Construction Management and Economics

ISSN: 0144-6193 (Print) 1466-433X (Online) Journal homepage: https://www.tandfonline.com/loi/rcme20

Craft versus industry: the division of labour in European housing construction

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Construction Management and Economics (2000) **18**, 689–698

Craft versus industry: the division of labour in European housing construction

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Received 5 March 1999; accepted 25 November 1999

Two distinct divisions and concepts of labour are apparent from an analysis of social housebuilding sites in the UK, Germany and the Netherlands: the craft form, based on controlling the output of labour; and the industry form, based on the quality of labour input. These are associated with different work processes, skills and training, and also different levels of mechanization and component prefabrication. In the UK, which is craft-based, low levels of mechanization and prefabrication were found compared with Germany and the Netherlands, and the range of activities for the separate trades in assembling superstructure elements was simpler. Labourers are distinct from craftsmen and remain a significant group. Skills are narrow and training provision low. A high proportion of the labour force remains self-employed, under labour-only subcontractors, working to price or output. In comparison, in Germany and the Netherlands labour is employed directly and work processes are more complex, with more specialisms at the interfaces. The division of labour is industry-wide, training provision is extensive, and skills are broad and integrated into the grading structure. Greater speed, higher productivity and lower levels of supervision are associated with industry-wide systems compared with traditional craft forms.

Keywords: Craft, Europe, housebuilding, skills, training

Introduction

Comparative studies of construction in different countries in Europe have revealed clear differences in the nature of the technology, whether machinery or technical organization, used in the production of the same or equivalent products (Atkins, 1994; Cooke and Walker, 1994; Clarke and Wall, 1996). Our research on social housing in the UK, Germany and the Netherlands[1] confirms this and reveals sharp differences in the social organization of production associated with a particular use of technology, including the number of subcontractors, range of skills, employment status, complexity of work processes and type of site management involved. Above all, it confirms differences observed in the quality and division of labour in different European countries, and especially the peculiarity of the UK compared with other leading north European countries (e.g. CEREQ, 1991; Biernacki, 1995; Winch, 1998; Marsden, 1999; Rozenblatt, 2000).

We argue that differences in housing production methods arise from qualitatively distinct labour processes, replicated in turn through their respective skill structures and training systems. These can be described as craft-based in the case of the UK and industry-wide in Germany and the Netherlands (Campinos-Dubernet and Grando, 1992). Not only can the rationales for different labour processes be distinguished, but the very concept of labour differs, as Biernacki has shown for the UK and Germany (Biernacki, 1995).[2] In Germany labour is 'the

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Construction Management and Economics
ISSN 0144–6193 print/ISSN 1466-433X online
http://www.tandf.co.uk/journals

continuous transformation in time of labour power into a product' whereas in the UK labour is appropriated solely through the product. This means that in Germany workers and their actions are essentially part of the technology of production, payment is based on hours worked and employer investment in training is commonly understood to enhance productive output. In the UK, by contrast, workers are employed for what they produce rather than their capacity to produce, and accordingly the wage is based on measurement of output (Biernacki, 1995, p.141). Consequently the employers' obligation for training is weakened, because their concern is with labour's immediate productive output, the skills required to fulfil a particular task, rather than with its productive potential or with the reproduction of skills.

These two different conceptions when applied to the construction industry define the difference between 'craft'- and 'industry'-based divisions of labour and the resultant divergent methods of production witnessed in our case studies. The craft system is based on preserving the exclusive privileges governing a particular trade, whether through traditional apprenticeship or maintaining a clear divide from the labourer and from other trades. In the UK the limits of the tasks an employee undertakes are defined by the 'tools of the trade', resulting in distinct social and technical interfaces in the work process (Marsden, 1999). In an industry system, by contrast, the skilled worker of whatever trade is fully integrated with other workers in that trade and in the industry both through the training system and the wage structure (Clarke, 1999, 2000). Thus in Germany and the Netherlands the range of tasks undertaken is defined by the employer but based on the qualification or grade that a worker holds, in itself the outcome of training that spans a range of industry-wide rather than just trade-specific knowledge and practice. Consequently, interfaces in the work process are more complex and not defined by trade, instead being undertaken by a number of specialist subcontractors.

