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# Work Organization Conventions and the Declining Competitiveness of the British Shipbuilding Industry, 1930-1970

*Edward Lorenz* *

**Abstract:** *»Konventionen der Arbeitsorganisation und der Niedergang der Wettbewerbsfähigkeit der Britischen Schiffsindustrie 1930-1970«.* This article attributes the declining competitiveness of the British shipbuilding industry from the 1930s to employers' slow and imperfect substitution of bureaucratic for craft conventions of work organization. An explanation is developed for this excess inertia. First, the article maintains that the interdependent nature of British employers' decision-making on matters of training and work organization tended to "lock-in" individual firms to a particular configuration. Secondly, it is shown how the uncertainty over the need for reform perceived by the majority of builders prevented the more progressive minority from using the industry's collective employers' association to coordinate a timely switch to a more bureaucratic convention. Thirdly, it is argued that once these obstacles were overcome, the process of achieving organizational reform was slowed or even blocked by a lack of trust between labor and management.

**Keywords:** British shipbuilding, competitiveness, work organization conventions, trust, uncertainty.

## 1. Introduction[1]

Researchers in the social sciences have shown a great interest in explaining why the organizational principles and conventions that assure the coordination of economic activity in a nation may persist over long periods of time despite significant changes in technology, markets, and relative economic performance. For economic historians, an explanation for this inertia promises to provide insight into the rise and decline of nations, involving processes of overtaking and falling behind (Landes 1969; Abramovitz 1992). For growth theorists, it may contribute to an explanation for enduring differences between

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[1] This is a revised English-language version of an article originally published in 1994 in *Genèse* 15: 48-68.

nations in the rate of per capita income growth.[2] Industrial relations specialists are concerned with understanding why the international diffusion of superior managerial methods tends to be slow and imperfect.[3]

This study attempts to provide elements of a response to the concerns of each of these disciplines. At the end of the 19th century, the British shipbuilding industry held a position of undisputed dominance in the world market. Between 1892 and 1899, Britain produced, on average, 75 per cent of the world's output. Britain's share of the world market fell to about 60 per cent around the turn of the century and fluctuated around this level until 1914. This decline resulted from the expansion of capacity in the United States and on the Continent, generally behind protective barriers. Britain's control of the unprotected parts of the export market remained uncontested, her share being 80 per cent as late as 1913. By the 1960s, however, after two decades of stagnation, the British shipbuilding industry accounted for a relatively modest share of world production: less than 10 per cent (Lorenz 1991, 25-6; Pollard and Robertson 1979, 62-3).

Britain had consolidated its dominant international position in the shipbuilding industry at the end of the 19th century on the basis of craft conventions of work organization.[4] The skilled metal working trades were organized on the basis of the squad system, whereby a group of skilled workers contracted for tasks such as a row of plates. The squads took responsibility for coordinating the production process on the shop floor and for supervising their semiskilled assistants. This reduced both the need for bureaucratic planning of production and for specialized managerial personnel to supervise the manual work force (Holms 1918, 474, 527).

Until the 1960s there was little fundamental change in the craft conventions of work organization in the British shipbuilding industry despite radical changes in the technology and design of ships. The development and perfection of welding during the 1930s and the war years increased the possibilities of prefabrication and of adopting a straight line organization of work. This ultimately led to an abandonment of the traditional system where the hull was assembled piece-by-piece at the berth. In the prefabrication of the hull, the aim is to start

[2] For evolutionary perspectives see Dosi, Pavitt and Soete (1990), Freeman and Foray (1992) and Nelson (1992).

[3] For a now classic comparison of France and Germany, see Maurice, Sellier and Silvestre (1982).

[4] Following Arthur L. Stinchcombe, (1959-1960, 170), I define "bureaucratic" administration of work by the criterion that the following features of the work process are planned in advance by persons not on the work crew, the location of tasks; the movement of tools, materials and workers to these locations; sometimes the movements to be performed to complete tasks; the time allotments for tasks; and the inspection criteria for particular operations. In craft administration of work, these characteristics of the work process are governed by workers in accordance with craft principles.

with relatively simple and standard shaped components, which are built up into more complex and larger block assemblies. In constructing a large tanker or bulk carrier, for example, most of the hull can be built up from standard panels, which consist of a series of three or four steel plates, cut rectangular, welded together in a row, and to which steel beams are welded to stiffen the structure (Boekholt 1971, 2-10; Cuthbert 1969, 122-32). The move towards the standardization and preassembly of components was promoted by the rapid increase in the demand for tankers from the 1930s, associated with a shift in world energy use from coal to oil. Tankers were relatively simple craft with long flat surfaces that could easily be built up from a number of standard components (Parkinson 1960, 120-1).

