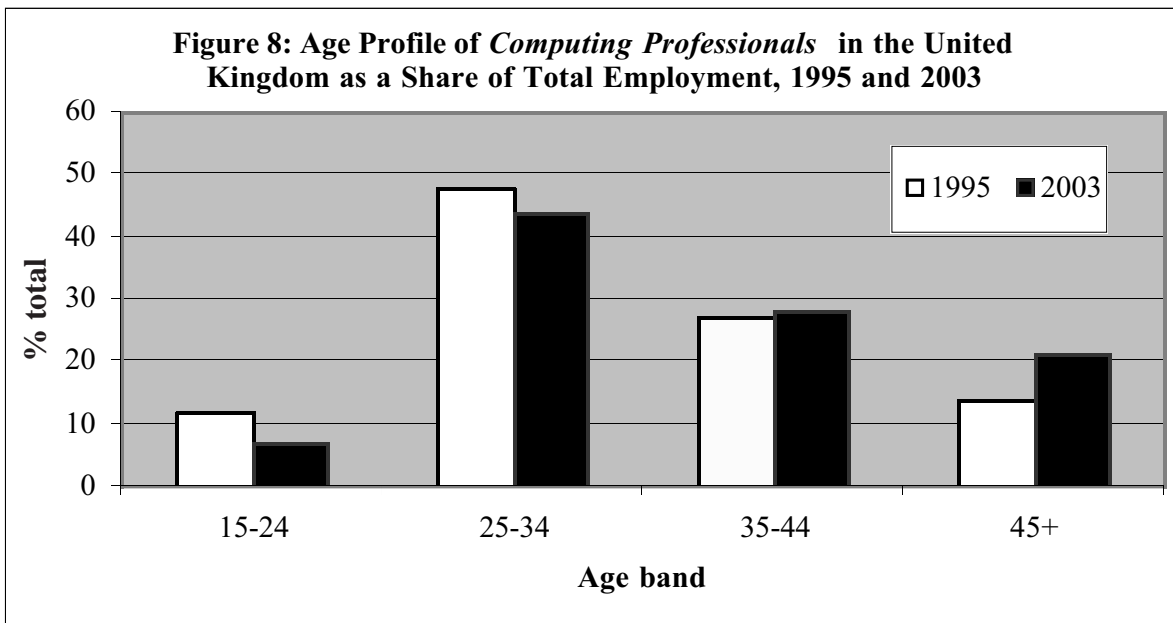
*Comparative figures for the 15-24 age band are for 1998 and 2002, due to cell sizes for 1995 which fell below reliability thresholds

Figure 7



*Comparative figures for the 15-24 age band are for 1997 and 2002, due to cell sizes for 1995 which fell below reliability thresholds

Figure 8



The relative growth of the 45+ age group was most pronounced in the United Kingdom and the Netherlands, where proportions increased by 7.7% and 5.2% respectively. By 2003, 21.4% of *computing professionals* in employment in the United Kingdom were aged 45 and over, compared to 13.7% in 1995. This is a surprising finding, given the level of concern expressed in the computing trade media (both in electronic and paper forms) over unemployment, and under-employment, among ageing IT professionals. An online readership survey of Computing, the weekly IT magazine published in the United Kingdom, suggested that ageism is common in the industry, especially in the recruitment process¹⁹. Regular letters to Computing have highlighted the difficulties experienced by older computing professionals in securing jobs. The following letter, headed 'Left on the shelf', expresses a typical concern since the IT downturn:

"I am an IT professional with more than 25 years' experience, who has spent the last six months looking for a job... I noticed that once I reached 40, jobs started to get more difficult to obtain. Now it is impossible to get an interview."

Letters Page, Computing Magazine, 2003²⁰

The reason for the changing age profile of *computing professionals* in employment is uncertain. It is possible that we are seeing a 'cohort' effect, where IT workers aged 35 to 44 years have moved to the next, older age band during the years chosen for this statistical comparison (1995 to 2002/3). It is also a possibility that mature IT professionals were able to survive the IT recession a little better than their younger counterparts, perhaps because they were in more senior positions, in more secure posts or in more stable organisations. It may be that older IT professionals who have invested heavily in skills upgrades or advanced qualifications are more attached to computing work, and less likely to seek other kinds of work during a downturn. Further research is needed into flows in and out of work across ages and over time. It would also be interesting to explore in more detail the relationship between retention in IT occupations and seniority, contractual status and experience. The key question for the sector is whether the increase in the proportion of the IT workforce aged 45 years plus is temporary, or part of the wider long-term trend towards an ageing labour force in these three European countries.