This paper draws mainly on empirical data from detailed case studies of six housing association construction sites and their associated contractors and clients in the UK, three equivalent sites in Germany and three in the Netherlands, supplemented by data from pilot studies and from visits made in June 1999. All sites present typical methods of production for each country. The first part concerns the nature of the tasks, methods of construction, work processes and level of skills observed, the second the different characteristics of industry and craft skills and their associated training and employment systems, and the final part the implications of these differences in terms of speed, productivity and managerial control.

Different activity ranges and technologies

The UK

UK housing construction techniques are characterized by low levels of site mechanization. In our case studies of social housing sites, a 15 or 25 ton crane was hired on a short term basis when required for the positioning of roof trusses and precast concrete flooring slabs. No sites were found using large scale prefabrication although the use of prefabricated components was common. For instance, frequently ground floors were precast concrete slabs supported by precast concrete beams and roof trusses were almost always used in preference to a traditional roof frame. All the case study sites were of brick and block cavity construction with timber upper floors in the terraced housing and concrete upper floors in the flats. None of the flats under construction was higher than four storeys.

The bricklayer's main activities consisted of laying bricks and blocks with their wall-ties and the fixing of cavity insulation, but in two cases they also placed in position timber door and window frames ready for later fixing by carpenters. Generally a forklift truck was used to supply bricks and containers of mortar to bricklayers working from scaffolding, and the bricklayer's labourer carried bricks to the point where the bricklayer was working (often using wooden hods). Bricks in most cases where labour-only subcontracting is used are supplied by the main contractor and mortar and mixers by the subcontractor. The bricklayers themselves were self-employed except in the north of England, where medium-sized contractors used their own directly employed bricklayers. When these latter firms took on extra bricklayers they worked in gangs on a self-employed basis alongside and on the same bonus and wages as the direct employees.

Carpentry work, when subcontracted, usually was tendered in one package that included the fitting of suspended timber floors, erection of stud partitioning and frequently the positioning of timber roof trusses, for which the subcontractor hired a crane on a short term basis. All second-fix work, that is finishing carpentry as in the laying of timber floors, door hanging, skirting and architraving, also was included in this package. Carpenters, where directly employed by the main contractor, made the timber templates for doorways and window openings used by the bricklayers. It is usual on a carpentry subcontract package deal for timber and joinery items such as stairs to be supplied by the main contractor, with the carpenters supplying their own fixings, hand-held power tools and power from hired generators. All the terraced housing in the case studies used timber stud and plasterboard internal partitioning.

Germany

The typical construction process for social housing in Germany is associated with flats. Levels of mechanization are higher than in the UK, with the widespread use of small tower cranes for the handling of pre-stressed floor beams, blocks, formwork and *in-situ* concrete. Mechanization is central to the construction process and in all the case studies the main contractors, irrespective of their size, owned a wide range of plant. Two of the three case study sites visited used concrete block construction and one case study site and the pilot site were of *in-situ* concrete frame construction. Internal partitions were all in blockwork.

On one of the German sites, producing five blocks of seven-storey flats, the largest contractor on site was the *Rohbau* (structural work) firm, which employed mainly Polish workers. The firm owned its own system of sliding metal shuttering, mixers, pumps and cranes and also supplied its own concrete. Foundations, frame and internal load-bearing walls were all constructed by this one firm.

The bricklayer's activities on German sites extends beyond the range found on UK sites to include the fitting of metal door-linings into blockwork partitions, the fitting of external insulation material, and the making and fixing of temporary timber guard rails to open stair wells and lift shafts.

Nevertheless, Germany was the only country where roofs were constructed traditionally, the rafters and purlins being pre-cut to size and fitted on site by the carpentry contractor. Felting, battening and tiling were carried out by a separate roofing contractor.

The Netherlands

Although typically Dutch housing, as in the UK, is low-rise and terraced, the Dutch housing construction process is characterized by high levels of prefabrication and associated mechanization. This was borne out in the case study sites where, as in Germany, the main contractors owned all of the site plant in use.

