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'Quality and selling price go hand in hand, like ham and eggs, toast and butter': American Bosch, Local 206, and the blunting of shopfloor participation, 1950–1970

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Introduction

Contemporary management literature is replete with books and articles that extol the virtues of worker involvement, shopfloor teams and continuous improvement. It is now an accepted axiom that quality is an essential ingredient for success. However, what is missing from such discussions is an historical perspective on labour, and in particular trade union interest in these issues. The traditional history is that, at the conclusion of World War II, whatever interest workers had in making a difference at the point of production dissipated as one international union after another ceded over the shopfloor to managers in return for an increased pay packet and a plethora of new benefits, including such things as cost of living clauses, health insurance and retirement guarantees. We are thus left with the limited vision of heroic managers in the 1970s fighting the good fight to increase productivity, improve quality and engage the 'hearts and minds of workers' in the face of declining manufacturing output and the erosion of US international market share in industries such as steel, automobiles, machine tools and consumer electronics. It is as though managers and their gurus plucked from the sky the idea that the tacit knowledge and shopfloor expertise of production workers mattered, and then, armed with this kernel of knowledge, they set out to bribe, cajole or coerce their employees that 'Quality was Job One' and that they needed to 'get on the team'. But history is much more complex than this and, as the case study presented here of the Springfield, Massachusetts American Bosch plant demonstrates, is replete with examples of workers and their unions demanding that their skills and tacit knowledge be utilised on the factory floor.

While on a recent tour of a 100-person metalworking company that specialises in the manufacture of defence and commercial aerospace components, I learned that there were no supervisors on the shopfloor and that all production was directed by work teams. These teams determined all job sequencing, provided customer quality assurance and guaranteed that production deadlines were met. At a second plant, engaged in the design and production of medical instruments and surgical implants for knees and hips, I learned that machinist teams

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determine scheduling and hiring, and directed the purchase of all new machinery for their production areas. In each plant, the worker teams routinely sought out ways to improve production and were rewarded with quarterly cash bonuses for their efforts. According to each plant's general manager, company success is predicated on three things: a continuous search for the most efficient method to produce parts; the absolute assurance to every customer that only perfect parts are shipped to them; and the essential role that machinists play in determining how work is performed. Can arrangements like this only take place in union-free air? Does the mere spectre of a union induce brain death in workers and propel them to lapse into the posture of 'greedy economic man', while non-union shops allow the worker's brain to come alive?

In 1978 labour historian David Brody reviewed US labour historiography in search of a synthesis that could bring together American ethnic, cultural, economic and institutional labour history in much the same fashion that E. P. Thompson's *The Making of the English Working Class* (1963) had done for England. In Brody's schema, the centrepiece became work and the job (Brody, 1980). For Brody and several historians of US labour, worker attitudes towards their jobs, particularly their notions of fair treatment, and their efforts to bring order and efficiency to the factory floor, are themes that run through their writing and establish the importance of considering how unionists wanted their vast production knowledge utilised on the shopfloor (Montgomery, 1979, 1987; Laurie, 1989; Scranton, 1989; Babson, 1991). For example, just prior to US entry into World War II, the Congress of Industrial Organizations issued a policy paper on national defence. It read in part, 'Out industrial unions constitute a great reservoir of productive, technical and administrative skill and resourcefulness. The brains of labour should be utilized to serve the nation' (American Council on Public Affairs, 1940, p. 5). In the same year, the United Automobile Worker's Walter Reuther, himself a skilled tool- and die-maker, assembled a team of engineers and machinists to draft a quite detailed plan for the conversion of automobile plants to wartime aircraft production (Clark, 1941; Lichtenstein, 1995). In 1941 the United Electrical, Radio, and Machine Workers called for the establishment of labour–management production teams, noting that 'if a machinery is established whereby the workers can combine their knowledge with that of management, increased production will result' (Emspak, 1943, p. 91).

1. Argument

In this article, I trace the persistent efforts by Bosch unionists to participate in production-related decision-making between 1950 and 1970. Workers carried forward into the 1950s and 1960s participation ideas that they had practised to boost production during World War II, but in spite of their best efforts they were placed on the defensive by a corporate strategy designed to lower production costs by shifting work out of the unionised facility into lower wage plants in the southern US, and through the establishment of joint production ventures in Europe (Lichtenstein, 1980; Montgomery, 1987; Meyer, 1988; Tolliday and Zeitlin, 1992; Brown,

1995).[1] At the conclusion of World War II, Bosch unionists did not want to relinquish the production role they had played on the shopfloor and were reminded, through their union newsletter, that their stake 'is as great or greater in American Bosch than the stockholder . . .. Make suggestions, better the product, give them a dollar's work for a dollar's pay! Don't kid yourself. There are unions more militant than ours that recognize that the increased assumption of responsibility leads to increased benefits.' For these unionists, brain power and hands-on production knowledge were inextricably linked to job security. Workers were also told that counterparts in Europe 'have been guaranteed the right of co-determination which implies union participation in corporate financing, pricing, supply, and all other functions of management', and that the United Automobile Worker's Walter Reuther 'has been covering this in some of his writings and we hope in some future issue to bring you a report on this *tremendous advance in union responsibility*' (emphases added) (*Bulletin*, February 1951, September 1951. The *Bulletin* was the Local 206 monthly newsletter. It was distributed to all unionists at the plant gates). On a day-to-day basis, shop leaders fought to protect their members' contractual rights. However, they also understood that plain and simple contractualism and a focus on wage demands meant little without jobs, and that one of the best assurances for maintaining work was for the hundreds of years of collective production knowledge that unionists possessed to be utilised to enhance the flow of quality work in the factory. Unionists offered intelligent solutions to production problems over the course of several local leadership changes and in the face of significant job loss caused by corporate disinvestment strategies, thus demonstrating that their interests here were neither ephemeral nor a smoke screen for an agenda of factory floor disruption; in fact, participation resonated with local leadership and rank and file workers.

In what follows, I discuss labour's efforts to provide input on the factory floor in the face of the corporation's strategy to reduce production costs in Springfield by locating alternative manufacturing sites with lower labour costs. Parts 2 and 3 of the article briefly trace the general history of metalworking in Springfield and the specific history of the American Bosch plant. Special attention is paid to the role that skilled metalworkers have played in the city and plant's history. Section 4 reviews the evolution of the company's labour relations strategy at the conclusion of World War II. In section 5, the company's quality and technology programmes and the union's responses to them are discussed, and in section 6 the company's global expansion is considered. In section 7 the union's collective bargaining response in the late 1960s and early 1970s is considered. The concluding section summarises the Bosch story and draws some lessons for contemporary labour relations.

[1] In *The Baldwin Locomotive Works*, Brown (1995) makes the point that the pre-eminent builder of locomotives in the US relied heavily on shopfloor skill for its success, but that tension emerged between Baldwin's management strategy and that of mass production firms in the early 20th century. 'Mirroring other capital equipment firms,' Brown concludes, 'Baldwin learned that growth derived from the broadening of markets, product lines, and productive capabilities, while long-term success depended on workers' skills, quality products, close relations with customers, and continuous technical support' (p. 235). The internal flexibility that this approach engendered stood in sharp contrast to the mass production strategy that Henry Ford soon introduced.

2. A brief history of metalworking in Springfield, Massachusetts

Springfield began to secure its diverse manufacturing base soon after it was selected by Congress in 1776 to be a federal armory site.[1] The Armory became the hub of a flourishing industrial district along the Connecticut River populated by small metalworking and machine-making firms. By 1850 rail connections to Boston and Worcester, Massachusetts, Hartford, Connecticut and Albany, New Work sparked further growth. Throughout most of the 19th century, Springfield enjoyed a comparative technological advance over many other regions of the country owing to the diffusion of Armory manufacturing techniques, such as the utilisation of gauges, fixtures, jigs and dies, and the availability of large numbers of skilled metalworkers residing in the city. According to historian David Hounshell (1984, p. 4), 'The Armory acted both as a clearing house for technical information and a training ground for mechanics who later worked for private arms makers or for manufacturers of other goods'.[2]

Rigorous production standards were developed for the numerous subcontractors in the region who supplied parts to the Armory. Given the opportunity, these small-shop owners studied Armory designs, manufacturing techniques and methods of organisation, thereby improving their own plant efficiencies. This skill-based approach to problem-solving sank deep roots in the fertile Connecticut River Valley. By 1880 there were 437 mills and shops in Springfield, employing 7000 workers, and in 1910 manufacturers employed 12,361 workers, with foundries, machine shops, machine tool builders and electrical machinery firms leading the way (Rosenberg, 1963; Meyer, 1989; Best, 1990). In a 1917 *American Machinist* article about the Armory, it was noted that 'many good ideas are gathered from the rank and file and it is to the foreman's best interests to bring out the best that is in his men'. Armory historian Patrick Malone concluded that 'successful foremen at Springfield always followed this practice; most of them had risen from the rank and file in the production shop or had served an apprenticeship under a skilled machinist'. This shop culture placed tremendous value on practical experience and promoted worker participation in machine design and incremental innovation. This resulted in a regional skill base that was recognised both nationally and internationally. It was fundamental to the region's late 19th and early 20th century manufacturing success, while its disjuncture after

[1] Springfield's industrial growth was jeopardised only briefly when, at the conclusion of the Revolutionary War, Congress decided to relocate the armory 10 miles across the Connecticut River at West Springfield, where a facility was to be built to harness the power of the Agawam River. However, after protests against this move by large numbers of West Springfield farmers, the Armory remained in Springfield, and that city, rather than West Springfield, benefited from the economic stimulus the Armory soon provided (Frisch, 1972).