¹⁹VNU Business Publications (2003) Computing Research: Ageism & IT, VNU Research & Market Intelligence, London. The findings of this online survey are based on a 9% response rate among 3,000 readers of Computing.

²⁰Hobb-Chambers, Patrick (2003) 'Left on the shelf', Letters Page, Computing, 20 February, 2003, p. 20.

Older workers & IT occupations

Despite a modest change in the age profile of working *computing professionals* over time, there were few *IT practitioners* in employment aged 55 years and over. Germany had the largest proportion of *IT practitioners* aged 55 to 64 in 2002. But even here, this amounted to only 1 in 20 (or 5.4%) of those in employment. In the UK and the Netherlands, even fewer *IT practitioners* in 2002 were aged 55-64 (3.2% and 3.7%, respectively).

A similar picture emerges in the other countries involved in the WANE study. In Australia, around 6% of the IT Labour Force was aged 55 years and over in 2001. In the United States, a study of the IT workforce published in 1997 found that 5% of computer systems analysts and scientists, and 4% of computer programmers, were aged 55 and over. In Canada, Labour Force Survey data for 2001 found that only 3% of IT workers were aged 55 to 64 years.

More research is needed on the reasons for this under-representation of older workers in the IT profession. Have these experienced IT practitioners taken early retirement, or switched to allied or different occupations? **Phase Two** of the WANE study will be examining the barriers to employment for IT professionals in later life. We will be asking how older workers can sustain their careers and upgrade their skills, given the volatile nature of the industry, the speed of innovation, the global cost pressures, the trend to off-shoring and the influx of younger IT-qualified professionals from developing nations.

d) Working arrangements in IT employment

Flexible working arrangements are growing in importance in each of the three European countries involved in this study. Full-time staff jobs, although still a feature of organisational life, now sit alongside an increasing variety of alternative working arrangements, such as part-time employment, short-term contracts and self-employment. The advance of new technology, in particular through fast communication links, has facilitated such moves. To what extent, then, have flexible working time arrangements permeated the lives of IT professionals? Is it reasonable to expect the IT industry to be at the forefront of innovative forms of flexible labour?

A recently published report on flexible working in the Information Technology industry in the United Kingdom²¹ highlighted the long-hours culture experienced by many IT professionals. Part-time working appeared to be relatively rare; flexibility, meanwhile, tended to mean 'constant availability' (DTI, p. 17) rather than manageable schedules which permitted a balance between work and personal obligations.

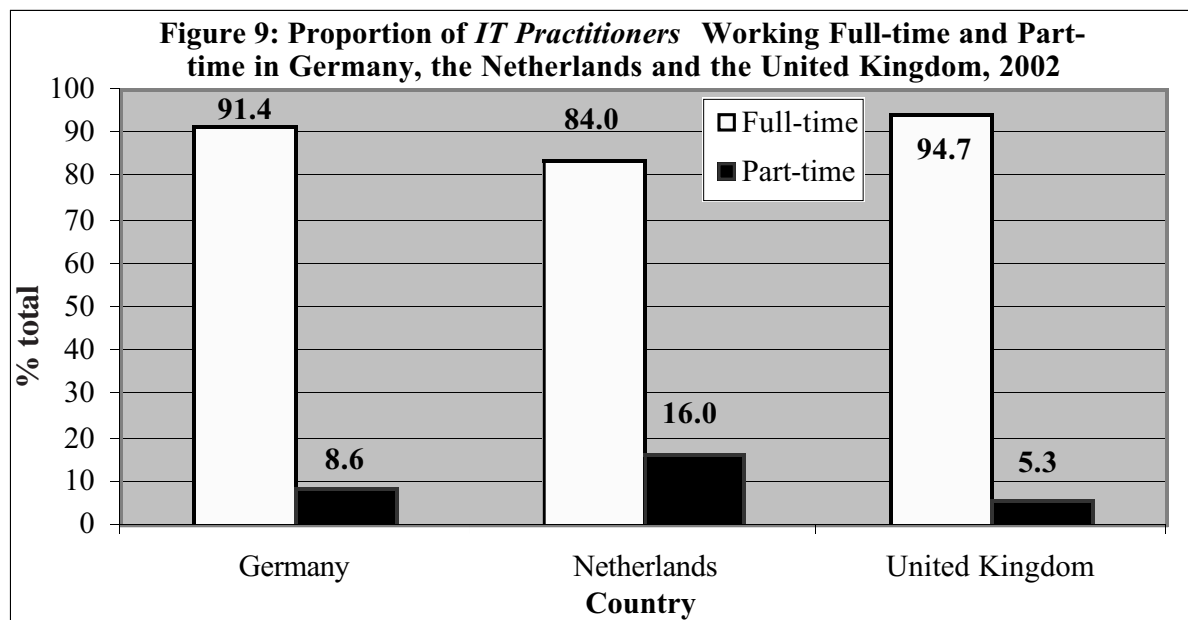
This section of our report examines how part-time working in IT compares with patterns in the labour force as a whole. It analyses variations by gender and age, between 1992 and 2002, and across the three WANE Europe case countries of Germany, the Netherlands and the United Kingdom. The final part of this section focuses on self-employment and temporary work.

