

An Introduction to the
SOCIOLOGY
of **WORK** and
OCCUPATIONS

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Industrialization and Its Consequences

As the previous chapter noted, the Agricultural Revolution initiated massive changes in human life and work. In the centuries that followed, despite wars, religious upheavals, the rise and fall of ruling dynasties, and substantial population growth, the great majority of the world's population continued to earn a living in the same ways that their ancestors had done for centuries, either by tilling the soil or engaging in small-scale handcrafts. Although technology advanced in fits and starts, a basic continuity in the way things were done prevailed. An 18th-century French peasant would find much that was familiar in the farm work that was performed during the early Middle Ages, and a contemporaneous shoemaker would feel right at home in a Roman workshop. Yet within a relatively short space of time, many key aspects of work, technology, and economic organization were altered almost beyond recognition by another revolution.

The Industrial Revolution

The word *manufacture* literally means production by hand, and this is an apt description of how things were made for thousands of years. Wielding simple tools and exercising considerable skill, artisans produced life's necessities and luxuries in small workshops, aided by family members and a few apprentices. This mode of work began to be radically transformed around the middle of the 18th century, first in Britain and then in many other parts of the world. The technological and organizational changes that were the basis of this transformation have been labeled the *Industrial Revolution*,¹ although the term is a bit misleading in that the word *revolution* implies a sudden, massive shift. The Industrial Revolution produced thoroughgoing economic and social changes, but these took many decades to unfold. Moreover, the Industrial Revolution did not represent a complete break with the past; radically new ways of doing things coexisted with traditional modes of production for a long time, and in fact, many preindustrial ways

of doing things persist to this day. To note the most prominent example, despite many efforts to manufacture homes as though they were cars or washing machines, residential construction still largely proceeds through a series of craft operations.²

Although the Industrial Revolution was slow in unfolding and did not always mark a complete break with the past, it nonetheless embodied major changes in technology, work organization, labor processes, and economic relationships. In the technological realm, one of the signifying features of the Industrial Revolution was the large-scale use of external sources of energy. The Industrial Revolution is often identified with the development and use of steam power, but until the middle of the 19th century, the most common source of industrial power was flowing or falling water that acted upon a wheel or turbine.³ The steam engine, first used to pump water out of mines, was made substantially more efficient through the efforts of James Watt during the late 18th and early 19th centuries.⁴ The development and utilization of external sources of power continued during the latter half of the 19th century, when what has been described as a Second Industrial Revolution was literally powered by electric motors and internal combustion engines.

These new sources of power were used to operate a host of mechanical devices that augmented or took the place of human labor. During the early phase of the Industrial Revolution, this occurred most prominently in the textile industry, where jennies for spinning thread and power looms for weaving displaced spinning and weaving by hand. Mechanization transformed many other industries; everything from pins to locomotives were made in large volumes through the use of innovative machinery.⁵ At the same time, machine tools such as precision lathes and automatic milling machines made it possible to produce objects that would have been beyond the capability of the most skilled traditional craftsman.

These advanced modes of manufacture were located in a new kind of production locale, the factory. Before the Industrial Revolution, the largest productive enterprises were a small number of European shipyards that employed a few hundred workers at most. By the second half of the 19th century, the industrial landscape was dotted with textile mills, meatpacking plants, steel mills, shoe factories, and other productive enterprises that put large numbers of workers under one roof. By the end of the century, factory complexes employing thousands of workers had spread over large tracts of real estate in Britain, continental Europe, the United States, and other parts of the world.

In part, this shift to large-scale production was a consequence of the use of power sources such as water turbines and steam engines. According to standard accounts of industrialization, new sources of power influenced the scale of factory-based manufacture because large, capital-intensive pieces of equipment such as steam engines and water turbines were not well suited for supplying power to a multiplicity of small, independent enterprises. But this is not the whole story, as the linkage between the adoption of advanced power technologies and large-scale factory organization is not as solid as

often has been assumed. The typical factory was a large structure where a complex of shafts and belts transmitted power from a central power source to dozens of individual machines, but there are intriguing instances of large steam engines powering clusters of decentralized, small-scale manufacturing enterprises. One such example was the Coventry ribbon-weaving industry, a collection of enterprises lined up in a row so that their looms could be powered by a single steam engine.⁶ Similar examples could be found in the prototypical Industrial Revolution cities of Sheffield and Birmingham, where a multiplicity of small workshops made use of a single power source, and “Power to Let” signs notified artisans of the availability of steam power that was conveyed by transmission belts to each shop.⁷