[2] Hounshell points out that two keys to Armory success were an early reliance on private arms contractors as a source for innovation and the perfecting of various ways to inspect parts in the process of manufacture. This concept spread to other metalworking establishments in Springfield and, over time, added to the region's reputation for high-quality work (Hounshell, 1984, pp. 33–34, 44). Hounshell also cites Felica Deyrup's *Arms Makers of the Connecticut Valley* (1948) for its documentation of instances when the Armory's pattern-makers and skilled foundrymen made machine casting for area machine tool builders who lacked the internal capacity to do so.

World War II was fundamental to the region's manufacturing demise (Malone, 1988, p. 64; Best and Forrant, 1996).[1]

3. The Springfield Bosch plant

The German-based Robert Bosch Magneto Company constructed one of its first US plants in Springfield in 1911 to take advantage of the city's skilled labour and to gain access to the nation's nascent automobile industry.[2] The plant was seized by the US government during World War I for security reasons and was sold at auction in 1914 to a group of Springfield buyers. Robert Bosch repurchased the plant after World War I and renamed it the American Bosch Company (AB). The workforce grew between the wars, and in the mid-1920s the plant employed 2000 people and produced 50% of all the electrical starter parts required by the burgeoning US automobile and truck industries. In the late 1930s the plant's product mix was diversified to include commercial radios and fuel injection equipment for the aviation industry. Most manufacturers in Springfield were non-union until the mid-1930s, when the United Electrical, Radio and Machine Workers (UE) successfully organised Bosch and several other firms. Skilled machinists played the lead role in these organising efforts, and, with skills shortages in Springfield, machinists gained significant control on the factory floor. This is similar to what Nelson Lichtenstein found in Detroit's automobile plants, but unlike Detroit there was very little disruption of production in Springfield and no evidence of work stoppages at all in Bosch (*Bulletin*, 25th Anniversary Issue; Stone, 1930; Lichtenstein, 1980, p. 343; Meyer, 1988; Forrant, 1996).[3]

The plant benefited from the surge in war-based production during the 1940s; however, Robert Bosch never gained financially because the US government assumed control of the plant in 1941 through its Alien Property Custodian's Office

[1] In 1919 England's Rolls Royce, Inc. undertook a thorough investigation of potential sites for a manufacturing facility and chose Springfield. Reasons given for the choice included access to a constant supply of skilled machinists and easy access to high-quality drop forgings. According to Rolls Royce, 'the artisans of Springfield—from long experience in fine precision work—were found to possess the same pride in workmanship as the craftsmen of England' (Stone, 1930, p. 550). By the early 1920s automobiles costing $20,000 were produced by Rolls Royce's 1400 workers. The plant ceased production in the early 1930s as the US customer base shrank with the onset of the Depression. Henry Ford had similar praise for the region's metalworkers. According to Ford, 'The skill of Springfield's engineers and workers is traditional. Less well known is the fact that in its world-wide search for never ending improvements, the Ford Motor Company has found in Springfield dependable sources for a substantial portion of its equipment and parts used in building Ford cars' (*Springfield Republican*, 21 November 1936, p. 13).

[2] Founded in 1886 in Stuttgart by Robert Bosch, the company achieved rapid growth between 1900 and 1915 with Bosch's invention of a high-voltage magneto to create an electrical supply for the internal combustion engine. In 1915 the company employed over 5000 workers and was the largest manufacturer in South Germany. Early photographs of the Springfield facility show hundreds of lab-coated machinists utilising their skills in the production of electrical parts for the emerging automobile and truck industries (Mueller and Loveridge, 1995).

[3] Photographs taken as late as the mid-1930s show skilled machinists in shirt and tie at their work benches in the Bosch tool and die shop. In 1936 these toolroom workers were the nucleus of the United Electrical Worker's successful union organizing effort. The UE used this base in Springfield to launch successful unionisation efforts up and down the Connecticut River Valley from Bridgeport, Connecticut to Springfield, Vermont. By 1939 UE represented workers across the north-east who were responsible for the output of 80% of US electrical goods, from the smallest appliances such as toasters and fans to the largest electrical generators built in the world (*UE News*, 7 January 1939, pp. 4–5).

(APC). After the seizure, the Federal Defense Plant Corporation provided $4 million in leased machine tools to the plant to increase production.[1] The magnetos that AB manufactured powered virtually every military aircraft built during World War II, and its fuel injection equipment could be found in most of the engines powering navy battleships and submarines. Sales climbed to $50 million in 1943 from $13 million in 1941, and employment rose to 6700 from slightly under 1000. By 1944 sales had reached $61·2 million and employment totalled 7300. Throughout the war, the APC paid out small stock dividends and also set aside $5 million in cash to assist in what it believed would be a costly downward adjustment in the plant to eventual peacetime production.

Bosch emerged from the war as part of the electrical machinery and vehicle components sector of the nation's burgeoning manufacturing economy. National output in the sector declined after the war but increased rapidly at the onset of the Korean War, as sales jumped an amazing 106% between the summers of 1949 and 1950, to $16·8 billion. According to economist Jules Backman, production swung wildly throughout the rest of the 1950s with the ups and downs of the business cycle, and this demand volatility, coupled with an industry-average output per man hour increase of 65% between 1939 and 1954, caused virtually permanent employment instability (Backman, 1962, p. 32). The output boost came mainly from a sharp increase in capital expenditures. By 1958 the average amount invested per worker in the industry stood at $14,300, placing it third behind automobiles and machine tools in investments per production worker (Backman, 1962, pp. 180–185).

It was reasonable in 1945 for Bosch workers to assume that both the high concentration of UE locals in Springfield and labour's steadfast support for the war effort—there had been no work stoppages during the war—would provide them with a strong bargaining position and allow them to maintain the same voice on the shop floor they exercised during the war. However, in Western Massachusetts and Connecticut, 823 military contracts, worth an estimated $250 million, were abruptly cancelled and 20,000 workers lost their jobs in the early autumn of 1945. These erratic employment swings were to remain a constant feature in the region for the next several years (Forrant, 1994).[2] Finally, between 1948 and 1950, internal union politics dominated workers' attention when the UE came under sharp political attacks for allegedly being Communist Party-led. Under assault, the members of several Springfield UE locals, including Bosch, voted to leave the UE and affiliate with the upstart and unabashedly anti-communist International Union of Electrical Workers (Schatz, 1983; Rosswurm, 1992).

[1] *Springfield Morning Union*, 14 February 1941, 27 March 1942, 22 June 1942. The APC's Leo Crowley had control over the stock and could sell it at his discretion. In 1942, at the insistence of the Treasury Department, 23 employees were terminated as security risks, including the vice-president for product development and 12 engineers.

[2] During the immediate post-war years, Springfield labour was also rocked by the bitter internal strife that broke out in the American labour movement over the alleged role of Communist Party members and sympathisers in several national unions and tore apart trade unity in Springfield. The split was swift, as in just 8 weeks during November and December 1949 every UE local in the city disaffiliated with it to join the fledgling and unabashedly anti-communist International Union of Electrical Workers (IUE). There are several studies of this split. See for example Schatz (1983), Rosswurm (1992) and, for Springfield, Forrant (1994).

While this political fight dominated unionists' attention, the APC sold the plant in 1948 for $6 million to AMRA, a 2-year old financial holding company headed by Charles Allen, the president of the Wall Street investment firm Allen and Company. The holding company's board of directors included the major partners of several Wall Street legal firms as well as the presidents of the American Securities Corporation and the American Overseas Development Corporation. The sale was a particularly lucrative one for the holding company since at the time of purchase the plant was valued at $13·5 million and the cash reserves that the APC had established during the war had reached $5 million. In 1949 Allen merged the Bosch plant with ARMA Corporation, a Long Island, New York defence electronics firm, to form American Bosch-ARMA (ABA), with headquarters on Long Island. The Springfield Bosch became one of several production facilities owned by a multinational financial holding concern whose growth strategy was predicated upon product and market diversification, cost-cutting at its existing facilities, the construction of plants in the South and the establishment of numerous joint production ventures in Europe (Forrant, 1994). This switch from localised ownership with its primary concern for the well-being of the Springfield plant, to ownership with the ability to play off the interests of several production facilities against one another in a search for maximum profits, had an impact on labour relations in the plant.[1]

4. The reorganisation of corporate labour relations in the 1950s

In May 1954 Charles Perelle was named president and Chief Executive Officer of ABA. Perelle had worked his way up from being a part-time painters' helper at a Boeing plant in Seattle in the early 1930s, to becoming manager of Boeing's entire Canadian operation. In 1940 he joined another airplane manufacturer, Vultee Aircraft, where he was in charge of all production and was credited for introducing assembly line techniques into the aircraft industry. At the end of World War II, Perelle spent 3 years at Gar Wood, a manufacturer of speed boats and truck bodies, followed by a brief stint at ACF Brill, a bus manufacturer. According to *Fortune*, Perelle's reputation was that of a 'doctor of ailing companies', and when Charles Allen's financial holding company, which owned Brill, decided to liquidate it in 1954, he hired Perelle to run ABA (*Fortune*, 1959, p. 115).

