

Towards Collaborative Interdependence: A Century of Change in the Organization of Work

by

Paul S. Adler

Dept. of Management and Organization

School of Business Administration

University of Southern California

Los Angeles, CA 90081-1421

tel: (213) 740-0748

email: padler@usc.edu

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A Century of Change in the Organization of Work

THE PUZZLE

Work organization denotes how tasks are grouped into jobs and how activities are coordinated across these various jobs. It is an important factor shaping (as well as shaped by) both workers' values and behavior and managers' policies in human resource management and industrial relations. The reciprocal effects of these three (clusters of) variables — work organization, worker attitudes, management policies — shape key dimensions of organizational performance such as turnover, satisfaction, and efficiency.

Given the importance of work organization, it is regrettable that there is so little agreement about its underlying determinants or its evolution. We have many studies of the evolution over time of management *doctrines* of work organization — from scientific management, to human relations, job enrichment, socio-technical systems, total quality management, and business process reengineering. But we lack systematic studies of the corresponding *practices*, so we do not know how extensively these doctrines were implemented. We have numerous *fragments* — accounts of the evolution over short time periods of specific facets of work organization in specific firms, occupations, and industries. But we lack a common theoretical *frame*, so we do not know how to weave out of these fragments a compelling characterization of the broader trends.

In the absence of reliable data, we are forced to rely on anecdotal evidence. Consider this worker's recollection of his father, who was a trimmer for Cadillac from its very early years (quoted in Peterson, 1987: 38):

“I remember seeing him one time in the factory and he wore a leather apron which was filled with all types of needles, round and semicurved and long and short and thick and thin, and he had a thread in this pocket. And I remember he used to say that he would take a bolt of cloth and some springs, some mohair and tacks and a hammer and his needles and go into a car and trim it from one end to another....He had a half dozen pairs of shears and he used to have yellow chalk that had string around it and it used to hang from a cord around his neck and he would stick it in his pocket. My father would draw the patterns out for the cushions and the various other pieces of upholstery that was necessary for the trimming of the automobile. Then came the automatic cutters or machine cutters and the scissors got rusty around the house. ...Then came sewing machines and my father no longer sewed. Then came men who just tied springs together, and my father was no longer in spring tying. Gradually he lost all the components of his trade.”

Faced with eloquent stories such as these, scholars have divided into three broad camps. A first camp reads such accounts as evidence of a broad trend towards the deskilling of jobs, the degradation of labor, and the alienation of workers. They point to the progressive elimination of artisans in the occupational structure and to the narrowing of skills and discretion for a broad range of jobs.

A second camp points to some facts left out of this auto worker's account, and reaches very different conclusions. First, the starting point of this story leaves out the much larger number of entirely unskilled laborers who typically worked alongside these craftsmen or on farms. It also leaves out the many workers who chafed under the exploitation of craftsmen operating as "inside contractors." And it leaves out the many children working in huge textile mills — the eight-year-old girls working under abominable conditions for 15 hours a day and earning \$2.40 for a six-day week (Van Norst and Van Norst, 1903: Ch. IX). And second, the Cadillac worker's story leaves out much of the subsequent evolution of work organization. Alongside the demise of craft, the auto industry, like many others, saw a huge increase in machine operators, technicians, and clerks. These workers were less skilled and less autonomous than the trimmer had been, but they were far more skilled than most of the laborers they replaced in the occupational structure, and they were increasingly at ease with the functional interdependence that replaced the trimmer's autonomy. Some scholars therefore argue that the central tendency of work organization of the 20th century was a path of progress towards higher skills and broader interdependence.

Yet a third camp, faced with both the lack of systematic data and the great variety of situations and trajectories, sees no consistent trends at all. Indeed, looking across workplaces and industries at any given time, we observe a huge range of variation. Given the lack of data and the powerful arguments marshaled by all three of these camps, it is not obvious that any meaningful story can be told about long-term aggregate trends.

I believe that notwithstanding the gaps in our knowledge we can advance some reasonably well-grounded broad generalizations about these trends. To do so, however, we need a story-line about the long-run evolution of work organization that can acknowledge the merit of all three camps' arguments. This chapter advances such an interpretation, focusing on the U.S. In the first part, I present the main pieces of the puzzle. In the second part, I discuss how we might make sense of these pieces. A conclusion summarizes the key trends, and argues that the story of work organization in the 20th century is one of a zig-zag path towards more collaborative interdependence. My argument is more speculative in some places and more empirically grounded in others. My goal is to lay out a theoretical account that can frame productive debate and serve as a fruitful source of hypotheses for future research.

PIECES OF THE PUZZLE

The purpose of this first part is to present the main pieces of the puzzle — the key facts on which broad agreement seems possible across otherwise divergent points of view. The sections in this part address in turn: the state of work organization at the end of the 19th century, subsequent changes in the broad structure of the economy, the key vectors of change in work organization, the sequence of innovations in work organization, and the diversity of forms of work organization at the end of the 20th century.

The starting point: work organization in the late 19th century

First, two contradictory and equally mythical images of work organization during the 19th century should be set aside: that it was centered around independent artisans, and

that it was a structure of direct, simple control by owners. In reality, during the bulk of the 19th century, work organization took four very different forms:¹

- (1) a large but shrinking *self-employed* category composed mainly of farmers, but also including considerably smaller contingents of artisans, and shop-keepers;
- (2) a traditional sector of *external subcontracting* in the “sweated trades,” producing mainly consumer goods such as clothing, boots, shoes, and toys;
- (3) a small but growing sector of *direct* employment and control in new, larger-scale plants, often found in chemical production, as well as (quasi-) monopolistic service operations such as the Post Office;
- (4) a heterogeneous sector of *indirect* employment and control via “internal contractors” of various kinds, in (a) industries derived from domestic production, such as textiles, (b) industries founded on a craft basis, in traditional assembly operations (e.g. shipbuilding, coachbuilding), metalworking and non-traditional assembly, and others such as glass, and (c) gang-work industries, such as in mining and the docks.²

The overall trend during the 19th century was clearly to the expansion of the types 3 and 4 factory sector. However, even in 1880s, the typical factory was little changed from a century earlier. It remained “a congeries of craftsmen’s shops rather than an integrated plant” (Nelson, 1975: 3). Plants were still very small, and their owners were preoccupied with financial problems, ignorant of supervision and personnel relations as distinct administrative functions. In most industries, foremen and skilled workers controlled the pace of work, the flow of materials, and the choice of methods. Inside contractors still often controlled the hiring, firing, pay, and work of subordinate helpers and laborers. Production technology was still mainly in the form of hand-tools. Authority relations were relatively personalized and often coercive. Production know-how was largely tacit. Most firms had little by way of formalized procedures. Only very few had adopted the extensive standardization that was the pride of the American system of manufacture. Beyond the shop-floor, accounting and sales were the only well-established functions; but given the small average firm size, these functions were typically assured by just one or two trusted employees. In comparison with contemporary organizations, inefficiencies abounded.

As the 19th century drew to a close, the process of industrialization and centralization accelerated. Over the last decades, average firm size doubled in many industries.³ Direct employment (type 3) grew in its total share. Work organization emerged as a central problem for management and as the object of wide-scale debate and struggle.

¹ Adapting Littler’s (1982) account of the British case.

² The subcontractors were sometimes parents employing family members: this was particularly common in the earlier years of the 4a category. Sometimes the subcontractors were craftsmen, especially in the early years of the 4b category. And sometimes the subcontractors were gang-bosses who functioned as small-scale capitalists: this was particularly common in the 4c category.

³ Textile mills had seen a jump in size earlier in the century, but their size then stabilized. By 1900, steel, locomotives, electrical and agricultural machinery industries had much larger plants, with several employing over 5,000 workers (See Nelson, 1975).

The 20th century: the evolution of the broader context

Before proceeding to the heart of the matter, it may be useful to remind ourselves of the main lines of evolution of the structure of the U.S. economy and labor force during the 20th century. I summarize this evolution under eight broad headings.⁴

First, the century saw a huge change in the structure of the U.S. labor force. While the male labor force participation rate fluctuated between 75% and 80% over the century, the female labor force participation rate grew from around 19% in 1900, to 30% in 1950, to 60% in 1999. The huge influx of immigrants around the turn of the century gradually subsided. Of males over 21 years of age, 24% were foreign born in 1900, but only 11% in 1950 and 7% in 1970, rising modestly to some 9% by 2000. The industry distribution of the labor force shifted considerably, with a continuous decline in the share of agriculture, an increase then a decrease in the share of manufacturing, and an increase in the share of services.

The occupational distribution evolved in parallel — see Exhibit 1. The shares of farmers and of laborers in both farming and manufacturing declined dramatically. Paralleling the evolution of manufacturing, the shares of craftsmen and operatives first grew then fell. There was strong, sustained growth in the share of clerical and professional-technical categories, and more modest growth in the share of service, sales, and managerial occupations.

<put Exhibit 1 about here>

Second, the average education level of the labor force increased, and here too the change was dramatic. The fraction of 17 year-olds who had completed high-school grew from 6% in 1900, to 57% in 1950, to over 80% by the end of the century. Despite this huge increase in supply, investment in high-school and college education continued to yield a sizable positive return (Goldin and Katz, 1999), which suggests that at least some of this increase in education levels reflected increasing skill requirements rather than pure screening and credentialism (Abramowitz and David, 1996). As Goldin and Katz write, the most plausible explanation for this pattern is that “technological change and capital deepening have both served to increase the demand for more-skilled labor over the long run” (1999: 25-26).

Third, continuing the trends characteristic of the prior century, the proportion of self-employed progressively declined. Over the course of the 1800s, this proportion had progressively fallen from more than 80% to less than 40%, and this share would continue to shrink, reaching less than 7% by the end of the 20th century.

Fourth, the size of firms and establishments grew. In part, this was due to the contraction of the traditional farm sector. However, even within the non-farm sector, there was a considerable increase in the average size of firms and of establishments — although this trend seems to have leveled off in the last couple of decades (Pryor, 2001).

Fifth, alongside growth in firm size, the century seems also to have witnessed growth in the density of market transactions between firms. The inter-industry division of

⁴ Unless otherwise noted, the supporting data for this section come from *Historical Statistics*, 1975, and *Statistical Abstract*, various years.

labor deepened, with the proliferation of new classes of consumer and producer goods and services. The connections linking these industries became denser.

Sixth, unions grew then shrank. Only 3% of the labor force belonged to unions in 1900. In the subsequent years, that rate rose slowly, then increased dramatically after passage of the Wagner Act in 1935, to reach 25% of the total workforce in 1956. The rate then began to decline, slowly at first, but then accelerating after 1980, to reach 14% at century's end. The threat of unionization nevertheless continued to influence management in relatively unionized industries and regions, and unions continued to shape law and regulations.

Seventh, government became a progressively larger factor in the economy, both directly and indirectly. Direct employment in federal and state government grew almost continuously — from 3.8% of the labor force in 1900, to 10.1% in 1950 and to 15.1% in 1999 — leveling off towards the end of the century. Total government expenditures grew from 8% of U.S. Gross Domestic Product in 1913 to 38.5% in 1992 (Maddison, 1995, p. 65). The state's indirect influence also grew as both work organization and employee and industrial relations were progressively “legalized” by a growing panoply of laws and regulations that constrained management practices in these domains.

Finally, over the course of the 20th century, work organization in the U.S. was disrupted by two periods of macro-economic dislocation (1930s, 1970s and 1980s) and by two world wars. The economic downswings brought wide-spread unemployment and destruction of capital. The wars — fought elsewhere — had almost counter-balancing effects in strengthening the hand of workers in their conflicts with management.

Four vectors of change

Within these broader contextual trends, four vectors of change characterized the evolution of work organization over the course of the 20th century: greater specialization, the development of managerial techniques of coordination and control, automation, and the rationalization of management authority. Most observers would agree with these descriptors, but their significance continues to be debated.