At best, the technical requirements of new sources of power provide only one reason for the rise of the large factory. At least as important was the need to organize and supervise large numbers of workers who had no personal stake in effective and efficient factory production. One important consequence of the Industrial Revolution was the emergence of large numbers of wage workers, or proletarians, to use the term favored by Marxists. Unlike independent artisans of the preindustrial era, factory workers did not own the tools they worked with, the materials that they transformed into finished products, or the buildings where the work was done. What they brought to the job was their ability to put in a day’s work using whatever skills they might have, along with at least a grudging willingness to submit to supervision. For this they received a wage that might not meet much more than their subsistence needs. Put simply, the majority of workers were treated as commodities with no personal stake in the enterprise that employed them. Further diminishing their motivation was the rural background of many workers, which made them disinclined to accept the rigid work schedules that were prominent features of these enterprises. In the factory the clock ruled, enforcing a working day of ten to twelve hours, six days a week.⁸ Under these circumstances, close supervision was essential if workers were to perform their tasks adequately and at a sustained pace. Factories provided settings in which workers could be confined to clearly delimited spaces and kept under the watchful eyes of foremen and other managerial representatives of the owners of these enterprises.⁹

Capitalism and Market Economies

Gatherers and hunters, with their limited stock of personal possessions and their ethos of sharing, live in societies with little in the way of social differentiation other than age and gender. In contrast, agricultural societies usually contain definite class divisions that center on the possession of land or the lack of it. In preindustrial Europe, large landowners (including institutional bodies such as the Church) were at the summit of economic and political power, where they were able to strongly influence “high culture,” the literature, painting, music, and architecture that we associate with particular times

and places. Land was not the only basis of wealth, of course; many agrarian societies had wealthy merchants who, in addition to profiting from trade, might acquire more wealth through their control of small-scale manufacturing enterprises. In this sense, they could be considered early capitalists, but in its purest form, capitalism is an economic system in which some individuals derive the bulk of their income through their ownership of productive assets such as mines, railroads, banks, and factories. Lacking ownership of these assets (which Marxists and others call “the means of production”), the great majority of the population have had to earn their livelihood by selling their labor to capitalists and receiving a wage or salary in return.

Industrialization greatly expanded this form of economic differentiation. Factories and other industrial enterprises supplanted land as the primary source of wealth and income, while large numbers of people earned their livelihood as employees of capitalist enterprises. Some individuals became members of the capitalist class through their own entrepreneurial efforts, while others did so by investing funds in a firm as a partner or stockholder. In both cases, a fair amount of risk was usually involved; enterprises could fail for many reasons, leaving entrepreneurs and investors in severe financial difficulties. But whether it was through skill, luck, or some combination of both, some industrial capitalists were able to amass wealth that rivaled or exceeded the holdings of the old landed aristocracy.

Closely associated with the rise of capitalism, but distinct from it, was the extension and development of market economies. In considering the significance of market economies, it is well to begin by noting that there are only three fundamental ways of distributing goods and services. The first is through sharing relationships of the sort found in the !Kung San economy and society. Reciprocal sharing arrangements can be practical and effective forms of distribution in small communities with close and recurrent person-to-person interactions that are guided by universally accepted social norms. Economies encompassing thousands or even millions of individuals lack these attributes, and for much of human history, the distribution of goods and services was controlled by those who held positions of power; in other words, they operated within a “command economy.” Command over portions of the economy can be exercised by many different kinds of political actors—tribal chiefs, clan heads, tax collectors, or officials of modern planned economies.

The third mode of distribution, one based on market exchanges, is markedly different because it has no external sources of control or guidance. It is entirely self-regulating, guided by Adam Smith’s famous “invisible hand.”¹⁰ All that a market requires is one set of individuals who supply goods or services and another set who want these goods or services and have the ability to exchange something in return for them. In most cases, these transactions involve the transfer of money, but it is also possible to trade goods and services, a process known as barter.

Although we tend to think of market exchanges as involving the buying and selling of physical commodities, as we have just seen, there also can be

markets for labor, and in fact one of the key social and economic changes brought on by the Industrial Revolution entailed the expansion of labor markets. With the spread of industrial capitalism, relatively fewer workers earned their livelihood as independent artisans or peasant farmers locked into traditional economic arrangements with the owners of the land that they tilled. In the place of these ancient arrangements, an increasing number of workers received a wage in return for the tasks that they performed for their employers.

Wages and Working Conditions in the Industrial Revolution

Any discussion of labor markets and wage labor leads us to the inevitable question: did workers as a whole benefit from the spread of industrial capitalism? One important part of this question centers on workers' wages, an issue that has drawn opposing responses that often reflect particular political stances. Scholars influenced by Karl Marx have seen capitalism as an inherently exploitative system, one in which capitalist profits are extracted from the productive efforts of workers, whose low wages do not fairly compensate them for the work that they perform. Others have taken the opposite position, arguing that capitalist industrialization, although uneven in its consequences, brought about a rise in incomes and living standards for the bulk of the working population.