Perelle was described by those around him as 'peppery, ambitious, a master of production' and more disparagingly as a 'hot-tempered bantam rooster' (*Fortune*, 1959, p. 112). Perelle was like many other executives of American corporations who sought, according to historian Nelson Lichtenstein, 'the restoration of the managerial prerogatives that wartime conditions had eroded in the areas of product pricing, market allocation, and shop-floor work environment (1995, p. 228). In the

[1] In 1953 construction of a new plant commenced in Mississippi. In a letter to workers that for the first time raised the issue of wage competition, the company president stated that a move of some work to a low-cost area was essential if the company was to maintain a competitive advantage in the manufacture of high-volume automotive components such as windshield wiper motors. The letter noted that, 'When one or more companies start producing in an area where operating costs are much lower, other competitive companies in the same field also have to move in order to survive. Its either move or quit' (Donald Hess, letter quoted in Forrant, 1994, p. 72).

summer and autumn of 1954, Perelle brought dozens of managers to Springfield who had worked with him at Vultee, Gar Wood and Brill to replace several Springfield executives who, he believed, were too sympathetic to labour. In particular, he forced the vice-president in charge of employee relations, Herbert Riddle, to resign. Riddle had worked at Bosch since 1940 and was given credit by the union for establishing excellent labour–management relations during and immediately after World War II. James Mote, the manager of the Bosch time standards and rate-setting department, was named to replace Riddle, and Charles Tuttle became the director of corporate labour relations. Mote's appointment was unpopular (his nickname in the plant was 'Moat the Goat'), since his department was responsible for establishing job standards and piecework rates in the plant. Tuttle was liked even less. He was described by unionists from a plant where he had previously worked as 'a cold, arrogant, and highly technical man', who had turned the labour agreement there into 'a technical document and not a co-operative working agreement'.

Mote and Tuttle were a formidable combination, and these appointments sent Bosch unionists an unmistakable message that labour relations were to take an unfriendly tack. However, while Perelle's dismissal of Bosch production supervisors and foremen provided him with a management team he was comfortable with, it effectively robbed the shopfloor of hundreds of years of collective experience in the machining and assembly of fuel injection components, a process that required the ability to work in tolerances as close as plus or minus 1/10,000 of an inch. In addition to his personnel changes, Perelle also relocated all of the Springfield plant's mass-produced electrical products to a new, lower-wage and non-union factory in Columbus, Mississippi (Forrant, 1994).

To soothe workers' feelings, Perelle informed them that he relied on them to help 'increase our business and overall efficiency so that we can maintain our competitive position without drastic changes' (*Craftsman*, August–September 1954; *Craftsman* was the monthly company newsletter). However, at the same time, he eliminated the plant's longstanding labour–management committee, which had been started at the insistence of Local 206 officers in 1936. The union's president and business agent, and several top managers, were members. The committee was modelled on one set up at the nearby Westinghouse Electric and Manufacturing Company, and met monthly to examine and resolve production-related problems. The *Bulletin* pointed out that the committee worked as 'an honest and effective means of settling common problems' and called for its continuation. Unionists firmly believed that their participation in the resolution of production-related problems was essential for plant survival, but Perelle failed to respond to this request (*Bulletin*, January 1955).[1]

[1] For a history of the Westinghouse Committee see, War Production Board, The Labor–Management Committee of the Springfield Westinghouse Corporation, Washington, 1944. A brief review of the Westinghouse group is helpful in understanding the role of the committee. In 1942 close to 300 management and union employees were members of various work groups, directed by an eight-person executive group co-chaired by the union president and the company's superintendent of production. Each work group sought to improve manufacturing in their respective work area. Department quality committees met weekly and cut the shop's scrap rate from 13% to 6% in just 2 months. Committees also worked with engineers to determine the best approaches to producing new parts.

5. Quality and technology: corporate strategies and labour's response

In 1954, despite their displeasure with management, unionists expressed concern that a new quality control plan being introduced could not work. Under the plan, all parts were to be inspected off the production floor in newly designated inspection areas. There, quality analysts were to prepare detailed written reports to supervisors cataloguing the reasons for failing inspection. As part of the plan, and in an effort to slash production costs, the number of floor inspectors was scaled back by 50%. Unionists argued that management's cost-saving strategy left too few floor inspectors to check and catch bad work at the machine and also failed to 'correct the reason for the Scrap or Rework at the source when it is being made or before, but is a statement as to the reasons (AFTER THE BULL) [emphasis is original] has been made' (*Bulletin*, October 1954). In November 1954, in a *Bulletin* editorial entitled 'Scrap—what is it?' the links between scrap, production costs, and customer satisfaction were made explicit:[1]

> It means time wasted, money wasted, material wasted, and it's like water going down the drain. Each person from any level in the American Bosch should take the time to analyze why a certain piece of work was scrapped and that it actually means money out of their pocket, plus maybe eventually the loss of jobs, because we cannot meet the necessary standards and commitments of our customers.

The union further challenged the company's quality efforts in the 1950s and early 1960s. In 1957 they argued that sharp piecerate cuts and a stress on greater output per worker pushed operators to cover up their bad work and pointed out that foremen, hard pressed to meet higher production quotas, knowingly passed scrap out of their departments. A front page *Bulletin* carton, 'Foremen solve scrap problem', depicted a sweaty and nervous foreman filling a hugh hole that he had chopped in the floor with scrap. According to the union, 'Past experience here at Am. Bosch has taught that Scrap can be repeated after all precautions have been taken unless the source, at the time of machining, is protected' (*Bulletin*, May 1957). The union noted that workers 'have a certain amount of pride, hidden or out in the open as to our accomplishments, our work, etc. . . .. Today, thanks to Operation Speedup, gone is the pride we had . . .. Through no fault of the workers who can still produce quality unparalleled, the system installed allows for too much leeway, too many reworked parts and a bungling of operations out of sequence'. The union feared that defective parts could turn customers against the plant and cost production workers their jobs. A *Bulletin* cartoon depicted the plant with a railroad engine steaming toward it, pulling box cars full of rejects from customers, while a truck sped away from the loading dock packed full with junked parts (*Bulletin*, August 1957). In a 1960 open letter to the corporation, the issue of product reliability and customers was again raised: 'With product reliability comes reputation, repeat orders, and jobs. Take away the performance of parts and assemblies and you have customer apathy.' Workers remained adamant that they could help to smooth out the chaotic flow of work in the plant and build customer confidence in

[1] Quality expert W. Edward Deming wrote in 1986 that '100 percent inspection to improve quality is equivalent to planning for defects, acknowledgment that the process has not the capability required for the specification. Inspection to improve quality is too late, ineffective and costly' (Deming, 1986). The union's 1954 critique of the management plan certainly captured much of what Deming contends here.

Bosch products, and must have wondered whether the defunct labour–management committee could help to resolve these difficult issues.[1]

Unionists were cheered in 1956 when Perelle announced the establishment of a cost improvement programme (CIP) and the purchase of several million dollars of new machinery. Perelle was intent on improving productivity in the plant in order to generate sufficient profits to enable him to expand ABA. Determined to establish ABA as a leader in the defence industry, Perelle was ready, according to Fortune, 'to risk stockholders' money at the frontier of technology' (*Fortune*, 1959, p. 113). For a time Perelle's plan appeared to work. In fact, the Springfield plant's 1957 commercial sales of fuel injectors generated 50% of ABA's after-tax profits. However, the 1958 recession decreased sales in the plant's truck, farm and automotive equipment markets and slowed Perelle's growth initiative (*Fortune*, 1959; Forrant, 1994).

Under the CIP, workers were encouraged to submit ideas to 'lower costs, improve working conditions or in some way improve the quality of American Bosch products'. However, Perelle inexplicably ordered that the union's two committee representatives could attend just four monthly meetings a year. This made no sense, unionists argued, since 'suggestions authored by members of Local 206 amount to about 95 percent of all submitted'. In spite of Perelle's insulting edict, the union continued to offer ideas on how to improve the CIP. 'The average factory worker has good ideas but usually has trouble expressing them in 25 words or less, which is the average on the blanks provided. So it is our belief that a short talk with someone trained in methods or drawing would definitely increase the value of a good suggestion tremendously.' As with the quality programme, the corporation's anti-union animus prohibited any acknowledgment that this suggestion had merit, even though, by management's own admission, worker suggestions saved the company $1·5 million in the plan's first 14 months (Forrant, 1994).

Over $10 million was spent to acquire machine tools between 1957 and 1960. Many of the machines were equipped with numerical controls, and all could hold multiple cutting tools and perform several machining operations with only limited operator intervention. These purchases were part of a nationwide trend toward the utilisation of numerical control equipment, 'the one overwhelming metalworking development of the century', according to a 1964 special report entitled 'Numerical control: the second decade', in the trade publication *American Machinist*. According to the magazine, the technology could pay for itself through reduced tooling costs, a decrease in direct labour expenses, reduced lead time and increased quality (*American Machinist*, 26 October 1964, p. NC2).