The 1950s and 1960s saw the progressive adoption of these methods in the world shipbuilding industry. The expansion in world demand for ships during this period was rapid and stable by historical standards. By lessening the problem of high overhead costs during cyclical downswings, stable growth in demand favored the adoption of larger-scale and more capital intensive methods of shipbuilding. The average size of vessels also increased, and there was a growing acceptance in the market of standard designs for tankers, bulk carriers, and general purpose cargo ships (Parkinson 1960, 150, 182-3). Product standardization potentially allowed firms to benefit from economies of the learning process, generally estimated to confer a 20 to 30 per cent improvement in labor productivity over the first four to five standard vessels built (Forbes and Varney 1976).

Despite the radical changes in the technology of shipbuilding, work conventions in the British industry remained fundamentally unchanged. The 1962 Patton Report on shipbuilding technology noted the undeveloped nature of managerial hierarchies in the industry:

> The British shipbuilding industry has a long tradition of working with a minimum managerial and technical staff and requires to learn how to effectively integrate and use specialist functions in its management structure, so that real advantage commensurate with the increase in overhead costs is obtained (Patton Report 1962, 75).

A 1973 Department of Trade and Industry commissioned report confirmed the continuing rudimentary nature of planning techniques in British shipbuilding, noting the key role of skilled workers and their supervisors:

> Except in yards building warships, control of quality and dimensional accuracy is provided by the workforce [...] Informal scheduling and planning, depending on the skill and experience at foreman level, is often the only detailed planning available once original plans have been bypassed and due dates have been missed (Booz-Allen and Hamilton Report 1973, 143-4).

The continued use of traditional craft methods of work organization is all the more surprising if one considers British producers' progressive loss of market share to foreign producers, notably to Dutch and Swedish shipbuilders, that had adopted more bureaucratic methods of work organization (Van Donkelaar

1932; Montgomerie 1937-1938). The more than twofold increase in world output of the 1950s saw the proportion of ships built in Britain cut from 40 per cent to 15 per cent. During the 1960s, while world demand expanded at an unprecedented rate, the British industry sustained an absolute decline with the closure of a number of the major yards. By the end of the 1960s, Britain accounted for about 5 per cent of world output and in terms of output ranked fourth behind Japan, Sweden, and West Germany.[5] The decline in Britain's share of the world export market was equally precipitous, plummeting from 35 per cent in 1948-50 to 4.5 per cent in 1961-65. Import penetration followed closely on the heels of loss of the export market, as British owners responded to the lower prices and quicker delivery dates being offered abroad. Foreign producers increased their share of the tonnage delivered to the UK fleet from a paltry 3.2 per cent in 1951-55 to 38.3 per cent in 1961-65, and to an overwhelming 74.0 per cent in 1966-70.

There is little doubt that, during the late 19th and the early 20th centuries, when most ship were bespoke and built to the owner's specifications, the use of craft conventions of work organization had conferred an advantage on British ship constructors. However, when demand shifted from the 1930s towards larger and more standardized vessels, British producers suffered from the retention of craft methods that were poorly adapted to the changes in the characteristics of the product and market demand.[6] An explanation for this can be derived from Arthur Stinchcombe's (1959-1960) argument that different forms of organization are suitable for different market environments. In general, bureaucratization of work administration depends on the long-term stability of work flows. Only under this condition will the overheads associated with the firm-specific information processing channels required to operate bureaucratic systems be sufficiently productive to make them economical.

The flexible British system of craft production which avoided these firm-specific overheads had proven highly successful during the late 19th and early 20th centuries because the product was non-standard and market demand was highly variable. The highly trained British workers were easily able to adapt to an ever changing product mix without the need for upper level supervision. They were also able to move among the yards in a district as firm output levels varied. With the shift in world demand from the 1930s towards larger and more standardized vessels, however, bureaucratic methods progressively became more competitive.[7] The highly specialized Swedish producers were perhaps the

[5] Figures on export market shares are taken from *Lloyd's Register of Shipbuilding*, "Annual Shipbuilding Returns."

[6] For a general discussion of the relation between product types and work conventions, see Salais and Storper (1992, 169-93).

[7] On the use of systematic planning methods in the French shipbuilding industry, see Ravaille (1964, 192-211). For their use more widely on the Continent, see The Patton Report (1962, ch. 2 and ch. 3).

most successful in making use of these methods during the 1950s and 1960s. Their considerable success at the Eriksberg yard in Gothenburg is described in a 1962 report of a French investigatory mission:

> The study they made allowed the yard (Eriksberg) to determine that 60% of their expenditure (value added) in building a ship corresponded to transporting personnel and materials and only 40% to work on constructing the vessel per se. Consequently they decided to rationalize the transportation system and to minimize the movements of the personnel by keeping a worker at the same work station and by assuring that the same team always would do the same work at the same point. But, a highly developed planning system is needed to achieve this and the work plan has to be established very carefully in advance (Navires, ports et chantiers 1962, 13; [my translation]).