Resolving this debate through a precise reckoning of industrialization's effects on its workers is a difficult task, one that has been marked by considerable controversy from the 19th century onwards.¹¹ Regional variations, substantial differences between industrial sectors and between different *categories of workers*, varying levels of employment and unemployment, fluctuating prices for consumer goods, and a lack of comprehensive statistics on employment and prices all affect the ability of economic historians to precisely determine how the Industrial Revolution affected the material standards of living of the industrial workforce. As a starting point in evaluating the overall effects of the Industrial Revolution on workers' lives, it is important to remember that preindustrial life and labor were marked by poverty, periodic unemployment, physically exhausting work, and short life spans. The great majority of the population earned a living through agriculture, and rural life was anything but a bucolic idyll. Work had to be done in all kinds of weather for meager rewards. Many European countries experienced periodic crop failures, and widespread hunger and malnutrition were widespread even in places not marked by chronic famines. Unemployment also was endemic; according to one estimate, half of the population of the English countryside prior to the Industrial Revolution were paupers with limited opportunities for full-time employment.¹²

Under these circumstances, industrialization created at least the potential for higher incomes and elevated living standards. Although per capita income in Britain grew at a slow pace during the early phase of industrialization, it still doubled over a fifty-year span.¹³ Not all of this gain was shared equally, of course. Workers on average benefited from higher wages after about 1820, but income inequality also increased until the late 1860s.¹⁴ Not only did the income gap separating members of the working class from the middle and upper classes widen, the same thing happened with the remuneration of workers at the higher and lower reaches of the income scale.¹⁵

Although the benefits of industrialization were spread unevenly, for many workers, factory labor was the preferred alternative to traditional ways of making a living. Wages were appallingly low by today's standards, but industrialization also resulted in falling prices for manufactured goods, which meant an increase in real wages and higher levels of consumption. In addition to acquiring a few manufactured items, the typical industrial worker enjoyed a better diet. Higher nutritional standards and other improvements in material existence were reflected in demographic trends. Between the years 1780 and 1860, the British population "increased to an astonishing and unprecedented degree."¹⁶ Much of that growth was the result of longer life spans and increases in fertility, a fair portion of which may be attributed to higher material standards of living. Despite crowding, poor sanitation, and excellent conditions for the spread of epidemic diseases, mortality rates even improved in the cities.¹⁷

While monetary incomes generally trended upwards, industrial working conditions often were barely tolerable. Many writers have invoked William Blake's "dark, satanic mills" when describing factory life during the early phases of the Industrial Revolution, and in some ways, it is an apt description. Long working days and weeks were the norm, and operatives usually had to remain at their workstations at all times, except for brief breaks for meals. Work was for the most part monotonous and physically demanding in the extreme, and industrial accidents were a frequent occurrence. Work and the people who performed it were strictly governed by foremen, who had direct responsibility for hiring and firing workers, as well as determining their rate of pay. Management practices were anything but subtle, as foremen made abundant use of profanity, threats, and physical abuse.¹⁸ It also was a time when children were an important part of the labor force in many industries. Children as young as six were put to work oiling machines, replacing bobbins on spinning machines, and, in some extreme cases, pulling mine carts hundreds of feet below ground.

The abuses associated with the Industrial Revolution are undeniable, but not all of them can be attributed to industrialization or capitalist exploitation. Life was also being transformed by rapid urbanization. To take one important example, from 1760 to 1830, Manchester, a center of early industrialized textile production, grew more than tenfold, from 17,000 to

180,000.¹⁹ Many of the hardships of the era were the result of severely overcrowded living conditions and an appalling lack of sanitation. Laissez-faire theories of governance prevailed, resulting in an unwillingness to address the strains brought on by rapid urbanization. Municipal governments were slow to deal with smoke and other sources of air pollution, unpaved streets, and massive quantities of sewage and refuse. Polluted water supplies were sources of epidemic diseases, and parks and open spaces were rare. Making matters worse were antiquated laws in some municipalities that assessed property taxes based on the number of windows in a building, adding interior gloom to skies polluted by smoke and soot emissions.

Assessing the mixture of material progress and misery brought on by the Industrial Revolution is a difficult task; equally problematic is the effort to determine the effects of early industrialization on the working lives of early factory operatives. Factory work entailed a more regimented pace of work than farm work or traditional artisanal activities, and for some critics of the early industrialization, this along with rapid urbanization and other far-reaching social changes may have caused more distress than long hours and low wages.²⁰ But much of this is necessarily speculation, tinged with our tendency to project our own expectations onto people living in a different era. Not only is there a lack of solid evidence regarding how people felt about their working lives, even if there were, it would have to be compared with similar assessments of rural laborers and artisans, which are almost completely nonexistent. Even so, our inability to precisely assess the psychological consequences for workers during the Industrial Revolution does not mean that the topic should be abandoned altogether, and we will return to the issue of worker alienation, morale, and job satisfaction in subsequent chapters.

Women in the Industrial Revolution

One of the striking social changes that accompanied the Industrial Revolution was a significant movement of women into paid employment. This was not the same thing as an increase in the number of "working women." Women have always worked, but much of their work was performed in a household setting and was not done for a cash wage or salary. The Industrial Revolution gave women new wage-earning opportunities, especially in the textile industry. In some enterprises, as was the case with the early New England textile industry, the majority of the workforce was made up of young, unmarried women.