Perelle anticipated that the machines would make it easier for engineers to measure the time required to produce finished parts, and also help production

[1] LB, June 1952, p. 2; April 1960; February 1968, p. 1; June 1968, p. 1. In April 1960 the *Bulletin* pointed out that the manufacture of diesel engines was growing worldwide and noted that 'The business is there, it won't come to us, we have to secure it by quality, fair pricing, and dependability. It can be done with the same people that had Bosch on top once—the members of Local 206 I.U.E., AFL-CIO.' For the union, the top three impediments to output were: the failure to repair equipment in a timely fashion, resulting in lost production time and scheduling problems; a lack of available tooling when machines were being reset to perform new jobs, resulting in excessive downtime; and incomplete scheduling information, leading to inventory and workflow problems.

managers to gain greater control over factory workflow and to increase productivity (*Progress*, March, April, May 1959). Automatic milling machines with dual cutting heads and air-clamp fixtures increased the output and speeded up the loading and unloading of parts. Lathes with powerful drive motors and tungsten carbide tools now made it possible to increase machine feeds and speeds, cut bar stock to finish dimensions and eliminate several secondary machining operations as well as the workers who performed them. Burgmaster multispindle drill presses, capable of performing up to eight separate drilling operations without removing a part from its fixture, were located in six departments. 'No attention is needed', the company newsletter *Progress* reported, 'except to load, press the start button, and unload. This permits the operator to operate a second machine .... It's obvious that outdated machine tools are a handicap which AB cannot afford.' Kingsbury horizontal drilling and tapping machines were acquired and, according to management, 'Working back-to-back, two units are capable of drilling, counter-sinking, and tapping up to 26 holes simultaneously. Internal to the drilling time on the first machine, the holes are being threaded by tapping in the second machine. Versatile quick-changing fixtures and tools provide a means of rapid changeover for various parts.' Machine tool builders promoted these machines as a way to eliminate skilled labour: 'One man operates as many machines as the cycle times of jobs permit', read a typical advertisement. The *American Machinist*, however, was more cautionary and argued that the drive to reduce operator skill was ill-advised: 'At least under the present state of the art, the operator must make certain that all is progressing properly, though he may be able to handle more than one NC machine. Also, since the operator is monitoring rather expensive equipment, it makes good sense to put a skilled man at the control panel (26 October 1954, p. NC16).[1]

The acquisitions were utilized to displace skilled workers, and the union's initial happiness with the investment turned sour when they realised the impact that the machines were going to have on employment. 'Battery of new operator–eliminator machines being set up rear of Department 160', read a *Bulletin* headline. 'There will be so much new machinery by July of next year that there will undoubtedly be fewer people working here. *Automation means—Meet the market competition by fewer Union Members*. Without a doubt the definition should be in Webster's dictionary.' Management's efficiency programme was castigated as a ploy to get workers to participate in their own speed-up and was dubbed the 'consolidate effort—eliminate personnel' campaign (*Bulletin*, October 1959).

Historian William Lazonick has pointed out that 'technological change need not be, and virtually never is, only skill displacing' (1990, p. 5). To develop and properly use the new machine tools, a variety of new skills, including programming, set-up and adjustment and maintenance were required. The 'skill issue' was not settled in the late 1950s, and in the early 1960s alternatives to managerial control

[1] *Progress*, 3 March 1959, p. 1. Management said that the new machine tools allowed workers to move up from 'the model T to a Lincoln', *Progress*, May 1959, p. 1; June 1959, p. 1; September 1959, p. 1. For a typical Kingsbury advertisement, see *American Machinist*, June 1950, p. 26. The advertisement noted that 'You need several general-purpose machines and several operators to keep up with one Kingsbury and one operator.' For an excellent history of one US machine tool-builder, Burgmaster, see Max Holland's *When the Machine Stopped: A cautionary tale from industrial America* (1989). *American Machinist*, November 1954, pp. 8–9, 32, 39; December 1954, pp. 52–53.

and the devaluation of shopfloor skill were being discussed. In an *American Machinist* special issue on numerical control, they advised that 'Frequently a good machinist can become an excellent programmer', and indicated that maintenance personnel were important and that it was wrong for companies to rely on outside personnel to service their equipment, since 'no outside maintenance arrangement can match the speed of a properly trained inside staff' (26 October 1964, p. NC16). However, Bosch technology decisions were deemed a management prerogative, and the company turned a deaf ear to repeated union calls for the establishment of a joint committee to study the implications of technology and automation on workflow, quality, training and jobs. The roadblock to co-operation was the same one that interfered with labour's attempts to provide input on how to improve quality. Once again, Perelle ignored labour's call for collaboration and, in a blatant rebuff, he constituted a management-only technical advisory committee (Forrant, 1994).[1]

6. Sales, profits and jobs fluctuate and global competition intensifies

In the midst of the technology investment programme, Perelle announced that Springfield sales were going to double between 1958 and 1961, based on new product development efforts. In July 1956 Ford, Lincoln and Packard all indicated that fuel injection systems developed in Springfield were going to be options on their new models, and Mercedes Benz agreed to install Springfield fuel injection systems on many of its most expensive vehicles. Carried away with enthusiasm, Perelle announced plans to expand the Springfield workforce by 600 and to add a third shift by the summer of 1959, to bring total employment to 2300. However, the fuel injection deals fell through. In a further blow to expansion plans, a push-button transmission designed and built for Ford's brand new Edsel models never went into full production because the car was an abject market failure. By early 1960 the plant was on a 4-day week, and in March 1961 the production workforce fell to under 750, down from 2500 in 1955 (for employment ups and downs, see Fig. 1). Corporate sales plunged to just under $71 million in 1964, down from $133.6 million in 1961, as profits reached a nadir of $1·5 million. Only the Vietnam war defence build-up breathed new life into Springfield and the corporation's newly organised Diesel Systems Division, of which the Springfield plant was the largest part.

In 1961 Bosch received a $2·5 million order to build weapons control systems for B-52 bombers and a $3 million order to produce fuel injection systems for 800 tanks. This was followed by an order from Studebaker–Packard Corporation of South Bend, Indiana for 4000 multifuel injection systems for the military trucks it was building. In 1963 the Army agreed to purchase fuel injection systems for all of

[1] According to Lazonick, new manufacturing technologies, while allowing for greater operator output, magnified the importance of gaining worker co-operation. In his words, the workers best situated to either wilfully or not restrict output and produce scrap at faster rates were 'those for whom manual dexterity as well as minute-to-minute judgment remained important on the shop floor' (1990, pp. 231–232). Since most of the work in the Bosch plant was not repetitive, assembly-line paced, but required consistent labour intervention, either workers needed to become willing partners in the technology changeover that was occurring or an intensive regime of shopfloor supervision needed to be installed.

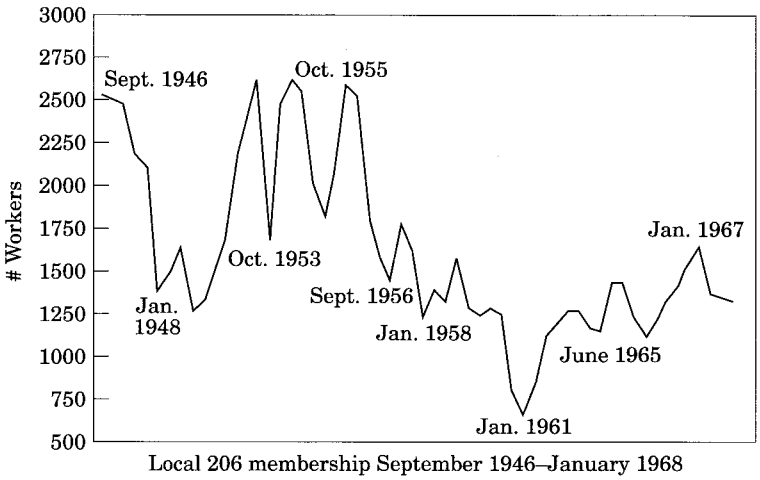

Fig. 1. Local 206 membership 1946–1968. (Source: Union membership lists.)

its 5-ton trucks from Springfield, with deliveries to commence in early 1964. This order was quickly followed by another one for the Army to equip its 2·5-ton trucks. The value of these orders totalled closes to $30 million and required the expansion in assembly capacity that Beck announced. Sales for the diesel division reached $47·9 million in 1969, up from $33·9 million in 1965—a 30% increase (Forrant, 1994). These defence orders and the large production backlog they caused masked the biggest problem that the Springfield plant was to face at the end of the 1960s: commercial automotive products faced stepped-up global competition, and 70% of the plant's commercial diesel fuel injection market was being lost to German competitors.

As early as June 1959 workers were warned in a letter that Perelle sent to everyone's home that 'American Bosch's foreign competitors enjoy a greater and too frequently a decisive cost advantage over us . . . A major cost factor is of course labour costs.' Springfield commercial sales in 1959 fell a third of what they had been in 1955 in spite of increased worldwide demand for diesel products. Perelle warned that 'For every dollar earned by an AB employee an employee of a foreign competitor is paid an average of only 25 cents. This means that where our average hourly rate is $2·66 the comparable hourly rate in West Germany is 66 cents, in Japan 27 cents and only 80 cents in the United Kingdom' (Forrant, 1994). Large-volume automotive parts production was already relocated to Mississippi where hourly wages were lower. What, workers wondered, would be left?

In fact, in 1960 and again in 1961, Perelle considered purchasing all components from German, Japanese and English suppliers, with only diesel pump assembly to remain in Springfield. Despite falling profits, with 1960 sales of $125·3 million and assets of $64·5 million, ABA still had the financial wherewithal to make capital location decisions, leaving Springfield workers vulnerable to product line relocations and even to complete plant shutdown. However, Perelle decided, for two reasons, to maintain production in the city: he was unable to find a skilled labour

pool at lower wages, and defence-related orders commenced and its was politically expedient to keep this work in the US. Defence work reversed the plant's downward slide for a time; however, the profits realised were used mainly to expand the corporation's global reach and ensured that by the late 1960s the corporation no longer relied on Springfield to produce diesel fuel injection components and pumps.