²¹Department of Trade & Industry (2004) Flexible Working in the IT Industry: Long-hours cultures and work life balance at the margins?, A report to the Department of Trade and Industry and the Women in IT Forum carried out by Flexexecutive.

Part-time & full-time employment

Figure 9 shows the predominance of **full-time work** among *IT practitioners* in 2002. This was particularly so in the UK and Germany, where 94.7% and 91.4% of working *IT practitioners*, respectively, were full-time. Such high rates of full-time work contrasted strongly with those for the workforce as a whole.

Figure 9



Even in the Netherlands, where the rate of full-time working among IT professionals was lower than for the other case countries, this rate (at 84%) far exceeded that for the workforce as a whole (58%).

Table 7: Full-time and Part-time Employment as a % of Total among *IT Practitioners* and the Total Workforce in Germany, the Netherlands and the United Kingdom, 2002

	Total workforce			IT practitioners		
	Full-time	Part-time	Total	Full-time	Part-time	Total
Germany	79.2	20.8	100.0	91.4	8.6	100.0
Netherlands	58.0	42.0	100.0	84.0	16.0	100.0
United Kingdom	75.0	25.0	100.0	94.7	5.3	100.0

Source: Eurostat customised data

Among the three European case countries, the lowest incidence of part-time working in IT was in the UK, where only 5.3% of *IT practitioners* were part-time. The proportion of part-time working among *IT practitioners* was three times higher in the Netherlands (at 16%), but this was still considerably less than the part-time rate for the workforce as a whole (at 42%).

Part-time working may be relatively uncommon among IT professionals, but its incidence appears to be growing. Considerably more *IT practitioners* were employed as part-timers in 2002 compared to 1992²²: the number of part-timers doubled in Germany and the Netherlands, and trebled in the UK. However, such increases must be set against the strong growth in IT employment as a whole during this 10-year period. In relative terms, the proportion of *IT practitioners* working part-time increased only modestly between 1992 and 2002: by 0.4% in Germany (compared to a 6.7% increase in part-timing working in the total workforce), 1.4% in the United Kingdom (against a 2% increase in the total workforce) and 4.2% in the Netherlands (7.4%).

²²Figures for the UK for 1992 are based on ISCO 213 only.