The owners of many of these enterprises exhibited a paternalistic attitude regarding their employees. Young women workers were housed in company dormitories where they were closely supervised but also were provided with company-sponsored cultural activities such as lectures, plays, and musical performances.²¹

Whether or not women benefited from early industrialization is a debatable point. Employers certainly profited from women's work, as their employment drove down the cost of labor.²² The low wages of women factory workers were often justified on the grounds that these workers were members of families headed by higher earning men, so they did not have to depend on these wages for their subsistence.²³ Lower wages paid to women also reflected a gender-based division of labor that confined women to tasks that required less skill than the work done by men. Occupational segregation of this sort had much less to do with the inherent abilities of men and women than it did with male workers appropriating jobs that involved working with advanced equipment, leaving women to work with older, less productive technologies.²⁴

Industrialization created new opportunities for women, but it also reflected and even reinforced gender-based divisions of labor. Paid employment gave women the potential for greater independence, a situation that was not always welcomed by the heads of their families or by contemporary social commentators.²⁵ And in most cases, whatever freedom women workers gained was short-lived; it has been estimated that half of them had married and left factory work by their mid-twenties.²⁶

In assessing the effects of the Industrial Revolution on women's work, it also has to be kept in mind that early industrialization did not create large numbers of jobs for women. Household-based manufacture remained an important part of the national economy, where it continued to employ large

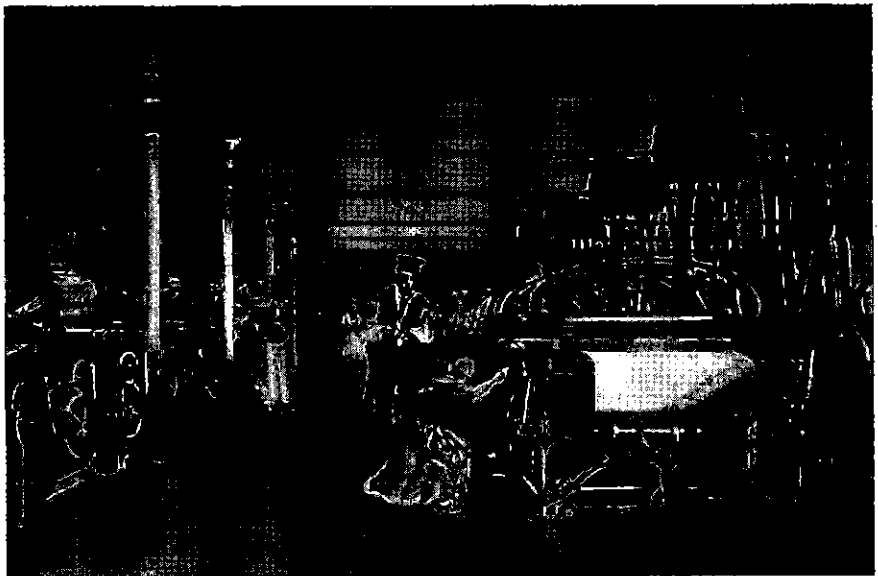


Photo 2.1 Power loom weaving of cotton cloth in a textile mill, 1834

SOURCE: The Granger Collection, New York.

numbers of women for the production of textiles and clothing.²⁷ And despite the growth of the mechanized textile industry and other industrial enterprises, far more women continued to be employed as domestic servants than worked as factory operatives. This in fact is an important clue regarding the willingness of women factory workers to put up with long hours and low wages: difficult and poorly paying though it was, many women preferred factory work to working as servants, which usually entailed subservience, submission to the whims of capricious masters, forced politeness, and even longer working hours.

Industrialization and Social Protest

One important consequence of the Industrial Revolution was the emergence of a distinct industrial working class.²⁸ Forged amid the hardships and dislocations of the era, working-class consciousness at times was manifested in organized social protest. One of the most prominent examples of worker militancy was the wave of machine smashing that took place in the early 1800s. This action was given the name “Luddism,” which, according to one interpretation, took the name of Ned Ludlum, an apprentice who answered a foreman’s reprimand by smashing the machine he operated.²⁹ Luddite attacks are often portrayed as attempts to prevent the spread of labor-replacing machines, but machine breaking also was an extreme example of collective protest against low wages and poor working conditions.

The Luddite movement was eventually put down through the deployment of large numbers of soldiers and the execution, imprisonment, and exile to Australian penal colonies of the movement’s members and their leaders. Luddite protests were also dampened by the emergence of large industrial enterprises, which made it easier to unionize workers who could pursue their goals through less violent means. In some ways, however, the Luddite spirit was never completely extinguished, and as later chapters will indicate, concerns over deleterious consequences of technological advance are still very much with us.

