

## **Who did what: Division of labour among construction-related firms**

Christopher Powell

This conference is a welcome new international opportunity to link and compare hitherto separate bodies of knowledge. So this study takes as its subject something common to all buildings, regardless of date, site or function. Rather than being about buildings themselves, the study stretches construction history to include the means of building. It asks how the various processes in building were divided between producers: who did what? This intangible organizational question is best explained by examples. Many buildings were created by single firms doing virtually all the work themselves. For instance, some nineteenth century UK builders undertook to do almost everything from designing to brickmaking, to plastering interiors and all the rest. Elsewhere and at other times many a building was built not by one firm but by uniquely assembled groups of many separate firms. One thinks, for example, of eighteenth century craft tradesmen in London or Bath, each project with its independent bricklayer, carpenter and so on. As will be shown, sometimes single integrated firms did the work, and other times groups of divided firms did it. The endlessly varied business of building shows great diversity in industrial organization among firms, with wide national, regional and market differences.

Questions are posed about how different divisions of labour between firms emerged in different historical contexts. Why were, say, masonry and

other craft skills integrated in a unified firm in one place and time, but remained independent and separate in another? Why were materials processed by the builder here, but by independent materials suppliers there? Why did builders' merchants, as a separate trade, split off from raw materials producers? Why was responsibility for design separate from construction here, but combined with it there? How did owners of firms choose between combining different trades or specializing in a single one? In short, why did boundaries between business entities differ and shift? Were changes arbitrary or were they rational responses to particular conditions?

Before looking at detail, it is worthwhile glancing at modern fields outside construction. Division of labour between non-building firms is often interestingly fluid: for example in retailing one trend is integration, away from divided, specialized high street shops and towards supermarkets. Elsewhere, insurance companies, airlines and other big integrated firms move in the opposite direction, towards division. Some now divide their functions by subcontracting computing or customer telephone services to new specialized firms located remotely in, say, India. In terms of industrial organization, there are issues here about the advantages and disadvantages of specialization and scale of firm: control, agility in responding to change, economies of scale, labour costs, vertical integration along supply chains, and so on. The context of each industry, as

well as its own internal culture, play a part in deciding division of labour among firms.

This short study aims simply to examine, by means of case studies, a range of divisions of labour among firms in various periods of construction history and to review some possible determinants of division of labour. The term «firm» is taken to refer to an independent business entity, whether small master, partnership, joint stock company or other formation. The term «division of labour» is taken to refer to that aspect of industrial organization to do with the distribution of building-related processes between separate firms. The summarized case studies following relate mainly to the part of the industry which produced large higher quality works. Regrettably, most of the examples have had to be drawn from UK rather than wider historical experience.

#### RENAISSANCE FLORENCE

The first of four snapshot case studies, in chronological order, is of building in fifteenth century Florence, based on the admirable study of Goldthwaite (1982). Renaissance Florence was, of course, architecturally precocious to an unusual degree; in mid century a prosperous pre-industrial city of perhaps 40 000 people, in which institutions and wealthy individuals were gripped by a propensity to build.

Much demand for building stemmed from rich private individuals using accumulated wealth to build urban palaces for their own enjoyment. They engaged closely with the construction industry, often employing the necessary labour as salaried employees and (fortunately for us) they kept very detailed accounts. Goldthwaite tells us that accounting was so elaborate as to be «almost as impressive as the palace itself» (a reminder that heavy paperwork is not solely a modern bane). Sometimes materials or labour were contracted for, but mostly only on smaller works. Generally, lack of capital among craftsmen, operatives and materials suppliers discouraged an entrepreneurial role among them, and obliged the building owner to employ direct labour. A purveyor of the works was directly employed on large projects, such as the Strozzi palace which took about fifteen years from 1489, by up to one hundred

workers. Purveyors of the works, who had a clerical or administrative rather than craft background, made arrangements for materials supply, checked deliveries, took charge of financial administration, made payments and kept accounts. This financial administrative role was complemented from the craft side by a foreman of the works, either full or part time depending on project size. He had supervisory powers to co-ordinate the workforce although, as noted, they were employed on independent terms by the building owner. Design work was headed by an architect, although his role was more fluid and less clearly defined than it later became. Often the architect was paid as a sort of part time consultant. Materials supply was the responsibility of the building owner who obtained bricks, sand, lime and so on from independent producers through the market. Where steady supply was wanted contracts might be made, although the business climate held an accepted notion of «fair price». Site work was carried out by direct labour «wallers» (Goldthwaite's term for skilled builders in stone, brick, roof tiles and plaster) and «stonecutters» (hewers, scapplers and sculptors). Wallers were independent workers who each headed a small gang of an assistant and one or two labourers usually paid by the building owner rather than by the waller who directed them. Wallers often worked in association with each other, but not in formal partnership. Goldthwaite points out that they possessed most preconditions for becoming contractors in a modern sense, except credit and willingness to organize labour.