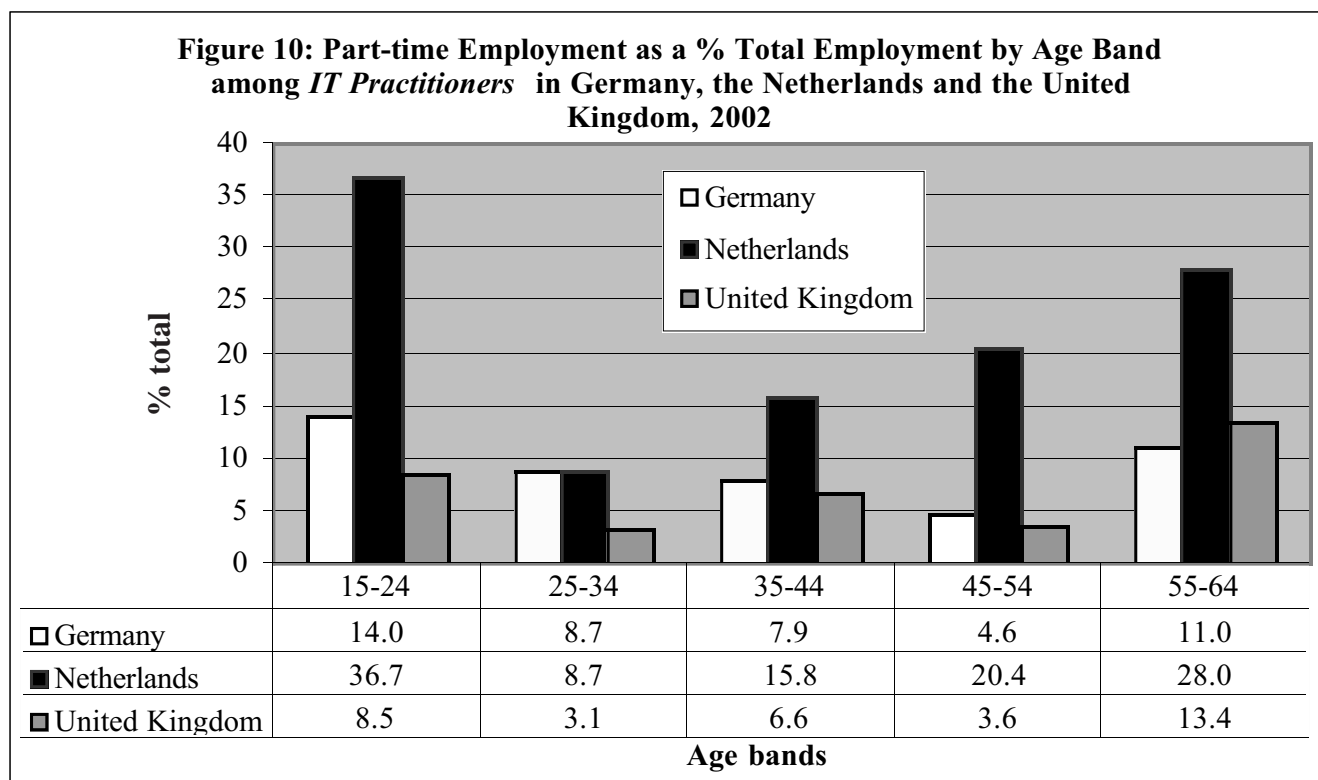
Table 8: Proportion of IT Practitioners Working Full-time and Part-time in 1992 and 2002, compared to the Total Workforce, in Germany, the Netherlands and the United Kingdom

	<i>Germany</i>		<i>Netherlands</i>		<i>United Kingdom</i>	
	1992	2002	1992	2002	1992	2002
IT Practitioners						
Full-time as % total	91.8	91.4	88.2	84.0	96.1	94.7
Part-time as % total	8.2	8.6	11.8	16.0	3.9	5.3
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total workforce						
Full-time as % total	85.9	79.2	65.4	58.0	77.0	75.0
Part-time as % total	14.1	20.8	34.6	42.0	23.0	25.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Eurostat customised data
 * Data for 1992 based on ISCO 213 only

There are considerable variations in the incidence of full and part-time working by age band. The youngest and oldest IT practitioners were the most likely to be working part-time in each of the case countries.