A site visited near Utrecht was typical, with the tunnel form being owned by the main contractor and operated by the main contractor's direct employees. This is a rapid method of *in-situ* concrete construction that can produce the superstructure for a three-storey terrace of twenty houses in three weeks. A four-person gang fixes the mesh reinforcement and fits the gas and water pipes and the conduit for electrical wiring into position in the formwork before the concrete is poured. The same gang strikes the formwork the next day and moves on to the next floor or unit, following the tunnel form, which is craned into its new position.

Separate subcontractors are responsible for the fitting of the external wall insulation, the cladding, internal partitions, screeding and other elements. Most main contractors hold a labour force of concretors, general labourers and carpenters, where carpenters are still seen as the 'key' trade despite the disappearance of many of the activities that were traditionally part of the construction carpenter's work. For example, timber stud partitions are now used only rarely: on three of the four sites visited compacted plaster panels installed by specialist subcontractors were used, and on one site metal stud partitioning (rarely if ever used for housing in the UK). Prefabricated roof trusses have almost entirely replaced traditional roof construction. A commonly used alternative roofing system consists of structural roof panels laid on top of the purlins to allow the roof space to become habitable through eradicating the cross-ties found in timber trusses.

The method of supplying materials to the bricklayers on Dutch sites was significantly more rationalized than in the UK. For example, on one site forklift trucks delivered bricks to a small mechanical hoist at the end of each scaffolding run. The bricks were then transported to the bricklayers using specially designed wheelbarrows. Mixers were placed at regular intervals along the scaffolding to supply mortar. In the Netherlands the bricklayer's wooden hod is a museum piece. This does not mean that there is no brick-and-block construction. Indeed, though tunnel form construction is used to produce 40% of housing, brick-and-block accounts for another 40%, while the remaining 20% is produced using either timber or concrete prefabricated systems. Systems developed in the 1960s on high rise blocks were not abandoned in the Netherlands as they were in the UK but developed and adapted to produce the now predominant low rise terraced housing. The resemblance between the Dutch and UK pitched roofs and red-brick terraces is superficial; Dutch terraced housing is more likely to be brick-clad concrete than the traditional brick-and-block cavity construction found in the UK.

In summary, therefore, the degree of mechanization and use of prefabricated elements, in other words the level of technology, was greatest on the Dutch sites and significantly greater on the German sites than the UK. Contrary to commonly held prejudices, the range of activities involved for the separate trades in assembling superstructure elements was greater the higher the degree of component prefabrication and mechanization.

Complex versus simple work processes

It might be assumed that higher levels of technology go together with simplification of the organization of the work process on site. The reverse was in fact found to be the case on examination of the subcontractor divisions and social interfaces involved in producing each of the superstructural elements: an important indicator of the complexity of site organization. It is immediately apparent from Table 1, which relates to three sites visited, one in each country, that in the Netherlands and Germany there is a greater range of specialist subcontractors involved than in the UK. This is associated with higher levels of component prefabrication and also implies a greater level of organizational complexity on sites, with a large number of different specialist firms. By contrast, in the UK organizational requirements are simpler.

In the UK the carpenter is central to the social organization of the work process, being involved in the assembly and installation of all the superstructure elements. The wall/window interface is very simple and involves the interaction of only two trades: bricklayer and carpenter. This simplicity of interface, both social and technical, applies not just to the wall/window connection but to all elements of the superstructure.

In Germany and to a lesser extent the Netherlands, interfaces are much more complex than in the UK. For example, the interface between an external wall and window on a Wiesbaden site involved five different specialist firms: the concretor (*Betonbauarbeiter*), responsible for *in-situ* frame and fitting of external insulation; the bricklayer (*Maurer*), responsible for fitting the subframe; the window fitter (*Fensterbauer*); the artificial stone fitter (*Kunststeiner*), responsible for fitting internal stone sills; and the external plasterer (*Aussenputzer*).