Perelle stepped down as president and Chief Executive Officer of ARMA in 1964 and was replaced by Charles Beck, the former president of the Philco Corporation. Beck announced investments in Springfield totalling $6 million for the construction of a research centre and an assembly building. This marked the first construction in the city in 20 years and appeared to consolidate the Springfield plant as the largest facility in the most profitable of the corporation's manufacturing divisions. The research centre was integral to the corporation's plans to boost engineering and product development capabilities by 40%, while the assembly building was required to meet the booming production schedule for fuel injection systems purchased by defence contractors. The assembly plant opened in 1966 and contained an automated monorail system for moving machined parts from the production facility to the assembly area, and a temperature-controlled room for the hand-fitting of extremely close tolerance special products. At the building's opening, Beck announced that 700 additional workers were to be hired, to bring total employment in the city to 3000 (Forrant, 1994).

Although Springfield's defence work was on the upswing, warning signs persisted as commercial business continued to slump and, determined to control labour costs and diversify away from diesel and defence, Beck launched an aggressive acquisition campaign. From 1966 to 1969 several companies were purchased, including: Bacharach Instruments and Packard Instruments, US leaders in the production of electronic measuring and testing instruments for medical and radiation research; Pace Industries, a Tennessee defence manufacturer; and Michigan Dynamics, a producer of scientific and medical instruments. European leaders in the production of a full range of factory automation equipment were also purchased: Hispano Suiza in the Netherlands and Steelweld in Great Britain. In addition, a joint production agreement was reached with the British conglomerate DeHaviland Holdings, Ltd. to establish a presence in important European defence and automotive markets.[1]

Beck also launched an effort to improve productivity and lower manufacturing costs in Springfield by installing a $3·5 million state-of-the-art International Business Machines (IBM) data retrieval system and implementing a value analysis engineering programme. The IBM system, complete with 25 data entry stations

[1] These European acquisitions were part of a dramatic increase in domestic disinvestment and capital reallocation by US corporations between 1965 and 1980. Total direct investment abroad in factories, office buildings, machine tools and office equipment, which was less than $50 billion in 1965, reached $124 billion in 1975 and surpassed $213 billion by 1980. According to economists Barry Bluestone and Bennet Harrison (1982), profits from these investments jumped from $5·2 billion in 1965 to more than $424 billion in 1980. Plant closings in the US became endemic, and by Harrison and Bluestone's calculation 'over the whole decade of the 1970s, a minimum of 32 million jobs were probably eliminated in the United States as a direct result of private disinvestment in plant and equipment' (Lazonick, 1992, pp. 283–284; Harrison and Bluestone, 1988, pp. 26, 35; Forrant, 1994). Beck's investments were part of ABA's corporate strategy to reduce production costs at the expense of the Springfield workforce and gain access to European markets, and were similar to the strategic business choices made by hundreds of other US corporations at the time (Kochan *et al.*, 1986).

spread across the factory, was programmed to calculate the payroll, track parts production and keep track of inventory. The engineering programme consisted of a cost evaluation and redesign of all assembly operations. Because of the over 100,000 machining and final assembly operations in the plant, the paper system currently in use to record production was too cumbersome and contributed to scheduling problems. This frequently resulted in increased overtime work to meet delivery dates. Much to the union's consternation, the new system also generated sufficient data to enable supervisors to check on the output of individual workers. Unionists feared that this information could be used to speed up workers when their output was low and conversely to cut incentive rates whenever output was too high (Forrant, 1994).

However, for the computer system to be effective, the shopfloor needed to be reorganised by product families, a radical departure from the existing arrangement by machine tool function. Under this functional system, parts to be ground went to a grinding machine department, and parts to be milled went to the milling department, regardless of the next machining operation to be performed or their final assembly destination. Engineers took several months to develop new machining and assembly layouts for the plant's major product lines, but the reorganisation stalled and the production inefficiencies caused by the crazy-quilt pattern machined parts traversed over the length of the sprawling plant were never eliminated. This notion of a sequential floor layout by product family as opposed to manufacturing operation was not a new one. It cut down significant production costs associated with inventory and material handling and also helped to expose production bottlenecks. However, at no point was the union consulted about the redesign of the shopfloor, even though stock-handlers and parts expediters clearly understood the problems associated with workflow, and, in the end, rather than increase productivity the expensive computer system simply allowed management somewhat more effectively to track this workflow anarchy. The values engineering programme suffered the same 'fate of incompletion' as the workflow reorganisation and provided only minimal cost relief.[1]

In spite of investments dating back to the mid-1950s, production problems remained. In an interview with the business editors of the Springfield newspapers, Beck placed much of the blame for slumping production on the $3-an-hour wage differential between the Springfield plant and its European competitors. With the extremely close-tolerance final machining and intricate assembly of fuel injection pumps still difficult to automate, the labour savings to be made by shifting production to lower-wage plants were considerable. Beck warned that 'competitive market conditions will determine the future of any facility in Bosch's corporate

[1] For an insightful discussion of the evolution of sequential layout in US manufacturing, see Best (1990, pp. 52–55). The head of engineering told the local newspapers 'every material, design feature and manufacturing operation will be analyzed to determine if parts are over-designed for their intended purpose'. In one case, operating levers on a series of pumps had always been machined using steel stock. After review, it was determined the levers could be produced using a stamping operation and cheaper material, resulting in a 66% labour cost saving. In a second case, spring guides on injection pumps were turned out of bar stock in a very time-consuming series of machining operations. Value analysis determined that the springs could be made out of moulded plastic at 33% of the original labour and material costs. With over 250 components in a typical fuel injection system, and close to 200 different systems being built, the savings possibilities were significant but remained elusive.

Table 1. *Corporate net sales in millions by division, 1964–1971*

	1964	1965	1966	1967	1968	1969	1970	1971
Diesel systems	27·7	33·9	40·6	43·6	48·1	47·9	34·0	30·0
Electrical products	13·4	14·9	17·4	16·4	19·9	21·6	21·7	26·0
Scientific/medical instruments	11·6	13·7	18·1	22·5	22·6	26·4	32·3	36·6
Aerospace	31·2	25·4	32·0	28·5	25·6	20·7	20·5	14·8
Industrial products	3·6	3·8	4·7	8·2	12·3	12·2	16·9	10·6
Ordnance					22·5	31·2	30·4	16·8

structure' and pointed out that the average hourly labour cost of Germany-based Robert Bosch, Springfield's chief competitor, was just $1·52, compared with $4·45 in Springfield. He concluded that Europe and Japan were closing the technology gap and that 'automation to the nth degree' was essential if the Springfield plant were to become cost competitive with its European counterparts. Although the production woes in the plant had nothing to do with the hourly wage differential and everything to do with Perelle's and Beck's failure to more than cosmetically improve the shopfloor, the wage argument was a convenient way to shift responsibility for the plant's troubles onto labour. Unlike Perelle's situation in 1960, Beck's purchases and joint ventures gave him an important trump card, for it was now possible to shift work from Springfield to lower-wage plants in Europe where there were highly-skilled machinists and engineers experienced in making diesel engine products. The threat of permanent job loss was now a potent weapon in the corporation's arsenal (Backman, 1962, pp. 291, 361; Forrant, 1994).

At the end of the 1960s the defence boom waned and sharp employment cuts occurred. In addition, the corporation decided to construct factories in Italy and Holland to manufacture several newly designed diesel fuel injection systems for the automotive and agricultural equipment market. This decision was a serious blow to Springfield's future, since all of the prototype development and experimental machining for these pumps was completed in Springfield. The corporation also started to shift its future market orientation away from the diesel and defence work through the stepped-up acquisition of several more companies in the scientific and medical instrumentation fields. As a result of this changed corporate focus and the drop in federal defence spending, diesel and aerospace sales fell to $45 million from $73 million between 1968 and 1971, while the only divisions to register strong sales gains were scientific and medical instruments, whose sales jumped to $36·6 million from $22·6 million, and electronics, which rose to $26 million from $20 million (see Table 1). In 1970 the corporation was renamed AMBAC Industries, removing the Bosch name from the title, thus further diminishing the once-central role the plant had played in the corporation. AMBAC's 1971 Annual Report celebrated the fact that '27 percent of total sales and 40 percent of total profits came from scientific, medical, environmental, and industrial instruments, products all acquired or developed in the last five years' (AMBAC, *Annual Report*, 1971; AMBAC, *Securities and Exchange Commission Perspectus*, 1971). Bosch workers' production expertise

was less relevant than ever, as even much of the remainder of the fuel injection work was shifted to the Netherlands and Italy.

7. A long, hard struggle: Local 206 in the 1960s

The swift pace of diesel growth and decline and corporate international expansion served as the backdrop for four contract negotiations between 1962 and 1971. The decade started out uneventfully when negotiations proceeded smoothly in 1962. Bolstered by a rank-and-file strike vote, and armed with the knowledge that work was plentiful, union negotiators gained significant wage and benefit improvements for the first time in over 10 years. However, for the rest of the decade favourable contract settlements were difficult to obtain and negotiations resulted in two lengthy work stoppages centering on the company's attempts to gain wage relief through substantial modifications of the incentive system.

Prior to the 1965 contract talks, the union challenged management to cut costs by bringing 'the level of Top Management down to what more foreign companies have, not a heavy overloaded drain on the profits of the company with high salaries, but competitive in the same sense as the average worker is informed he must be'. Local president Al LeBeau warned unionists that 'This is only the beginning of a long hard struggle in which everyone must do his or her part in order to survive the viciousness of management in protecting our jobs and security' (*Bulletin*, June 1964, p. 1). LeBeau ruefully challenged the company that 'You cannot keep giving your customers excuses for no delivery of parts or bad parts without eventually losing them' (*Bulletin*, September 1964, p. 1). Workers voted almost two to one to accept a 3-year contract that was short on wage gains but contained many long sought-after improvements, including an upward wage adjustment for the skilled trades, early retirement language and a fifth week of vacation for workers with over 30 years of service (Forrant, 1994).