Figure 10

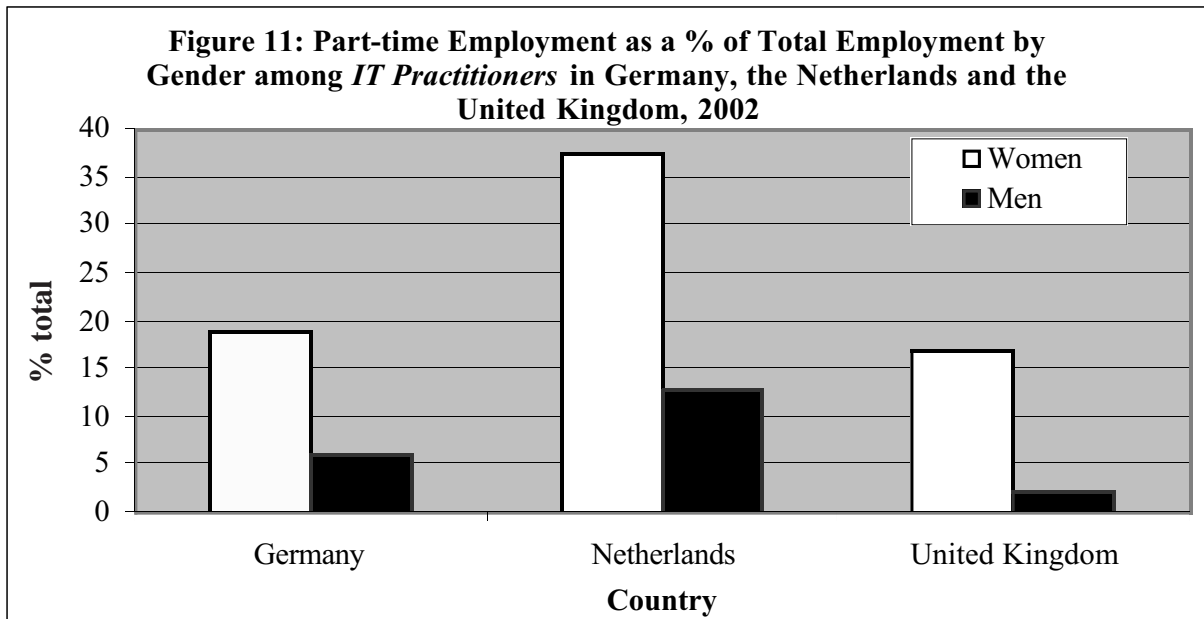


In the UK, for instance, 3.1% of IT practitioners aged 25 to 34 years were in part-time work, compared to 8.5% of those aged 15-24 years, and 13.4% of those aged 55-64 years. In the Netherlands, a similarly low proportion of IT practitioners aged 25 to 34 years were in part-time employment (8.7%). This is in marked contrast to part-time working among 15 to 24 year-olds (36.7%) and 55 to 64 year-olds (28%).

Part-time work and gender

Part-time working in IT is gender-related, as it is for the workforce as a whole. In 2002, German and Dutch women working as IT practitioners were three times more likely to be part-time than men; UK women were seven times more likely than men to be working part-time in the core IT occupations.

Figure 11



- In Germany: 6.2% of male *IT practitioners* were part-time, compared to 19% of female *IT practitioners*
- In the Netherlands: 12.9% of male *IT practitioners* were part-time, 37.5% of females
- UK: 2.4% of male *IT practitioners* were part-time, 16.9% of females

Nevertheless, rates of part-time working for women in IT professions were far lower than for the workforce as a whole:

- In the UK, 16.9% of women *IT practitioners* were part-time, compared to 44% of working women in the total workforce
- In Germany, 19% of women *IT practitioners* were part-time, compared to 39.5% of working women in the total workforce
- In the Netherlands, 37.5% of women *IT practitioners* were part-time, compared to 72.2% of working women in the total workforce

Table 9: Part-time Employment as a % of Total Employment by Gender for *IT Practitioners* and the Total Workforce in Germany, the Netherlands and the United Kingdom, 2002

	<i>Men</i>		<i>Women</i>	
	<i>IT practitioners</i>	<i>Total workforce</i>	<i>IT practitioners</i>	<i>Total workforce</i>
Germany	6.2	5.8	19.0	39.5
Netherlands	12.9	19.4	37.5	72.2
United Kingdom	2.4	9.4	16.9	44.0

Source: Eurostat customised data

This disparity in part-time working in the IT professions, compared to the total workforce, was also the case for men in the UK and the Netherlands (but not in Germany). For instance, 2.4% of male *IT practitioners* in employment in the UK were part-time, compared to 9.4% of men in the total workforce.