Specialization

First, as average firm size grew, workers found their tasks and roles progressively specialized.⁵ This specialization provoked considerable debate. On the one side, protests were common against the division of craft labor. The shoemakers were affected early, as reflected in the eloquent testimony to a 1879 Congressional committee by Charles Litchman, a Grand Secretary of the Knights of Labor, and a leader in the Knights of St. Crispin, which sought to organize shoemakers in the 1860's and early 1870s:

“By the subdivision of labor a man now is no longer a tradesman. He is part of a tradesman. In my own trade of shoemaking, twenty years ago the work was done almost entirely by hand, and the man had to learn how to make a shoe. Now, with the use of machines of almost superhuman ingenuity, a man is no longer a shoemaker, but only the sixty-fourth part

⁵ Here we are discussing what Marx called the “detailed” division of labor — the specialization of tasks within firms, coordinated ex ante by managers — as distinct from the “social” division of labor — the specialization of firms and industries, coordinated ex post by market exchange.

of a shoemaker, because there are sixty-four subdivision in making shoes; a man may work forty years at our trade, and at the end of forty years he will know no more about making the whole shoe than when he commenced the business.”⁶

The primary significance of this specialization lay in the associated loss of economic independence. The demise of domestic and handicraft forms of production and their replacement by specialized functions in large-scale factory production meant above all greatly reduced opportunities for economic independence. In the latter part of the 19th century, the contrast between these trends and the dominant ethos of economic independence provoke growing protests. These protests continued into the early years of the 20th century. The term “slavery” was often used to condemn wage-labor as a long-term status (Rogers, 1974). By the mid-20th century, however, economic independence was a remote prospect: independent farmers and domestic production had all but disappeared. While craftsmen remained a sizable component of the labor force, they became increasingly dependent on facilities provided by large employers.⁷ In the latter part of the 20th century, concerns about loss of economic independence were more commonly voiced by professionals such as lawyers and doctors protesting the growth of larger professional firms and of the corporate employment of professionals.

On the other side of this debate, observers such as John Dewey and Jane Addams saw a more positive social potential in this, more extensive, division of labor. The old “rugged individualism” of the farmer and artisan-craftsman was being replaced by a “new individualism” that was less parochial and more organically tied to a broader community (Dewey, 1930). Addams wrote:

“A man who makes, year after year, but one small wheel in a modern watch factory, may, if his education has properly prepared him, have a fuller life than did the old watchmaker who made the watch from beginning to end. It takes thirty-nine people to make a coat in a modern tailoring establishment, yet those same thirty-nine people might produce a coat in a spirit of “team work” which would make the entire process as much more exhilarating than the work of the old solitary tailor, as playing in a baseball nine gives more pleasure to a boy than that afforded by a solitary game of handball” (Addams, 1902, as quoted by Rogers, 1974, p. 82).

⁶ Quoted from United States House of Representatives, Investigation by a Select Committee of the House of Representatives Relative to the Causes of the General Depression in Labor and Business; and as to Chinese Immigration, Washington DC: GPO, 1879, pp. 429, in Irwin Yellowitz, *The Position of the Worker in American Society 1865-1896*, Englewood Cliffs NJ: Prentice Hall, 1969, p. 88.

⁷ Note however, that aspirations to economic independence were still significant at mid-century. In Chinoy’s 1946-1951 study of the GM-Oldsmobile plant in Lansing Michigan, 48 of the 62 auto assembly workers interviewed answered in the affirmative the question: “Have you ever thought of getting out of the shop?” Of these 48, 31 said their goal was a business of their own and a further 6 wanted to become independent farmers (Chinoy, 1992, p.82). Only 6 aimed for other wage employment. Even the weekly paper published by the CIO unions in the city frequently carried stories about auto workers who had ventured into small business (p. 4).

Contrary to the view expressed by Litchman, Dewey and the other pragmatists suggested that automation too contributed to this “fuller life”: as engineers, technicians, blue-collar workers, clerks, or managers, a growing proportion of the labor force found themselves designing, maintaining, and using technology, thus creating an intimate link between the worker and society’s growing body of scientific and technological knowledge.

Coordination and control

Specialization provoked (and was provoked by) management efforts to improve the coordination and control of work. Chandler (1962, 1977) shows how management progressively tamed the challenges of operating more efficiently with higher fixed costs, faster throughput, and greater scale and scope. Hobsbawn’s (1964: Ch. 17) analysis of 19th century Britain suggests that management efforts to improve the coordination and control of work were also causally intertwined with the evolution of owners’ values from custom to profit and with the replacement of non-economic labor control mechanisms by economic ones. The impact of these combined forces was, in a first phase, that “managers learned the value of intensive rather than extensive labour utilization,” and in a second phase, that they “discovered genuinely efficient ways of utilizing their workers’ labour time (‘scientific management’)” (1964: 406-7). (In Marx’s terminology, the “real subordination of labor to capital,” with the associated focus on “relative surplus value” progressively replaced “formal subordination” and “absolute surplus value” as the key axis of development.)

As a result, after considerable struggle in the late 19th and early 20th century, much of the day-to-day control of the work process shifted to management. Inside contracting (type 4 workers) largely disappeared. The ranks of foremen swelled, and as Frederick Taylor had recommended, the work of these foreman was progressively specialized into a panoply of roles filled by a growing group of engineers, technicians, and clerical employees.⁸ The ratio of non-production to production employees in manufacturing rose from 10% in 1899, to 22% in 1947 and to 33% in 1980 (Melman, 1951; Census of Manufacturing, 1987, Vol. 1, table 1.) Notwithstanding press accounts of “delaying,” it is not clear that the trend changed much in the last two decades of the century (Gordon, 1996).

⁸ Whereas many writers assert that Taylor’s ideas on “functional foremen” were antithetical to the doctrine of “unity of command” and were therefore rarely implemented, Stephen Meyer (1981) seems closer to the truth when he writes: “In the new Ford plant [circa 1917] , however, the foreman’s duties were more circumscribed, and he had assistant foremen, sub-foremen (straw bosses), clerks, inspectors and others to help him. ...They directed, recorded, or examined the work of others. In fact, each occupation reflected Taylor’s notions of ‘functional management’ and the division of the foreman’s job into specific functional tasks” (p. 54). Taylor’s proposal was to divide the traditional tasks of the foremen into these distinct positions. This departed from the well-tested precept of “unity of command”; but this difficulty was overcome with articulation of the line/staff model by Urwick and Gulick (Gulick and Urwick, 1937, Chs I, II).

Automation

Automation was the third major vector of change. The average stock of equipment per worker increased by a factor of about seven over the century.⁹ The degree of automation of transformation, transfer, and control functions varied considerably across industries. Scranton (1997) is surely correct that images of the assembly line and of the oil refinery's flow process should not blind us to the continuing importance of custom and small-batch production. But even custom manufacturing and similar service-sector activities enjoyed a considerable infusion of automation over the course of the century (Blackburn, Coombs, and Green, 1985).

Debate raged throughout the century over the impact of automation on work. This is hardly surprising, since automation in these debates often stood as a proxy for — or indeed as the main driver among — the entire constellation of forces shaping work. These debates thus mirrored the more general disagreements over the evolution of work organization. From the shoemakers of the late 19th century to computer programmers in the late 20th, some observers argued that automation was primarily a deskilling effect — at least under capitalist conditions — while others saw a predominantly upgrading effect, and yet others saw no generalizable pattern.

Two studies by the IRC, the first in 1964 and the second in 1988, analyzed automation's impact on work organization in a range of settings.¹⁰ With hindsight, the IRC studies appear to have characterized accurately the broad pattern of effects. The 1964 study, addressing both employment security and work organization, concluded that these effects were primarily benign (Beaumont and Helfgott, 1964: 218-237):

* “Generally, but far from universally, modern technology tends to reduce physical effort and increase mental effort. It also demands greater versatility on the part of those who do the work....Each member of the workforce now has to relate his performance to the entire operation, rather than to a specific task, and this necessitates change in the employee's perception of work.”

* Automation displaces the direct human production role — workers become more like technicians — with titles such as “instrument mechanic” replacing electrician or pipefitter; workers need greater versatility, especially where production and maintenance tasks are combined.

* Automation tends to increase the share of skilled over unskilled, of maintenance relative to production, of technicians and engineers relative to blue-collar, and of service relative to manufacturing.

* Sometimes automation brings a polarization of jobs' skill requirements, leading to a greater employment shares at the top and the bottom of the scale.

⁹ Data from Maddison (1995), indicate that the stock of machinery and equipment per worker increased from \$4,115 in 1890 to \$6,932 in 1913 to \$39,636 in 1992 (in constant 1990 international dollars).

¹⁰ The 1964 study was based on interviews and quantitative data from 46 establishments (in 36 companies) selected as representative of “operating situations where major technological innovation had occurred” (Beaumont and Helfgott, 1964: 13) in manufacturing, transportation, and public utilities. The later study (Helfgott 1988) was based on case studies of the impact of computer-based technologies on 16 companies in a range of relatively high-technology and capital intensive manufacturing industries.

- * The environment of most jobs becomes more pleasant and safer.
- * Industrial relations challenges are substantial, in particular because “It may not longer be feasible to abide by seniority as the mechanical determinant in job placement.” Unions and management will need to find a way to recognize the importance of “trainability.”
- * “Old work groups are now broken up” — but “new group relationships are evident...Not only does each crew member have to understand his own responsibilities and tasks, he also has to coordinate his efforts with those of his co-workers, particularly in diagnosing and correcting machine breakdowns.”
- * “Negative factors” were often salient during transition periods but tended to disappear with time; nevertheless, an increase in shiftwork seems unavoidable, and in highly automated facilities, boredom at work constitutes a major challenge.

Some 20 years later, the findings were remarkably similar in general tone (Helfgott 1988: 67-78, ff.):

- * “Computer technology is having a profound effect on the nature of job and the ways in which work is organized. The scope of jobs is expanding. Workers are being trained to be more versatile and are being accorded greater responsibility and control over their work.”
- * “The work environment also is undergoing change, becoming safer and cleaner.”
- * “Operators will not gain control [over production processes] if management is reluctant to allow them such control. Some managements, however, have been more willing to share power with their employees, pointing to a movement toward a more versatile, higher skilled work force.”
- * “Not all types of jobs benefit from new technology in terms of skill.” Numerical control of machine tools, for example, turns machinists into machine tenders. But the subsequent generation of technology — CNC — usually brings some programming back to shop floor.
- * “Since programming a robot is not difficult, many companies find that it makes sense to train production workers as programmers. If programming of NC machine tools is often performed by white collar technicians, “the explanation lies in the labor relations area — a management desire to keep programming out of the bargaining unit in unionized situations. This desire is based on the fear that if the job is in the bargaining unit, it will be subject to stringent rules on demarcation and seniority bumping procedures, which could threaten flexibility of operations and result in extraordinary training costs and inefficient operations as untrained workers bump into positions involving programming.”
- * Broader job classifications allow production workers to do some maintenance and set-up.
- * A common problem was social isolation in the factory because human-manned work stations become physically farther apart. Therefore, more enlightened managers allowed music and created Employee Involvement teams.

The changing nature of authority

Over the course of the century, the nature of managerial authority changed profoundly. The arbitrary authority of the “foreman’s empire” and the “drive system” were progressively replaced by more bureaucratic forms of discipline (Nelson, 1975, Ch. 3). This change was due partly to the rising power of unions and partly to management’s

quest for more control over the details of unit operations. The general cultural evolution of society towards greater respect for the individual must surely have contributed too.

Using Weberian categories, we could say that at the beginning of the century, management's authority was coercive. As such, it was often contested or fatalistically accepted as coercive. Sometimes it was accepted on traditional or even charismatic bases. Over the subsequent century, coercive and traditional forms of authority were largely displaced by reliance on rationality. This rationality took two different forms — formal and substantive. Formal rationality, by far the predominant one, was expressed in the use of bureaucratic procedures and market exchange to exercise more effective control, ensure efficiency of operations, and improve profitability. Substantive rationality was expressed in the efforts of a growing minority of firms to create a community of purpose within the organization — a focus on consent based on common commitment to a superordinate value.¹¹ Debate continues about whether this mutation in the nature of authority constituted an civilizing process or a means by which workers' subjectivity could be yoked to the imperatives of profit.

The evolution of authority was expressed in the changing nature of the effort-wage bargain. Erratic, pre-industrial norms of work intensity progressively dissipated, and new norms of time-discipline were progressively internalized (Thompson, 1967). The term “driving” was often a contraction for “slave driving”; but workers progressively grew accustomed to “wage slavery” and to the remoteness of any prospect of economic independence. As a result, the idea of management determining methods and speed of work became less foreign and less objectionable. Protest sometimes flared against the specific forms of work imposed by management (notably by less skilled workers in the late 1960s and early 1970s). But as unions gave workers the means by which to demand compensation for work intensification, protest was generally replaced by negotiation. In the last decades of the century, Japanese-inspired production management techniques such as TQM sought to eliminate yet more of the remaining “pores” in the working day (and to replace unproductive with productive effort). This ratcheted up once again norms of work intensity (Adler, 1993; Kenney and Florida, 1988). By the end of the century, however, unions were too weak to assure that workers shared in the associated productivity increases (Osterman, 1999: 111).