The Florentine industry may be summed up as a fragmented one in which the building owner played the key integrative role as direct labour employer. Below him was a small tier of senior people, the purveyor of the works, architect and foreman. The site workforce was of direct labour wallers, stonecutters and labourers, and materials were obtained largely through independent producers. The owner kept close overall control and could stop or redirect works virtually overnight if he chose.

#### MID-NINETEENTH CENTURY LONDON

The second case study is of London around 1850, based mainly on Satoh (1995). Greater London was a large city (nearly 3m. population) whose vigorous

growth was powered by early industrialisation. Demand burgeoned for new commercial, industrial, institutional and residential buildings in new and traditional forms.

Much demand came from capitalist enterprises investing in building for gain (and maybe glory). The industry was led by large general contracting firms owned by individuals or partnerships such as Cubitt, Grissell and Peto, and Myers. These firms contracted with building owners for erection of whole buildings, having submitted competitive bids, typically on the basis of independent architects' designs. That profession had gradually distanced itself from builders and was likely to be paid directly by the building owner. General contractors employed all, or nearly all, the traditional craft trades of stonemason, carpenter and so on, enabling them to do virtually all the work themselves. Small specialized works (such as stonecarving or gasfitting) might be subcontracted to independent specialist firms answerable to the general contractor. Subcontracting was constrained by building owners' and architects' distrust of unreliable firms (which abounded). A sound reputation was important to general contractors, who needed to trade on their ability to integrate the various crafts needed on large projects. To rely on subcontracting, due to slenderness of means or other reason, was to deal with a shady commercial world of small struggling firms, poor quality work and worse. Despite this, some rather furtive subcontracting was done from time to time, where possible with firms with whom the general contractor had already worked. The big general contractors were substantial concerns: as early as the 1790s Alexander Copland had employed up to 700 on urgent military projects. By 1850 some firms were said to employ one, two, or even three thousand. Most were casually employed, but it appears that a few key skilled men were found continuous employment. Management structures are not well understood, but appear to have been divided into men directing workshops and yards, those overseeing site work and those with overall responsibilities. These three groups were also subdivided by craft trade (such as slater or plumber). Firms occupied their own well-equipped yards and workshops for storing and processing bulk raw materials such as timber and stone: independence rather than reliance on other firms was the aim.

General contracting was far removed from

Florentine building practice. The key role had shifted from building owner to general contractor. Under his direction were grouped nearly all the necessary craft skills: division of labour was minimal and integration and control were at a premium. Specialized firms were confined to the margins, being limited to occasional and semi-covert assistance to general contractors (and humble small works). The large integrated general contractors met a market preference for dealing with reliable established firms. Successful proprietors of firms earned wealth and prestige, with a number of them entering Parliament and gaining other recognition. A problem which they all faced in their ascent was to match the capacity of their firm with workload fluctuations. How to continuously employ the various skills and assets, without slackness or overstraining?

#### LATE NINETEENTH CENTURY NEW YORK

Half a century and the Atlantic Ocean separate the second case study from the third. Late nineteenth century New York shared with mid-century London a context of large market (New York population exceeded 1.5m. by 1890) and runaway urban growth. This study draws on Davis (1999) and his concept of building cultures.

While having points in common with London, New York building demand appears to have differed by using capital with greater urgency and dynamism. The industry again was organized on general contracting lines, but grafted on to this were some complicating features. Building owners were likely to begin their projects with more involved funding arrangements. Also, owners commissioned designs from consultants who could belong to sizeable firms in their own right: by early twentieth century some architects' offices were over one hundred people strong. Complexity was further heightened by novel technology (steel frames, lifts, etc.) and tightening building codes. Bids would be negotiated with competing general contractors and an appointment made. Here arose a notable difference from London practice, with wider use of subcontracting. Some subcontracts were initiated by the main contractor for work for which he did not possess the resources. The architects also might arrange subcontracts, probably for high quality or complicated specialist work. More

than in the past, parts of buildings were brought to site ready finished or at least partly prepared: for example, where once bricklayers toiled at hearths and convoluted multi-storey flues, now there were iron heating appliances and pipework. New factory made components and materials included the likes of fireproof partitions, metal skylights and asbestos lagging. This extended the range of suppliers and firms working on site and in doing so added to the general contractors' managerial burdens of co-ordinating, supervising and accounting. General contractors, although carrying overall project responsibility, were becoming reliant on networks of specialist firms.