Table 10: Proportions Working Part-time by Gender among IT Practitioners Compared to the Total Workforce in Germany, the Netherlands and the United Kingdom, 2002

	<i>Total Workforce</i>		<i>IT Practitioners</i>	
	<i>Women Part-time as % Total Women</i>	<i>Men Part-time as % Total Men</i>	<i>Women Part-time as % Total Women</i>	<i>Men Part-time as % Total Men</i>
Germany	39.5	5.8	19.0	6.2
Netherlands	72.2	19.4	37.5	12.9
UK	44.0	9.4	16.9	2.4

Source: Eurostat customised data

Comparing data for 1992 and 2002, we find that part-time working among *IT practitioners* increased for both men and women in the three case countries. But, in Germany and the Netherlands, men experienced the largest gains in relative terms. In Germany, 4% of male *IT practitioners* were part-time in 1992, increasing to 6.2% in 2002. Rates of part-time IT work for women, meanwhile, were similar in both years, at 19% of female *IT practitioner* employment. In the Netherlands, the proportion of male part-timers was 7% in 1992 and 12.9% in 2002 (compared to 35.9% for women *IT practitioners* in 1992, 37.5% in 2002).

The apparent growth of part-time employment for men in IT employment follows similar trends in the workforce as a whole. Rates of part-time working for men in the total workforce for 1992 and 2002 are as follows:

- Germany: 2.3% in 1992 to 5.8% in 2002
- Netherlands: 15.6% to 19.4%
- UK: 6.3% to 9.4%

The limited opportunities for short hours working in the core IT occupations is likely to have discouraged professionals with caring responsibilities from remaining in the IT labour market. It may also have presented significant problems for older IT workers wishing to negotiate a gradual exit out of the labour market. However, more research is needed into the practicalities of introducing more part-time arrangements into IT work. **Phase Two** of the research will be comparing opportunities for different forms of flexibility across case study companies and between the countries involved in the WANE study.

Self-employment & temporary work

Self-employment is a small but significant part of IT professional work. In 2002, 7% of *IT practitioners* in the Netherlands were self-employed, 8.7% in the UK and 9.6% in Germany. This was slightly lower than for the workforce as a whole in each of the respective countries.

The proportion of *IT practitioners* working as self-employed professionals increased between 1992 and 2002 in Germany (from 5.2% to 9.6% - a faster growth rate than for self-employment in the workforce as a whole) and the Netherlands (from 3.5% to 7%). Comparative figures for the UK show similar proportions of self-employed *IT practitioners* at these two points in time; however, rates were likely to have fluctuated year-on-year.

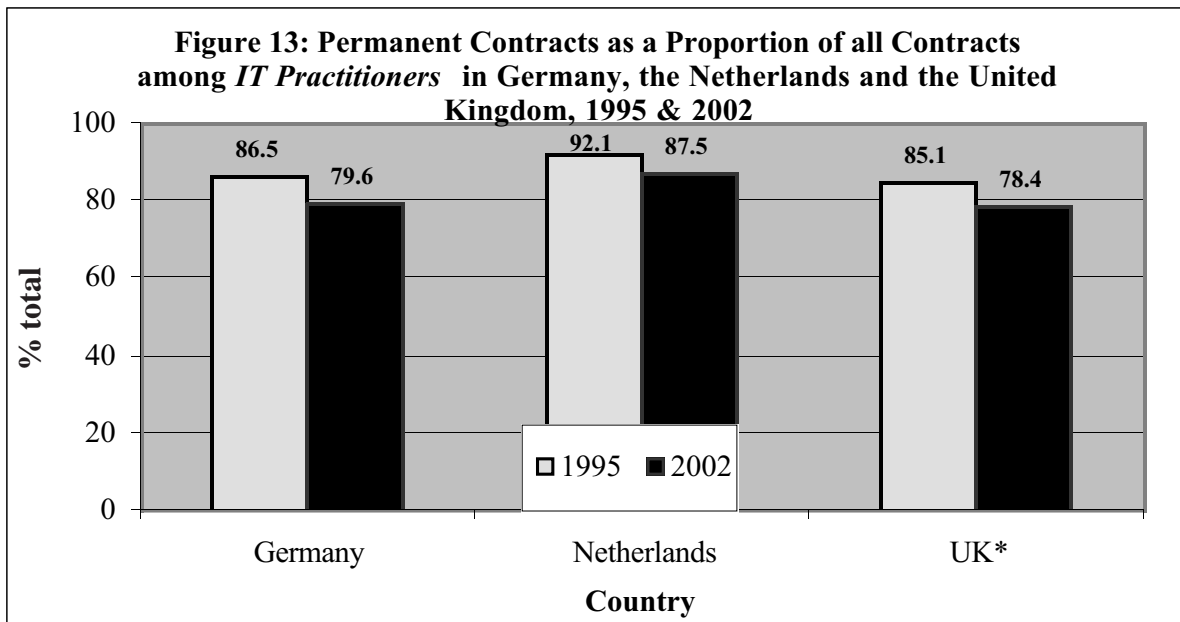
Figure 12



* Data for 1992 based on ISCO 213 only

The proportion of *IT practitioners* on permanent contracts declined in 2002, compared to 1995, in each of the case countries²³.