A sedimented sequence of innovations work organization

The state of work organization at the end of the 20th century reflected not only the evolution of the broader context and the four general vectors of change described in the previous two sections: it also reflected the sedimentation of a series of organizational innovations. As pointed out in the Introduction to this chapter, it is difficult to assess the extent to which these innovations diffused in practice. But in tracing the evolution of these innovations, we are arguably tracing at least the leading edge of the changes in work organization.

Several researchers have identified this sequence of innovations by analyzing the content of articles in management journals (Guillen, 1994; Barley and Kunda, 1996; and

¹¹ The charismatic basis of authority seems to have been a perennial theme in the management literature, expressed in the continuing interest in “leadership” as something distinct from (and often “superior” to) “management.”

Abrahamson, 1997). Their findings suggest that we can group these innovations in two broad categories, each associated with a different type of “rhetoric”: one group emphasized formal rationality and aimed to ensure coordination and control, and the other emphasized substantive rationality and aimed to ensure employee commitment. Their analysis suggest that these two types alternated in their relative importance over the century. Changes in rhetoric corresponds (roughly) to the state of the Kondratieff long-wave.¹² New “rhetorics” tend to emerge at the troughs and peaks of cycles. Commitment was valued when business was headed into difficult times, but control was valued when business prospects were turning more favorable.¹³

The beginning of the 1872-1894 Kondratieff downswing saw the emergence of the first in this sequence of innovations — *welfare work*. Welfare work, or “betterment,” did not touch work organization directly, but aimed instead to shape values, build basic skills, and improve physical health, and thus to promote loyalty. It used company schools, employee magazines, company churches, company cafeterias. While some of the specific practices of early welfare work subsequently disappeared, many others persisted and were developed further by the human relations wave (discussed below).

The beginning of the 1894-1921 upswing saw the emergence of *scientific management* — a family of innovations designed to systematize management from the shop floor to the executive suite. On the shop floor, scientific management introduced techniques of production planning, work analysis, time standards, piece rates, etc. These were deployed not only in manufacturing but also in clerical occupations. The legacy of these innovations persisted. In their classic study of an automobile assembly plant in the 1950s, Walker and Guest quote workers describing work organization in terms we could have heard in 1930 — or in 2000:

* Foreman: “The line here, the moving line, controls the man and his speed. Then no matter how slow a man is, he has to keep moving. We’re all human, we like to go as slow as we can unless we are pushed, and this line controls him perfectly.”

* Worker: “The line speed is too great. More men wouldn’t help much. They’d just expect more work out of an individual. There’s an awful lot of tension. The work isn’t hard, it’s the never-ending pace. They guys yell ‘hurrah!’ when the line breaks down. It’s not the monotony, it’s the rush, rush, rush. On the line you’re geared to the line. You don’t dare stop. If you get behind you have a hard time catching up” (Walker and Guest, 1952: 11; 40; 51-52).

Comparable accounts could be offered of work in call centers a half-century later. Incoming calls are automatically routed to employees within a couple of seconds of concluding the preceding call. The employees respond to the calls by reading from

¹² Debate continues over the validity of Kondratieff’s hypothesis. For the present purposes, we rely only on rough periodization it offers.

¹³ It is interesting to note that there is arguably a similar, but inverse, cycle in British industrial relations since the mid 19th century: Ramsay (1977) argues that worker participation schemes have waxed when employers felt their prerogatives challenged — primarily in more prosperous phases — and waned when managers felt their power was more entrenched — primarily in economic downswings.

prepared scripts. Their bonuses depend on individual productivity. The quality of service is monitored secretly by supervisors who listen in to the conversations (Frenkel, Korczynski, Shire, and Tam, 1999).

In the management superstructure, this wave of formal-rationality innovations led to the definition of functional departments and differentiated roles for staff and line functions. Over subsequent decades, the legacy was extended in elaborate systems for formal planning, budgeting and control.

From early on, some scientific management proponents were eager to combine it with welfare work. Joseph & Feiss Company in Cleveland, Ohio, was a notable example. Under the leadership of the company's vice-president, Richard A. Feiss, the implementation of scientific management was very rigorous. The piece rate system, for example, was very detailed. The sizable Planning Department assured smooth, high-velocity operations. But Feiss's commitment to welfare was equally rigorous — especially after a strike in 1909 against the wage system and work rules. In 1913, Feiss hired Mary Gilson to head a new Employment and Service department (he rejected the Welfare label because it suggested philanthropy). Gilson helped organize a full panoply of welfare measures both at work — testing, promotion ladders, elimination of foremen's favoritism — and outside work — dances, picnics, choral societies, clubs, an orchestra, athletic programs, as well as home visits and other activities designed to promote the “mental, moral and spiritual advancement” of workers. Gilson later went on to join the IRC (Nelson, 1975: 78; Goldberg, 1992).¹⁴

The beginning of the 1921-1944 downswing witnessed the emergence of the *human relations* school of thought. It sought to broaden the role of the Personnel function and to infuse concern for employee commitment into the fabric of daily work. The associated innovations included ability testing for selecting employees, individual performance records, employee satisfaction surveys, coaching in supervisory skills, and the non-union employee representation plans promoted by the IRC.

These ideas grew in relevance over time. Their legacy was particularly strong in the management of less-routine operations such as craft, R&D, and professional work. Notwithstanding much early and some later mutual hostility, proponents of human relations and of scientific management often joined forces in the design of formalized personnel management systems, including compensation and performance incentives and suggestion systems. The Gilbreths represented an early version of this synthesis, with their focus on active worker involvement in scientifically-grounded quality improvement efforts. Later versions were associated with Allan Mogensson, the Training Within Industries program during World War II, and W. Edwards Deming.

At the beginning of the 1944-1971 upswing, a wave of *systems rationalization* innovations appeared, embodied in operations research, management science, strategic business units as a common corporate structure, and the further refinement of business planning and control systems building on the scientific management legacy. As this phase

¹⁴ Feiss's one major alteration of the Taylor system was also motivated by his interest in labor: a standard Taylorist approach to apparel manufacturing would have led him to introduce helpers to move materials around the plant, thus allowing the sewing machine operators to focus on their relatively higher-skilled tasks; but Feiss worried that this restriction on the movements of the operators would create boredom.

built momentum, it encompassed efforts to rationalize relatively non-routine activities, with the introduction of formalized R&D budgeting and project management approaches and the use of matrix structures.

Sometimes proponents of systems rationalization rode roughshod over the welfare work and human relations legacy. In particular, one reading of contingency theory seemed to justify a Theory X, disciplinarian approach to the management of routine operations. There were also, however, many initiatives that sought synergy. Many discussions of matrix management, for example, were attentive to its human dimensions — dealing with ambiguity, assuring appropriate upward influence, and so forth. And in the non-routine parts of corporate operations, contingency theory authorized a more employee-centered approach.

The beginning of the downswing starting in 1971 witnessed a resurgence of interest in commitment in the form of *employee involvement* (EI), as expressed in the themes of quality, culture, and empowerment. Building on the work of Maslow, Argyris, and McGregor, this wave was often framed in opposition to the scientific management legacy. Socio-technical systems theory (STS), a common reference point, popularized the idea that the human costs of excessively standardized and fragmented work would eventually lead to losses in productivity and quality — and that this would occur not only in non-routine tasks, but even in routine work. Proponents advocated the adoption of forms of organization that would give work groups and individuals far greater autonomy in determining work methods and far less specialization in their job assignments:

“The work force of the new plant [and office] is organized into teams responsible for segments of the work flow. They are delegated many self-supervisory responsibilities. They make internal work assignments, make production trade-off decisions, diagnose and solve production problems, and select personnel replacements to their team. Support functions such as quality control and maintenance are integrated into team responsibilities. Team members are paid for acquisition of additional skills, not for doing a particular job. Common parking lots and cafeterias and other symbols deemphasize status. Employees do not punch the time clock. Supervisors are expected to be facilitative, exercising progressively less direction and control as team capacities develop. Employees exercise voice over a wide range of conditions that affect them. Finally, and critically important, the organization is characterized by very high expectations about task performance and about people treatment” (Lawler, 1979: 2).

Sometimes these new tactics for eliciting commitment were combined with ideas from the formal-rational traditions of scientific management and systems rationalization. Two such families of synthesis can be noted.

First, in routine operations, scientific management ideas could be combined with EI ideas. Even if the result was not the kind of autonomous teams advocated by STS or found in refinery control rooms, such syntheses could nevertheless support high levels of worker commitment. For example, TQM in mass production industries often took the form of empowered teams (strong on commitment) themselves using standard quality improvement tools (strong on formal rationality). NUMMI provides an example. NUMMI is a GM-Toyota joint-venture producing Corollas, Geos, and Toyota light trucks

in Fremont, California. It has operated under day-to-day Toyota management since opening in 1984. Here is how one worker analyzed the effects of the rigorous implementation of the Toyota Production System at NUMMI:

“The work teams at NUMMI aren’t like the autonomous teams you read about in other plants. Here, we’re not autonomous because we’re all tied together really tightly. But it’s not like we’re just getting squeezed to work harder, because it’s us, the workers, that are making the whole thing work — we’re the ones that make the standardized work and the kaizen suggestions. We run the plant — and if it’s not running right, we stop it. At GM-Fremont, we only ran our own little jobs. We’d work really fast to build up a stock cushion so we could take a break for a few minutes to smoke a cigarette or chat with a buddy. That kind of ‘hurry up and wait’ game made work really tiring” (Adler, 1993: 145-146).

A second family of syntheses built on the systems rationalization efforts to bring some discipline to non-routine operations. EI in this context meant that staff could be actively mobilized to develop collectively their own formal methodologies and procedures. The general idea of process mapping — a tool used by both scientific management and STS — was brought into non-routine operations in such forms as IDEF, CMM, ISO 9000, and clinical guidelines in medicine.

I would conjecture that since the mid-1990s, the Kondratieff wave might have resumed an upswing, and note that in this period, we saw a resurgence of control-oriented innovations under the banner, first, of *business process reengineering*, *outsourcing*, and *networks*. The focus here was on radically rationalizing the scope and processes of work: downsize so as to focus on core competencies, and outsource the rest. A first phase of this cycle seemed deliberately scornful of the human dimension. Layoffs and downsizing cuts were trumpeted as signs of reinvigorated management recommitment to shareholder value. But within a couple of years, BPR champions were embracing STS ideas on how to configure job in the reengineered organization (Champy, 1995; Hammer, 1996). The literature on outsourcing reflects this continuity of commitment themes within innovations that are predominantly or initially control-oriented, with its attention to building trust and commitment with suppliers. The literature on knowledge management combines systems rationalizing focus on IT infrastructure and a commitment focus on “communities of practice.”

By century’s end

All these innovations — from the coercive to the consensual, from the ad hoc to the bureaucratic — were deposited like layers of sediment in the evolution of forms of work organization. We do not have data that allow us to compare directly the early years of the 20th century with the later ones, but surveys by Osterman (1994, 1999) and Lawler and his colleagues (1998) give us some economy-wide data on the recent past.¹⁵

¹⁵ Osterman’s surveys in 1992 and 1997 are described in Osterman (1999): they were both representative samples of private, for-profit sector establishments with over 50 employees, and asked respondents about practices pertaining to “core” employees, that is, employees in the largest occupational grouping. Lawler’s survey was of Fortune 1000 firms, and asked corporate HR executives to estimate the proportion of all employees covered by various practices.

At the close of the century, most blue- and white-collar employees had at least a moderate degree of discretion over their work activity. Few had either very much or very little control, as reflected in closeness of supervision, discretion over pace, or discretion over methods — see Exhibit 2.¹⁶

<put Exhibit 2 about here>

By century's end, work organization commonly involved some form of off-line problem-solving groups for at least half the core employees in some 57% of establishments. Job rotation too was similarly common in over 55% of establishments. "Self-managed work teams" were common in 38% and TQM practices in 57%. Some 39% of establishments used three or more of these practices for over half their core personnel. These data probably exaggerate the prevalence of these practices because respondents re-labeled conventional practices to make them appear in conformity with current management fads. However, it is difficult to imagine that comparable practices were anywhere nearly as widespread 50 or 100 years ago.