It is important to observe that, well before the Second World War, many European producers had adopted relatively more bureaucratic methods, not because of their superior efficiency, but rather as a response to shortages of skilled labor. As industrial economist J. R. Parkinson observed:

> Yet the impression remains that Continental shipbuilders were anticipating (during the 1930s) the changes which would take place in shipyard organization the next ten or twenty years rather more readily than shipbuilders in the United Kingdom. Paradoxically the Continental shipbuilders were drawing ahead because they did not dispose of adequate supplies of skilled labor. The legacy of skill in the British shipyards made it possible to build ships with the minimum of planning and labor supervision [...] The shortage of skilled labor on the Continent made such methods impracticable, and they were abandoned in favour of preparing detailed plans in the drawing office and templates in the loft, which could be used by semiskilled labor in the marking and processing of material (Parkinson 1956, 237).

Parkinson's remarks suggest that the increasing success of overseas builders after the war was at least in part fortuitous. Constraints linked to short supplies of skilled labor had "locked-in" foreign builders to bureaucratic work conventions at a time when they were poorly adapted to the nature of the product and the market (Lorenz 1987; Dewerpe 1991). This raises the question of whether British builders were in some sense "locked-in" to a craft-based work convention after the 1930s, despite the fact that a more bureaucratic convention would have proven more successful? The following section addresses this question while developing certain general characteristics of conventions.

## 2. Difficulties in Changing Work Organization Conventions

In his analysis of conventions, David Lewis provides us with the elements of an explanation for the inertia displayed by the members of a population in adopting a new convention (Lewis 1969, 76). Lewis defines a regularity *R* in the

behavior of the members of population confronted by a recurring problem as a convention if and only if it is both true and common knowledge that:

1) Everyone conforms to the regularity, *R*;
2) Everyone expects everyone else to conform to the regularity, *R*;
3) Everyone prefers to conform to the regularity *R* on the condition that almost everyone else does;
4) Everyone would prefer to conform to a different regularity, *R'*, on the condition that almost everyone else conformed to *R'*.

Aspects of this definition are linked to the phenomenon of "lock-in." Firstly, all conventions are arbitrary in a particular sense: there always exists another possible way to achieve coordination. As Lewis emphasizes, if there exists only a single way to achieve coordination the problem would be trivial. To illustrate this point, consider the case discussed by historians of technology of the adoption of the QWERTY keyboard by American producers of typewriters at the beginning of the 20th century (David 1986). No technical necessity justified the adoption of this solution to the problem of coordination. French producers, for example, adopted the AZERTY keyboard and there existed other possible conventions such as the DVORAK keyboard.

Second, the "cement" which binds everyone together in the adoption of a particular solution to the problem of coordination is a system of mutual expectations. Consider again the example of the QWERTY keyboard. If American typewriter producers at the beginning of the 20th century had anticipated that American businesses intended to train their typists for working on the DVORAK keyboard, then it is highly probable that they would have produced typewriters with the DVORAK standard.

Third, and this relates to the second point, when people are confronted by a recurring coordination problem they prefer to adopt the solution that is adopted by the others. This is related to the interdependent nature of decision making in problems of coordination or to what the literature on technological change refers to as "network externalities" associated with the adoption of a technological standard by a community of users (Arthur 1989). In the case of the typewriter keyboard, the externalities are due to the fact that the adoption of a particular keyboard standard, QWERTY for example, results in the creation of a pool of workers on the labor market trained to type with this keyboard standard. Businesses are consequently in a position to recruit from this pool of typists without having to make further investments in their training.[8]

When the network externalities are sufficiently important, the result can be a "lock-in" to the particular standard or convention even when other superior

[8] The adoption of a technological standard may results in other benefits from network externalities including scale economies associated with the development of specialized parts suppliers and specialized repair and maintenance service providers.

ones exist.[9] Competitive pressures between firms on the market will not automatically result in the adoption of the new superior standard or convention. This follows from the fact that each individual firm will not take the initiative to adopt the new superior standard unless it is certain that the others will do the same. The result is a "lock-in" to the existing inferior standard unless there is some non-market mechanism available for the establishment of a system of mutually reinforcing expectations facilitating a coordinated switch to the new standard. By illustration, tests performed by the American Navy during the 1940s demonstrated that the advantages in terms of speed of moving from the QWERTY to the DVORAK keyboard would amortize in the space of 10 days, the additional cost of retraining typists already habituated to the QWERTY keyboard (David 1986). Despite this evidence, American businesses made no effort to convert their typists to the DVORAK standard. There simply was no institutional mechanism that would have allowed them to collectively coordinate this change.

Even in situations where there is a non-market institutional mechanism available for facilitating the coordinated switch to a new convention, there is no guarantee that all members of a population connected to the institution will prefer to make the change. Uncertainty concerning the future benefits of the new standard may dissuade people from changing their habitual ways of doing things, even when the "superiority" of the new standard has been demonstrated.[10] In a dynamic context, where technologies and products are constantly evolving, people may decide to stick with their established methods of coordination rather than to risk adopting a new method that may at some point in the future prove less profitable than their current solution. Uncertainty dictates prudence, especially when the move to the new standard involves making irreversible investments in firm-specific training and information processing channels.