The Dutch tunnel-form method of construction for the housing superstructure results in very different interfaces from those found in the UK and Germany. On the Utrecht site in Table 1, storey-high prefabricated panels without window units completed the front and rear walls so that the wall/window interface involved the concretors, specialist subcontractors responsible for external insulation, carpenters to fit factory-made window units, and bricklayers responsible for external cladding.

Thus, whereas in the UK only a bricklayer is involved with producing an external wall, in Germany we find a concretor and external plasterer and, in the Netherlands, a concretor, insulator and bricklayer.

The social complexity of interfaces involved in superstructure construction on the German and Dutch sites is reflected in the number of subcontractors employed on sites. Despite the far higher number of direct employees on German and Dutch sites, there was also

Table 1 Social interfaces between superstructure elements on typical sites in the UK, Germany and the Netherlands

Element	The UK	Germany	The Netherlands
External walls	Bricklayer	1. Concretor 2. External Plasterer	1. Concretor 2. Specialist subcontractor (Insulator) 3. Bricklayer
Internal partitions[a]	Carpenter	Bricklayer	Specialist subcontractor (Plasterer)
Windows	Carpenter[b]	1 Bricklayer 2. Carpenter 3. Specialist subcontractors	Carpenter
Upper floors	Carpenter	1. Concretor 2. Specialist subcontractor	1. Concretor 2. Specialist subcontractor
Internal stairs	Carpenter	1. Concretor 2. Bricklayer 3. Specialist subcontractor	Carpenter
Roof structure	Carpenter	Carpenter	Carpenter
Dwelling type	2-storey terraced housing	7-storey flats	3-storey terraced housing
Type of construction	Brick and block cavity wall	*In-situ* concrete superstructure	Tunnel-form concrete superstructure
Region	London	Wiesbaden	Utrecht
No. of units	60	98	148

[a] Non-load bearing.
[b] Bricklayers can place windows in position for fixing by carpenters.

found, contrary to expectation, a much greater number of subcontractors. In the UK the main contractor on a typical social housing site will employ no more than 16–18 subcontractors and, for the elements of the superstructure, usually there will be no more than 3. In Germany, by contrast, we found 25–28 subcontractors with 6–8 employed on the superstructure, and in the Netherlands typically there were 25–30 with 6–8 on the superstructure.

The relative simplicity of the interfaces observed between external wall and window on the UK sites exemplifies the simpler method of construction applied and the less complex forms of coordination involved than on the German and Dutch sites.

Skill levels and training

In Germany and the Netherlands over the past 20 years construction workers have become increasingly skilled and organized, as few activities remain outside the realm of the skilled worker and there exist few construction 'labourers'. In Germany the proportion of labourers in the workforce declined from 33% in 1974 to 17.5% by 1996 (ZDB, 1997), a decline that occurred mostly in the 1970s. On a large site visited in 1999 the site manager reported that no labourers were employed, only skilled workers. Labourers are, anyway, integrated into the grading structure, with the possibility of working and training their way up to skilled worker status. In the Netherlands, where a similar grading structure applies, labourers represent an even smaller proportion of the workforce, 7% in 1997 Stichting Vakopleiding Bouwbedrift (SVB), a proportion that also has been steadily decreasing, being 18% in 1984, and that may be particularly low compared with other countries because it does not include civil engineering workers.

In sharp contrast, in the UK the proportion of labourers in the labour force actually increased from 32% in 1974, approximately the same proportion as in Germany at that time, to 35% by 1989 (when statistics broken down by trade were discontinued). If any finding indicates the impact of a low and reduced level of training and the persistence of the craftsman–labourer dichotomy it is this. Symptomatic of this divergence of the UK construction process from that of the more highly developed west European countries is the trade of concretor in Germany and the Netherlands. Though constituting only 3–4% of the labour force, concreting is yet a recognized and skilled trade for which training is given. In the UK, apart from shuttering, an occupation that is part of carpentry, concreting tends to be undertaken by the labourer.

The generally higher number of labourers in the construction industry in the UK was borne out in our case study sites, being on average 19%, a large number of whom were hodcarriers but who also included machine operators (in Germany a skilled trade group). In Germany, the proportion of labourers was never higher than 14%.