In 1966 the union withstood an attempt by management to utilise cameras on the factory floor to establish incentive rates on day-work jobs like machine tool set-ups. Since set-ups often required a series of fine adjustments to bring tools in to their proper settings, this work remained notoriously difficult to time, and a large amount of job control and discretion remained in the hands of set-up workers. Lichtenstein has discussed the role of set-up personnel in the automobile plants in the 1930s and 1940s and notes how these workers were 'somewhat free of the harsh, mechanical discipline imposed by the moving mechanical assembly line' (1983, p. 286). With this relative degree of autonomy and occupying a key role in ensuring that machines were running quality parts, they were instrumental in maintaining adequate production levels and, by implication, the overall flow of work in the factory. It appears that in shops like Bosch, these workers maintained at least some degree of autonomy and job control well into the post-World War II period, later than many labour historians have surmised, and did not quietly accommodate managerial claims to control over the shopfloor. In the Bosch case, set-up personnel and their union allies resisted a concerted management effort to eliminate their job autonomy. Under the threat of the camera, set-up men formed alliances with workers who performed other as yet untimed jobs, including inspectors and stock-handlers. Also,

since the labour agreement required that set-up personnel be paid on an hourly, rather than an incentive, basis, the union protested that attempts to establish rates for such work were a contract violation.

However, management persisted, cameras were brought in and a showdown ensued. By the union's account, on 27 May the company approached a worker to film a set-up; however, by pre-arrangement a union steward called the worker off the job for a meeting with business agent Steve Jaross. Contractually, the union had the right to call for such a meeting. 'At this point the company was aware that as each operator was to be studied, the same procedure would be followed by the Union, and as everything being done followed a pattern, the company stopped all further taking of studies.' Management most probably backed away from a confrontation in order to complete the backlog of defence orders it had on hand. For the union, this was a rousing but short-lived victory, while for management it was a defeat that probably pushed them to expedite their search for alternative, cheaper production facilities.

In 1968 management again appealed for wage relief, and again their entreaties fell on deaf ears. Workers were cognisant of the corporation's global acquisitions and the recent construction in the city, and argued that money was indeed available for pay increases. When management negotiators failed to offer a wage proposal until 1 hour before the contract expired, a 3-week strike ensued. The union demanded cost of living protection, and sought extra wage increases for the skilled trades and additional vacation time for workers with 10–20 years seniority. Management failed to divide the union with its wage relief appeals, and workers eventually accepted a wage package that was 35% greater than the company's original offer (Forrant, 1994).

In the months leading up to and immediately after the 1968 strike, unionists made one more concerted effort to join with management to resolve production problems in the plant. In the February 1968 *Bulletin*, business agent Jaross discussed the company's abortive effort to relocate the toolroom and used the incident as a primer for worker involvement. In January Bosch planners relocated the toolroom to a central location in the main plant from a third-floor wing in the building, but the new location proved disastrous. 'Now does it make any sense,' Jaross reflected:

> to take a department such as the toolroom, where all the tools, fixtures, and gages to be used throughout the plant are to be manufactured at close tolerances . . . and place it in an area just recently vacated by a cast iron manufacturing department with the added inconveniences of poor lighting, uneven flooring for machines which must hold close tolerances, and dust from the nearby manufacturing departments which settles on plates and size blocks used in the daily performance of these tool room employees and makes their work of CLOSE tolerance almost guess work? There are some tool room grinders, whose skill in determining the precise amount to be ground from a tool, fixture, or gage is judged by the sound of their grinding wheel and this can no longer be done.

Implicit here was the notion that problems like this could be avoided if workers were consulted.

After the 3-week walkout in 1968, the union urged that regular meetings be scheduled to resolve several shopfloor problems. Using the *Bulletin*, the union's

leaders provided the company with an analysis of what they deemed to be the plant's five most pressing production problems. These were: the consistent failure to repair defective equipment, resulting in excessive lost production time and scheduling problems; a lack of proper tooling to complete set-ups and keep production jobs running; incomplete data on job processing sheets and work orders, leading to inventory and planning problems; the generally dirty conditions in the plant; and poor workflow and production bottlenecks, resulting in lack of work for some departments and excessive overtime for others. The union also poked fun at the company in a cartoon entitled 'Chain of command'. From left to right in the cartoon stood first the cigar-smoking stockholder, one hand full of money and the other out looking for more. Next to him stood the plant manager, with formulae swirling around in his head, eyes crossed and a vacant stare on this face. Then came four foremen, called the pinheads. Last in line was a machine operator with a chain fastening him to his drill press. Free the operator, the cartoon implied, and you gain the expertise needed to resolve the problems on the shopfloor that your foremen and plant managers are powerless to prevent (*Bulletin*, October 1968). There was no response from management to LeBeau's request for meetings, and the plant drifted into the 1970s buffeted by declining sales, lay-offs, heightened international competition and deteriorating labour–management relations—a very bad mix indeed.

The Springfield plant was now enmeshed in a global corporation with six distinct manufacturing divisions. After the investment of millions of dollars in Springfield, greater financial returns were expected; however, the slump in diesel sales focused negative attention on Springfield and, as 1971 contract negotiations commenced, the wage differential between Springfield and the corporation's European factories remained the significant stumbling block to successful talks. The joint production ventures abroad, especially with plant founder and industry rival Robert Bosch, emboldened company negotiators to confront the local head-on in the 1971 talks to gain wage relief. Before the contract expired, each side made appeals to the rank-and-file. In a leaflet dated 13 April, the union blasted the company's central proposal to re-rate all incentive jobs in the plant using predetermined engineering times. This, the union charged, was tantamount to 'rolling us back to the 1930's working condition era', when workers had no say over rates and no rights to argue how they were set.

Management, in a 'Dear Worker' letter mailed to every unionist's home, claimed that its goal was to ensure that the plant's competitive position deteriorated no further, and reminded workers that over 1000 Bosch employees were currently on lay-off status. 'We are in a difficult competitive position. We have been diligently reducing costs for more than a year. The Union must face the necessity for changes in the Agreement to enable the Company to maintain its competitive position and thus continue to provide and expand employment in Springfield' (Forrant, 1994). This 'reduced costs' argument carried no weight with the rank-and-file since it was viewed as a 'make the workers pay' approach to resolving problems in the plant. Past management failures to involve the workforce in any production enhancement programmes steeled workers to any efforts to roll back wages or make significant changes to the labour agreement.

The strike commenced on 22 April. Management charged that the union never responded to its piece-rate proposal and contended that the current system was inaccurate, unfair and impractical. 'Some employees with less than a reasonable effort', vice-president of operations Hershfelt charged, 'can attain higher than average earnings, and many employees have a limited earning opportunity in spite of their very best effort.' Only the introduction of a new system would allow methods to be improved and costs controlled so that 'we could earmark a reasonable amount for wage and pension increases in the years to come'. However, for 6 weeks the union refused to comment on the predetermined time plan other than categorically to reject it.

During the strike, the union was assured that there were no plans to shift production to Europe, but workers knew that Springfield's military work was destined to shrink by close to 80% and they were aware that the plants in Italy and Holland were open. 'It is out responsibility to plan a course of action for American Bosch that can ensure the survival of the Division', a company letter stated. 'At this time the improved technology and capabilities of European manufacturers, their advanced engineering, low import duties and the low cost of transportation bring new competition and new pressure to bear with our efforts to maintain a volume of business in the heavy-duty truck manufacturing industry of this country.' For added emphasis, workers were reminded that several Springfield plants had recently closed. 'Some of these are substantial firms, national in scope, and not really affected by a temporary set-back or recession. They left Springfield because of a limited future considering manufacturing costs in this area.' After 15 weeks a settlement was reached that included a 75 cents an hour improvement in wages and benefits over 3 years. This marked a significant increase from the company's early June proposal of 41 cents, which had been contingent upon the union's acceptance of the predetermined time system, for in a bitter defeat management failed to secure the incentive programme they coveted (Forrant, 1994).

Conclusion

Scholars of Japanese manufacturing contend that a good deal of the success enjoyed by firms there is based on the full engagement of the hands and the heads of front-line employees. Pushed into the background are the early 20th century precepts of Frederick Taylor and others who advocated the simplification of tasks coupled with a system of work organisation predicated on managers determining all production processes. In the contemporary global economy, this approach has proven anachronistic. Speed of transaction and speed of internal organisation and reorganisation in response to market changes is a must. As Harvard Business School professor Ramchandran Jaikumar pointed out in a 1966 article, Japan's success was not predicated simply on obtaining successively more sophisticated levels of technology but 'from achieving continuous process improvement through organizational learning and experimentation' (1986, p. 70). Such an approach requires a workforce that is equipped to use all of its faculties and a management orientation that considers worker intellect as an asset and not a liability (Lazonick, 1990; Kochan and Osterman, 1994; Nonaka and Takeuchi, 1995).

The American Bosch story depicts a fluid period in the 1950s and early 1960s when in plants that still contained high percentages of skilled workers and work routines not yet highly automated, it may have been possible to establish richer, more productive union–management shopfloor relationships that provided for the fuller engagement of workers' production intellect.

