The impact of national ICT qualification systems on companies' recruitment practices – an Anglo-German comparison*

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The aim of this study is to analyse and assess the contrasting national skills policies associated with ICT (Information and Communication Technologies) skill supply in Britain and Germany. We also aim to examine the impact of these strategies on firms and to assess the utilization of skills at different qualification levels in companies. Finally we point to possible implications for companies, young people and educational institutions of a change in German higher education to the Bachelor degree. The study is based on published statistical sources and on interviews with some 90 firms in Britain and Germany. These were drawn from four sectors, financial services, retailing, motor manufacture and software development.

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Contents

1 Cross-national comparisons of vocational training

Cross-national comparisons are a useful concept to analyse the functioning of international systems and to identify what outcomes can be achieved by different means and inputs. Especially in an area of increasing internationalisation such as the exploitation of Information and Communication Technologies (ICT), an understanding of national systems is critical for assigning personnel and exploiting business opportunities. In addition to statistical analysis the adoption of case studies not only identifies differences between systems, but also explains who the actors are, what links exist and how production factors interact. Depending on the efficiency and effectiveness with which inputs are combined, different results are achieved. Since national systems are extremely complex, research is therefore focused on subsystems and – preferably – on countries of similar size and with similar industrial development but with diverse institutional foundations. Because of the relative similarity in size and industrialisation, Germany is typically compared to France and the UK. While similar in these respects, the countries are interesting to compare as they differ with respect to the conceptual framework of their social and economic institutions (Piore and Sabel 1984; Sorge and Warner 1986; Sorge and Streeck 1988; Campbell et al. 1991).

Hall and Soskice (2003) categorised the institutional variation across nations in their varieties of capitalism approach: they classify the UK, together with countries like the USA, Australia and Canada, as liberal market economies (LMEs), while Germany, together with countries like Japan, Switzerland and the Netherlands, are categorised as coordinated market economies (CMEs). CMEs make use of workers with high levels of industry-specific skills which are generated by an education and training system largely coordinated by industry-wide employer associations and trade unions (Thelen 2004; Culpepper 1999). German production strategies have been characterised as relying on high and diversified quality production (DPQ) supported by a skilled labour force (Sorge and Warner 1986; Streeck 1991; Herriegel 1996). The backbone of the German production system is the apprenticeship qualification which has provided training for about 70 % of an age group. However, the emergence of lean production has threatened diversified quality production as it enables manufacturers to produce goods of comparable quality far more quickly. It places more emphasis on team work than on the individual worker's skill, close partnerships with suppliers and a system of continuous improvement. This has led to extensive questioning of the relevance of the traditional German apprenticeship, in particular since companies are moving towards a flexible, more customer-oriented model of work organisation which is characterised by rigorous cost-control (Baethge and Baethge-Kinsky 1998).

LMEs resolve their coordination problems mainly by market relations. Vocational training in these countries focuses on general skills provided by (higher education) institutions offering formal education. Thus, British universities have become the more important system for vocational qualifications. The number of graduates has increased tremendously in the last ten years (Mason 2000) while, until 1994, the UK apprenticeship experienced a sharp decline (Unwin 2004). During the 1980s it was competing with a wide variety of frequently changing and very short-term employment and training schemes, e. g. the 'Youth Training Scheme', the 'Youth Opportunity Scheme' or the 'Training Opportunities Programme'. The measures were seen as provisions for the bottom third (Unwin 2004) and not for the majority and therefore had a poor reputation. When the severe decline of the apprenticeship appeared to be almost irretrievable, the situation was remedied to some extent through government action in the mid-1990s, aimed both at improving the national stock of skills and at reforming the government-funded vocational training available to young people. Apprenticeship and Advanced Apprenticeship is a new model of work-based training in 82 sectors including ICT and now enrols between a third and a quarter of an age cohort by the age of 25.

2 Aims and method

Given these differences in the political and economic environment it is widely accepted that the vocational and professional training system has a strong impact on organisational structures. While a number of studies look at the effects of apprenticeship qualifications on the work organisation of companies and on productivity in an international context, the mixture of apprenticeship and university qualifications and how they interact with organisational strategies has not been researched – at least not in a British-German context (Backes-Gellner 1996; Sorge/Warner 1986; Steedman/Wagner 1989; Wagner/Finegold 1999). This study therefore has an explorative character. It first provides information about the national supply of qualifications and second reveals major differences in recruitment and employment practices. By recruitment practices we understand the procedures and criteria used to sort and differentiate between candidates for a given po-

sition in the company. To increase the comparability we concentrate on the recruitment of school-leavers and university graduates into the ICT departments of enterprises. The coverage of four sectors helps to obtain a more general impression as skill needs differ between them.

It is not the aim of this study to provide an assessment of costs and benefits or to evaluate the provision of specific and general skills and their effects on organisational structures (von Bardeleben et al. 1995; Becker 1964). Nor do we attempt to test assumptions on the effects on job mobility or the signalling values of different types of qualifications (Wolter 2002; Acemoglu and Pischke 1999; Spence 1973; Backes-Gellner et al. 2001). A major result of this study could be to generate further research. Research topics could include productivity performances, differences in recruitment and training costs to companies, employees and the government or career paths.

This study aims to improve our understanding of the impact of the supply of qualifications at different levels on the recruitment and the likely career progression of graduates and apprentices working in ICT in Britain and Germany. Career progression is understood here in a fairly restricted sense as the expectations voiced by those in charge of recruitment as to the progression of different categories of employees. This comparison is of particular policy relevance as the German higher education system will move to the Bachelor/Masters system in future. The comparison with the British system – where the Bachelor/Masters system was implemented long ago – could provide some indications of possible consequences of this change on the organisation of German companies and help develop hypotheses for future research.