Those classed as 'labourers' or 'general operatives' in the UK are not, of course, necessarily lacking in skills; rather what they lack is systematic, recognized skills. Only when skills are recognized is training given and a skilled pay rate accorded. In general, however, we can assume that the higher the level of training provision in a country and the higher the proportion of those acquiring formal skills, the higher the overall level of skill in the labour process. In this sense, training does provide an indication of the level of skill of the workforce.

A comparison of equivalent trainees, that is youth trainees in training for an agreed duration of time and having a training agreement with an employer, reveals that in the UK training in construction occupations declined in the 1990s. First year entrants in building trades (CITB YT trainees) declined from 26 700 in 1991 to 21 800 in 1997 (CITB statistics), a decline of 18%. By contrast there was an increase in German trainees from 35 400 in 1991 to 58 400 in 1997, a rise of 65%. The Dutch figures have been stable, with an average of 10 000 trainees each year between 1991 and 1997.

A good indicator of the amount of training occurring in the three construction labour forces is found by comparing the proportion of construction trainees to construction employees in the two dominant trades of carpentry and bricklaying (Table 2). Compared with the UK, the amount of carpentry training in the Netherlands is over twice as high and in Germany nearly five times higher. For bricklaying, training is considerably higher both in Germany and the Netherlands. The significantly higher current level of training in Germany and the Netherlands compared with the UK is apparent also from investment in training. In the Netherlands, for example, the levy on a firm's payroll is over 4%, whereas in the UK it is only 0.29% on a firm's direct payroll and 2.28% on labour-only payments, raising half the Dutch level though the Dutch construction labour force is a quarter the size of the UK.

Not surprisingly, considering the levels of training and financial investment in training apparent in Germany and the Netherlands, the stocks of qualifications in the workforce are higher than those found in the UK. An analysis of comparable qualifications among employed construction manual workers in Germany and the UK found that, whereas 82.7% of

Table 2 Ratio of trainee carpenters and bricklayers[a,b]

	The UK[c] 1995	Germany[d] 1996	NL 1997
Carpenters			
No. employed	193 146	92 758	67 040
No. trainees	8 994	15 841	7 806
Trainees:100 carpenters	4.6:100	20.1:100	11.6:100
Bricklayers			
No. employed	86 713	306 142	20 422
No. trainees	5 004	42 476	1 767
Trainees:100 bricklayers	5.7:100	16.9:100	8.6:100

[a] Sources: Labour Force Survey 1995; CITB College Survey 1995/6; SVB (Stichtung Vakopleiding Bouwbedrijf) statistics; ZDB, *Jahrbuch des Deutschen Baugewerbes 1997*; *Baustatistisches Jahrbuch*, 1998.
[b] No allowance has been made for drop-outs and so probably these figures are higher than the actual numbers in training.
[c] Figures for CITB YT first year entrants trainees have been used as a basis for an estimate of the total numbers in training.
[d] Figures for carpenters and bricklayers employed include trade foremen

the German workforce had completed an apprenticeship, only 36.4% of the UK workforce (not including the self-employed) were qualified to NVQ level 3 (Richter, 1998).

Industry versus craft divisions

The fact that there has been no recognition of the 'concretor' in the UK is symptomatic of a qualitative difference between the UK and the other two countries. In Germany and the Netherlands, skills are defined and divided on an industry-wide basis through the social partners, that is the employers and the trade unions, and the state, unlike the UK where they continue to be craft-based. The UK construction industry working rule agreement distinguishes between 'craftsperson' and 'labourer' or 'general operative', though four intermediary skill rates have been introduced. A skilled worker enters into and is employed in the 'craft' or trade rather than the industry and this craft basis has been reinforced by labour-only subcontracting and self-employment which, through the contract relations imposed, have served to strengthen trade boundaries (Clarke and Rainbird, 1991).