This mix of forms of work organizations was reflected in the range of HR/IR policies. These policies can be grouped into three broad categories: flows, rewards, and voice:

* **Flows:** whereas Henry Ford boasted that assembly-line workers could be recruited from among the least educated, auto assembly plants at the end of the century demanded that even applicants for assembly-line jobs have a high-school education, strong interpersonal, teamwork skills, as well as a capacity to learn new skills.¹⁷ Given such changes, it was logical that "internal labor markets" proliferated in large and medium-sized firms, replacing reliance on the external labor market with internal development and promotion.¹⁸ Moreover, the focus of this training seems to have evolved: by the end of century, training focused not only on job skills, but also team building, quality statistics, group decision-making and problem-solving skills (see Cappelli et al. 1997, Ch. 4; see also

¹⁶ In Osterman's survey, the respondents were managers, who may not be the most objective or well-informed on these questions. However, the results in Exhibit 2 are similar to those obtained from workers themselves in the Quality of Employment Survey (Quinn and Staines, 1979).

¹⁷ MacDuffie and Kochan (1995) found that newly-hired auto assembly plant production workers received on average 42 hours of training in their first six months in U.S. firms, 225 hours in Japanese transplants, and 364 hours in Japanese plants. Workers with over one year's experience received 31 hours in the U.S. companies, 52 in the transplants, and 76 in Japan.

¹⁸ In the last decades of the century, however, the trend towards internal recruitment slowed and even went into reverse. Observers noted a proliferation of "contingent" work and a decline in average job tenure. This decline in average tenure was, however, modest in magnitude and restricted to men. Nevertheless, by 1996, only 9% of firms offered employment security assurances to over 80% of their employees — down from 26% who offered it to over 80% of their employees in 1987 (Lawler). Public debate about employment security grew in intensity: some observers interpreted the trends as signs of a shift towards to a more dynamic economy, while others saw it as an assertion of unrestrained employer power. The positive import of these changes was difficult to see through the human cost of this insecurity; but this shift also seemed to encourage a broadening of identities. The parochial quality of 1950s-style loyalty — the loyalty of the "organization man" to the closed community of an individual corporation — was in decline, and two images competed to replace it: a hyper-individualistic "free agency" image, and a more professional model of "community of purpose" (Heckscher, 1995). HRM ideas about "employability" were often ambiguous enough to encompass the two competing versions.

Educational Quality of the Workforce survey online at <http://www.irhe.upenn.edu/centers/ctrs-prog3.html>.)

* **Rewards:** reflecting the importance of skill formation for firms' competitiveness, skill-based pay systems for at least some employees were found in over 60% of large companies. And reflecting the growth of teamwork, rewards for performance of the work-group, the plant, and the firm were growing more common. Osterman's survey shows that some 45% of establishments offered employees some form of profit sharing.

* **Employee voice.** here the picture was more mixed. Lawler's survey shows that by century's end, most firms gave over 80% of their employees information on corporate and unit-level operating results, and most firms gave over 60% of their employees information on business plans. It is difficult to imagine that the corresponding figures for a century earlier were that high. However, provision of such information is a very weak indicator of employee voice. Union and non-union forms of representation are a more robust indicator, but these were in decline for most of the latter part of the century. Legal protection of employee rights did increase over this same half-century; but the courts are a relatively inaccessible forum for most employees. At the end of the 20th century, the voice gap — the unfulfilled demand of workers for participation and representation — seemed pervasive (Freeman and Rogers, 1999; but see Kaufman, 2001, for a more moderate assessment).

MAKING SENSE OF THE PIECES

Making sense of the evolution of work organization has proven difficult. In this second part of the chapter, I advance an interpretation that has the advantage of acknowledging the merits of both optimistic and pessimistic accounts. The following sections address in turn prior interpretations of this evolution, the key dimensions of work organization, the technically-induced tendencies in the evolution of work organization, the socially-induced tendencies, and finally, the combination of these tendencies in workers' experience of work.

Four generations of research

Prior to the second World War, research on the history of work organization was scattered between two poles. At one pole, there was a growing body of applied, managerial literature. At the other pole, commentators and critics attempted to characterize the trends they observed in terms inherited from the broad-scale theories of Marx, Weber and Durkheim. In the U.S., the first major scholarly work focused on work organization was perhaps the research by Roethlisberger and Dickson (1939), in collaboration with Elton Mayo. (Another notable landmark was Gulick and Urwick, 1937). However, even in this work, only scant attention was paid to the history and determinants of work organization *per se*.

Since the second World War, scholarly research on trends in work organization has gone through four major generations. Let us briefly review them: we will see how this evolution has both clarified and obscured our object of analysis.

The first generation, in the 1950s and 1960s, was dominated by authors such as Blauner (1964), Woodward (1965), Touraine (1954), and Mallet (1963), who, despite their differences, all saw a curvilinear trend in work organization. In a first phase, the

shift from unit and small-batch production to mass-production led to narrower, less-skilled jobs. In a second phase, the shift to more automated, continuous-flow production led to broader jobs and upgraded skills. Woodward's analysis was particularly cogent: Exhibit 3 summarizes her key conclusions. Like others of this generation of research, she argued that automation, by encouraging a shift towards continuous flow production, would restore craft forms of work and an associated "organic" form of organization.

<put Exhibit 3 about here>

The advance of automation over the century did indeed shift some mass-production activities to continuous flow forms. Moreover, under the impact of computer-integrated manufacturing, even highly differentiated production sometimes came to resemble continuous flow (Adler, 1988). In other respects, however, this prognosis missed the mark. First, the focus on manufacturing ignored the rapid growth of the service sector, where mass-production forms of clerical work proliferated. Second, on closer examination, work in continuous flow processes looked less like traditional craft than had been predicted and the associated organizational forms looked less organic. The kinds of skill involved were those of the technician rather than the craftsman (Barley and Orr, 1997). While some operational decision-making was indeed decentralized, decision premises were often rigorously defined by a growing panoply of formal procedures.

The second generation of research emerged in the 1970s and reflected a changed social context. Less-skilled workers had played a prominent part in the resurgence of social conflict in the late 1960s, and their demands often targeted alienating and oppressive work organization rather than compensation. Moreover, scholars were impatient with the internal limits of the older research whose optimism seemed based almost exclusively on the potential effects of automation in a narrow band of continuous process industries. This second generation argued that automation's potentially favorable effects on work organization were rarely realized. Often inspired by Marx's analysis of the labor process, authors like Braverman (1974) in the U.S., Freyssenet (1974) in France, Beynon and Nichols (1977) in the U.K., and Kern and Schumann (1972) in Germany all argued a common thesis: capitalist societies tend to deskill work and narrow job responsibilities in their constant search for lower production costs and for greater control over a potentially recalcitrant labor force.

This second generation attacked what they saw as the "technological determinism" of the first generation. The implementation of the same technology would have, they argued, very different effects in different types of societies. In capitalist societies, interests of workers and capitalists diverge over the intensity of work and over control in the labor process. Given the structurally subordinate place of workers in such a society, the overall effect of technological advances could therefore only be a long-run decline in average skill and discretion. (For some authors, this trend was combined with the creation of a smaller number of highly-skilled positions in a polarization scenario.) The assembly-line was the key image of the future of work for these researchers.

The polemical intent of this deskilling proposition was fairly evident. In the absence of systematic statistics, case studies were used to great effect to show: (a) a frequent gap between workers' capabilities and job requirements (skill under-utilization), (b) instances where management's drive for profitability and control did seem to lead to

deskilling, and (c) other instances in which managerial ideologies and political concerns led to deskilling at the expense of efficiency.¹⁹

There was, however, a glaring discrepancy between the second generation's predictions and the reality as evidenced in the long-run trends in occupational distributions and in the broader sets of case-studies such as the IRC's. A third generation of research thus emerged, marked by a move away from the analysis of broader trends and "big generalizations." Some authors attempted to renew research of a first-generation kind, with arguments about the emergence of "flexible specialization" or "post-industrialism"; but now, in tune with a growth of skepticism among currently influential thinkers concerning anything resembling historical "laws of development," the focus was often on the political contingencies governing evolutionary trajectories. The focus shifted to the local dynamics of change, and for this "contextualist" generation, which attained dominance in the late 1970s and early 1980s, there was no valid generalization possible concerning long-run trends in work organization.

This skepticism generated valuable research into the "social construction" of skill labels — the idea that the distinction between skilled and unskilled is often more political and ideological than economic and technical. The research also explored the host of local factors that shape work organization such as the balance of political power, union organization, and local labor and product market conditions. The group around the French journal *Sociologie du Travail* can, in this respect, be compared to the research of Edwards (1979) in the U.S. and Gallie (1978) in Britain (see also the collection edited by Knights and Willmott, 1986) in their common focus on the impact of relative bargaining power and specific market conditions on automation, staffing, and labeling. This generation saw work organization as if through a kaleidoscope — constantly shifting configurations, forming no overall tendency.

Most recently, a fourth generation has shifted attention away from work organization as an object of study. The shift can be traced in the decline of two fields of research, industrial sociology and industrial relations. Work organization was a central term in the field known as "industrial sociology." With the turn to subjectivity and language in sociology, studies of work increasingly focused on issues of identity and Foucault-inspired research on managerial discourse. More fundamentally, the field of industrial sociology has declined in centrality within sociology, and in tandem with this decline, we have seen the rise of organizational research in business schools.

Work organization was also a central issue in the field of "industrial relations," but it, too, has been in decline. As Kaufman (1993) showed, industrial relations lost its legitimacy when interdisciplinary studies fell out of favor in universities. The main centers of continued research (Sloan, Wharton, Cornell, Berkeley, etc.) seem to function increasingly at the margins of the established and ascendant disciplines. Industrial relations maintains a niche in economics (expanding modestly with the rise of personnel and organizational economics) but it too has largely migrated into business schools.

¹⁹ STS and EI proponents started with the same empirical premises — that deskilling was common and that it led to performance benefits far less frequently than its popularity would suggest. Whereas labor process theorists assumed that the frequency of deskilling called for a structural explanation, the proponents of STS and EI assumed that management could be awakened to the superiority of more humane forms of organization (see Helfgott, 1992).

Translated into a business school setting, the “work” part of work organization has disappeared to the benefit of a focus on the issues of more direct salience to managers — the “organization” part (Barley, 1996). Industrial relations has mutated into human resource management. What remains has bifurcated:

* On the “macro” side, work organization is addressed by studies of “organization design” as part of the field known as “organization theory.” Increasingly, however, the focus of organization-theory research has shifted from the plant or establishment — the level of analysis favored by Woodward’s generation — to the top-level structure of the corporation, to broader industry-level processes of institutional structuring, and to ecological processes driving the fortunes of whole populations of organizations.

* On the “micro” side, work organization is addressed by studies of “job design” as part of the field known as “organizational behavior.” These studies focus on the individual or the work team. They aim at a social-psychological understanding of work experience, and in particular those subjective features of work that lead to high versus low levels of commitment, alienation, satisfaction, and so forth. Over the decades this research given impetus and theoretical shape to the human-relations and EI movements. However, this research has thus tended to leave aside, as too “macro” and sociological, efforts to characterize broad trends in work organization.

The cumulative result of this evolution in scholarly approaches is a remarkable degree of both disinterest and confusion relative to the question of the long-term trends in work organization. The disinterest can perhaps be explained by the progressive weakening of unions. As long as unions gave voice to protests over changing forms of work organization, scholarly work on the issue had a strong *raison d’être*. Today, as compared to 50 or even 100 years ago, such interest is much weaker — as witnessed by the decline in the frequency of Congressional hearings and of studies funded by public agencies. The confusion, by contrast, must be explained in more properly theoretical terms — the subject of the following sections.

A theoretical framework

The confusion over trends in work organization is, I believe, due in large part to reliance on competing but equally truncated views of the nature of the forces that shape work organization:

* Some observers see work organization as an essentially *technical* system: from this point of view work organization is shaped primarily by technology, instrumental rationality, and efficiency considerations, even if it has in turn important social and psychological consequences.