ICT was chosen as the target of research for a number of reasons:

1. ICT has a large impact on the economy of both countries, and the technologies used in the two countries are virtually identical.
2. Demand for qualified ICT personnel is strong in almost every sector in Britain and Germany but the responsiveness of higher education systems to strong demand has been very different.
3. ICT apprenticeships were introduced in Britain and Germany at almost the same time, namely in 1995 and 1997 respectively. In Germany, this apprenticeship rapidly attracted large numbers of companies to offer apprenticeships (24,000 school-leavers were in ICT apprenticeships as early as 2001) but in the UK, hardly any companies offer this apprenticeship.

The study of work organisation and recruitment practices for positions in ICT departments is based on interviews with about 90 firms in Britain and Germany, drawn from four sectors: financial services, retailing, motor manufacturing and software development plus some interviews with associations, chambers and universities. The "matched plant sample method" is used, which matches a sample of enterprises with regard to product and workforce size in both countries. This method has been successfully implemented in a large number of research projects for the comparison of international case studies (Daly et al. 1985; Wagner1993; Steedman/Wagner 1989; Keltner et al. 1999; Mason/Wagner 2005). While the method is based on fixing some parameters it leaves enough variability in the comparisons to highlight the effects of other factors.

In chapter 3 of this paper we compare the supply of graduates and describe the structure and uptake of ICT apprenticeships in Britain and Germany. Further to these statistical data chapter 4 looks at the results of the interviews we conducted to illustrate the impact of the supply of qualifications on the recruitment practices of companies and the effects on the earnings of graduates in both countries. The paper closes with a short summary and discussion of the future positioning of the apprenticeship in Germany after the implementation of the Bachelor/Masters system.

3 Comparison of the supply of qualifications in ICT

3.1 Output from computer science university courses

In 2001 about 6,000 computer scientists graduated from German universities and universities of applied science (Fachhochschulen – FH). In Britain in the same year some 16,000 computer science graduates left university with a Masters (post-graduate) or Bachelor (first degree) qualification. This puts Britain ahead of Germany by a factor of 2.5. This relation has improved slightly since in Germany the number of computer science graduates doubled to about 13,000 in 2005. In that year some 25,000 British students gained a Bachelor or Masters degree in computer science.

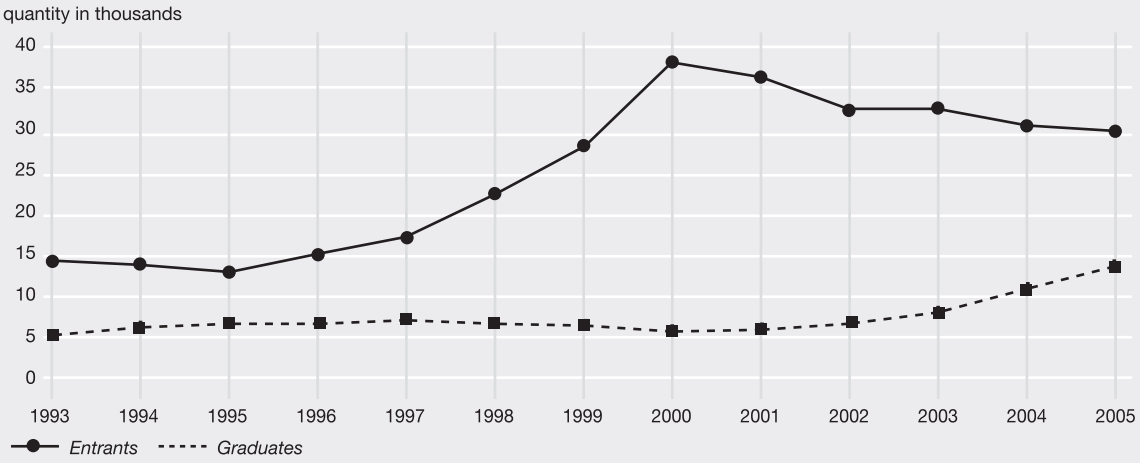
The courses at traditional universities and universities of applied science run parallel in Germany and last at least four years. Switching between the two types of university is cumbersome and time-consuming and therefore rarely occurs. The very long lead

time taken to produce graduate-level skills in Germany and a high drop-out rate produce a very low annual output of ICT graduates. Therefore the output from universities cannot respond rapidly to changes in market demand. However, the numbers of entrants to computer science courses expanded strongly from 1996 onwards. Figure 1 shows that the number of ICT graduates remained nearly stable until 2003 although entrances soared between 1996 and 2000 in response to increased market demand.

With the implementation of newly designed Bachelor and Masters courses in Germany, a faster reaction can be predicted. This will also make it easier to switch between subjects on the one hand and between traditional universities and FHs on the other hand. So far only a small number of students have graduated from these shorter degree courses: 1,755 Bachelors and 680 Masters graduated in 2005. This amounts to about 19 % of all graduates in computer science.

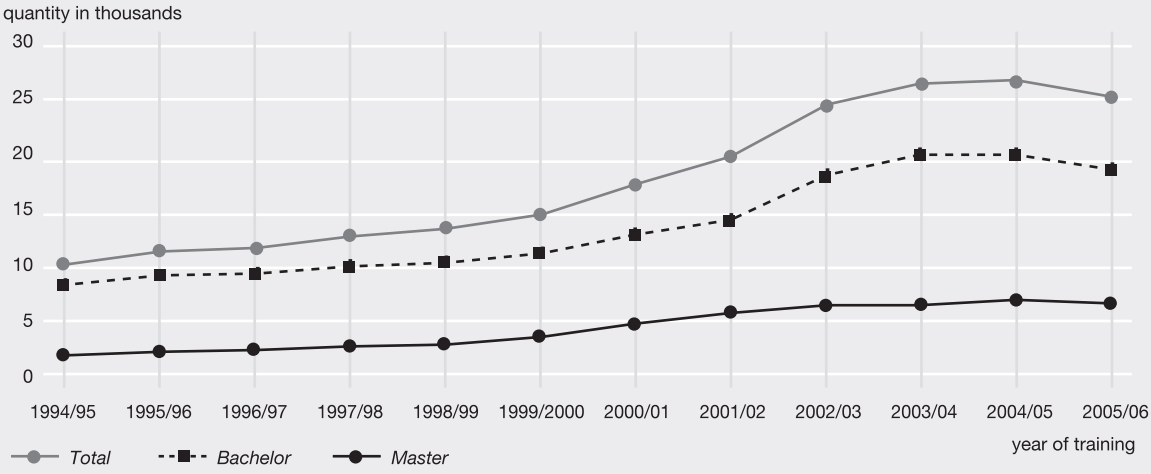
Lower drop-out rates and shorter courses in Britain have led to a steady increase in ICT graduates. Bachelor courses last three years – Masters courses between one and two years As Figure 2 shows, the

Figure 1
Comparison between entrants and graduates in computer science between 1993 and 2005 in Germany



Source: Statistisches Bundesamt Wiesbaden.