A difference between New York and London half a century earlier was in technical complexity which complicated management and fostered need for control. While old crafts and informal relations based on trust between firms survived, more businesslike relations with formal, detailed legal agreements were growing. In Davis' words «[s]trong hierarchies of control governed building and general contracting firms . . . » The significant point about division of labour was growth in numbers of different firms. General contractors still held the centre, but specialized firms multiplied all around: an integrated pattern was dissolving into a divided one.

#### MID-TWENTIETH CENTURY BRISTOL

The final case study is of Bristol, a representative provincial UK city (1931 population c.400 000) on the eve of the Second World War in 1939. The time was mildly prosperous as a diversified regional economy recovered from recession.

This study draws on Powell's (2002) study of proliferation of firms.

Building demand stemmed from private commerce and industry, and occasional public sector projects. General contracting again prevailed, in another adapted form. As before, building owners often initiated projects with elaborate funding arrangements and then commissioned designs from specialist consultants. There were likely to be at least three specialists (architect, structural engineer and quantity surveyor), reflecting increased technical complexity of buildings and, indeed, division of labour among design functions. Competitive bids

were submitted by general contractors and usually the lowest was accepted. Much of the work was subcontracted either by the main contractor or through architects' nomination. Many subcontracts were for supply, or supply and fix, of technically advanced goods: steel frames, patent flooring systems, electrics and so on. Some traditional work such as plastering also might be subcontracted. At least 150 different building-related trades operated in Bristol (as distinct from the total number of building-related firms, which was much larger). About two thirds of the 150 trades were makers: the processors, manufacturers and suppliers of building goods, from plywood manufacturers to metal window makers and others. The remainder, in order of diminishing numbers of trades, may be categorized as: site work trades (engaged in work on site, such as concretors or shopfitters); building services trades (engaged in making or fitting services, such as plumbers or neon sign manufacturers); and merchants (trades engaged in stocking and dealing in materials and components, such as slate merchants or gasfitters' factors). The number of different trades in Bristol had approximately doubled since 1900, with fastest growth among makers and building services. In the half century before 1900 there had also been growth, but it was slower. As would be expected, London, a much larger market, supported many more trades (300 or more in 1900). As the twentieth century had advanced, and transport and communications improved, the London-based specialist trades had increasingly won work in Bristol, where fewer trades were based. Thus, a national building market was beginning to supplant the regional one and, with technical innovation, the number of different trades was multiplying. The result was increasing dependence of Bristol general contractors on whole networks of firms, some based locally and others in London or elsewhere. What was true of Bristol, by implication, was equally true elsewhere in the UK. By 1939 subcontracting had so advanced that general contractors were noted to be mainly concerned with coordinating the work of specialist subcontractors. Specialization had grown so that the number of subcontractors on a project could reach as many as thirty: «[t]he large general contractor of today merely takes on the function of general organizer for the entire project» (Robinson 1939, 15).

Division of labour in UK building had travelled far

by mid-twentieth century. General contractors still occupied a central role, but work on and off site had become yet more intricate, specialized and carried out by specialist firms. It was subcontractors who increasingly performed the physical operations on site, while general contractors were moving far towards being managers, dealing in information rather than directly in goods.

### THE CASE STUDIES GENERALLY

The case studies do not do full justice to the variety of division of labour. Briefly to emphasize the point are four further UK cases, the first of which is those eighteenth century rural building firms in which were integrated most materials supply and building works on site (Powell 1999). Second are speculative private house developers of the 1920s and 1930s in which were integrated the responsibilities of building owners and builders. A contrast were post-1945 local authority housing providers in which were integrated owners, designers and, sometimes, direct labour site workforce. The only operations not integrated here were materials supply and some minor subcontracted site works. Finally were some postwar industrial «package deal» builders in which were integrated design and building site works (and sometimes site acquisition) (Bowley 1966, 362–95, 419). Such variety renders any evolution in division of labour difficult to trace.