Making Management “Scientific”

The Luddite movement and other militant actions by workers underscored the fact that the Industrial Revolution had created two new socioeconomic classes, factory workers and their employers. This division was at the core of Karl Marx’s conceptualization of modern society, but one did not have to be a Marxist to recognize that conflicts between workers and their bosses seemed to be an inherent part of the social order. In today’s terminology, the industrial economy and society was seen by many as a zero-sum game. That is, the gains of some individuals or groups were matched by the losses of



Photo 2.2 English workers and Luddites smash looms in a factory during the riots of 1811–1816

SOURCE: The Granger Collection, New York.

other individuals or groups. This idea is an integral part of Marxist economics because profit comes from the extraction of “surplus value.” As Marx saw it, workers’ wages represented only a portion of the economic value that their labors had created; the rest was appropriated as profits by the capitalists who owned the factories they worked in.

Later chapters will cover worker remuneration today. For now, we will shift our attention to Frederick W. Taylor, whose ideas and practices stood in sharp contrast to Marx and others who viewed the industrial economy in zero-sum terms. Taylor was the scion of a well-to-do Philadelphia Quaker family who, after a health crisis while he was in college, went to work in a steel mill. Through a combination of work experience and self-study, he became a renowned engineer. He did pioneering work in the development of high-speed tools for cutting and shaping metal, and he created detailed charts to help machinists select procedures aimed at *maximizing* efficiency as they went about their tasks.

The industrial environment in which Taylor worked was a turbulent one; hostility between labor and management was often intense, as reflected in

strikes that sometimes turned violent, industrial sabotage, or simply the tendency of workers to do as little as possible while on the job, a behavior that Taylor called "systematic soldiering." All of this could be avoided, thought Taylor, if both workers and employers adopted production methods that substantially improved productivity. In that way, both groups could each get a big slice of a large pie instead of endlessly arguing about how to cut up a small one.

Taylor had already shown how the application of scientific principles had increased production and productivity in machine shops. It seemed reasonable, then, that the use of these principles could effect improvements in worker output in general. The key research method employed by Taylor and his associates centered on "time-and-motion studies." These consisted of carefully observing the actions of workers, breaking them down into their basic constituents, and using a stopwatch to precisely time each action. Through these observations and measurements, Taylor determined that workers went about their jobs in a highly inefficient manner, which limited their output and ultimately the wages that they received. It was therefore necessary for Taylor's experts, many of whom had a background in engineering, to determine the optimal way that they went about their work. Every action was strictly programmed, even the timing and duration of rest breaks.

Some of the flavor of Taylor's approach can be sampled in a dialogue that Taylor presented in his influential book, *The Principles of Scientific Management*. In it, Taylor presents a dialogue in which he first asks "Schmidt," an unskilled worker, if he is a "high-priced man," that is, if he is worth \$1.85 a day instead of the \$1.15 he is currently earning. When Schmidt answers in the affirmative, Taylor responds,

"●f course you want \$1.85 a day—every one wants it. You know perfectly well that that has very little to do with your being a high-priced man. For goodness' sake answer my questions, and don't waste any more of my time. Now come over here. You see that pile of pig iron?"

"Yes"

"You see that car"

"Yes."

"Well, if you are a high-priced man, you will load that pig iron on that car to-morrow for \$1.85. Now do wake up and answer my question. Tell me whether you are a high-priced man or not."

"Vell—did I got \$1.85 for loading dot pig iron on dot car tomorrow?"

"Yes, of course you do, and you get \$1.85 for loading a pile like that every day right through the year. That is what a high-priced man does, and you know it just as well as I do."

"Vell, dot's all right. I could load dot pig iron on the car to-morrow for \$1.85, and I get it every day, don't I?"

“Certainly you do—certainly you do.”

“Vell, den, I vas a high-priced man.”

“Now, hold on, hold on. You know just as well as I do that a high-priced man has to do exactly as he’s told from morning to night. You have seen this man before, haven’t you?”

“No, I never saw him.”

“Well, if you are a high-priced man, you will do exactly as this man tells you to-morrow, from morning till night. When he tells you to pick up a pig and walk, you pick it up, and you walk, and when he tells you to sit down and rest, you sit down. You do that right straight through the day. And what’s more, no back talk. Do you understand that? When this man tells you to walk, you walk; when he tells you to sit down, you sit down, and you don’t talk back at him. No you come on to work here to-morrow and I’ll know whether you are really a high-priced man or not.”³⁰

According to Taylor, this condescending conversation had its intended effect. Expertly guided by one of Taylor’s associates, Schmidt went from carrying 12½ tons of pig iron a day to 47½ tons, and he received his promised \$1.85 daily wage. Accomplishments such as these, Taylor claimed, could be used to increase productivity and output in many other industries. Even more generally, the principles of Scientific Management could be “applied with equal force to all social activities: to the management of our homes; the management of our farms; the management of the business of our tradesmen large and small; of our churches; of our philanthropic organizations, our universities; and our governmental departments.”³¹

Scientific Management was a potent intellectual force during the late 19th and early 20th centuries. Even in the newly founded Soviet Union, no less a personage than Vladimir Lenin expressed the belief that “the possibility of building Socialism will be determined precisely by our success in combining Soviet government and the Soviet organization of administration with the modern achievements of capitalism. We must organize in Russia the study and teaching of the Taylor System and systematically try it out and adopt it to our purposes.”³²