Figure 2
Development of British computer science graduates from 1994/95 to 2005/06



Source: Higher Education Statistics Agency.

number of graduates has risen steadily. In 1994/95 some 10,000 students left university with a degree. Ten years later some 20,000 students passed their Bachelor exams and some 6,800 attained a Masters degree.

An important characteristic of the British system is the built-in flexibility to move from first to postgraduate degree. It is also possible to change between subjects when moving from the first to the postgraduate degree: those with a first degree and some years of work experience often return to university for additional one- or two-year courses to attain a Masters degree.

3.2 Output from the apprenticeship system

Since ICT apprenticeships were launched in 1997, German companies have recruited and trained more than 86,000 young people in the three-year apprenticeship programme. A further 55,000 are currently in training. It has become the largest source of ICT skills. German employers co-operated with the government and with the trade unions in planning the curriculum and regulations governing the new apprenticeships – as would be expected in a coordinated market. German employers' extensive support for the initiative to increase the number of young people entering a career in ICT via the apprenticeship route can be explained by institutional rigidities holding back the supply of graduate skills in Germany.

It was clear to German employers from the outset that one aim of promoting apprenticeships was to produce the skills that the companies needed. In our study we found that more than half of the German companies with apprentices in training expected that apprentices would take on some tasks similar to those now carried out by graduates. Other companies hoped to develop a core of personnel which did not aim for fast promotion and provided stability at the base of the firm. It was emphasised that apprentices would need to continue training and study. However, if that condition was satisfied, there was confidence that they would play a significant part in combating skill shortages in the future. To make it easier for companies to train, the in-company apprenticeship training programme is composed of core competences and optional elements which allow for specialised training relevant to the apprentice's training firm. Training in project management and team building is also included and a proportion of assessment is based on the successful completion of a project. Employers are thereby allowed greater freedom to choose the content of the work-based training element than has been the case in traditional apprenticeships.

There is a huge contrast between employers' enthusiasm for apprenticeship in Germany and British employers' almost complete neglect of the British Modern Apprenticeship in the ICT sector. Just over 1000 young people started a technical ICT apprenticeship in Britain in 2005–06 compared to 11,300 in Germany. We investigated the standards required of the German and British apprenticeships to see whether a difference in the usefulness of the standard of training given could explain the difference in numbers. A British examination expert for National Vocational Qualifications (NVQs) who was consulted considered that the British and German standards in the intermediate and final exams were not grossly out of line. A good Modern Apprentice capable of attaining NVQ Level 3 could cope with most of the demands of the German apprenticeship exams.[1]

We must also recall that in Germany there is no tradition of apprenticeship training in an industry as young as the ICT industry. In fact the ICT Modern Apprenticeship in Britain was established in 1995, two years before the establishment of the four German ICT apprenticeships discussed here. A tradition of training cannot therefore explain German employers' higher investment in apprenticeships. Two reasons may help to explain the difference between German and British companies in their attitudes to the development of intermediate skills. Firstly, British companies have benefited from a larger supply of graduates and have been more flexible in their attitude to the employment of non-ICT graduates. Secondly, partly because employer involvement in establishing training programmes is lower in Britain, British companies undoubtedly suffer from an information problem in relation to apprenticeships. Hardly any of those we spoke to had heard of Modern Apprenticeships and we could therefore not explore with them the reasons for not taking up apprenticeships. By contrast, the German managers we spoke to were familiar with the introduction of the new ICT apprenticeships and had usually considered whether or not to take on apprentices. Considerable campaigns by the German government and the Chambers of Commerce had informed them, the public and school-leavers about the new ICT apprenticeships.

[1] The expert consulted was in charge of apprenticeship training in the field of ICT in a British further education college.

Another important difference between the two countries is the pool of young people available to enter apprenticeships. When, as is the case in Germany, around two thirds of all young people expect to enter an apprenticeship (around 20 per cent of whom will subsequently enter university or FH), the pool of those able to take on a challenging apprenticeship such as ICT is relatively large. Thus the relatively small numbers entering university in Germany proves to be a positive advantage when promoting an intermediate skills route. When, as is the case in Britain, around 50 per cent of the age cohort is aiming for university on the A-level route, the pool of those able to work to the demanding standards required in an ICT apprenticeship is considerably smaller. This pool is further reduced when – as we found in our research – companies recruit young people with A-levels to their own training schemes.

While the behaviour of the German companies in the face of skill shortages appears rational, that of the British companies cannot be so easily understood. We must conclude that a combination of factors explains that behaviour:

1. British companies may not have sufficient information about Modern Apprenticeship to appreciate possible advantages.
2. It is widely accepted in Britain that using public funds for training an apprentice involves costly and burdensome assessment and administration. Anecdotal evidence from discussions with two British companies that took on ICT apprentices confirmed this.
3. Evidence from training providers who try to place young people on ICT apprenticeships suggests that insufficient young people with the requisite educational level are currently coming forward.