A few simple generalizations can be made about division of labour. One is that a small number of loosely defined functions in the building process were common to all (or nearly all) projects. The functions were those of, first, building owner (also variously referred to in the literature as developer, client, promoter, etc.); second, designers, where appropriate, taken to include architect, engineer, surveyor, etc.; third, suppliers of materials and components; and fourth, makers or builders on site, including installers, assemblers and labour only workforces. Additionally, there were at least two other functions which were more or less significant. They were funding agencies (banks, etc. lending to building owners) and merchants (breaking bulk in materials supply, supplying to site and extending credit to firms on site). Within each function were various trades or specialisms. For example, among the makers might

be excavators, carpenters and roofers, while among suppliers might be quarries, timber merchants and paint mixers.

The second generalization is that the number of firms working on a building varied widely from project to project. Each project could be placed on a notional scale stretching from the pole of full integration (one firm did all) to the pole of full division (many firms divided the work between them).

The third generalization is that the functions and the firms referred to above seldom corresponded exactly with one another. Sometimes there was integration: a firm straddled separate functions (and the trades within them). Sometimes there was division: each function, or part of a function, was undertaken by a separate firm. It may be asked, what determined whether there was integration or division?

### EXPLAINING DIVISION OF LABOUR

This section considers some theoretical factors determining firms' choice of function. The factors affected whether a firm undertook an activity for itself (making, not buying from other firms), or transacted in the marketplace (buying, not making). This «make or buy» decision was the key one which, repeated countless times, determined the extent of division of labour in an industry.

Factors which influenced the «make or buy» decision were of two sorts: those arising from the external context of the project and those within the firm itself. Among the contextual factors, of which there were at least four, was the *extent of the market*. Economist Adam Smith famously pronounced that «... the extent of [division of labour] must always be limited by the extent ... of the market» (Smith [1776] 1954, 1: 15). A large market provided wider opportunities for specialization than did a small market. It followed that advanced division of labour was more likely in London or New York than in a small town. A study (Powell 2002) has noted the relevance of Adam Smith's dictum to late nineteenth century building firms.

The second factor was building owners' attitudes to *risk*. Where they were risk-averse, or where malpractice or failure of firms looked probable, owners resisted using unreliable firms. This could

favour established large integrated firms and thus restrain formation and survival of new small firms. An example of this in action was when small (and notoriously unreliable) single-craft firms were superseded by large general contractors in nineteenth century London. Thus, risk-aversion could favour integration.

The third factor was building owners' *ideology*, rooted in the broad cultural context. Ideology could influence owners' attitudes in favour of one form of division of labour over another. A UK example was mid-twentieth century leftward-inclined local authorities, among them some London boroughs and the city of Sheffield, which at times built by municipal direct labour rather than contracting with privately owned firms (to which they were politically antipathetic). In this example ideology favoured integration; elsewhere with different ideology, the reverse might be the case. Ideology in this sense appears as a wild card, not readily classified or susceptible to generalization.

The fourth factor was *workload fluctuations*. These were (and remain) endemic in the rather volatile construction industry, and were often central to the survival (or death) of firms. A firm faced with growing demand had to decide whether to expand capacity or to subcontract. In the opposite case of a firm faced with falling demand it had to decide whether to retrench or to retain costly unused capacity in the hope of an upturn in workload. Firms which subcontracted in busy times had the effect of increasing division of labour in the industry; those instead remaining integrated could face difficulties in times of recession. Thus, fluctuations and business strategies to cope with them favoured division of labour.

Four more factors influencing firms' «make or buy» decision remain, all of them internal to the firm. The first was the *availability of capital* or credit, and the entrepreneurial spirit to make use of it. Where these were scarce, small firms in a divided industry would have been deterred from growth and, possibly, integration. Thus, scarcity of capital would have favoured low division of labour, as among the Florentine wallers. Also connected with availability of capital was ease of entry of new firms. Where there was little need for capital, firms could easily begin trading and could readily proliferate (as did, say, painters). On the other hand where new firms needed

much capital, there were few small firms. A case was cement producing firms, few and large because they needed costly plant. This leads to the next factor.