As things turned out, Scientific Management did not meet expectations in the Soviet Union, the United States, or anywhere else. Part of the problem lay in the nature of the work to be done. Time-and-motion studies were reasonably easy to conduct for simple operations such as loading pig iron into a railroad car, but much more difficult when the tasks were more complex and variable. Even more important was the resistance Scientific Management engendered in the workplace. Most workers were understandably hostile to a managerial practice that strictly controlled all of their activities. The promise of higher wages did not mitigate their hostility, for they feared—often with considerable justification—that improved productivity would cause management to adjust piece rates downward, leaving them no

better off financially than before. Traditional managers were no less hostile to Scientific Management because they were unwilling to share or even give up their authority to Taylor's expert minions.³³ Most foremen and other lower-level managers had come up from the ranks, and they were not eager to cede their territory to college-educated twenty-somethings armed with stopwatches and clipboards.

The Assembly Line

Opposition from both workers and management resulted in Scientific Management being of more theoretical than practical significance. Far more important in changing the nature of industrial work were advances in manufacturing technologies. Whereas Taylor was concerned with getting workers to perform their tasks at peak levels of efficiency, others wanted to eliminate human labor altogether or, when that was not possible, to keep it under tight control.

The most significant of these new manufacturing technologies was the assembly line. Assembly lines are based on the idea that industrial operations can be performed more efficiently when workers stay in one place while the work comes to them. During the second half of the 19th century, several industries such as biscuit making and food canning began to use this technique. Perhaps the most notable example was found in an industry that employed a kind of "disassembly line": meatpacking in the American Midwest. A carcass was hung from an overhead conveyor, and as it moved down the line, workers would perform all the operations necessary for converting a recently slaughtered animal into particular cuts of meat and other products. Some workers removed sections of the hide, other workers cut off various body parts, and others extracted the internal organs, so not much was left by the time the carcass literally reached the end of the line.

One industrialist who said he took his inspiration from this procedure was Henry Ford. A pioneer manufacturer of automobiles, Ford was determined to cut production costs to the point where automobiles would be in the financial reach of what he called "the great multitude." In part, he was able to achieve this goal by engineering a car, the legendary Model T, to be light and simple yet durable, reliable, and capable of carrying four passengers at a reasonable rate of speed (35 mph) over the miserable roads of the time. But he also was determined to make manufacturing more efficient. In part, this was realized by making components to precise standards so that they could be immediately put in place with no need for filing, scraping, or reaming. The Model T's basic design also remained largely unchanged from year to year so that the costs of retooling could be kept low. But Ford's key cost-cutting innovation was the assembly line. In 1913, Ford and his associates laid out a line for the assembly of a part of the magneto, the electrical component that energizes the spark that ignites the air-fuel mixture in the

engine's combustion chamber. The first assembly line did not use a moving conveyor; the magneto part was simply slid along rails from one workstation to another. Even so, the improvement was substantial; under the old procedure, one worker could do the complete operation in eighteen minutes. After the process had been subdivided into a number of simple operations, only thirteen man-minutes were required, and after a moving line was installed, the figure had fallen to five minutes.³⁴ So successful was this experiment that within a year, the whole car was being put together on an assembly line. The time required to produce an engine was cut in two, from twelve hours to six, while the time to assemble a chassis went from twelve and a half hours to one hour, thirty-three minutes.³⁵ Many refinements of assembly-line production ensued, and by the early 1920s, productivity gains had pushed the price of a new Model T runabout down to \$290, and half the cars on America's roads were Ford "flivvers."

While it promoted economical and efficient manufacturing, the assembly line extracted a severe toll on the workers who manned it. The pace of work was relentless, the monotony of doing the same operation over and over was deadening, and noise was pervasive. It was all too much for most workers, as was reflected in a turnover rate of 370 percent in 1913. So bad were working conditions at Ford that 71 percent of new hires quit after fewer than five days on the job. Employee turnover of this magnitude took its toll on the bottom line; although much of the work had low skill requirements, Ford still incurred substantial costs in hiring, deploying, and training new workers.