Trust and compromise are closely linked to the problem of uncertainty. While it is true that a work organization convention may respond to the mutual interests of agents by assuring the coordination or work activity, it is also the case that a set of established claims on gross output are embedded within the convention. These claims amount to a set of implicit property rights grounded in jobs, in the sense that the job position establishes an implicit right to a share of the returns from joint productive activity. As a rule, any change in the convention will affect "property rights" so defined, and so the distribution of returns.[11] One reason for this is that a change in the administration of work affects the promotion and career opportunities of different members of an organization in different ways. More generally, changes in the administration

[9] For a general discussion, see Boyer and Orléan (1991).

[10] See Heiner (1983) and Hey (1981) who, in the spirit of Herbert Simon's theory of *satisficing*, show that it is reasonable in a situation of uncertainty to stick with habitual rules.

[11] This discussion in this paragraph draws on the analysis in Stinchcombe (1987, 221-30).

of work shift around decision-making authority, and the authority to make a decision can determine who receives profits.

From the perspective of the distribution of established claims, a given convention of work organization can be seen as a compromise between the actors, and this compromise may prove very resistant to change if there is a lack of trust among them.[12] If mistrust is deeply ingrained in their relations, even apparently easy changes which promise benefits for all may arouse suspicion and provoke resistance due to the fear that one side is opportunistically trying to shift the longer-term distribution of returns to their favor.

The discussion in this section has identified three factors that contribute to rigidity in established methods of coordinating work: the interdependency of decision-making, uncertainty regarding future states of the world, and distrust regarding the intentions of others. Each of these factors plays a role in the following account of the introduction of welding technology in the British shipbuilding industry and the persistence of established craft conventions of work organization.

## 3. Coordination Problems and the Persistence of Craft Conventions of Work Organization

In order to understand the relevance of the above discussion to work organization in the British shipbuilding industry during the late 19th and early 20th centuries, it is important to appreciate that individual shipbuilders relied on skilled workers whose industry-specific standards of training and certification applied to all employers in the sector. While individual employers or workers might have had divergent preferences concerning which set of standards to apply, once a standard has been established, all actors had a conditional preference that they would be respected.

To appreciate this, it is important to consider that, at this time, the British shipbuilding industry was highly fragmented, being divided between two major regions, the Clyde in Scotland and the North-East coast in England along the Tyne, Tees and Wear rivers. Each region was composed of between 40 and 45 enterprises, the large majority of which were single-yard establishments (Lorenz 1991, 25-6; Pollard and Robertson 1979, 62-3). Ships were, for the most part, bespoken and the production levels of individual shipyards varied considerably over time. As each producer's relative demand for particular types of

[12] To place one's trust in another implies that one acts in a way that increases one's vulnerability to another whose behavior in not under one's control, and that one believes that the other will act in ways that are favorable rather than unfavorable to one's interests. When I say that two agents trust one another, I am referring to this background of belief they hold concerning each other's behavior. See Gambetta (1988, 221) and Lorenz (1993, 307-8).

skilled craftsmen varied, they would hire and lay off workers with specialized skills who continually moved among the numerous yards in the industrial districts (Price 1981, 6-8). Consistent with this labor market structure, both employers and workers had an interest in the adoption of common standards of training and certification. Common standards facilitated the mobility of workers between different shipyards in the region, and made it possible for employers as a group to offer a high degree of stability of employment, which contributed to the build-up and maintenance of pools of skilled labor.

In other words, there were important network externalities in British shipbuilding associated with standards of training and certification that were specific to the industry. Commons standards of training and certification meant that the investments in the language or "codes" necessary for the efficient use of the information channels in the shipyard production process were not irreversible investments for the individual enterprise. The workers carried the codes with them as they moved among the shipyards in a region.

The skilled craft unions contributed to the efficiency of the system. By the end of the 19th century, a high degree of union organization had been achieved by the skilled trades in British shipbuilding. Seventeen unions organized the majority of the skilled workers and the closed shop prevailed in the major yards. The most important numerically was the United Society of Boilermakers, which grouped the majority of the hull-construction trades and accounted for about 30 per cent of the manual workforce. The second in importance, accounting for 10 percent of the manual labor force, was the Shipwrights Society, which included those crafts responsible for mould-loft work, the laying of the keel, erecting and fairing the frames, and launching the vessel (Mortimer 1973; Dougan 1975).

The work force acquired its skills through a system of apprenticeship that was administered by the unions. Apprentices were paid well below the fully skilled rate during their five-year indentures which, in general, were adhered to. The low pay of apprentices relative to their productivity during the final years of their indenture allowed the employers to recoup their initial investments in training in an industry where skills were, for the most part, industry-specific.[32] Further, the geographically based union branches increased the efficiency of the labor markets by acting as local labor exchanges and by facilitating the mobility of labor between regions through the provision of tramping benefit (Mortimer 1973, 42).