4 Results from interviews: comparison of company ICT skill procurement

4.1 Companies interviewed

At the beginning of the project we planned to interview about ten enterprises in each of the four sectors: financial services, retailing, motor manufacture and software development to cover users of ICT in services and manufacturing together with a specialist ICT sector. The investigation was focused on the department in which the software maintenance and development for the company was carried out. This department was mainly found at the headquarters. The numbers of employees who were supported by this department was taken for the matching of the enterprises. A consideration of different industrial structures in each sector and the matched-plant method led to some revisions of these figures. Thus the numbers of companies and the numbers employed in retailing were much higher in Britain, whereas in motor manufacture they were lower than in Germany (O'Mahony/Wagner 1995). In retailing, mainly large department stores were matched. Discounters were addressed but did not agree to be interviewed. In motor manufacture the restricted number of manufacturers led to a lower number of interviews in Britain. In software – one of the strong employers of IT employees – the number of matched companies was increased to cover differences between the types of software suppliers, services and sizes of companies (Table 1). All branches included international companies which were active in Britain and Germany. Very often these were able to provide comparisons between employment capabilities of British and German graduates. The questions to the interviewees referred to the year 2001. The economic situation in the two countries was similar.

Table 1
Number of plants interviewed

	Germany	Great Britain
Banks	11	11
Retailing	8	14
Motor manufacture	10	6
Software	14	14
Total	43	45

The interviews were mainly conducted in three regions in each country to reduce travel costs. In each region three rounds of visits were planned. In the first stage companies were chosen in one country which were then matched in the second round of visits. This second round was also used to select and visit companies which were then matched in the other country in a third round. In Germany the majority of visits took place in the areas of Berlin, the Ruhr district and Munich. In Britain the main areas were London, the South East and the North West. Because of a concentration of British software companies in the M4 corridor between London and Swindon about half of them were interviewed there.

Companies were selected at random from trade literature and the internet from each region. As can be seen from Table 2 the numbers of employees served by the ICT department could be matched quite well in banks and software industries. As men-

Table 2
Number of employees served by the ICT department

	Banks		Retailing		Motor manufacture		Software	
	D	GB	D	GB	D	GB	D	GB
> 1000	6	8	1	0	1	0	4	4
500 <= 1000	0	1	1	3	4	1	0	0
100 <= 500	3	2	2	10	2	0	4	3
< 100	2	0	4	1	3	5	6	7
Total	11	11	8	14	10	6	14	14

tioned above a different industry structure in retailing and motor manufacture made it hard to find precise matches. Around half of those firms originally approached agreed to be interviewed within the time-frame of the project. Half of the interviews were carried out face to face by two researchers, one from Germany and one from Britain. The remainder were interviewed by one researcher through telephone interviews. In both cases a semi-structured questionnaire was used and, in the course of discussion, core questions and issues were put to our respondents in the companies in both countries. The interviews were recorded directly and then typed. The visits were conducted between March 2002 and February 2003.

4.2 Recruitment practices

British companies were found to be extremely flexible in their attitude to the recruitment of skills. Little attention was paid to degree qualifications once sufficient experience had been obtained. We were told that 'the last three jobs' were what really counted in the decision about recruitment. Graduates seeking first employment could be employed from a wide range of academic disciplines and not just from ICT or cognate courses. This obviously widened the pool of recruits to encompass those who were self-taught, had switched careers, or were seeking permanent employment after a spell in self-employment. However, a fairly undiscriminating approach to recruitment led to problems in narrowing down the pool of applications and selecting good quality from the pool. British companies used recruitment agencies to assist with this task. However this strategy incurred high costs as a result of recruitment company charges.

Shortage of skills had less of an effect on the British than on the German companies, because they recruited graduates of various disciplines. The corollary of this flexible approach is, of course, relatively high initial training costs. British companies trained new graduate recruits for longer and more intensively than was the case in Germany although at lower salary costs. British companies showed a lack of innovation in recruitment practices below graduate level, however. Hardly any companies had considered taking advantage of the public funds available for ICT apprentice training in the Modern Apprenticeship initiative. Instead, a considerable number continued to bear all the costs of individual training for non-graduate entrants.

German companies were much less flexible in their recruitment strategies at graduate level. We found that German companies were only prepared to recruit graduates with ICT or physics degrees. Engineering degrees were acceptable to motor manufacturing employers. Companies even mistrusted those who had been through ICT 'conversion courses' from the Ministry of Labour although these individuals already had a first degree. Companies sought a mix of graduates and non-graduates, as in Britain. However, the percentage of non-graduates who had not completed an apprenticeship was very small. The highest percentage (17 %) was found in the software sector where people were hired during the initial development of ICT departments and therefore did not complete their university courses.

As we see in Table 3, in Britain the graduates and non-graduates each account for around 50 % – except in software companies. In Germany the large proportion of personnel who have undergone apprenticeship training is typical for the German economy.

In the German retail sector only a third of ICT staff were graduates, but 60 % had completed vocational training. Retailing companies told us it was difficult to find graduate ICT experts who like to work with the legacy and/or company-specific software systems frequently found in the retail sector.

Table 3
Qualifications of ICT employees by sector and country

Sector	Germany			Great Britain	
	graduates as %	non-graduates with any type of completed vocational training as %	non-graduates without completed vocational training as %	graduates as %	non-graduates as %
Financial	50	45	5	56	44
Retail	33	60	7	49	51
Motor manufacture	79	21	0	54	46
Software	78	5	17	77	23

Source: Own data and calculations.

In the German motor manufacturing industry almost 80 % of ICT employees had a degree in computer science, engineering or a closely cognate subject. Engineers were favoured as they understood the work and design processes in this industry as well. Non-graduates without vocational training were seldom found in this sector.

In British and German software companies nearly eight out of ten employees are graduates. Remarkably, in the German software companies 17 % of the employees have neither a degree nor a vocational training qualification. This phenomenon could be explained firstly by young people who start programming in their leisure time and have practical experience. A second possibility is the strong demand for ICT skills at the end of 1990s and the beginning of the new millennium which could not be met by ICT graduates or skilled ICT workers. At that time ICT students were often poached from university before completing their degrees.

The recruitment process in German companies took considerably longer than in Britain and, unlike British companies, German companies rarely used recruitment agencies.

4.3 'Interns' and 'sandwich' students

The employment of 'interns' is part of business in German companies in contrast to British companies, where interns are rarely found. The closest we come to internships in Britain are sandwich students, who spend part of their studies in employment as a course requirement for their degree qualification.