The second factor was *ease of integration of technology* in making buildings or their parts. Some technologies were inherently easy to combine and others less so. For example, a nineteenth century brickmaker might easily enough set up also as a tilemaker: raw materials were similar and so were kiln firing processes. The ready technological possibility of combining brickmaking and tiling encouraged integrated firms. An example of the opposite case was brickmaking and joinery manufacture. Here, neither raw materials, manufacturing processes or labour skills were held in common, so integration offered few advantages. Often integration was affected by the potential for economies or diseconomies of scale. For example, producers of structural steelwork benefited from economies of scale and this favoured integrated firms. On the other hand, where economies of scale were few, such as among jobbing builders, integration was far less common.

The third factor was *transaction costs*, the costs to firms of trading with other firms, which arose with a decision to buy rather than make. Transaction costs were incurred when firms searched where to buy, specified what was wanted, negotiated, monitored and enforced contracts, and the like. Where transactions were enacted frequently, costs often diminished (Gruneberg and Ive 2000, 123–4). Some building cultures had inherently higher transaction costs than others. What made the difference were prevailing levels of trust and business probity, ease of communications and existence of standard documentation and procedures. A comparison which illustrates this comes from late eighteenth century UK rural builders. Their transaction costs, with slow communications, probably were higher than those in, say, late nineteenth century New York where communications were far more developed. Thus, high transaction costs favoured integration.

The final factor was *technical innovation*. When innovations occurred, new firms were often set up to trade in them. For example, the advent of novel structural frame systems, fireproof floors and partitions, electrical services, precast concrete, and so on, led to new engineering-based firms. Older building firms, steeped in craft traditions and

sceptical of change, often preferred to stay with what they knew and to leave novelty and attendant risk to others. Thus, technical innovation encouraged new specialist firms and high division of labour. The point is illustrated by comparison between London firms in c.1850 and 1900 which shows very many new firms entering the market with innovative products, such as patent glazing contractors and electrical goods suppliers.

The probable influence of these factors on division of labour is summarized as follows. Seldom was any one single factor necessary, or sufficient, to give rise to a particular pattern of division of labour: the factors worked in combination. High division of labour (many firms) was more likely where one or more of the following predominated:

- large market
- low risk aversion among building owners
- favourable ideology
- widely fluctuating workloads
- readily available capital
- building technology unsuited to integration
- low transaction costs
- many technical innovations.

On the other hand, low division of labour (few firms) was more likely where one or more of the following predominated:

- small market
- high risk aversion among building owners
- favourable ideology
- stable workloads
- scarce capital
- building technology suited to integration
- high transaction costs
- few technical innovations.

Further case studies from a wider range of building cultures might add to the list of factors. Moreover, further work probably would enable the factors to be given priorities, distinguishing major influences from minor. Would causes of division of labour emerge

more clearly relative to period, place, level of technology and so on?

### SIGNIFICANCE OF DIVISION OF LABOUR

What of significance to construction history emerges from this somewhat abstract study? Eight factors have been introduced which appear to determine the extent of division of labour between firms in construction. Arguably, the factors offer some insight, at least, into who did what in building and all that this implied: the distribution of power, the roles and responsibilities, and priorities which prevailed on projects and their contexts. Industrial organization and division of labour deserve to be more widely recognised as playing a part, just like climate, gravity, user needs and so on, in shaping the forms of buildings.

### REFERENCE LIST

- Bowley, Marian. 1966. *The British Building Industry: Four Studies in Response and Resistance to Change*. Cambridge: Cambridge University Press.
- Davis, Howard. 1999. *The Culture of Building*. New York/Oxford: Oxford University Press.
- Goldthwaite, Richard. 1982. *The Building of Renaissance Florence: an Economic and Social History*. Baltimore/London: Johns Hopkins University Press.
- Gruneberg, Stephen and Ive, Graham. 2000. *The Economics of the Modern Construction Firm*. Basingstoke: Macmillan.
- Powell, Christopher. 1999. «Cobing and Helling: a Georgian Building Firm at Work». *Construction History*, 15: 3–14.
- Powell, Christopher. 2002. «Specialities Still Continue to Increase Amazingly: Division of Labour Among Building-Related Firms». *Accounting, Business and Financial History*, 12: 43–72.
- Robinson, Herbert. 1939. *The Economics of Building*. London: King.
- Satoh, Akira. 1995. *Building in Britain: the Origins of a Modern Industry*. Aldershot/Brookfield: Scolar Press.
- Smith, Adam. [1774] 1954. *The Wealth of Nations*. London: Dent.