In 1997 in the UK the so-called 'self-employed' constituted over 50% of the labour force, a rise of over 50% since the early 1980s, going together with a fall in the number of directly employed operatives of 36% (DETR, 1998). On the sites surveyed, none of the large contractors employed their own labour, relying instead on labour-only subcontractors working according to price/output and using self-employed operatives; only medium size firms maintained a core of directly employed operatives. By contrast, in Germany only those who have achieved a *Meister* certificate are eligible for self-employment, and the self-employed represent only 11% of the construction labour force. On our case study sites, although a third were non-German (either Turkish or east European), all were directly employed under the same terms and conditions as German workers. Also in the Netherlands the proportion of self-employed workers, at 12% of those employed, is relatively low.

In contrast to the UK, employment in Germany and to a greater extent the Netherlands, whether by the main contractor or subcontractors, is instead direct and on an industry basis. In Germany there are eight industry wage grades related strictly to qualification levels, and the dichotomy between craftsperson and labourer does not apply. Nevertheless, remnants of craft organization do survive through the continued importance attached to *Handwerk*, that is small to medium size construction firms responsible for 84.5% of construction trainees in 1996 (HDB, 1997). *Handwerk* firms are organized separately from *Industrie* firms, which include medium size as well as large national contractors.

In the Netherlands there is a much more fully integrated and industrially based grading system, with five grades, A–E, related to different skill levels. Grade A, the lowest 'unskilled' grade, is paid at 25% above the minimum wage, though only 4% of building workers are on this grade; 35–40% of building workers are on grade B, the semi-skilled category that includes roofers and shutterers; and 35–40% are on grade D, the category of 'independent' skilled worker.

Most indicative of the distinction between graded and craft skill forms are the different training systems in each country and the increasingly abstract nature of the skills acquired. The wider range of specialist activities and the greater level of technical complexity found in the work process in Germany and the Netherlands also directly reflect these systems.

In the UK, training is trade based, that is, 16-year olds enter into a trade-specific training programme, culminating in the qualification of skilled workers in their chosen trade. The introduction of NVQs (on paper a way of allowing multi-skilling during training through the acquisition of 'units of competence' outside the main trade) has in effect further narrowed the breadth of knowledge acquired, and hence made for skills that are even less 'transferable' and abstract (Steedman, 1992). In other words, training has become less an educational process, rather tending to specific work processes and to result in lower levels of skill.

By contrast, in the German industry-based system trainees enter initially into a broad-based course covering many practical aspects of the construction industry together with a compulsory educational component, and specialize in only one of 14 trades in their final year. This system creates a workforce that is broadly skilled in the sense that practical knowledge and expertise are not confined to the boundaries of a single trade. The 'tools of the trade' are far less significant under this system and are not a defining characteristic of the nature of the work undertaken by the worker. Sufficient theoretical and educational grounding is given to enable workers to transfer easily from one task to another, even without practical experience, and to progress to higher grades. In other words, flexible, transferable skills are created through imparting the knowledge necessary to tackle a range of activities, which need not be trade specific. This is reflected in the organization of sites, both in the complexity of the social interfaces and hence the necessity to work in close coordination with those in other areas, and in the fact that few of the workers employed are 'unskilled'.

The Dutch system also is industry wide. Here trainees embark on a training route defined by occupational division, for instance woodworking or concrete working occupations, and specialize in one of 26 trade 'profiles' in the third year of training. All practical training is accompanied by theoretical supporting knowledge together with a wider curriculum covering the construction industry in general and taught in the senior vocational college system. Again, the emphasis on understanding the construction process as a whole rather than specific trades is appropriate to the Dutch organization of sites, where interfaces between trade areas are not only complex but also require extreme precision, and where specialists and those from different occupations need to work as a team.

Both the German and Dutch industry-based systems are designed to produce a workforce prepared for innovation and change within the industry through the breadth of knowledge and expertise acquired over the time spent in training. This broadly skilled and adaptable labour force accords well with the higher levels of technical complexity of the German and Dutch construction processes.