Around half of the German companies interviewed were employing 'interns' – university/FH students who were spending three months working in the company as part of their study course. Students from universities of applied sciences (FH) stay for an additional three to six months to write their theses including a company project. The companies arrange a work-based project for them which they can write up and present in order to fulfil this part of their degree requirement. German companies boost their flexibility by employing 'interns'. Interns constituted a surprisingly large proportion of all ICT employees in the firms which were employing them – 7 per cent in the financial sector, 3 per cent in retailing, 10 per cent in motor manufacture and 5 per cent in the software companies.

The German companies were generally enthusiastic about the contribution made to the company by interns. They could be entrusted with or participate in projects that were useful to the company, their salaries were considerably lower than those of graduate employees (they often worked for free) and their suitability for permanent employment could be assessed during the internship. It is clear that the requirement for students to write up a project in dissertation form as part of their degree benefits both students and the companies that employ them.

Compared to Britain, the requirement of internships at FHs is an advantage of the German system. This leads to an early contact between students and companies and provides experience of the world of work, facilitating an easier recruitment process if the student subsequently enters a job at this company. Consequently this reduces the training costs for the company. This effect is strengthened when the student also writes his/her thesis at the same company.

Only one of the British companies interviewed employed a student as part of a sandwich course. A

further five companies offered paid summer placements which were open to any students who applied. There was no great enthusiasm in the British companies for employing students as interns. Companies complained of the difficulty that ICT departments had in finding suitable short-term projects for the students and their consequent reluctance to take them in.

4.4 Hiring prospects and introductory training

British companies are less likely to take graduates without previous experience than German companies. It should also be remembered that British graduates study for about half of the time that it takes a German student to graduate. It is not surprising, therefore, that new British graduate entrants (not on a recognised graduate training scheme) needed substantial off-the-job training before starting work in the company. Once in the company, it was common for new graduate entrants to continue learning on the internal help-desk or as junior members of a project or programming team. In this capacity they would be mentored and were expected to learn on the job for a period of two to six months with new training coming up with a move to the next position within this company. It is not clear how well this worked or how high the re-training costs were. However, no British companies complained that employees were unwilling to work flexibly in this way. Indeed, for those contemplating self-employment, a broad skills portfolio acquired while in permanent employment could become a personal asset.

New graduate entrants to German companies were given much shorter formal training periods than their British counterparts. We had the strong impression that German companies expected university and FH graduates to become fully effective at a relatively high level within a short space of time. Learning was on-the-job through projects and short seminars. Human resource managers from multinational companies visited made it clear that new German graduates took on more responsible positions than their British counterparts. However, they too were expected to spend several months learning on the job. The duration of training depended on the type of job and the practical experience a graduate brought with him/her. German companies which employed both new graduates and apprentices pointed out that, unlike graduates, the qualified apprentice requires no further period of introductory training when first employed in a permanent position. This was considered to be an important advantage of apprenticeship contracts.

4.5 Comparison of salary levels

To evaluate the benefit of ICT qualifications at universities and in apprenticeships, companies were asked about starting salaries for new employees in their first job after completing their education or training. Our main reason for these inquiries was to try to understand better the extent to which the additional years of study achieved by German students at all levels relative to British students were recognised in starting salaries as adding value for the employer company.

To compare the development of salaries in Germany and Britain we also enquired about the earnings that a 'very successful' employee might expect after 3 years with the company. The enquiry about earnings after three years with the company was added at a later stage as we began to notice that the earnings of British graduate employees increased more rapidly than those of German graduate employees.[2]

The categories of employees about which we enquired in Germany were,

- university graduates (average age of graduation 28),
- FH graduates (average age of graduation 28),
- certified ICT apprentices (average age of apprenticeship completion 22).

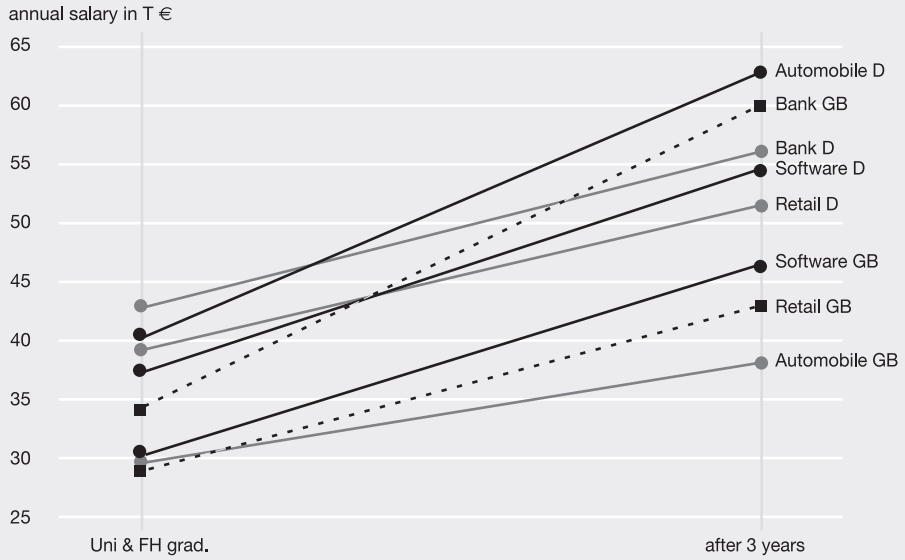
In Britain we asked about university graduates (average age of graduation 23).

British students graduate from university about five years earlier than German ones. Figure 3 shows earnings by country and by sector for university and FH graduates in Germany and for university graduates in Britain – starting salaries per year compared with the highest possible earnings of the most successful IT staff after three years.

We found that starting salaries for university graduates in Germany were higher in all sectors than in Britain and this difference holds even when an adjustment is made to take account of differences in purchasing power in the two countries. This suggests that a German graduate entering first employment may be more productive than a British graduate. Of course, one factor explaining higher German earnings could be the result of a higher excess of demand over supply in the German labour market for ICT

[2] It should be noted that the figures we obtained for graduate earnings after three years do not relate to average earnings but only to the earnings of the 'most successful' i.e. the highest earnings that a graduate might expect to achieve after three years.