Ford's response was not to make assembly operations less physically and psychologically taxing but to make the work sufficiently rewarding financially

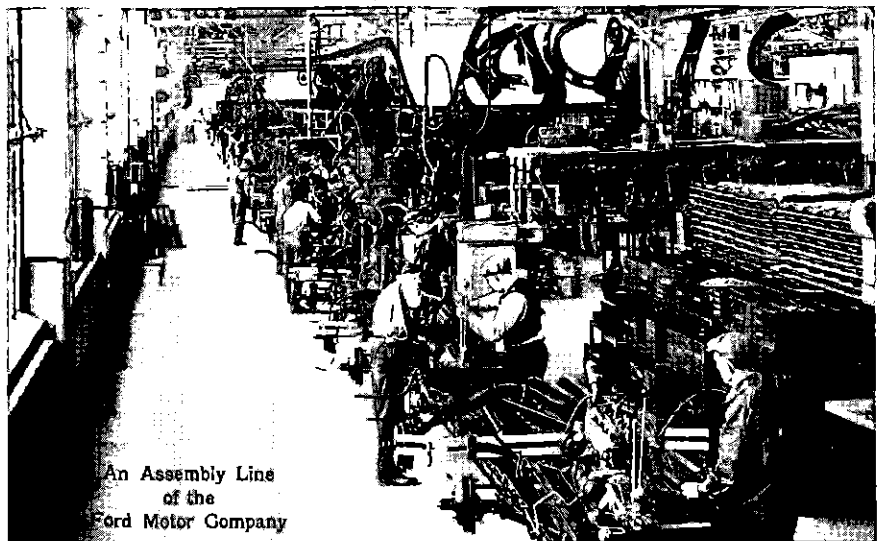


Photo 2.3 Postcard of Ford Motor Company's River Rouge plant

SOURCE: ©Rykoff Collection/CORBIS.

that the workers would put up with just about anything. In 1914, Ford announced his intention to pay his workers at the rate of \$5 a day, a stupendous sum at the time, about double the going rate for unskilled manufacturing labor. The \$5 a day wage had its intended results; prospective workers poured into the Ford manufacturing complex in Dearborn, and once hired, the majority stayed on the job. As an added bonus, Henry Ford was hailed as a great benefactor of American workers. As subsequent events would show, however, this reputation would fall wide of the mark as wages fell relative to the cost of living, and Ford showed himself to be an implacable foe of unionization.

In some respects, the productive innovations that culminated with the assembly line represented a continuation of a long historical process. From the 18th century onward, industrial operations had been accompanied by the modes of work that were faster paced, more rigidly controlled, and more divorced from other aspects of life than had been the case with traditional farming and artisan work. Yet for many contemporary observers, oppressive working conditions in industry were the inevitable consequence of mechanized production. Even Friedrich Engels, a staunch supporter of working men and women and the coauthor with Karl Marx of *The Communist Manifesto*, argued that tight discipline and strict managerial authority were essential elements of industrial production, no matter who the owners might be:

If man, by dint of his knowledge and inventive genius has subdued the forces of nature, the latter avenge themselves upon him by subjecting him, in so far as he employs them, to a veritable despotism independent of all social organization. Wanting to abolish authority in large-scale industry is tantamount to wanting to abolish industry itself, to destroy the power loom in order to return to the spinning wheel.³⁶

Engels's views can be characterized as a version of technological determinism, the belief that technology acts as an independent source of social change and resultant economic structures. It is a belief that has fallen out of favor with historians and sociologists, but there can be no denying that the kinds of technologies used on the job will have a significant influence over the way work is done, how it is organized, and the working lives of the people who use it. The Industrial Revolution was the scene of fundamental changes in technology, work organization, remuneration, and working conditions. We will return to these interrelated topics in some of the pages to come.

A Postindustrial Revolution?

The key technologies in the opening phase of the Industrial Revolution were water and steam power; machinery for carding, spinning and weaving; rail

and canal transportation; and innovative processes for the large-scale production of iron and steel. Toward the end of the 19th century, a new set of technologies began to propel what has been described as the Second Industrial Revolution. Again, the ability to make use of new sources of energy was crucial. The internal combustion engine invented in Germany by Nicolaus Otto in 1876 began to compete with the steam engine as a more compact and efficient source of industrial power before it became the standard automotive powerplant. Of even greater importance to industry was the use of electricity to power a variety of industrial processes. In addition to serving as a new source of power, electricity allowed the layout of factories to be more flexible and efficient because individual machines could be run by their own electric motor, obviating the need for complex power transmission systems that were difficult to change once they were in place. When complemented by new ways of organizing and scheduling work, such as the assembly line, the result was a massive increase in productivity, whether reckoned in terms of output per worker or output per unit of capital. By the early 20th century, the first and second industrial revolutions had transformed the economies of many nations and fundamentally changed the nature of employment and work. At the same time, advancing productivity provided the underpinnings for levels of material prosperity that would have been inconceivable a century ago.

But nothing in modern economic life stands still for long. While industrialization was changing the economic and social landscape during the 19th and 20th centuries, another revolution was under way, one that continues to this day. To understand the nature of this revolution, we need to go back to preindustrial times, when agriculture was the dominant means of making a living, typically employing more than half of the workforce. The primacy of agriculture as a source of employment began to diminish as industrialization created large numbers of new jobs outside the farm sector. In addition to *shrinking* in relative terms, the agricultural workforce also declined in absolute terms as mechanization and other technological advances eliminated the need for a great amount of human labor. All of these changes took place amid population increases that, had it not been for industrialization, would have produced even more unemployment than is usually found in agrarian societies.