The greater number of specialist subcontractors on the German and Dutch sites compared with the UK might nevertheless be taken to support the contention of greater specialization and an ever greater intensification in the division of labour, rather than a more universal use of skills and a reduction in the division of labour. An important point to be made in this respect is that divisions in the 'physical work process', which the division into specialist activities on site represents, are not the same as the 'division of labour', such as the division between carpenters and bricklayers, which is constituted at the level of society rather than the individual site. Though a variety of specialist firms were responsible in Germany and the Netherlands for producing the superstructure elements shown in Table 1, these refer to different subcontracts or subcontracting firms and not to the nature of the labour involved as such. Indeed, it is highly likely that the specialist firms in both countries employ the most 'universal' tradespersons, either carpenters or bricklayers, who subsequently specialize.

The German bricklayer is considered the 'universal' building worker and, as shown in Table 2, there are two bricklayer trainees for every one carpenter. The broad basic training given in the first year of the dual system introduces the trainee to the work of all the other trades together with a working knowledge of carpentry and tiling. The skilled bricklayer is expected to be able to undertake most of the tasks in a small general building firm. There are also more bricklayers than other construction trades who continue training to *Meister* level, a requirement for setting up and trading legally as a building firm.

In the Netherlands, by contrast, the carpenter is the universal building worker and there are four carpentry trainees for every bricklayer. This is reflected in the dominance of industrialized prefabricated building techniques and the reduced role of the wet trades in favour of dry assembly on site.

In the UK trades do not exhibit this universality, and carpentry and bricklaying maintain a craft form and remain synonymous with contractual divisions. Thus the division of the site work process, as represented in Table 1, is quite distinct with a very clear and simple divide between the work of the bricklayer and the carpenter. A bricklayer remains someone who lays bricks, though (as in the Netherlands) carpenters are the key construction workers, as reflected in training where they are twice as numerous as the bricklayers. The UK example is also distinct because it represents not the specialist activities of different specialist firms, providing their own materials, labour and plant, but separate 'labour-only' subcontract packages. These relate in effect to a simple but fragmented form of labour, in contrast to the universal but – at the same time – specialized labour of the German and Dutch subcontractors.

Productive labour versus management control

Our studies revealed differing implications of a craft versus industry system for both productivity and management.

Construction speed and productivity

Analysis of data from our sites supports the traditional economic assumption that higher levels of skill and mechanization go together with greater speed and productivity of labour. The speed of constructing the highly prefabricated dwellings in the Netherlands was nearly four times faster than the traditional house type built in the UK, and just under three times faster than the concrete frame flats built in Germany. Average square metres produced per week were: the UK 73 m^2; Germany 104 m^2; and the Netherlands 252 m^2. From the data obtained it was possible also to make a very approximate estimation of the input of the structural trades, measured in person-days per square metre. This was calculated by multiplying the number of days in the contract programme, allowing for such factors as Saturday working, by the average numbers employed in the structural trades (bricklayers, concretors and carpenters) on site over a defined period of time. The average input of the structural trades in person-days per square metre calculated on this basis was: the UK 1.8; Germany 1.6; and the Netherlands 0.8.

Even allowing for the crudity of the measure, the results show significant differences between the three countries, with over twice as much labour for the structural trades required to produce one square metre in the UK compared with the Netherlands. In Germany, twice as much labour is required as in the Netherlands, though this is still significantly less than in the UK.

Site management

Higher levels of managerial control might be expected to be found on sites with higher levels of technology and greater numbers of specialist subcontractors at work, given the demands on coordination that both must pose. Conversely, frequently labour processes continuing to rely on craft skills are assumed to accord more autonomy to the individual worker (e.g. Braverman, 1974). In fact, the reverse was found in the case studies, with higher numbers of site-based managers on the UK sites despite the lower numbers of subcontractors and trades involved. Site management staff was defined as those white-collar, site-based staff involved in the day-to-day running of a site who did not engage in manual work. Quantity surveyors and engineers, who are also often based on site, were not included, and neither were contract managers who regularly visited. The numbers of site management staff were in all cases taken at a point just after midway into the contract period. The ratios of site management staff to the number of units being built were: the UK 1:24; Germany 1:33; and the Netherlands 1:49.