Figure 3
Average graduate salary levels by sector and country on leaving universitiy and after 3 years



Source: Own data and calculation.

skills. Another possible explanation for the difference in starting salary is the higher probability that in Germany new graduate employees will either have a computer science qualification or a closely cognate subject degree such as physics, mathematics or engineering.

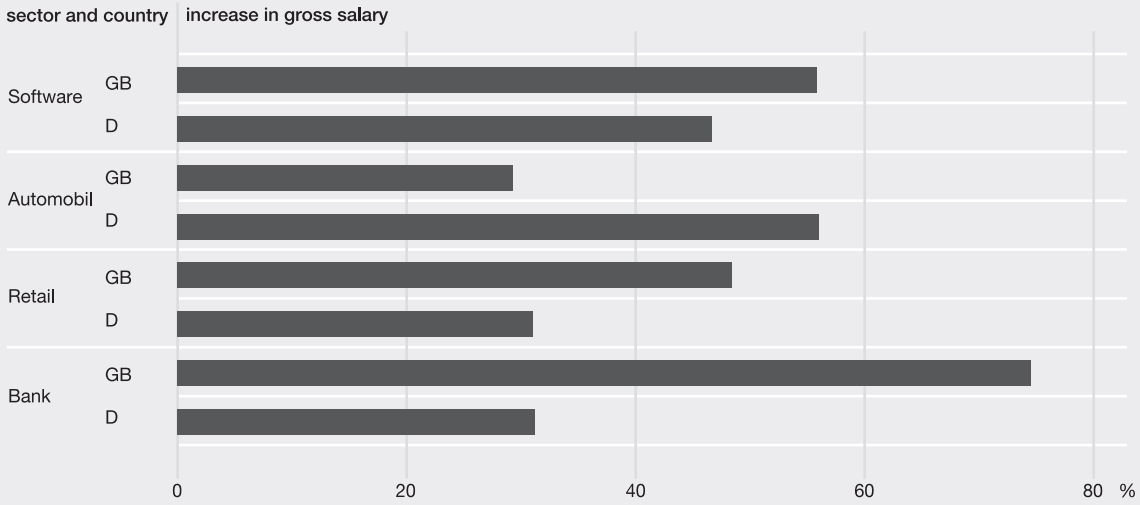
In contrast (as mentioned above), all British companies are willing to take graduates from a wide range of academic disciplines into employment in an ICT department and to subsequently 'train them up'. This leads to longer initial training periods for British graduates recruited straight from university than is the case in Germany. We cannot, therefore exclude the possibility that the difference between the starting salaries of the British and German new graduates to some extent reflects the added value derived from the longer education and maturation process in Germany.

When we look at estimates of likely earnings growth for successful graduates in both countries we note that in all but one of the British sectors investigated, the percentage increase in earnings is higher than for the corresponding sector in Germany (Figure 4). Therefore an equalisation of salaries is noticeable.

Our findings revealed that British ICT graduates usually started with salaries of some € 30,000 per year with the exception of the financial sector where they received € 5,000 more. German ICT graduates drew a salary of between € 37,000 and € 43,000. After three years successful British computer scientists in the retail and software field could achieve rises in salaries of about 50 %, in the financial sector of nearly 75 %. British motor manufacturing companies paid just 30 % more. The sectoral growth in salaries was quite different in Germany. The development in the motor manufacturing and the financial industries exemplifies this: in Britain the increase in motor manufacturing is relatively low (30 %) whereas in German companies this sector has the highest growth of the four industries; the large increase in British banking contrasts with a relatively meagre increase of 30 % in German banks. The starting salaries of ICT graduates in the German motor manufacturing industry are not reached within three years by successful British ICT graduates. In contrast the increase in earnings of the most successful ICT entrants in the British financial sector (75 %) takes them € 5000 above the highest German income level.

A number of interpretations can be put on these findings. British graduates are younger and have had fewer years of education than German graduates. Their rapid increase in earnings may be explained by their very much lower starting point. Nevertheless, the findings point to considerable learning gains resulting from experience and training while in employment and to a corresponding investment by the British companies in order to achieve the gains noted. One explanation for the relatively high starting salaries in the British financial sector and the

Figure 4
Average percentage increase in gross salaries of university graduates after 3 years of experience; by sector and country



Source: Own data and calculation.

sharp increase of nearly 75 % after three years can be found in the selection procedure. Banks and other financial institutions primarily recruit graduates from the most prestigious universities such as Cambridge and Oxford with a disproportionately high demand for salaries. Another reason is the relatively high cost of living because the majority of financial institutions are based in London.

Overall, the salary levels of German graduate ICT employees are higher than British graduates employed in ICT. Therefore, it is likely that German companies look for a reduction in personnel costs. One possibility is recruiting 'interns'. During internships undergraduates work for free or for a token payment. In addition, German companies recruit apprentices in the new ICT apprenticeship programmes. These non-graduate entrants are normally paid only two-thirds of graduate earnings once qualified and require no additional training once employed. While in training (usually 2.5–3 years), apprentices are paid a training allowance of about one third of their earnings when qualified.

For ICT employees aged 30 and over the 'Kienbaum International Comparison of Salaries' shows that on average British and German ICT employees in similar positions earn similar salaries (Kienbaum Management Consultants 2001). This suggests that in ICT over the longer term the investment made by students in the time-consuming German university education gives a lower return to the individual than the investment in the shorter British university course. There is just one exception – the motor manufacturing sector.