* Other observers interpret work organization as a *social* system: as part of the structure of ownership and control within the firm, work organization is both the site and the object of often-conflicting interests between workers and managers.²⁰

²⁰ A Weberian variant of this second view argues that technical rationality is an important force, but is itself a socio-cultural phenomenon. To this essentially idealist view, this chapter counter-poses the first, more materialist view. A related, “social constructionist” variant of the second view grants that work organization as shaped by technology, but argues that technology itself is shaped by the broader social structure. It is easy to show some social influence in specific equipment design choices, but it is an

Reading the research described in the earlier section, it is difficult to avoid the conclusion that there is merit to both these views; and from this observation, I draw a simple conclusion: work organization is located at the intersection of these two clusters of forces. The evolution of work organization reflects *both* technical exigencies and opportunities for improved efficiency *and* the social imperatives associated with the prevailing patterns of ownership and control (property rights and the associated decision-making rights). Taking this as my starting point, the following sections argue that technical and social forces impart distinct and often contradictory tendencies to the evolution of work organization. The trends we actually observe reflect the relative strength and interacting effects of these tendencies.

In order to describe these trends with any precision, we first need to define more specifically what we mean by work organization. As I will use the term, work organization has two main components: the skills required of workers in their jobs, and the relations that coordinate activity in these jobs:²¹

* **Skills** : Work organization is, first, a matter of how tasks are organized into jobs. From the workers' point of view, this aggregation defines the skills they need in their relationship to the objects of their work and to the tools they use. Skills vary in many concrete ways: we can distinguish manual from cognitive skills, technical from social skills, task skills from learning skills, etc. Abstracting from these concrete differences, skill can be reduced to, and measured by, required education and training time.²²

* **Work relations**: Work organization is, second, the fabric of relations that link different jobs and workers. This too is a multifaceted notion. Broadly we can distinguish three key dimensions of work relations: relations that workers have with others in their immediate work unit, the horizontal coordination of this unit with other work units, and the vertical authority relations by which these units' activities are coordinated and controlled. Abstracting from these concrete differences, work relations are often reduced to, and measured by, autonomy. I will argue below, however, that autonomy is merely the converse of interdependence, and that the latter concept gives us a better vantage point from which to assess changes in work relations.

altogether more difficult task to show that social factors determine the broad, overall trajectory of technological change. For reasons such as those advanced by Hutchy (2001), I find this latter idea quite implausible, so I will leave it aside in the analysis that follows.

²¹ Available conceptualizations of work organization are strikingly a-theoretical. Organization theory does not offer a concept of work organization per se, but focuses on the dimensions of organization structure that have emerged as important in the history of that field. Mintzberg (1979) for example, distinguishes positions (formalization, specialization, training), superstructure (departmentalization), lateral relations (planning and control, liaison devices), and decision-making (vertical and horizontal de/centralization). Frenkel and associates (1999) adopt a more "topological" view, and distinguish employment relations (recruiting, training, careers, rewards), control (process and output controls, participation), co-worker relations (task interdependence, learning interdependence, informal relations, forms of teamwork), work complexity, (theoretical knowledge, creativity, social and analytic skills), and customer relations (duration, affectivity, differentiation, standardization). There is a considerable degree of overlap in the substantive areas covered in these different conceptualizations, as with those found elsewhere in the literature. The one striking discrepancy is organization theory's ignorance of compensation systems.

²² Skills also differ in symbolic ways. Most notably, skills are often gendered: the education and training time required for work designated as "womens'" is often grossly undervalued.

The impact of technical forces

Let us take first the technical forces acting on work organization and identify some of the tendencies that can be attributed to them. (We will return in the next section to the impact of the social forces.) Mobilizing science and technology in the service of greater instrumental rationality and improved efficiency, modern industry progressively transformed both the skills and the relations components of work organization. Even though the rate of change varied greatly across firms and industries, I think we can advance some fairly robust generalizations concerning the overall direction of these transformations during the 20th century.

In a nutshell, these technical forces pushed in the direction of a progressive upgrading of skill requirements and a progressive loss of autonomy through a broadening and tightening of the web of interdependencies in work relations. This generalization does not apply to all cases: some forms of technical change created low-skill and isolated machine-tending or ancillary jobs; but these appear to have been exceptions to the broader pattern.

The impact of technical forces on skill requirements

The main effect of technical forces on skill requirements was a gradual shift upwards in the level of education and training required in most jobs. First, technological change over the last century led to a shift of jobs out of out manual occupations and into occupations that on average had higher skill requirements, most notably technical, professional, and managerial occupations. Second, skill requirements increased for most individual occupations, both manual and non-manual. The breadth of jobs typically narrowed — i.e. specialization increased — but the associated deskilling effect was in most cases outweighed by greater depth of knowledge. Such seems to be the most plausible interpretation of the general increase in educational and training requirements found in most occupations. Notwithstanding the recent disturbing trend towards a polarization of incomes and wealth, the skill requirements of jobs themselves have not been polarizing, but have been gradually increasing across the board. There are some exceptions to this generalization, and there remain lots of very-low-skill jobs in the U.S., but these are proportionately fewer today than 50 or 100 years ago.²³

²³ Goldin and Katz (1998) review the extensive literature finding complementarity of skilled labor and capital. They argue that this complementarity is due to two factors. First, it reflects the increase in the ratio of tool makers (equipment design, manufacture, and maintenance tasks) to tool users: they assume that the former tasks are on average more-skilled than the latter. This raises two problems. First, it is not clear that employment in the two broad families of tasks have evolved in the direction asserted, at least when viewed over the whole economy and clerical and sales occupations are included among tool users. Second, it remains to be shown that skills in the former are in fact generally higher than in the latter. The second reason they give for complementarity is that electrical power replaced many of the least-skilled, laborer jobs: the generalization seems plausible, but one wonder why this should be the case. Why technical change has been on average complementary to, rather than a substitute for, skilled labor remains therefore an unresolved puzzle. (For another interesting, but more limited and equally unsatisfying, discussion, see Autor et al. 2001.) By contrast, it is perhaps easier to see why technical change should tend to broaden interdependencies rather than strengthen autarky. At its core, technical change consists of a progressive extension of rational mastery, and such instrumental rationalization undermines parochial identities, imposing a universal standard of reason where tradition and affect previously dominated people's relations

Viewed more concretely, skills requirements evolved from manual to cognitive and social, reinforcing the need for higher levels of education. Automation contributed to the “abstraction” of work (Adler, 1986; Zuboff, 1988). The task of “direct” labor — in manufacturing but also in activities such as drafting — shifted from direct contact with the raw material to indirect contact via complex technical systems. The associated skills changed from manual and tactile to the intellectual mastery of symbolic representations and of mental models of the production process. With this shift, experience-based training became relatively less important and formal education relatively more so. The growth of indirect tasks within manufacturing and service industries (staff roles in engineering, accounting, etc.) and of high-end “symbolic analyst” services (law, consulting, etc.) reflected this abstraction of work, and contributed to the corresponding rise in education requirements.

Social skills also grew in importance. First, as we will discuss further below, teamwork became more common in both manufacturing and service sectors. Second, the growth of service industries meant that a growing number of employees found themselves in direct contact with customers. Education — if not the content, then the associated personal and interpersonal disciplines — helped large masses of workers acquire the interaction skills needed in such settings.

The impact of technical change on work relations

The main effect of technical change on work relations was to further encourage a longer-term shift away from autonomy and towards greater interdependence. As indicated above, I believe that a focus on autonomy, while informative, has the drawback of being backward-looking. It allows us to discern what was being lost, but it does not give us a conceptual vantage point from which to identify the evolving forms of interdependence that replaced the lost autonomy.²⁴

As noted earlier, if we go back 150 or 200 years, a large proportion of workers were independent producers, either on small farms or in small, artisanal shops. By 1900, most people were no longer economically independent; nevertheless, in their day-to-day work, they often made their own decisions about what to do, when, and how. Over the subsequent decades, the scientific management revolution and its systems rationalization extensions swept through most of U.S. industry. As a result, workers no longer controlled their own work, and control was increasingly lodged in a network of specialists and managers and embodied in technology and procedures. (Thus the rising administrative/production ratios noted earlier.)

to the material and social world. The social forces discussed in the following section also clearly contribute to the broadening of interdependence: the market undermines particularisms and autarky.

²⁴ In micro “organizational behavior” research, autonomy is often presented as a critical motivating characteristic of jobs — even though the evidence is just as strong that formalization of work procedures reduces stress and increases commitment (see for ex., Rizzo, House and Lirtzman, 1970; Jackson and Schuler, 1985; Organ and Greene, 1981; Podsakoff, Williams and Todor, 1986). Specialization and the resulting interdependence are assumed to be likely to undermine commitment because they reduce the “identity” of the worker’s task. If interdependence is addressed in this research, it is usually only within the work team, and the focus is once again on autonomy — now, the autonomy of the self-directed work team. Macro “organization theory” offers a richer range of concepts for characterizing interdependence and the associated coordination mechanisms — see below.

In this process, the autonomy of the worker to choose their own tools and procedures was progressively eroded. For most of our species' existence, tools were sufficiently rudimentary that they could be created by the individual worker or work group for their own use. Over the past century or so, by contrast, tools have increasingly taken the form of complex systems, and an extensive social division of labor has made tool development the object of distinct industries. Moreover, under a more extensive division of labor within the individual firm, formalized procedures — also developed by specialist experts, often located outside the focal firm²⁵ — typically tell the worker how to use these tools.

Interdependence thus overtook autonomy in all three dimensions: the individual work unit, the horizontal relations between work units, and the vertical relations within and across work units. Let us review these in turn.

Within the individual work unit, the evolution of interdependence appears to have been more complex. In a first phase, the individual replaced the group as the basic unit of work organization. Scientific management sought to eliminate “work gangs” so as to give management more control over the individual's work. The effort appears to have been successful. Time-and-motion analysis and other forms of job analysis proliferated in both manufacturing and service-sector work during most of the first half of the century (Baron, Dobbin, and Jennings, 1986). In a second phase, the human relations movement taught managers to be attentive to the individual employee and to their social relations at and outside work. On these foundations, the later phase of socio-technical systems theory helped popularize teams (Pasmore, Francis, and Haideman, 1982). These teams were rather different in their responsibilities than traditional teams or pre-scientific-management gangs. They were more likely to choose their own leaders, participate in setting work goals, do their own quality control, meet to solve problems, do routine maintenance, assign daily tasks, and schedule time away from work (Appelbaum and Berg, 2000: 126).

While social forces clearly play a role in this evolution (I return to them below) and management fads too (traditional arrangements are sometimes simply relabeled), technical forces appear also to have contributed to this shift from the individual to the work team. In places like banks, insurance companies, manufacturing plants, and chemical refineries, automation eliminated many stand-alone manual tasks, leaving workers with the new role of overseeing large-scale automated systems, and in many cases, this system-controller role could more effectively be played as a team. Moreover, in many industries, an increasingly demanding competitive environment forced an acceleration in the rate of change in task content, and it often became technically more efficient to give groups of workers primary responsibility for working out how they would adjust to these changes, rather than forcing them to wait for a staff specialist to reorganize their tasks for them. This enrichment of workers' tasks is the kernel of truth to

²⁵ These procedures may originate within the firm; but they can also be purchased, as when firms buy copyrighted forms and procedure manuals. They may also enter the firm as recommended administrative procedures that accompany the purchase of equipment. In more highly “institutionalized” settings (in the sense of Scott, 1995), they may enter the firm in the form of professional norms and regulatory requirements.

the proposition advanced by Woodward and echoed by Helfgott (1988: Ch. 10) that automation leads to a shift from mechanistic to organic structures within firms.

The second dimension of work relations is the “horizontal” relationship between specialized units. The trend over the last century was towards ever-greater interdependence in these relationships, as each unit became increasingly specialized and therefore dependent on a larger number of other units. Here too technical factors were important drivers. As knowledge accumulated, its progress naturally created new specializations, and the effective use of this new knowledge required new coordination efforts. Reflecting the broader contextual changes over the 20th century discussed above, this process was played out in four successively broader spheres: within firms, between firms, between industry and the public sector, and between countries. Let us briefly review them in turn.