Lacking forward-thinking national leadership on issues such as runaway shops, corporate disinvestment strategies and in-plant speed-up, local unionists were left to their own devices to shape a response to management shopfloor prerogatives. Those unionists still interested in the production question also had to face-down a school of thought from erstwhile allies in such organisations as the Industrial Relations Research Association that 'the management function of initiating, directing, and providing a driving force remains as a basic value in a dynamic, progressive economy' (Tripp, 1952, p. 103). In national collective bargaining between the United Auto Workers and the Big Three, and between the United Steel Workers and US Steel, attention focused on improved wage and benefit packages and the strengthening of seniority provisions, often at the expense of a local voice on the shopfloor. The excitement generated on the shopfloor by Reuther's 1940 plan to turn the automobile assembly lines of Detroit into factories to produce 500 planes a day was forgotten at the national level, but, as the Bosch story indicates, at the plant level production issues still mattered. According to Lichtenstein, Reuther's biographer, the excitement that the Reuther plan evoked came from the fact that it represented 'counterplanning from the shop floor. Organized and coordinated through the union, veteran machinists and tool and die men had a better overall understanding of industry technics than did any individual corporate manager' (1995, p. 162). Unquestionably, Bosch workers knew that their production knowledge was vastly superior to that of newcomer Perelle's hastily assembled management team. While multispindle drill presses reduced the physical control that workers had over the pace of their manual labour, the deployment of technology did not lead to a knee-jerk renunciation of it, nor did management's disregard of labour's concern for quality immediately result in labour's denunciation of their role in ensuring that quality products were produced.

The Bosch story helps us to shape a more thorough understanding of post-World War II industry decline, while it also helps to clarify why much of the rank-and-file union movement was hardened against employer calls for participation and 'jointness' in the 1980s, in spite of the massive manufacturing job loss that was taking place (Kochan *et al.*, 1986, p. 12). For good reason, workers did not trust management's calls for participation. In 1983 economists Thomas Weisskopf, Samuel Bowles and David Gordon developed an analytical model to help explain lagging US business innovation and productivity since the mid-1960s. In their model, they took account of several factors affecting productivity, including issues of work intensity, the effectiveness of employer control over labour, worker job satisfaction, technological innovation, capital intensity and changes in markets. While they indicated that their findings were provisional, they argued that the principal problem was the rapid decline in work intensity after 1966; the hearts and minds of workers were disengaged from their work (1983, pp. 382–383, 422). Compare this to what Martin Kenney and Richard Florida found in their study of

Japanese transplant companies: 'Perhaps the key element of the Japanese industrial system lies in its ability to harness workers' knowledge as a source of value directly at the point of production' (1993, p. 39). Springfield's skilled workers were perceived by managers as a threat to their ability to run the factory while, according to William Lazonick, their Japanese and German counterparts viewed such workers as 'a source of enhanced value creation' (1990, pp. 290–292).

In the aggregate, US managers were opposed to ceding workers any authority to exercise control over the flow and quality of work. By discounting skill and devaluing worker input, managers denied themselves the utilisation of the very knowledge base essential for their long-term success. What sense could it make for management to erect a barrier against the rich production knowledge of the 50 men who joined the Bosch 25-year employment club in 1948? The ten tool- and die-makers and machinery set-up men in the group had a cumulative 250 years of experience manufacturing diesel components; Perelle's management team had none. Surely there was something managers could have learned! For 20 years Bosch workers expressed their concerns about production-related issues, only to be told by management that these issues were not in their purview. After numerous management rebuffs, these unionists concluded that their knowledge was unwelcome, and as a consequence they turned to a series of strikes and other job actions in an attempt to block unilateral management efficiency, speed-up, production rationalisation and cost-cutting strategies.

Labour's folksy but accurate quality paradigm linking selling price directly to quality offered part of an alternative strategy, one that required an investment in the workforce and a willingness on the part of management to make room for the tacit production knowledge that workers did indeed possess to help resolve sticky manufacturing problems. In an early 1950s editorial entitled 'Quality is an investment', the *Bulletin* acknowledged that 'we live in a highly competitive world', and that product quality and selling price must be attractive enough to solicit business. The editorial noted that 'Actually, the quality and selling price go hand in hand, like ham and eggs, toast and butter, etc. How could you possibly maintain a harmonious relationship between the two if some irresponsible people cause parts to be machined over and over again, thus throwing the actual selling price to a lower level than the actual cost?' It concluded that quality work was essential to safeguard jobs and the economic future of Springfield (*Bulletin*, September 1952).

Here, unionists articulated an axiom that was not fully grasped by US managers until well into the late 1970s, that there was in fact a close causal connection between pride in workmanship, consistently high-quality production and firm success. Unionists knew full well that quality production was an essential ingredient of job security and offered a running critique of management's quality strategy that was remarkably similar to that being offered in Japan by highly celebrated quality improvement champions such as W. Edwards Deming and J. W. Juran. While one could argue that Bosch unionists had little real interest in solving production problems and were acting mainly to impede management change efforts, a close examination of the historical record reveals a more complex interpretation and shows how corporate union animus after World War II prevented managers from acknowledging any positive union overtures toward the construction of shopfloor

problem-solving partnerships. Ironically, such problem-solving arrangements conformed closely to the strategy employed by American Bosch's ablest competitor and Springfield plant founder, Robert Bosch, GmbH, and the union representing Robert Bosch workers. Robert Bosch recognised the importance of skilled labour and, through the works councils in its plants, drew upon the knowledge of the workforce to wrest the automotive and agricultural diesel markets rather easily away from its US rival in the 1960s.

After 1971 labour relations remained contentious on three specific issues in the Springfield plant: the timing of set-ups; the modification of the piecework incentive system through the use of predetermined time standards; and the proper role for workers in the resolution of production-related problems. Management continued to argue that labour costs needed to be dramatically lowered if the plant were to be competitive in the global economy. The irony here is that firms in the very competitor nations ARMA was concerned about—Germany and Japan—were actively pursuing productivity improvement strategies with worker input their centrepiece. Toyota did not argue with its workers about whether and how to establish incentive times on machine tool set-ups; instead, the parties worked to reduce the time it took to do them. German metalworking firms did not attempt to reorganise the factory floor solely through the introduction of computers and labour-saving equipment; instead, they developed layouts to achieve better workflow and invested in apprenticeship programmes and other forms of worker training and education to take advantage of and enhance the tacit production knowledge resident on the shopfloor in order to get the most out of their technology investments.[1]

The 1971 'incentive system strike' demonstrates just how little workers linked management's pronouncements on labour costs to the concept of what they were to receive in their weekly pay packet. The union observed corporate acquisitions, they knew the plant was the recipient of millions of dollars in defence contracts and they were well aware of what top executives were paid. For the company's pivotal bargaining tenet to be effective, a shared sense that workers and managers were confronting common problems was a prerequisite. However, this was impossible when wage reductions were always the starting point for contract discussions. Even when Perelle realised in the late 1950s that he could not move production out of Springfield because he needed the plant's skill base, he did not signal to the union that their knowledge was an asset. Instead, he became more determined to find a substitute for worker knowledge through technology acquisitions and a series of mergers and acquisitions. As management lost the hearts and minds of the workforce, the union assumed a defensive posture, and labour and management

[1] For an example of what competitor firms were doing, see Taiichi Ohno, *The Toyota Production System: Beyond Large Scale Production* (1988). 'In the Japanese system', Ohno writes, 'operators acquire a broad spectrum of production skills and participate in building up a total system in the production plant. In this way, the individual can find value in working' (p. 14). The purpose here is not to debate Japanese-style management and its effects on unions and workers, or to treat lightly the literature on the subject, but to suggest what competitor countries were doing on their factory floors. By and large, US companies took the approach that Bosch utilised, mainly an overtly confrontational one, as opposed to the team-building and problem-solving orientation employed elsewhere. For a look at recent scholarship on the issue of work reorganisation and unions, see Bluestone and Bluestone (1992), Kochan *et al.* (1986), Turner (1991), Berggren (1992), Kumar (1995) and Golden and Pontusson (1992).

carried on a series of arguments over whether and how to time set-ups and what the best ways were to detect scrap until the plant was shuttered in 1986.

The Bosch story is not a simple case of a lack of capital investment; machines were purchased and buildings were built. As Barry and Irving Bluestone note, US workers indeed had technology to work with, and in most cases technology equal to or better than that found on factory floors in Germany and Japan. Citing the work of Alicia Munnell, the senior vice president of the Boston Federal Reserve Bank, they conclude that poor management was the real culprit (Bluestone and Bluestone, 1992, pp. 86–88). The failure of management in thousands of manufacturing facilities to recognise and accept worker interest in honest participation contributed to the calcification of labour relations, helped to cause lagging productivity growth and devastated manufacturing cities across the country that had relied for years on the skill, guile and tacit knowledge of hard-working people. In *Negotiating the Future* (1992, p. 127), the Bluestones quote Adam Smith: 'The man whose life is spent in performing a few simple operations has no occasion to exert his understanding . . . he naturally loses, therefore, the habit of such exertion, and generally becomes as stupid and ignorant as it is possible for a human creature to become.' Bosch workers never became stupid; instead they became selectively deaf and dumb and used their guile to only do what was minimally required to get through their 8-hour shift. They became openly contemptuous of management pronouncements that quality needed to improve. In 1978, in an open affront to the company that epitomised their deep-seated anger and alienation, rank-and-file unionists began to distribute a biweekly broad sheet at the plant's gates titled 'Drill, Tap and Scrap'. The paper's mast-head contained a cartoon that depicted a worker with a large screw turned all the way through his chest.