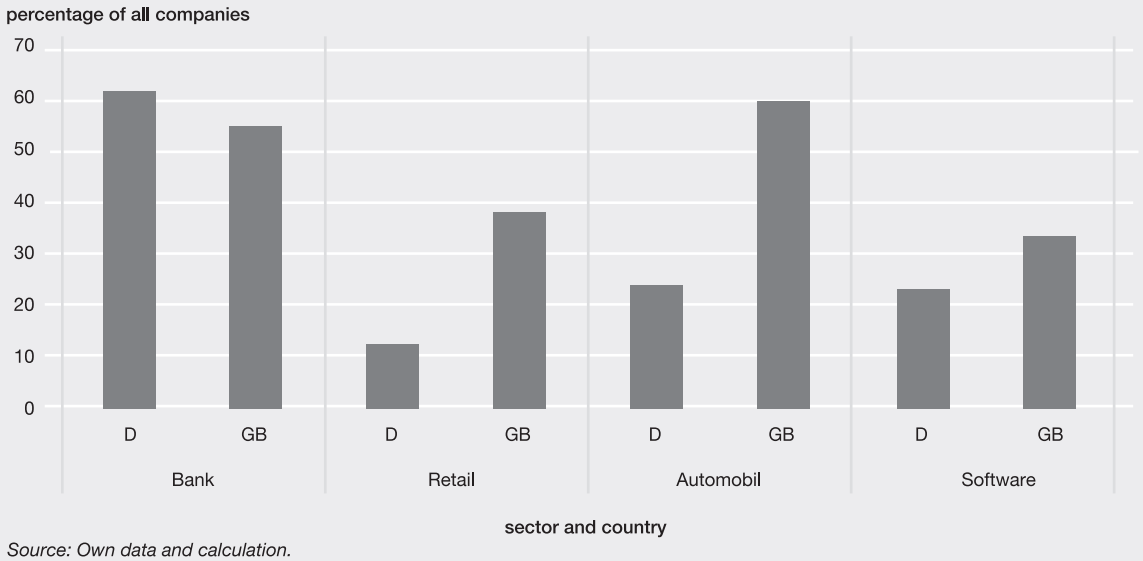
4.6 Use of contractors

In the firms visited, contractors were used extensively in both Britain and Germany. Contractors almost invariably elect their status following a period of employment as a member of an ICT department. This means that a large part of their skills portfolio has been obtained while in permanent employment. The skills obtained will have resulted in part from on-the-job experience and in part from company investment in their training. These skills, being highly transferable and portable, are then appropriated and exploited by the individual in his/her capacity as contractor. Normally, it might be supposed that this investment would be lost to the company; however, it is fairly common for employees to change to contractor status and to stay working with the same company.

It was suggested to us in discussion with the Professional Contractors Group (PCG) (UK) that ICT staff might opt for contractor status if they have achieved a certain level of seniority and the next career step would take them into management and away from a technical role which they preferred. Others might learn from their appraisal interview

Figure 5

Percentage of all companies in the sector in which contractor numbers were 10 per cent or more of all ICT employees, by sector and country (in 2001)



Source: Own data and calculation.

that they are unlikely to be promoted further and opt for contractor status as a way of boosting earnings – at least in the short term. A desire for independence and freedom to manage one's own career is also important.

Once contractors, ICT staff have to take responsibility for their own upgrading and skill acquisition. The PCG suggested that contractors might seek out a project that gives them the chance to acquire scarce skills and lower their charges if necessary. However, we were told that, as a result of Inland Revenue rules, they are unable to claim tax relief on courses of training which they might undertake outside of employment in order to enhance their marketability. In periods of economic downturn, with large numbers of contractors unable to find employment, it is likely that this rule contributes to skill loss among contractors in Britain, a matter which may be of concern to companies when demand for ICT contractors improves. In Germany, expenses for training courses to preserve or improve skills are tax-deductible.

The use of contractors in Germany was far more widespread than we had expected. In fact, the total number of contractors employed in the companies visited relative to all ICT staff was 14 per cent in both countries. Figure 5 illustrates that in every sector except the financial sector, fewer German companies had substantial numbers of contractors than was the case for the English companies. More than 62 % of the German banks interviewed used contractors. This is five times as high as in the retail sector. In motor manufacture and the software industry around one in four companies used contractors. In Britain 33 % to 60 % used contractors – and the motor manufacturing industry takes the top position.

Companies in both countries explained the use of contractors primarily in terms of the need to meet a short-term temporary skills gap which leads to more flexibility. We had initially supposed that the well-known greater inflexibility of German employment legislation would make it more difficult for employers to take on contractors and also lessen the attraction of contracting to individuals. A reason could have been that German companies have less flexibility when restructuring their workforce than in Britain. For example, new employees have a trial period of only 3 months during which they can be dismissed without formal procedures, compared to a period of two years in Britain. It is therefore of greater interest to German companies to enjoy a period of observation of a person's capabilities before making an offer of employment. Apprenticeship was used for this purpose – as were the graduate internships mentioned above. Another important reason – especially in German banks – was that contractors were taken on to circumvent a company ban on new hires.

4.7 Recruitment of ICT skills from overseas

The German language is a barrier to the employment of non-German speakers in ICT occupations, even though English is the working language in ICT. As some German companies pointed out to us, employees still need to communicate with other colleagues and customers and to fit into the working environment. Lack of knowledge of the German language had proved a significant barrier. The lack of German language skills also created difficulties for team-working etc. Because of this, German companies considered that they were losing out to Anglo-Saxon countries in the competition to attract good ICT practitioners from abroad, precisely because foreign workers usually had English as a second language and preferred to work in an English-speaking environment. The situation has eased since 1999/2000. Despite the introduction of the Green Card arrangements in 2000 it remained difficult for German companies to recruit skilled ICT staff from overseas.

By contrast it was relatively easy for British companies to obtain work permits for skilled ICT staff and there was a ready supply of skilled personnel overseas willing to apply. A number of British companies recruited skills from overseas or outsourced to other countries. Language problems are negligible due to the fact that English is used in the working environment and beyond it. Furthermore, especially for applicants from former British colonies in the Caribbean and on the Indian subcontinent it is likely that cultural differences to Great Britain are less rigorous compared to Germany. As a result, we concluded that British companies could use immigration to resolve ICT skill shortages more easily than German companies.