(a) Within firms, there was a growing number of specialized skills needed to cope with an increasingly complex world. New job titles proliferated, and new functional departments were created. Sometimes the best way to ensure teamwork between these specialized skills was to group them in the one work unit. Often, it was more sensible to organize them into specialized units and establish appropriate coordination mechanisms between the units. In either case, interdependence was both broadened and tightened.²⁶

More generally, firms introduced a whole panoply of organizational mechanisms aimed at assuring closer coordination. As discussed in standard organization theory texts (e.g. Daft, 1989; Mintzberg, 1979), these mechanisms included hierarchy, standards, plans and schedules, and mutual adjustment.²⁷ In their more elaborate form — which emerged in the systems rationalization phase — they included overlay, matrix reporting hierarchies, in which individuals and units report simultaneously to more than one manager. This enables coordination in more than a single dimension, such as function, product, and geography. Firms also introduced sophisticated planning and control tools for a host of different types of temporary organization forms: project teams, task forces,

²⁶ One example comes from the auto industry’s experience of automation (Meyer 1999). Like the nineteenth century craftsman, the skilled worker in the typical auto engine plant of the 1950s was “far removed from direct production and had considerable autonomy in and control over their work routines.” In more highly automated engine plants by contrast, where continuity of operations was crucial, the skilled maintenance worker became “tightly bound to the assembly line.” Further support for the general proposition comes from steel finishing lines in the 1990s. Gant, Ichniowski and Shaw (1999, 2000) find that in the higher-performing lines, workers’ communication networks were considerably denser both within the production worker team and among these workers and managers, staff, and support people. Support also comes from Appelbaum and Berg’s (2000, p. 130) analysis that finds that about a third of their sample of workers in steel, apparel, and medical electronics communicated at least weekly with technical experts outside their workgroup. The ratio was higher in technologically more-complex medical electronics than in steel or apparel; and it was higher in settings with self-directed and off-line teams than in settings with more traditional work organization.

²⁷ Thompson (1967) discusses *types* of interdependence (pooled, sequential, reciprocal) and the corresponding mechanisms of coordination (respectively standards, plans, mutual adjustment); but he pays little attention to the *degree* of interdependence (to the fact that operations may not be coordinated well or coordinated at all) or to the *scope* of interdependence (the scale of operations and the number of people being coordinated).

etc. The history of work organization in the 20th century was in considerable measure a history of increasingly sophisticated coordination and control mechanisms.²⁸

(b) *Between firms:* Firms became increasingly dependent on suppliers for specialized inputs of machinery, components, and services. The recent trend towards outsourcing is only partly fad. For another part, it is the continuation of a long-term trend towards the increasing specialization of industries. Indeed, most of the growth of the service sector over the century was due to firms outsourcing tasks to more knowledgeable and efficient specialist service firms. To ensure cost-effective coordination with such specialized supplier firms, a broad range of mechanisms developed, from product standards to partnership-style relationships. Workers increasingly found themselves interacting directly with suppliers and customers.

(c) *Between industry and the public sector:* Firms were increasingly dependent on non-corporate suppliers for access to scientific and technological information. One manifestation was the growing interconnection of high-technology industry and university researchers. Another was the growing frequency with which workers enrolled in community college courses to learn the latest production techniques and technologies.

(d) *Between regions:* Over the longer period, the U.S. in particular and the world economy in general also saw growing interdependence across regional and national boundaries.²⁹ Inter-regional trade and investment links grew more numerous. Not surprisingly, trade issues and adjudicating bodies naturally appeared ever-more frequently on the front pages of our newspapers. And workers were increasingly likely to find themselves talking to a visitor from an overseas sister plant, supplier, or customer.³⁰

²⁸ Looking at this evolution through the lens of autonomy, some authors privilege the role of “mutual adjustment” since this seems to restore autonomy to operating units relative to hierarchical superiors. This, however, is inconsistent with the argument of J. D. Thompson (1967). According to Thompson, the main coordination mechanisms form a “Guttman” scale: pooled interdependence relies on standards, where sequentially interdependent operations use plans *and* standards; and reciprocally interdependent operations use mutual adjustment *and* plans *and* standards. Self-managed teams therefore typically find themselves deeply enmeshed in highly bureaucratic structures (hierarchy, standards, plans) that ensure coordination *across* teams. The kernel of truth to the autonomy thesis is that mutual adjustment requires of individuals and groups, even thus enmeshed, a higher degree of subjective engagement in the coordination task.

²⁹ Within the U.S., growing interdependence is evidenced in the growth of interregional labor mobility and the convergence of wage rates across regions. The U.S.’s growing integration into the global economy is evidenced by the growth of exports as a percent of GDP: from 2.5% in 1870, to 3.7% in 1913, to 8.2% in 1992 (Maddison, 1995: 38). At a more global level, Lindert and Williamson (2001) mobilize a broad range of data to argue that the degree of integration of the global economy first grew between 1820 and 1914; then regressed between 1914 and 1950; then grew again between 1950 and 2000. The overall result, they argue, was that commodity price gaps between continents fell some 92%, and capital markets progressed 60% of the way from complete segmentation to global integration.

³⁰ A word on the impact of this globalization on work organization. The argument of this chapter is framed in terms of the U.S.; one might counter, however, that the progressive features that I identify in the evolution of work organization within the U.S. may have come at the expense of a degradation of conditions in other countries, in particular less-developed trading partners. Or alternatively, one might argue that past improvements within the U.S. are being reversed by current globalization trends. I doubt that either argument bears scrutiny. In general it has been the less-skilled jobs that have gone overseas. This has had terrible effects on the unemployment and wage levels of those less-skilled U.S. workers thrown into competition with workers in low-wage regions. But not all the effects are negative. First, the jobs created overseas are usually more highly-skilled and better-paid than the alternatives available for workers

The third dimension of work relations is the vertical structure of authority. Clearly, this structure is strongly influenced by the second set of forces — the social structure — which we will examine in the following section. But this authority structure also has a properly technical aspect. The function of management in the capitalist firm is not only (exploitative) command but also (productive) coordination. Under the impact of technical forces, this dimension of work relations also witnessed progressive differentiation and growing integration.

Three forces encouraging vertical differentiation are worth highlighting:

- * As the knowledge embedded in specialized economic units accumulated, hierarchies of expertise formed. Thus, even where the role of exploitative command was minimal, complex vertical relations emerged. In consulting, accounting, and law firms, for example, junior associates report to, and rely on guidance from, senior associates, who in turn have a similar relationship to junior partners, who in turn have a similar relationship to senior partners. Similar hierarchies characterize other knowledge-intensive operations, such as scientific research and engineering.
- * Not only technical expertise, but also properly managerial expertise grew in importance as the complexity of business management techniques grew. Professional training for managers grew in importance. To be sure, this training was partly for credentialing and screening, but it was also for the technical skills needed of both individual contributors and managers in finance, accounting, marketing, operations, and the other business functions.
- * Moreover, to the extent that the firm incorporated a growing number of specialized units within itself, it needed more middle managers to coordinate between the units.

Against these the forces, some observers argue that the accelerating rate of change and the growing complexity uncertainty of the business environment have recently encouraged the decentralization of decision-making within firms and a concomitant delayering of the organization chart. Compelling evidence of any widespread trend to delayering is, however, lacking. Moreover, just as with autonomy in horizontal coordination, the hypothesis of delayering in vertical structure is probably ill-conceived. Operating units way well require greater decision-making power to deal with their increasingly complex and uncertain tasks; but this increase in decision-making seems to have taken place within a broader organizational context within which higher levels of the organization set many of the key parameters (in March and Simon's (1958) terms: decision premises). In a non-zero-sum view of power (as articulated by Tannenbaum and Kahn, 1957, for example), we would say that both lower and higher levels saw their effective power increase.

The more plausible generalization is therefore that the growing differentiation of the vertical authority structure required in turn increasingly intensive forms of vertical coordination and integration, both within and across the corporation's business units:

in those countries. Second, while many U.S. workers have thus lost their jobs and suffered wage cuts, the recent acceleration of globalization appears to have continued to drive in the direction of overall skill upgrading in the U.S., and if the "adjustment costs" are distressingly high for so many workers, it is because our polity has not facilitated this adjustment by socializing its costs.

* Within work teams, employee involvement was increasingly valued as a means by which to ensure operations flexibility and quality and performance improvement. This involvement in turn required extensive supervisory support — smaller, not larger, spans of control (Gittell, forthcoming).

* Within individual businesses, Appelbaum and Berg (2000, p. 130) find that even in so-called “self-directed” team settings, over 85% of workers communicate daily or weekly with managers in their unit and 43% with managers outside their unit. Moreover, such communication is more, rather than less, frequent in self-directed team settings compared to traditional work settings. It is no less frequent in highly-automated steel than less-automated apparel.

* Across units within the larger corporation, planning and control systems grew in sophistication. The administrative burden they represented led larger firms to decentralize wherever possible, most notably in the form of the multidivisional corporation. In general, however, these divisions shared important interdependencies, and their relations could therefore not be simply reduced to market-style interfaces. On the contrary, the planning and control systems of multidivisional firms grew increasingly sophisticated in their recognition of these horizontal linkages, in the forms of matrix management, “core competencies,” and “horizontal strategies.”

* In general, lower levels of the organization appear to have been drawn into more active roles in the planning cycle — in contrast with the earlier mix of more autocratic forms of planning and lack of planning.³¹ This trend seems to have characterized both relations between work teams and their supervisors within individual organizational units, and relations between the higher levels of the management hierarchy. Corporations learned to exploit the autonomous strategic learning of business units (Burgelman, 1983). Even in the top-down form of strategy process, lower levels of management appear to have played an increasingly active role.

In sum, the vertical dimension of work organization saw three simultaneous changes: (a) increased centralization of power — insofar as fewer decisions were taken in complete autonomy by lower levels of the authority hierarchy; (b) increased participation — insofar as lower levels came to have more influence on decisions; and (c) reduced centralization of operational decision-making — insofar as formalized decision-rules allowed higher levels to delegate operational decisions to lower levels without loss of control.

The impact of social forces

So far, I have argued that technical forces shaping the evolution of work organization pushed in the direction of skill upgrading and broader interdependence in work relations. But what about the other set of forces shaping work organization — the social forces? These social forces can, of course, be analyzed under many different lenses. For the purposes of the present paper, however, I will concentrate on the generally “capitalist” character of the structure of ownership and control in the U.S. economy. If our task is to understand the main lines of evolution over a whole century of change in

³¹ I know of no data that would allow us to test this conjecture. Freeland’s (//) study is probative, but it is difficult to assess the generalizability of GM’s early history.

work organization, this structure is arguably the most pertinent. It is “deeper” — in the sense of deep versus surface structure in structural linguistics, and of Bhaskar’s (1978) realist theory of science — than other dimensions of social structure, and is therefore likely to be relatively more important in shaping broad trends. The basic social structure of our modern, capitalist society can be summarized under two broad headings: competition between firms, and a wage-based employment relationship within firms.³² What do we know about the nature and impact of the trends engendered by these structures?

First, as a result of these two basic features, capitalist firms are far more aggressive than enterprises in pre-capitalist societies in the rational, efficiency-oriented, development and use of science and technology. All the tendencies attributed to technical forces in the discussion above were reinforced (a) by the pressure created by competition and (b) by the opportunities created by the centralization of power within the firm, and (c) by the progressive displacement of custom by instrumental rationality in the service of maximum return on investment.

Second, under the pressure of market competition between firms and the structure of managerial authority within firms, each of the trends in work organization we have noted so far — trends that were largely benign — was partially undermined and significantly distorted. The reason is not hard to see. The wage relationship reflects a society divided into employees and owners. Managers owe ultimate allegiance to the firm’s owners. Under the pressure of competition, and independently of their personal attitudes and values, managers are therefore sometimes forced to impose owners’ interests against workers’. The vagaries of product, factor, and financial markets sometimes encourage or force firms to lay off employees, and the brutal, unforgiving nature of competition forces firms to cut costs wherever possible. In this process, stakeholders other than owners — most notably, subordinate employees — are often short-changed.