The history of the introduction of welding technology in the 1930s makes it clear that employers were aware of how their efficient use of skilled labor in the yards depended on the transferability of skills across yards in the industry. During the 1930s, welding initially was used as a supplement to riveting on main structural work in ship hull construction. The technology at this stage in Britain was almost entirely confined to the principal warship contractors such as Vickers-Armstrong, Cammell Laird, Swan Hunter, and John Brown. Despite

the limited extent of practical applications, by the 1930s, the view was widespread amongst British shipbuilders that the all-welded hull would eventually make traditional riveted construction obsolete (SRNA Archives, "Federation Circulars," 9 January 1932 and 28 September 1932).

It was in this context of limited practical experience, but with an eye to the future, that the Shipbuilding Employers Federation during the early 1930s set up a committee to establish a national policy for manning and rates on welding. This reflected their concern that, in the absence of a national policy, the division of labor and rates on welding would be introduced in an *ad hoc* manner at the yard level, the result of innumerable conflicts between employers and different groups of skilled workers. Past experience suggested that the outcome of such fragmented conflicts could well be to the advantage of strategically placed groups of skilled workers who, backed by national union organizations, would be able to impose their terms. Based on the welding committee's deliberations, the employers' federation presented its "Welding Scheme" to the unions in general conference in July of 1932. The scheme called for the creation of a new class of skilled worker, shipwelders, to be organized and trained outside the existing union structure and to be recruited initially from the supply of shipyard workers and apprentices, but not necessarily from those displaced by the process. The allocation of welding among shipwelders and other trades was to be at the discretion of the employer. Remuneration was to be at the national uniform rate for skilled labor, 60 shillings per week. Trainees with prior shipyard experience, whether skilled, semiskilled or unskilled, were to undergo a two-year training period and to start at the rate of 41 shillings per week, and advance to 60 shillings by equal half-yearly instalments. In the case of semi- and unskilled workers, the progression to the 60 shillings was to be dependent on the employer's assessment of progress (McGoldrick 1982, 168-80; SRNA Archives, "Federation Circulars," 7 March 1933).

The Welding Scheme was hardly revolutionary in nature. Its essentially conservative nature can be highlighted by contrasting it with a set of proposals presented in a March 1933 committee report calling for the elimination of the squad contract system of organization (SRNA Archives, "Federation Circulars," March 1932). The report specified the following: (1) that plate straightening could be done by unskilled platers' helpers; (2) that there was no general need for platers in attendance during plate mangling; (3) that plate and angle-iron shearing could be done by semi-skilled workers, as it required no special skill; (4) that it might be advisable to sectionalize plater's work, restricting platers to their sheds and making erection at the bay the responsibility of semi-skilled workers; and (5) that general care should be taken not to pay the skilled rate on new machine operations that could be done by less skilled men at lower rates.

The proposals were based in most details on the practices of one unnamed firm with extensive experience with welding:

> The squad system had been dispensed with, individual platers with necessary help employed on the operations of mangling and flanging. The work of planning continued to be carried out by a semi-skilled man. At the welding tables the plates were set in position by the welder after which any lining off was done by the loftsmen. The shaping and cutting of the plates and bars was then done by a semi-skilled man using an oxyhydrogen cutting machine, which machine was capable of cutting 100 feet per hour. As regards the erection of the work on the ship it was explained that the firm were following the previous system of employing yard laborers to transport the work to the ship where it was erected in position by a framing squad (SRNA Archives, "Federation Circulars," 28 November 1933).

The firm's practice amounted to a break-up of the squad contract system, with platers being confined to the more skilled fabrication tasks in the sheds: bending, flanging, joggling, and furnacing. Loftsmen laid off the work instead of platers, indicating a switch to the pre-templating system, while laborers were responsible for transporting material to the stocks.[13] These practices, if applied more generally in Britain, would have resulted in an increase in the detailed division of labor and a substitution of cheaper non-apprenticed labor for skilled labor on the simpler jobs. They consequently would have required substituting a more bureaucratic system of production control to replace the non-bureaucratic one provided by the squads.

The proposals for the break-up of the squad system most certainly reflected the interests of the minority of naval contractors within the employers' federation. First, naval producers were the only firms with considerable experience with welding by the early 1930s. Second, such major warship specialists as Vickers-Armstrong, Cammel-Laird, and John Brown were vertically integrated firms, with interests in steel, munitions, and possibly heavy engineering. The wartime experience of these firms as mass producers of munitions had provided them with a model of more systematically organized production. Drawing on this experience, it is not unreasonable that these firms should look for ways to apply these organizational principles to shipbuilding (SRNA Archives, "Federation Circulars," 7 March 1933).