4.8 Companies' views on how university education could be improved

German companies' views on how university education could be improved were also more consistent than the views of the British companies. With only two exceptions they felt that students from traditional universities did not have enough experience of the real world, particularly the realities of the business environment. However, companies expect graduates from universities of applied sciences (FH) to adapt more rapidly to job requirements because of their practical experience.

The views that British companies expressed about how university education could be improved and how it could respond better to industry's requirements were very varied and no consistent pattern could be detected. A number of companies expressed themselves very satisfied with the graduates they had recruited. Some were keen to recruit ICT graduates, others considered ICT degree courses a poor preparation for the work they needed to do. As was found in an earlier study (Mason 2000), arts graduates were appreciated for better communication/soft skills, and a lack of communication skills was identified as a weakness in ICT graduates. But around half of the comments recorded echoed the criticisms of the German companies: a lack of understanding of the business environment and poor communication skills were major weaknesses of new graduates.

5 Summary and outlook

In this study we found considerable differences between Britain and Germany in the skill supply available for recruitment to ICT support and development departments. In Britain, the skill supply is characterised by:

- a rapidly expanding university population,
- three-year first degree (Bachelor) courses,
- relatively low university drop-out rates,
- almost no use by companies of apprenticeship programmes,
- increasing use of work permits to import ICT skills,
- extensive use of contractors and out-sourcing.

The skill supply in Germany is characterised by:

- a relatively small number of students completing university courses in computer science, at about a third of the British figure,
- a long study period of between six and eight years,
- FH graduates who study for four years and often spend two periods of three to six months working in companies,
- a strongly increasing number of apprentices,
- difficulty in attracting/integrating employees from other countries,
- considerable use of contractors and some out-sourcing.

German companies were found to employ graduate entrants at higher positions and paid higher real starting salaries than in Britain. Not only was a smaller supply of ICT graduates available to Ger-

man companies, but German companies normally recruited only graduates with ICT or ICT-cognate qualifications such as physics. This attitude is compatible with the traditional concept of *Beruf*, (*occupation*), which defines both the individual's status in relation to other employees and also his/her 'ownership' of a defined area of skills and action. Institutional rigidities affecting the supply of graduate skills and the associated higher costs help to explain German employers' strong support for the apprenticeship route to increase the number of young people entering a career in ICT. The coordination between German employers, the government and the trade unions was speeded up and they reached consent in planning the curriculum and implementing regulations governing the new apprenticeships in just one year. The attempt to increase the ICT skill supply by hiring personnel from abroad was on the one hand hindered by legal guidelines; on the other hand it was difficult to integrate these specialists because of cultural and language problems.

British companies on the other hand were found to be extremely flexible and it was common practice to recruit graduates for ICT occupations from a wide range of academic disciplines. This more liberal attitude requires cooperation across organisational boundaries, a less hierarchical work organisation and a flexible working attitude. However, – given that the graduates came from all sorts of disciplines with only little or even no ICT specialisation – as a consequence British companies had to train new graduate recruits for longer and more intensively than was the case in Germany. This can also explain why at least 80 % of the enterprises preferred young people who could show evidence that they had gained some type of ICT experience. In this more open and liberal environment of British organisations the employment of foreign ICT specialists went smoothly, which was supported by English being a worldwide language. Willingness to train apprentices was low in British companies. A combination of factors can explain that behaviour. The first is a lack of information. Companies may not have sufficient information about apprenticeships to appreciate possible advantages. Second, anecdotal evidence from discussions with two British companies that have taken on ICT apprentices suggests that the regulations governing the assessment and certification of Modern Apprentices in Britain are burdensome and costly to companies. Third, evidence from two training providers who try to place young people on ICT apprenticeships suggests that insufficient young people with the requisite educational level are currently coming forward.

It will be interesting to see whether the very distinct impacts of the national supply of ICT skills on company organisation structures will persist in future. Once Bachelor degree courses are fully implemented in Germany, these studies will require the student to take fewer specialised technical courses than was the case with *Diplom* (the traditional German university degree) studies. Consequently, German companies will have to invest more in training for Bachelor graduates if they want them to fill positions previously filled by *Diplom* graduates. Furthermore, Bachelor graduates, whose degrees have an emphasis on broad foundation courses, will be less specialised. Thus German companies would have less reason to prefer ICT Bachelor graduates over Bachelor graduates from other disciplines. In conclusion, German company recruitment practices could become more similar to those in Britain. It remains to be seen whether this will lead to a less hierarchical organisation and a fading empathy with the "Beruf" culture to create a more liberal system where graduates from various disciplines will be accepted for a particular position.

It is not at all clear how the apprenticeship system will fit into the new educational system. Positions which were filled by employees with a completed ICT apprenticeship in Germany were found to be similar to the initial starting occupations allocated to graduates in Britain. The experience in Britain has been a strong attraction of able school-leavers into the higher education system so that only few school leavers were available to enter the more demanding apprenticeships (Mason 2000). Various scenarios are possible for the impact of the new Bachelor degree on the German dual training system. At one extreme a smaller number of academically able school-leavers applying for apprenticeship could be foreseen as the academically able move from the dual system into the university system. This would mean a shift from training costs borne by companies to training costs borne by the state. The number of university places would have to be considerably enlarged (in 2003 there were 75,000 new entrants with a university entrance certificate into the dual system). This might lead to a negative social effect for the reputation of the dual system if it is to be regarded as a training regime for less able achievers. At the other extreme, companies might insist on the apprenticeship since it provides well trained personnel familiar with the culture and work organisation of the company and available for middle management positions. Companies might find that Bachelor graduates are unsuitable for these tasks and employ only Masters graduates for higher positions. In this case the Bachelor degree would not have much currency on the labour market and would only be used as a stepping stone to the Masters degree. The outcome will depend on various factors on which more

research is needed: particularly the balance between the costs and benefits of the different types of company-provided training for apprentices and Bachelor graduates, the mixture of specific versus general skills required and the trade-off between stability and flexibility of employees in a coordinated market environment.

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