Postcript: The costs of decline

In a May 1994 award ceremony in Springfield, the Danaher Tool Company received a prestigious Partners in Progress award from Sears and Roebuck Company for being one of the top 1% of its 10,000 worldwide suppliers. The firm's 175 machinists and operators are represented by the International Union of Electrical Workers and are all that remain from a workforce that numbered 4000 in the 1970s. A lack of investment in the plant and intense global competition almost closed the factory, but, in the late 1980s, labour and management agreed to work together to save the jobs of the remaining employees. Hundreds of job classifications were eliminated, operators were cross-trained, dozens of new machine tools were purchased, quarterly productivity bonuses were put in place, union leaders were given unlimited access to the company's financial statements and teams were set up to engage in continuous improvement projects throughout the plant. These teams functioned much like the labour–management production committee that Perelle disbanded at the Bosch plant in 1954.

Danaher is now the only manufacturer in operation in the North End of Springfield, once home to close to 20 metal-working plants. Block after block of nearby triple-decker wood-frame apartments buildings, first home to the thousands of German, Scottish, Italian and Irish immigrant workers who made their way to the

city, have been burned down, torn down or are in disrepair. And, on a part of the neighbourhood that formerly contained several pubs and diners frequented by workers, stand a low-rise office building housing a local cable television studio, several doctor's offices and a bottle, can and newspaper recycling centre. Without the manufacturing jobs the neighbourhood once provided, children living there suffer the highest poverty rate in Massachusetts.

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Bibliography

American Council on Public Affairs. 1940. *The CIO and National Defense*, Washington, DC, American Council on Public Affairs

American Machinist. 1964. Numerical control: the second debate. Special Report no. 559, October 26

Babson, S. 1991. *Building the Union: Skilled Workers and Anglo-Gaelic Immigrants in the Rise of the UAW*, New Brunswick, Rutgers University Press

Backman, J. 1962. *The Economics of the Electrical Manufacturing Industry*, New York, New York University Press

Berggren, C. 1992. *Alternatives to Lean Production: Work Organization in the Swedish Auto Industry*, Ithaca, NY, ILR Press

Best, M. 1990. *The New Competition*, Cambridge, Harvard University Press

Best, M. and Forrant, R. 1996. Community-based careers and economic virtue: arming, disarming, and rearming the Springfield, Western Massachusetts metalworking region, in M. Arthur (ed.), *The Borderless Career*, Cambridge, Oxford University Press

Bluestone, B. and Bluestone, I. 1992. *Negotiating the Future: A Labor Perspective on American Business*, New York, Basic Books

Bluestone, B. and Harrison, B. 1982. *The Deindustrialization of America*, New York, Basic Books

Brody, D. 1980. Labor history in the 1970s: toward a history of the American worker, in Kammen, M. (ed.), *The Past Before Us: Contemporary Historical Writing in the United States*, Ithaca, NY, Cornell University Press

Brody, D. 1993. *In Labor's Cause: Main Themes on the History of the American Worker*, New York, Oxford University Press

Brown, J. 1995. *The Baldwin Locomotive Works, 1831–1915*, Baltimore, Johns Hopkins University Press

Clark, G. 1941. The strange story of the Reuther Plan, *Harpers Magazine*, 184

Deming, W. E. 1986. *Out of the Crisis*. Cambridge, MIT Press (quote also found in Schiff and Goldfield, 1994, p.659)

Deyrup, F. 1948. *Arms Makers of the Connecticut Valley*, Smith College Studies in History

Emspak, J. 1943. Labour-management war production councils, *Science and Society*, vol. 7, no. 1

Forrant, R. 1994. Skill was never enough: American Bosch, Local 206 and the decline of metalworking in Springfield, Massachusetts, 1900–1970, University of Amherst, unpublished PhD dissertation

Forrant, R. 1996. Skilled workers and union organization in Springfield: The American Bosch story, *Historical Journal of Massachusetts*, vol. 24, no. 1

Fortune. 1959. Charles Perelle's spacemanship, *Fortune*, vol. 59, no. 1
Frisch, M. 1972. *Town into City: Springfield, Massachusetts and the Meaning of Community, 1840–1880*, Cambridge, Harvard University Press
Golden, M. and Pontusson, J. (eds) 1992. *Bargaining For Change: Union Politics in North America and Europe*, Ithaca, NY, ILR Press
Harrison, B. and Bluestone, B. 1988. *The Great U-Turn: Corporate Restructuring and the Polarizing of America*, New York, Basic Books
Holland, M. 1989. *When the Machine Stopped: A Cautionary Tale from Industrial America*, Boston, Harvard Business School Press
Hounshell, D. 1984. *From the American System to Mass Production, 1800–1932*, Baltimore, Johns Hopkins University Press
Jaikumar, R. 1986. Postindustrial manufacturing, *Harvard Business Review*, vol. 64, no. 6
Kenney, M. and Florida, R. 1993. *Beyond Mass Production: The Japanese System and its Transfer to the U.S.*, New York, Oxford University Press
Kochan, T. and Osterman, P. 1994. *The Mutual Gains Enterprise*, Boston, Harvard Business School Press
Kochan, T., Katz, H. and McKersie, R. 1986. *The Transformation of American Industrial Relations*, New York, Basic Books
Kumar, P. 1995. Canadian labour's response to work reorganization, *Economic and Industrial Democracy*, vol. 16, no. 2
Laurie, B. 1989. *Artisans into Workers: Labour in Nineteenth-Century America*, New York, Farrar, Strauss and Giroux
Lazonick, W. 1990. *Competitive Advantage on the Shop Floor*, Cambridge, Harvard University Press
Lichtenstein, N. 1980. Auto worker militancy and the structure of factory life, 1937–1955, *Journal of American History*, vol. 67, no. 2
Lichtenstein, N. 1982. *Labor's War at Home: The CIO in World War II*, New York, Cambridge University Press
Lichtenstein, N. 1983. Conflict over workers' control: the automobile industry in World War II, in Frisch, M. and Walkowitz, D. (eds), *Working Class America: Essays on Labour, Community and American Society*, Urbana, University of Illinois Press
Lichtenstein, N. 1995. *The Most Dangerous Man in Detroit: Walter Reuther and the Fate of American Labor*, New York, Basic Books
Lichtenstein, N. and Harris, H. J. (eds) 1993. *Industrial Democracy in America: The Ambiguous Promise*, New York, Cambridge University Press
Malone, P. 1988. Little kinks and devices at the Springfield Armory, 1892–1918, *Journal of The Society for Industrial Archeology*, vol. 14, no. 1
Meyer, D. R. 1989. Midwestern industrialization and the American manufacturing belt in the nineteenth century, *Journal of Economic History*, vol. 49, no. 4
Meyer, S. 1988. Technology and the workplace: skilled and production workers at Allis-Chalmers, 1900–1941, *Technology and Culture*, vol. 29, no. 4
Montgomery, D. 1979. *Workers' Control in America: Studies in the History of Work, Technology, and Labor Struggles*, New York, Cambridge University Press
Montgomery, D. 1987. *The Fall of the House of Labour: The Workplace, the State, and American Labour Activism, 1865–1925*, New York, Cambridge University Press
Mueller, F. and Loveridge, R. 1995. The 'second industrial divide'? The role of the large firm in the Baden-Wurttemberg model, *Industrial and Corporate Change*, vol. 4, no. 3
Murray, P. 1941. *The CIO Defense Plan*, Washington, DC, Congress of Industrial Organizations Publication no. 51
Nonaka, I. and Takeuchi, H. 1995. *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*, New York, Oxford University Press
Ohno, T. (ed.) 1988. *The Toyota Production System: Beyond Large Scale Production*, Cambridge, Productivity Press
Rosenberg, N. 1963. Technological change in the machine tool industry, 1840–1910, *Journal of Economic History*, vol. 23, no. 4

Rosswurm, S. (ed.) 1992. *The CIO's Left-led Unions*, New Brunswick, Rutgers University Press

Schatz, R. 1983. *The Electrical Workers: A History of Labor at General Electric and Westinghouse 1923–60.* Urbana, Ill, University of Illinois Press

Schiff, G. and Goldfield, N. 1994. Deming meets Braverman: toward a progressive analysis of the continuous quality improvement paradigm, *International Journal of Health Services*, vol. 24, no. 4

Scranton, P. 1989. *Production, Markets, and Power in Philadelphia Textiles, 1885–1941*, New York, Cambridge University Press

Sengenberger, W. 1992. Intensified competition, industrial restructuring and industrial relations, *International Labour Review*, vol. 131, no. 2

Seidman, J. 1953. *American Labor from Defense to Reconversion*, Chicago, University of Chicago Press

Stone, O. 1930. *History of Massachusetts Industries: Their Inception, Growth and Success*, Boston, S. J. Clarke Publishing Company

Streeck, W. 1987. Industrial relations and industrial change: the restructuring of the world automobile industry in the 1970s and 1980s, *Economic and Industrial Democracy*, vol. 8, no. 4

Thelen, K. 1991. *Union of Parts: Labor Politics in Postwar Germany*, Ithaca, NY, Cornell University Press

Thompson, E. P. 1963. *The Making of the English Working Class*, New York, Random House

Tolliday, S. and Zeitlin, J. (eds) 1992. *Between Fordism and Flexibility: The Automobile Industry and its Workers*, New York, Berg

Tripp, L. 1952. The union's role in industry—its extent and limits, in Brooks, G. and Derber, M. (eds), *Interpreting the Labor Movement*, Madison, Industrial Relations Research Association

Turner, L. 1991. *Democracy at Work: Changing World Markets and the Future of Labor Unions*, Ithaca, NY, Cornell University Press

Weisskopf, T., Bowles, S. and Gordon, D. 1983. Hearts and minds: a social model of U.S. productivity growth, Brookings Papers on Economic Activity, no. 2

Wood, S. (ed.) 1989. *The Transformation of Work: Skill, Flexibility and the Labour Process*, London, Unwin Hyman