The large majority of the firms, which were specialized in producing merchant vessels, lacked the technical sophistication of the naval constructors. The merchant builders were not convinced that more bureaucratic methods of planning were suited to the shipbuilding industry. The attitudes of W. Jobbling, technical director at W. Doxford and Sons, a merchant builder, were representative of the majority opinion:

> My mind goes back a year or two ago when I was directly connected with a similar planning scheme which was tried out, but it was found that what could be applied in an engineering shop was not suitable in a shipyard. The scheme did

[13] On laying off methods and their relation to more systematic production planning see Lorenz (1991, 63-4).

> not work very successfully at that time […] I think shipbuilding is an industry which is distinct from any other, and to get improved production in shipbuilding the detailed production planning system as applied to engineering is, in my humble opinion, rather out of the question (Orenstein 1944-1945, D62).

Given the historical volatility in market demand, it was perhaps reasonable that the majority of British shipbuilders during the 1930s expressed doubts about the value of a shift to more bureaucratic methods of production. The use of relatively labor intensive methods allowed British producers to avoid the overheads that had often proved crippling to shipbuilders abroad during periods of recession, given the large commitments to fixed capital equipment. As the following quote from one of industry's principal professional journals suggests, concerns over the stability of demand continued to characterize producers in the industry during the years following the Second World War:

> If the "bulls" are right, and the present strength of the freight market develops into what may be described as a boom next year, and if it continues for any length of time, owners will undoubtedly become more interested in the possibility of acquiring additional vessels, whether secondhand or new. A resumption of ordering for dry-cargo ships will be welcomed by the shipyards; but it cannot be expected on any large-scale, at least until the huge volume of war-built tonnage still in existence begins to show definite signs of breaking down or wearing out (The Shipping World and World Shipbuilding December 1954, 581).

It was only at the end of the 1950s that that a consensus was achieved amongst the employers within the SEF on a program of more radical organizational reform. Under pressure from declining levels of profitability and the loss of market share to foreign producers, discussions were initiated within the SEF on a comprehensive reform of working practices in order to improve productivity (McGoldrick 1983, 210-21). These discussions resulted in the 1962 plan which the employers presented to the unions in general conference at the national level. Negotiations at the national level centered on proposals for the relaxation of demarcation lines among the skilled trades and on training provisions for upgrading non-apprenticed semi-skilled workers to skilled status. Union opposition led to the breakdown of negotiations and the abandonment of the plan. Despite this failure, these discussions were nonetheless significant in setting the agenda for the more successful local productivity bargaining that took place in the industry after 1965. In order to understand the failure of national negotiations, it is necessary to appreciate how the history of conflicting industrial relations that marked the industry had generated a high level of mistrust among workers and their unions over any proposed change in arrangements that threatened to alter the established division of labor among groups of skilled workers or between the skilled and unskilled.

## 4. The Problem of Trust

Once the shipbuilding employers' Welding Committee had rejected the more radical proposals for work organization reform in 1933, it was certain the introduction of welding technology would not be the occasion for a coordinated shift from craft to more bureaucratic work conventions. While the relatively modest proposals contained in the Welding Scheme were essentially conservative, they did challenge the established truce between management and labor in two important respects. First, it called for the creation of a new class of skilled ship-welders outside the existing union structure, and second, it stipulated that those workers and their unions displaced by welding should not necessarily be the ones to control the new technology.

The unions rejected these proposed changes in general conference in July and November of 1933 and the employers attempted to unilaterally introduce them in 1934. The control that the employers sought to exercise over apprenticeship was simply viewed as an opportunistic ploy designed to indirectly dilute with cheaper apprentice labor. The lack of trust is apparent in the following remarks made at the November 1933 conference by the Vice-President of the Shipbuilding Employers Federation and the representative of the National Union of General and Municipal Workers respectively:

> I submit that the proposals in connection with the payment of trainees are in no sense unfair, and the term 'dilution' has no proper use in connection with what is actually happening [...] The suggestion apparently is that although these men are not experts, although they cannot pretend to be experts, it is wrong to pay them less than the 60 shillings rate while they are being trained.[14]

> I am a practical man with 30 years' experience in handling these problems, and my colleagues may have more experience but it is the general experience in industry that the lower rate becomes the maximum rate. You may have these men deemed to be failures for the first 12 months or the first 18 months, and out you go and in comes a cheaper man. You may have a few – 3 men at the top and a greater proportion of 41, or 45or 50 shilling men making up the bulk of the men engaged in welding.[15]

In April 1934, members of the Boilermakers Society went on strike in opposition to the scheme in the Tyne, Clyde, and South Coast districts.[16] These strikes

[14] Vice-president of the SEF, minutes of the general conference, "Shipbuilding File," Shipbuilding Employers Association, Proceeding in General Conference with the Federation of Engineering and Shipbuilding Trades, London, Trades Union Congress Library, 1 November 1933.

[15] Representative of the NUGMW, minutes of the general conference, "Shipbuilding File," Shipbuilding Employers Association, Proceeding in General Conference with the Federation of Engineering and Shipbuilding Trades, London, Trades Union Congress Library, 1 November 1933.