Figure 13



* Data for 1995 based on ISCO 213 only

- In Germany, 86.5% of *IT practitioners* were on permanent contracts in 1995, compared to 79.6% in 2002
- In the Netherlands, 92.1% compared to 87.5%
- In the UK, 85.1% to 78.4%

It is difficult to say whether the trends towards more 'non-standard' working arrangements will benefit *IT* professionals in the long-term. Replacing permanent, full-time contracts with fixed-term or short-hours contracts may simply introduce a less secure form of employment and undermine further the ability of certain professionals to remain in paid employment within the industry. The risk is that fixed-term working may encourage firms to adopt a more short-term approach to people management, by off-shoring work when skills appear short and by limiting investment in skills upgrades. This would undermine moves by industry and the Government towards a greater emphasis on lifelong learning in new economy, high tech occupations.

Conclusion

Workforces are ageing in the developed nations involved in this research study. Europe, in particular, is experiencing a profound demographic shift as the proportion of the population aged 50 plus begins to outstrip younger age groups. This represents a formidable challenge for Governments, in terms of rising pension and welfare liabilities, as well as industry, in terms of the supply and re-skilling of labour.

Innovative employment policies and practices are seen as pivotal to the effective management of this ageing workforce. European Union Member States have introduced a number of legal and policy initiatives designed to increase the participation of older people in paid employment and to extend working lives beyond standard retirement age. There is a growing recognition that such 'macro' measures need to be supplemented by organisation-specific interventions which encourage better use of the skills of an ageing European workforce. It is likely that such measures will include the development of flexible working time arrangements and lifelong learning environments, so that older individuals can negotiate a more gradual and delayed exit out of the workforce.

²³Data for the UK in 1995 is based on ISCO 213 (computing professionals) only.

These issues are critical to information-led, global industries such as Information Technology. The European Union sees a highly competent IT workforce, at the cutting edge of the information revolution, as essential to its vision as an economic world-leader. However, the findings of **Phase One** of WANE (the Workforce Ageing in the New Economy research study) suggest that the Information Technology industry is some way off the innovative human resources policies which are needed to capitalise on the ageing workforce. Employers appear to be heavily dependent on younger men to meet their recruitment needs. Women and older workers remain poorly represented among the core IT occupations in each of the three European study countries of Germany, the Netherlands and the United Kingdom. This is in spite of their growing representation in other spheres of economic life, and the increasing number of policy and sector-level interventions in the fields of science, engineering and technology which are designed to encourage workforce diversity. In addition, there are few opportunities for short-hours working in these core IT occupations, presenting difficulties for individuals needing to inject a better balance to their home and working lives.

Industry leaders in the IT sector have recognised the unsustainability of such a working culture. They argue for the development of human resource practices which attract and nurture talent from a much broader pool of labour. Only in this way, they argue, can Europe survive as an innovative IT producer and a major global competitor. However, employers appear to have few incentives to introduce such innovative measures. The volatility of the IT market, coupled with global cost pressures, have led to the widespread use of off-shoring of IT contracts to less developed countries. A recent industry report found that more than a quarter of European companies have out-sourced some IT or business function to an offshore location²⁴. At the same time, industry groups and union leaders have expressed concern over the use of work permit exemption schemes which allow employers to recruit (younger) IT professionals into Europe from countries such as India. Such practices are seen as threatening the viability of Europe's own ageing IT workforce.

In **Phase Two** of our research, we will be working with a number of IT companies in Europe and further afield to identify policies and practices which address these questions. This will involve the surveying, evaluation and development of best practice in the recruitment and retention of IT talent. This is designed to assist the IT industry in addressing the challenges of an ageing labour force and to confront, head on, the critical question of how we can develop and manage highly skilled knowledge professionals as they age.

²⁴Forrester Research, quoted by Glick, Bryan (2004) 'A quarter of firms exploit offshore', Computing, July 8, p. 34.