During the early years of the Industrial Revolution in Britain, rising farm output kept up with population growth, although food supplies were squeezed as a result of the war with France that occupied the early years of the 19th century.³⁷ Over the long run, industrialization pushed agricultural production to much greater heights as chemical fertilizers, pesticides, herbicides, irrigation pumps, and farm machinery greatly expanded crop yields on existing acreage. These technologies also eliminated the need for a great deal of farm labor, so that by the middle of the 20th century, many developed countries were able to feed large and growing populations and even export substantial surpluses, even as the number of farmers and other agricultural workers had dropped to fewer than 5 percent of the total workforce.

The same pattern eventually emerged in the industrial sector. Improved manufacturing processes, along with the new sources of energy to power them, steadily boosted worker productivity. Where a single preindustrial artisan may have been able to produce a few shoes, ceramic pots, or bolts of cloth a week, the technological and organizational changes associated with industrialization increased output per worker many times over. Higher levels of productivity allowed people to obtain vast quantities of material possessions, but consumer spending didn't stop there. In addition to acquiring cars, domestic appliances, clothing, sporting goods, and all of the other products of industry, people were devoting increasing shares of their incomes to services.

Sometimes referred to as the "tertiary sector" (agriculture and raw materials extraction comprise the "primary" sector, and manufacturing occupies the "secondary" sector), the service sector encompasses an enormous variety of activities and occupations. Service sector outputs have been facetiously referred to as "anything that you can't drop on your toe" because they are not tangible products like a bushel of wheat or a DVD player. Included within the service sector are medical care, education, transportation, entertainment, government, and a lot more. A service sector "product" can be something as simple and inexpensive as a haircut or as complex and costly as a medical school education.

The relative decline of manufacturing and the growth of the service sector in a modern economy can be seen in changing employment statistics. In 1950, manufacturing, construction, agriculture, and raw materials extraction employed 20,512,000 workers in the United States, while 28,215,000 men and women were employed in transportation, trade, finance, education, health care, and other services. By 1998, after the addition of 70,790,000 workers, the manufacturing sector figures were 27,140,000 and 93,853,000, respectively.³⁸ In the 1950s, the United States had the world's most advanced manufacturing sector, but it was already giving way to the service sector as far as employment was concerned. The number of manufacturing jobs did not drop in absolute terms, but it fell sharply relative to service occupations. In 2003, the manufacturing sector accounted for only 591,000 more jobs than in 1950, while during the same span of time, the service sector added more than 80 million positions.³⁹ Even these figures underestimate the importance of the service sector because many workers included in the manufacturing sector are actually supplying a service of some sort. For example, an attorney or an accountant employed by General Motors is counted as a manufacturing employee, even though he or she has nothing to do with the actual manufacture of cars.

The reasons for the relative decline of employment in the primary and secondary sectors can be largely attributed to two factors: productivity improvements and the economic changes that go under the term *globalization*. Technological advance has been the main force propelling productivity improvements, but also contributing have been higher worker skills, more effective organization and management, and a better educated workforce. The role of globalization in altering the structure of the economy and the jobs it provides is complex and will be covered in the next chapter.

In aggregate, the erosion of jobs in the manufacturing sector has been more than offset by increased numbers of jobs in the service sector. But aggregate changes are not always reflected in the fates of individual workers, and while many displaced manufacturing workers have found work in one of the service occupations, limitations of training and skills have prevented many of them from moving into well-paying segments of this sector. Today, matching workers to the needs of a changing economy is a serious economic and social problem, one that will be revisited on several occasions in the chapters to come.

As we have seen in this and in the preceding chapter, working lives have undergone enormous changes from Paleolithic times to today's postindustrial society. Still, some basic continuities remain. Gender and other ascribed statuses continue to be strong influences on the occupations that people assume. Technological change remains a major force shaping the evolution of work and occupations, but it does not occur in an economic and political vacuum. Economic divisions along with conflicts between workers and management are intertwined with the choice and application of technologies and many other aspects of work as well. On a personal level, we still find ourselves wondering how our work fits into the totality of our lives. These and many other topics will be explored in the following chapters, but first we need to take a closer look at two of the main forces affecting work today, globalization and technological change.

For Discussion

1. One of the key features of industrialization has been the increasing size of productive enterprises. Could a multitude of small enterprises have produced the same results? Would such a pattern of industrialization have resulted in better working environments with no loss of efficiency?
2. Many poor countries have embraced industrialization as the primary way to elevate living standards. Are they correct in this belief? Are there any other ways to pursue economic development other than through industrialization?
3. Karl Marx believed there was an inherent and irreconcilable conflict between capital and labor, whereas Frederick W. Taylor held to the opposite belief. With which side are you inclined to agree? Has contemporary capitalism changed to such a degree that the perspectives of both Marx and Taylor are no longer relevant?
4. Does there seem to be anything "unnatural" about an economy where the great majority of workers are not directly engaged in the making of a tangible product? Is an economy strongly oriented to the provision of services sustainable over a long period of time?

Notes

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