[16] Executive Committee Report of the Shipbuilding and Shipwrights Association, 21 April 1934.

were resolved when the firms involved, which were mainly naval contractors, agreed to pay the men on a piecework basis in violation of the provisions of the Welding Scheme. The success of the unions in blocking the employers' initiative can, in large part, be explained by the divisions within the ranks of the employers. Only the small minority of naval constructors in the federation that had experience in using welding technology attempted to apply the terms of the 1932 Welding Scheme. Rather than call for a national strike, the Boilermakers Society strategically limited its strike action to the few yards that actually attempted to apply the terms of the scheme (SRNA Archives, "Federation Circulars," 28 May 1933).

The union's mistrust of the employers and their refusal to accept the terms of the Welding Scheme can better be understood if one takes into account the history of conflicts between the unions and the employers over the use of apprentices. The efforts of the employers to reduce labor costs by substituting cheaper apprentices for fully skilled workers towards the end of the 1890s (when the British industry began to lose export market share to foreign producers) was a factor in the creation of the Shipbuilding Employers Federation in 1899. The first major decision made by employers attached to the SEF was to refuse to renew the existing apprenticeship agreement with the Boilermakers Society which was due to expire in 1899. The agreement restricted the employers' freedom in the use of relatively cheap apprentice labor by fixing the ratio of apprentices to skilled men at 2 to 7 and by restricting the age of apprentices as well as the length of an apprenticeship. In 1901, negotiations between the SEF and the Boilermakers Society resulted in a new agreement which eliminated all restrictions on the number of apprentices (SRNA Archives, "Federation Circulars," January 1901).

The timing of these negotiations was not by chance. At the end of the 19th century, German builders had a certain success in penetrating Britain's traditional export markets.[17] This success coincided with technological change resulting in the replacement of traditional manual riveting and caulking methods by portable pneumatic riveting machines. The SEF created a committee responsible for examining the division of labor and pay levels to be applied with the introduction of pneumatic riveting. The committee concluded that the efficient use of pneumatic riveting would depend on the use of non-apprenticed labor unfamiliar with the existing division of labor for manual riveting (SRNA Archives, "Federation Circulars," January 1901). At that time, the Boilermakers Society had unilaterally demanded the right for its members to use pneumatic riveting equipment and to be paid at the established at piece rates that applied for manual riveting. The conflict between the employers and the union came to a head at the Wm. Gray and Co. shipyard when the Boilermakers called a strike over

[17] Britain's part of the international export market declined from about 80% in 1885 to around 60% in 1900.

the use of apprentices on pneumatic caulking machines. This strike led directly to national level negotiations that resulted in a confirmation of the Boilermakers Society right to operate the new equipment, but at piece rates below the rates established for manual methods.

The history of conflicts over the use of cheaper apprentice labor helps explain the reaction of the unions to the SEF's proposal around the introduction of welding technology at the beginning of the 1930s. In order to fully understand the how the division of labor on welding was determined, though it is also important to take in account another aspect of the industry's industrial relations, the history of demarcation conflict between different groups of skilled workers for control over changes in the organization of work brought about by the introduction of new materials or equipment. The Boilermakers Society, for example, had achieved its position as the dominant union in the industry at the expense of the shipwrights, organized from 1881 in the Shipconstructors and Shipwrights Society. During the era of wooden hull construction, the shipwrights had been the dominant trade in the production process. With the transition to iron, and later to steel construction, however, shipwrights initially refused to work with the new material and later they were supplanted by the boilermaker trades as the principal occupational group in the industry (Pollard and Robertson 1979, 153).

Ongoing conflicts between different groups of skilled workers also played a role in fixing the division of labor during the 1930s and 1940s. The Shipwrights Society complained on a number of occasions that members of its drilling section that had been trained for welding were being poached by the Boilermakers Society. For a short period, it appears that the Transport and General Workers Union successfully recruited welders in the Belfast region. By the early 1940s, though, the Boilermakers Society in large measure had been successful in establishing exclusive rights to arc welding in hull construction. In 1944 the Shipwrights Society effectively conceded the claim, noting that given that the Boilermakers established piece rates on welding and their uncompromising position, it would be unwise to press the issue and alternative sources of employment for displaced drillers were being considered. Ship-welders were effectively a new section of the Boilermakers Society.[18]

While the Boilermakers pursued a national campaign to establish their exclusive rights to use welding equipment on hull construction with considerable success, the allocation of welding for fitting-out work inside the vessel remained a point of contention after the Second World War. In the case of copper pipes, for example, the Boilermakers extended their prerogatives with success for all welding on ship repair work, while Coppersmiths were, in general, re-

[18] For the details on these demarcation issues, see Executive Committee Report of the Shipbuilding and Shipwrights Association, 31 January and 14 June 1933; 6 June and 25 July 1934.