In the UK higher levels of supervision were found on those sites using exclusively subcontracted labour than those using a core of directly employed workers, indicating the greater effort required to control the output of labour than to monitor its input or capacity. Interviews with staff employed by main contractors supported the increased site supervision required with labour-only subcontracting. Several firms using 100% subcontracted labour on site reported that often the site agent had to instruct subcontractors not just on where to work but on what to do, as well as helping them to interpret drawings and information. By contrast, the site agent with a medium-sized northern firm holding the highest numbers of directly employed in the British case study sites saw his role as facilitating the work of site operatives by ensuring materials arrived on time and the site was running to schedule. The contract manager with this firm commented that, with few exceptions, all the carpenters had been employed by the firm for over 12 years and did not need any supervision, and the same applied to the bricklayers.

Levels of supervision in Germany were significantly lower than for the UK, in accord with the premise of the training system that skilled operatives are able to take responsibility for planning, carrying out, and controlling their own work. One of the German sites visited, consisting of five blocks of seven-storey flats, was controlled from one site office by only a *Bauleiter* and his two assistants, with operatives from each of the *Handwerk* firms being managed by their respective trade foremen.

In the Netherlands, the Utrecht site being built by a large Dutch contractor and specialist house builder, with 148 units of low rise terraced housing, had even lower levels of supervision. Here site management involved the control of over thirty different subcontractors and suppliers, but there were only three full-time employees of the main contractor managing site activities: the site manager, assistant site manager and general foreman (acting as assistant site manager).

These findings can be explained partly by the more stable, less casual nature of employment and higher skill levels in Germany and the Netherlands. A study by the Nuffield Foundation, for instance, found that the UK building employers surveyed compensated for their modest expectations of employees' skills and abilities by additional layers of supervision (Steedman and Hawkins, 1994). However, the rationale for site management also differs. The UK construction process is largely indifferent to operatives' skills, as reflected in low training provision. Contractors put high levels of supervision in place to control in the first place not the quality but the output of labour which, given the unpredictable nature of skills, can be variable. By contrast, in Germany and the Netherlands supervision is, in Biernacki's (1995) words, to monitor 'the transformation of labour power into a product'.

Conclusions

In conclusion, the generic nature of the skills attached to the different trades in Germany and the Netherlands and the wide range of activities encompassed by each implies a less extensive division of labour (Janssen, 1985). This is apparent, for instance, from the division in German into only 14 different trades, covering all construction activities. The last time, in the 1980s, the CITB attempted to define all the different construction occupations that might be subject to training, 44 were listed and NVQs have been devised to cover 50 different areas, representing a greater intensification in the division of labour (Clarke, 1992; Clarke and Wall, 1998).

This paper has attempted to show how this fragmentation in the division of labour in the UK case goes together with a simpler work process and is associated with low levels of component prefabrication and mechanization. At the same time, it remains essentially craft-based, with labour-only subcontracts representing trade packages, fulfilled by 'independent' or self-employed craftsmen, working according to price and assisted by labourers.

Such a craft-based system contrasts strongly with the industry-based systems observable in Germany and the Netherlands. With this form of organization, operatives are employed in the industry in the first place, as reflected in their integration into the industry-wide training system and the collectively agreed graded skill structure. The universal skills imparted equip operatives for later specialization and make, at the same time, for functional flexibility in the work process, conducive to high levels of mechanization and the use of a range of prefabricated components.

Our research indicates that the industry form of organization, although significantly demanding in terms of skills and training provision, results in a more productive and speedier process, one which at the same time gives greater autonomy to the individual worker and requires lower levels of supervision. By contrast, the craft form of organization results in a less productive and slower process, geared to controlling the output of labour and relatively indifferent to its quality and maintenance.

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End notes

[1]These are: a Joseph Rowntree Foundation-sponsored project entitled 'Vocational training, quality and productivity in social housebuilding: a comparative study of the UK, Germany and the Netherlands', published in 1996; and a two-year EPSRC/DETR IMI LINK project 'Standard-isation and skills: a transnational study of skills, education and training for prefabrication in housing' that began at the end of 1998.

[2]Biernacki's (1995) evidence is based on an extensive, historical analysis of the development of the wool industries in the UK and Germany over three centuries, and has remarkable resonance for the construction industries of today.