Views differ on the extent of divergence of workers’ and owners’ interests. The labor process theorists’ neo-marxist assumption is that workers’ interests are essentially and universally divergent from managers’. By contrast, the “unitarist” (Guest, 1989) and “pragmatic reformist” view (Kaufman, this volume) holds that “there can be some degree of mutuality of interest between workers and employers, as both benefit from work restructuring. Management can gain increased efficiency by allowing workers more satisfying jobs and greater autonomy” (Helfgott, 1992:18). Of the two views, the latter seems empirically far more plausible. However, there remains an important kernel of truth in the neo-marxist view: it is surely a hallmark of the capitalist form of social organization that this mutuality of interests is realized only intermittently, rather than being a regularity that is systematically reproduced.³³

³² To these two features, we could plausibly add the critical role of the state (law, regulations) in setting the parameters of competition and of other forms of interaction. If our focus were on the distinctive character of work organization in the U.S. versus other countries, or on evolution over a shorter time frame, then we would expect to see the state as well as other forces such as politics and ideology — forces closer to the visible surface of social reality — to play a more central role in our explanation.

³³ Firms have some interest in their reputation as good employers, since it attracts higher-quality employees. But reputation is unreliable as a device for holding management to this “high road” — not only

Take skill upgrading: Even though their long-run competitive success requires skill upgrading, firms are often loath to invest in the required training since workers could take the resulting “human capital” out the door to a better-paying job down the street.³⁴ Moreover, skilled workers typically have more power than unskilled workers, and therefore managers’ control over the shop- or office-floor is easier to assure when jobs require less skill and employees are more easily replaced. Managers were thus often tempted to “dummy down” equipment and job responsibilities, and to deskill work. More advanced tools afford the opportunity to leverage others’ expertise in the performance of one’s work; but since these tools are deployed as the property of the firm’s owners, their design, selection and implementation often served owners’ interests at the expense of workers’. Since the employment contract is “incomplete” — leaving managers the task of assuring that the capacity to work is effectively translated into work effort — tools are often used to coerce more effort from recalcitrant workers, rather than to enable committed workers better to master their tasks — even though the latter approach is often more technically productive. Some of the cases documented by the labor process researchers are convincing in this regard.

Similarly with work relations: interdependence does not always take a collaborative form. The asymmetry of power between employees and owners and the competitive relations between firms mean that interdependence often takes the form of asymmetrical and oppressive dependence. We can see this tension in all three dimensions of work relations: again, let us review them in turn.

First, managers under short-term cost-reduction pressure often manipulate teamwork to create peer pressure. Peer pressure can temporarily improve productivity, even though debilitating in the longer term. Under pressure for short-term results, managers often find the temptation of such manipulation irresistible. When workers accept team responsibility for work outcomes, they have to negotiate among themselves a new balance of individual autonomy and team authority. The search for that delicate balance can easily be derailed, and the authority of the team has frequently turned into a nasty war of worker against worker (see, for ex., Barker, 1999).

Second, under the pressure of competition, horizontal specialization can degenerate into adversarial rivalry. Supplier firms’ interests do not always align with customers’, and when push comes to shove, potentially fruitful partnerships often fragment under the pressure of competitive rivalry. Horizontal relationships within the firm are also vulnerable to the pressures of competition — in particular, competition among managers for promotion opportunities. In some circumstances, horizontal interdependence appears to workers as mutually beneficial teamwork; but in other circumstances, it turned into a weapon against workers — who, like managers, must compete against each other in the external and internal labor markets. Outsourcing and globalization are often used as a threat, to “divide and conquer” (Bronfenbrenner, 2000).

because reputation markets are not well-formed, but more fundamentally because profitability (especially over the time-horizon relevant to decision-makers) can be assured in many different ways, not all of which require worker commitment.

³⁴ Theoretically, this assertion only applies to general as distinct from firm-specific training. But when training aims to prepare workers to use new technologies, it is likely to have a strong general component.

Third, and most obviously, the function of the vertical hierarchy in a capitalist firm is double: a productive function of coordinating activities and providing specialized expertise, and an exploitative function of squeezing more effort from employees. A form of society such as ours — in which workers' and other stakeholders' interests are structurally subordinate to those of owners' — constantly reproduces conditions conducive to a slide from collaborative hierarchy toward the exploitative, autocratic, “command and control” form of hierarchy.

The net effect of these various social forces is that work organization and HR/IR policies attempt to bridge objectives that are sometimes incompatible. To take a simple example, the firm may need a high level of worker commitment to quality and innovation, but may find itself in a situation where a sizable proportion of the labor force must be laid-off and where senior management acts autocratically in proceeding with these lay-offs. This potential incompatibility is at once trivial and fundamental. It is trivial, because most decision-making involves trade-offs. But it is fundamental too, since the nature of the trade-offs in question here makes any compromise inherently unstable (Hyman, 1987). The firm is simultaneously a purposive community and a structure of domination and exploitation. Managers' values may incline them to privilege one facet or the other, but the reality of capitalist competition imposes a double-bind from which no management, no matter how enlightened, can escape.

Work and workers at the intersection of technical and social forces

In a nutshell then, work organization has been buffeted between the longer-term technical-productive advantages of upgrading and collaboration and the shorter-term socio-economic advantages of deskilling and autocratic domination. What do we know about the resulting trends? These trends, I submit, reflect a basic asymmetry: the technical forces progress in a cumulative manner, but the social forces reproduce a relatively stable basic social structure.³⁵ The result appears to have been that (a) the technically-driven tendencies to upgrading skills and broadening interdependence prevailed in the aggregate and over the longer term of the 20th century, but (b) the social forces left their mark on this evolution, simultaneously accelerating and retarding it, making its progress sometimes too slow and other times too rapid, and leaving numerous small and several huge pockets of backwardness.³⁶

³⁵ I would add two notes concerning this formulation. First, two views have recently come into greater prominence arguing against the idea of cumulative character of technological change: path-dependence theory and the “social constructionist” view of technology. On the strong version of either of these, technology cannot be said to “progress” at all. In my view, it is only the least plausible components of these propositions that contradict the broad generalization of cumulative progress. Second, concerning the reproduction of a stable social structure: A more precise formulation would indicate (a) that the social forces tend to reproduce capitalist relations of production on an ever-expanding scale, and (b) that this reproduction does not exclude some degree of accommodation with subaltern forces when the dominant classes' control is threatened. Keynes was an articulate spokesman for such an accommodation in macroeconomics; the IRC represents accommodation in microeconomics.

³⁶ Too slow, as when new technologies could alleviate unsafe or burdensome working conditions but implementation is unprofitable. And too fast, as when technology changes more rapidly than society can absorb the displaced workers. Note that consistent with the previous footnote, this formulation allows social forces to change the rate but not the basic direction of technological change.

Moreover, even the progressive aspects of this evolution were not without their downsides for workers. Upgrading skills and broadening interdependence tend to undermine established communities of solidarity, constantly putting workers and unions on the defensive, and this in several ways. Upgrading often replaces old union craft workers with young nonunion technicians. Teamwork often replaces clearly delineated supervisory accountability with diffuse team accountability. New patterns of horizontal specialization undermine old bargaining units. New collaborative hierarchies ask unions to become partners, even though the need for tough-minded adversarial bargaining has hardly diminished.

These multifarious changes in work organization did not only affect the external conditions under which workers work: they also affected workers' values and their social identity. As E. P. Thompson argued relative to an earlier phase of (British) industrial history, the new conditions of industry required "new disciplines, new incentives, and a new human nature upon which these incentives could bite effectively" (1967: 57). What effects have the 20th century's changes in work organization wrought on workers' "human nature"? In the absence of compelling evidence, I offer four conjectures.

First, upgrading and interdependence progressively raised workers' level of intellectual sophistication and broadened their worldview. Education levels rose and communication and travel costs fell. People experienced an increasingly global web of interdependence in their work:

* As noted in the first IRC report: "It is evident from study observations that work group horizons are now broader in many instances, because any one segment of work is no longer limited to a group of men doing similar jobs. The 'group' today is an assembly of men working relatedly on a complex of jobs in a department or on a shift, and new and different types of individual interaction occur" (Beaumont and Helfgott, 1964: 232-233).

* Moreover, this "group" was not restricted to the peers within the firm: in their work practice, workers experienced a growing interdependence across firms. In the words of one worker I interviewed at NUMMI:

"In 23 years working for GM, I never met with a supplier. I never even knew their names except for the names on the boxes. Now, we're working with suppliers to improve our products. Workers sit down with our engineers and managers and the supplier's people and we analyze defects and develop improvement proposals. We even do that with the equipment vendors. Stuff like that gives us a better perspective on how our jobs relate to the whole process."

* And more: the "group of men" referred to by Helfgott often evolved into a group in which men and women collaborated. At century's end, gender segregation was still pervasive at the level of individual, narrowly-defined occupations (Bielby and Baron, 1986; but the growth of women's labor force participation rates over the century nevertheless drew increasing proportions of men and women into mixed-gender, interdependent work relations.

These various changes sometimes undermined old sources of worker identity and solidarity; but they also created broader solidarities, and thus greater potential for enlightened action on a broader scale.

Second, changes in work organization reshaped workers' subjective identity. Lewchuk (1993) describes the changes wrought in the early days of the auto industry to one of the most sophisticated of these identities, that of the 19th century artisan. Norms of masculinity among these artisans emphasized the value of independence in the work process. As Montgomery (1979: 13-14) put it, the "manly" worker "refused to cower before the foreman's glare — in fact, often would not work at all when a boss was watching." Once Ford had put in place an extensive division of labor and the assembly line, management worked assiduously to inculcate new norms. These norms emphasized values such as hard work under monotonous conditions, contributing to the creation of useful products, a fraternal community of Ford employees, and providing materially and spiritually for one's family. These values were actively propagated by Ford's infamous Sociology Department. Lewchuck marshalls evidence, albeit fragmentary and anecdotal, that the combination of work experience and management indoctrination did indeed lead to the progressive, if partial and refracted, internalization of these values by workers, and to corresponding change in working men's identity. I would add that the new norms were perhaps all the more significant — and simultaneously more difficult to propagate — because they emphasized values of interdependence and other-directedness rather than autonomy and self-regard — and thus were marked as feminine rather than masculine.³⁷ Under the impact of these various forces — plus, surely, the effect of the feminist movement itself — traditional values evolved and new identities emerged. One NUMMI worker described his personal evolution in these terms:

"I wish you could talk to the guys' wives about the changes they've seen [in workers' behavior between the GM-Fremont days and NUMMI]. I was a typical macho horse's ass when I worked at GM-Fremont. My typical line coming home was: 'Work sucks, so get my dinner and get out of my way until I cool off.' Now I'm much more of a partner around the house. I help wash the dishes and take the clothes hamper out to the washer because I'm so used to working cooperatively with my team at the plant. I bring a spirit of cooperation home with me rather than dump my work frustrations all over my family."

Third, upgrading and interdependence made workers increasingly intolerant of autocratic management in firms. As Roy Helfgott put it: "I do not want to posit a strict doctrine of technological determinism, for other factors are at play in advancing new approaches to work organization...[But the] new technology, which requires greater cooperation among all members of the workforce, helps undermine authoritarianism" (Helfgott 1988: 78). Protests against autocratic management are hardly new; they were numerous even among the immigrant workforce of the early 20th century. Indeed, the IRC owes its existence in large measure to such protests by the largely immigrant workers of the minefields of Colorado.³⁸ Such struggles were not, however, the norm: outside the

³⁷ As Fine (1993) writes: "All the hallmarks of masculinity at the workplace were eradicated by automation, machines, time clocks, as well as new management practices."

³⁸ "Coal mining imposed a degree of vassalage so inconsistent with the American ideal of freedom that resort to arms practically was inevitable....Discipline was maintained by intimidation, and, if need be, by physical assault" (Gitelman, 1988: 3). The IRC was formed by John D. Rockefeller, Jr. largely in reaction to the massacre at Ludlow in 1914 by government and company-paid militiamen of some 24 men, women,

artisan category, fatalistic acquiescence was probably more typical. Consider this story from Ford in about 1915, as recalled by a Ford office worker (cited by Meyer, 1981: 172) for what it tells us about this acquiescence:

“Despite a safety device, a foreign worker cut off his finger at his machine. Plant superintendent P. E. Martin and his assistant Sorenson wanted the worker to show them how it happened so the device could be corrected. The workman showed them and cut off another finger. ‘He understood,’ Brown related, ‘they actually wanted him to demonstrate how he cut the tip of his finger off.’”

Such heart-rending pre-modern subservience is unthinkable in today’s auto plants (see for ex., Hamper, 1992). Workers became less tolerant of autocratic management, and notwithstanding the recent decades’ decline in union power, the twentieth century witnessed a corresponding democratization of workplace relations.