sponsible for oxyacetylene and welding on new construction (SRNA Archives, Series 3918 BC, 9 February 1949). Regarding the allocation of plumbing work, plumbers were responsible for welding on board the vessel except in case where a pipe was welded to the hull of the ship, in which case the work was done by welders attached to the Boilermakers Society. Nonetheless, there were numerous exceptions to these rules. In the yards attached to the Manchester Ship Repairing Association, ship-welders were responsible for all pipe-welding work on board the vessel, and similar agreements were established at Barclay Curle and at Vickers-Armstrong toward the end of the 1950s (SRNA Archives, Series 3918 BC, 26 June 1964). At the Dock Co. yard on the Tyne, where the employers had refused to set up welding shops on board the vessel, the practice of welding pipes together in outdoor sheds after having fitted the pipes to the correct dimensions on-board the vessel had developed in the 1950s. In a September 1954 memorandum addressed to the London office of the SEF, the representative of the Tyne Association noted, "that there were no negotiations underway and the situation more or less amounted to the plumbers dictating to the enterprise how the work is carried out, thus introducing a change in methods" (SRNA Archives, Series 3918 BC 1, 24 September 1954).

## 5. Why did a Change in the Conventions of Work Organization Ultimately Come about?

Training standards and methods of work organization in the shipbuilding industry underwent considerable change during the 1960s. At this time, management at the local level negotiated a series of productivity agreements offering greater job security in exchange for increased flexibility and interchangeability between the skilled trades.[19] The way in which change came about raises a number of more general points. First, it was only when economic difficulties actually threatened the longer term survival for the industry that a consensus was achieved amongst the employers on the need for a radical change in methods. Internal discussions were initiated within the SEF in 1959 on an overall reform of work organization and training standards following a serious decline in industry profitability (McGoldrick 1983, 201-11).[20] Second, the consensus achieved amongst the employers did not automatically lead to reform. Up until 1964, the unions remained mistrustful of the employers' claims that a radical

[19] *Flexibility* refers to a worker performing tasks outside his established demarcation lines in order to progress what is his normal job. *Interchangeability* refers to transferring specialized workers from one occupational group to another on a temporary basis in order to relieve bottlenecks to production.

[20] According to a private survey conducted by Hoare and Co., the industry profit/sales ratio fell from 6.4 per cent in 1958 to 2.4 per cent in 1964; see Slaven (1980, 21).

reform was needed. The representative of the SEF made the following remarks in February of 1964 during a meeting with the unions:

> Your response is highly disappointing. While we didn't expect to accept wholesale our proposals, we did expect at a minimum your acceptance on the need for some reorganization of work processes… I must emphasize that we cannot leave things in their current state. Despite everything that we have said over the course of the last few months, it appears that you remain unwilling to face up to the fact that the Industry is going through a critical period in its history, and all those concerned, including members of the unions, must, if we are going to survive, make a serious effort (SRNA Archives, "Report on meeting with metalworking trades," 27 February 1964).

It was only towards the end of the 1960s that the unions agreed to the principle of negotiating agreements for increased flexibility and interchangeability between the skilled trades at the local level. A key factor in their willingness to negotiate at this time was the unmistakable severity of the crisis the industry faced. Increasingly effective foreign competition forced the closure of a number of major yards including Wm. Denny and Brothers, Harland and Wolff's Govan yard, Wm. Hamilton, and Fairfields (Wilkinson 1973, ch. 6). This leads to a third point. Given the legacy of mistrust between workers and employers, it required the visible threat of bankruptcies and closures that were perceived as originating from outside the managerial hierarchy in order to legitimize the need for change in the eyes of all the actors.

Local productivity bargaining did result in a degree of flexibility between the hull construction trades, organized by the Amalgamated Society of Boilermakers. Less use was made of interchangeability among the trades, but this reflected less union resistance than it did a limited need for it. Local agreements, however, did not provide for the promotion of non-apprenticed labor into skilled positions (Alexander and Jenkins 1970, 146; Wilkinson 1973, ch. 6). While local productivity bargaining was clearly an innovation in the nature of industrial relations in the industry, it ultimately only resulted in a local modification in the craft system. It did not result in a shift to bureaucratic work conventions, and this brings us to a fourth point. Even in a situation where there is a consensus amongst the actors concerned on the need for radical reform, if negotiations are designed to assure an outcome which is perceived as mutually beneficial by all the parties concerned, the result will tend to be only a local modification of existing arrangements.

The local nature of the changes brought about in the established work organization conventions in the British shipbuilding industry might appear to reflect mainly the cognitive limitations of the actors and lack of appreciation for the implications of their choices on the competitive position of the industry. But on a deeper level, the analysis has shown that the modest nature of the change was the result of the politics of seeking to negotiate a change that would be acceptable for all the actors. The importance of the political constraints is one of

the major conclusions that can be drawn from the history of the British shipbuilding industry.

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