And finally, workers grew increasingly intolerant of the economic insecurity that is characteristic of the worker’s status in a capitalist economy. As one of the founders of the IRC, Clarence Hicks, wrote:

“Present-day managements have come to the realization that the security of the employee is a matter of mutual and not solely individual concern. The repercussions of insecurity in human psychology are manifold. In a day when the co-ordination of human effort in industry has reached an extremely elaborate state, the fear of lost income and dependency has a costly effect on the efficiency of operations. Further, the type of employee most effective in the modern corporation is just that which values security most dearly. Human personality is not divided into watertight compartments. Foresight, reliability, and initiative in protecting one’s family and dependents are the same foresight, reliability, and initiative that make one a valuable employee” (1941: 98).

The most recent decade saw a decline in employment stability (albeit a modest one and for men only: Schultze, 2000), and arguably, younger workers today are relatively less concerned with job security and more concerned with career opportunity. Foresight, reliability, and initiative are thus perhaps now being played out on a broader stage — but there is no evidence that workers have become more accepting of their economic vulnerability.³⁹

CONCLUSION

The puzzle with which this chapter began was how to incorporate into a single narrative several contradictory but partially valid views of the long-term evolution of work organization. The first part of the chapter laid out some of the pieces of the puzzle; the second part proposed a solution. I argued that, on the one hand, the technical

and children striking against despotic conditions in the mining camps run *inter alia* by Colorado Fuel and Iron Company, of which Rockefeller was the principal shareholder.

³⁹ A 1996 Peter Hart poll found that 83% agreed (59% strongly) that “average working families have less economic security today, because corporations have become too greedy and care more about profits than about being fair and loyal to their employees” (cited in Heckscher, 2000.)

exigencies pushing towards higher skills and broader interdependence made employee commitment an increasingly important condition for effective operations; and on the other hand, the capitalist social structure worked sometimes to reinforce, but sometimes to undermine, that very commitment. I also argued that there was a basic asymmetry between the technical and the social forces, and that this asymmetry explains the dominance of the technical forces in the longer-term trends.

This suggests that the sequence of work organization innovations (discussed in the first part) does not merely represent a pendulum swinging between formal- and substantive-rationality, between control and commitment. My narrative suggests that hidden beneath this cyclical process, there is an underlying trend towards what we might call collaborative interdependence. Evidence for this underlying trend can be found if we look more carefully at the sequence of innovations.

* Note first, that in the sequence of normative approaches — from welfare work to human relations to employee commitment — there is a clear shift from the earlier reliance on paternalism, to relatively impersonal, bureaucratic norms of procedural justice, to an emphasis on empowerment and mutual commitment. The quality of commitment sought in each successive wave substantive-rationality innovation seems to have implied a shift from traditional “blind” trust to a more modern “reflective” form of trust (Adler, 2001). In its evolution, work organization sought progressively deeper forms of subjective implication of the individual worker.

* Second, the sequence of normative innovations is also notable in engaging progressively more directly with work and work organization. Welfare work did not seek to modify the core of work organization; human relations addressed mainly supervision; EI brought concern for commitment into the heart of work organization.

* Finally, the sequence of control innovations — from scientific management to systems rationalism to reengineering — seems to have become increasingly hospitable to commitment oriented variants. Within two or three years of publishing a text popularizing a rather brutally coercive method of business process reengineering (Hammer and Champy, 1993), both James Champy and Michael Hammer published new volumes (Champy, 1995; Hammer, 1996) stressing the importance of the human factor and the need for job redesigns that afford employees greater autonomy. The undeniably autocratic character of much early reengineering rhetoric and its rapid “softening” compares favorably with more unilateral and enduring forms of domination expressed in post-War systems rationalism. It compares even more favorably with the even more unilateral and rigid rhetoric in turn-of-the-century scientific management: scientific management only softened its relations with organized labor after nearly two decades of confrontation (Nyland, 1998).

Synthesizing these observations, we might chart the evolution of innovations not as a pendulum swing, but rather as shown in Exhibit 4.

<put Exhibit 4 about here>

Clearly there is a gap, often a huge one, between the rhetoric of work organization as expressed in management literature and the reality of work organization as experienced by workers. And just as clearly, there is a gap between the emergence of an organizational innovation and its diffusion through industry. However, this long-term

evolution of rhetoric and the associated innovations both reflected and reinforced a real trend to greater reliance on consent and trust. It reflected the evolving expectations of an increasingly educated workforce and the evolving needs of increasingly interdependent forms of organization. And it reinforced that trend because the emphasis of commitment progressively legitimized the idea that management authority depends on employee consent.

The IRC has been an important contributor in all three rounds of commitment innovations — welfare work, human relations, and EI . The story I propose to tell about the long-term evolution of work organization leads me to conjecture that “unitarist” HRM approaches such as those promulgated by the IRC will continue to wax and wane in popularity, but will tend to become more rather than less popular over the long (that is: very long!) period. These approaches, however, appear to encounter a limit in their ability to acknowledge the divergence of interests that is constitutive of the capitalist employment relation — and the resulting limits of any commitment to commitment.

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Exhibit 1: Evolution of the occupational structure of the U.S. labor force

Year	1900	1910	1920	1930	1940	1950	1960	1970	1980	1991
Clerical	0.03	0.05	0.08	0.09	0.10	0.12	0.14	0.18	0.17	0.18
Professional, technical	0.04	0.05	0.05	0.07	0.07	0.09	0.11	0.14	0.15	0.17
Service, excl. private household	0.04	0.05	0.05	0.06	0.07	0.08	0.08	0.11		
Private household workers	0.05	0.05	0.03	0.04	0.05	0.03	0.03	0.02		
Service, including private household	0.09	0.10	0.08	0.10	0.12	0.11	0.11	0.13	0.13	0.13
Salesworkers	0.05	0.05	0.05	0.06	0.07	0.07	0.07	0.07	0.11	0.12
Operative and kindred	0.13	0.15	0.16	0.16	0.18	0.20	0.19	0.18		
Laborers, excl. farm and mine	0.12	0.12	0.12	0.11	0.09	0.07	0.05	0.05		
Operatives plus laborers, excl. farm and mine	0.25	0.27	0.28	0.27	0.27	0.27	0.24	0.23	0.18	0.15
Managers, administrative, proprietors	0.06	0.07	0.07	0.07	0.07	0.09	0.08	0.08	0.10	0.13
Craftsmen, foremen	0.11	0.12	0.13	0.13	0.12	0.14	0.14	0.14	0.12	0.11
Farmers	0.20	0.17	0.15	0.12	0.10	0.07	0.04	0.02		
Farm laborers and foremen	0.18	0.14	0.12	0.09	0.07	0.04	0.02	0.01		
Farmers plus farm laborers	0.38	0.31	0.27	0.21	0.17	0.11	0.06	0.03	0.03	0.03

Data for 1980 and 1991 combine operatives and laborers, do not distinguish private household workers, and do not distinguish farm laborers from farmers and farm managers.

Source: U.S. Bureau of the Census, 1900--1970. Data for 1980 and 1991 from Barley and Orr, 1997, p. 3, based on Klein, 1984.

Exhibit 2: Degree of control over work by “core” employees

	All core occupations	Blue-collar core workers	Professional/technical core workers
Closeness of supervision:			
Complete	5.87	5.88	4.81
Large	24.26	14.96	20.56
Moderate	53.02	61.95	43.08
Small	16.60	16.91	30.65
None	0.25	0.29	0.90
Discretion over pace:			
Complete	6.63	7.11	12.80
Large	24.31	16.80	37.55
Moderate	36.75	47.42	28.95
Small	19.98	15.75	9.19
None	12.32	12.91	11.52
Discretion over work method:			
Complete	4.81	3.13	8.97
Large	39.86	39.88	45.77
Moderate	37.04	39.70	32.59
Small	14.21	11.24	12.67
None	4.07	6.05	0.0

Source: Osterman National Survey of Establishments, cited in Cappelli et al., 1997: 100.

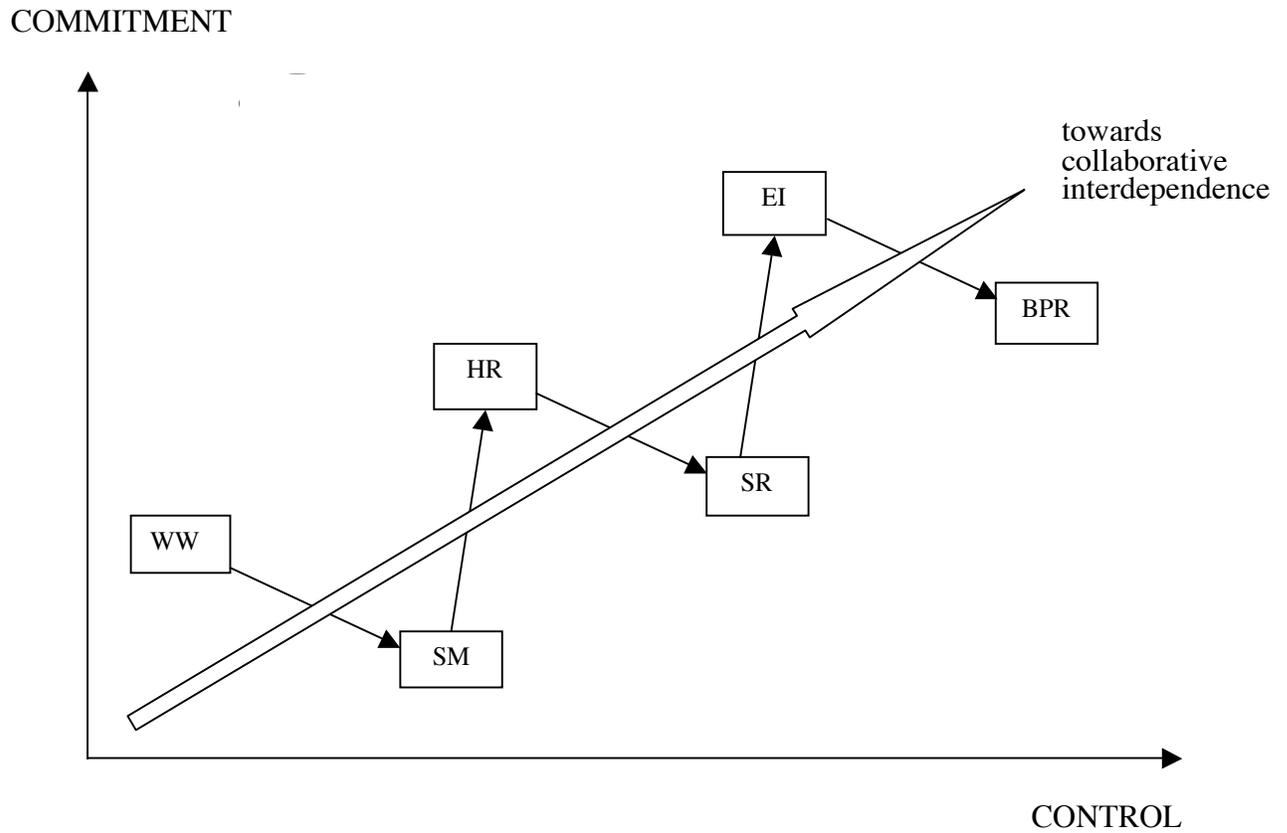
Note: core occupations are the largest group of non-supervisory, non-managerial workers in the surveyed establishment, directly involved in making the product or providing the service. Blue-collar workers were 42.5% of core occupations, sales were 19%, service were 18.3%, and professional/technical were 14.3% (Osterman 1994: 175).

Exhibit 3:
Woodward's typology of production systems

	unit production	mass production	continuous process
no. of mgt levels	3	4	6
supervisor span of control	23	48	15
direct:indirect labor ratio	9:1	4:1	1:1
manager to total personnel ratio	low	medium	high
production worker average skill level	high	low	high
formalization of procedures	low	high	low
centralization	low	high	low
amount of verbal communication	high	low	high
amount of written communication	low	high	low
overall structure	organic	mechanistic	organic

Source: Woodward, 1965

Exhibit 4:
A trend towards collaborative interdependence



Legend:

WW = welfare work

SM = scientific management

HR = human relations

SR = systems rationalization

EI = employee involvement

BPR = business process reengineering