Changing Technology: Helping to Ease the Transition

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I. Introduction

Since the early days of the Industrial Revolution man has been developing new methods of production and new goods to be produced. As the technology used in the different processes of production has changed, the skills needed to produce these goods have also changed. For example, literacy was once confined to a small percentage of the population, but production developments eventually required a workforce that was able to read and write. This was one factor leading to the development of free primary education.

In the future, as high technology becomes ever more widely adopted (as most experts predict it will), the necessary inventory of skills that a worker will have to possess will change dramatically. The consequent implications of technology on the labor market, and on the economy in general, are worrisome. Some experts predict that almost 45 million of the existing jobs in the economy (out of a total of nearly 100 million) could be adversely affected by automation in the factory and the workplace. Much of this impact would occur between now and the year 2000 ("Changing 45 Million Jobs," p. 64).

When discussing the impact of automation and technological change on the level of employment, it is important to note that there are two aspects to consider: the rate of development of technology and the rate of adoption of new technology. In examining the effects of technology on employment the rate of adoption is the key; for it determines whether changes in requirements for different types of labor affect primarily existing or future employees.

Changes in the processes of production which utilize new technology, as opposed to changes in the products produced, are also more likely to adversely affect employment. New processes are adopted because they are seen as being more efficient, using fewer resources than the old process in order to produce the same quantity of output. When the conserved resource is labor (as it most often is in a labor-intensive industry), the firm will re-
quiere fewer employees for the same level of output. If the manufacturer faces a mature market for its final product, then overall employment must fall.

In this paper I examine some of the many implications of changing technology. In particular, I consider the potential mismatches between the skills of workers and the skills needed to fill the job openings in the factories of tomorrow. Also, I look at the negative effects brought about by the spread of technology to third world nations on American industries. Finally, I outline some policies which business and government could adopt to lessen the employment effects associated with technological change.

II. Technology, Foreign Competition, and Unemployment

Although the problem of unemployment existed long before recent technological innovations, a new dimension to unemployment has been added by the demands placed upon workers in the “high-tech” economy. As a report by the Office of Technology Assessment states, “Programmable automation is not likely to generate significant net national unemployment in the near term, but its use may exacerbate regional unemployment problems, especially in the East Coast and Middle Atlantic areas where metalworking industries are concentrated” ("Automation and the Workplace," p. 12).

Some of the effects of technology on the labor market result from the transfer of existing technology abroad. For many years the industries of the Western nations, such as European and American steel and American automotive and electronics, held a virtual monopoly over much of the technological know-how and resources of production in their industries. Over the last few decades, however, due to the spread of basic technology to emerging nations, this has ceased to be the case.

The post-World War II period has seen the spread of production techniques to foreign nations which have consequently built up considerable industrial capacity and have entered into competition with virtually all of the older Western industrialized nations. Countries such as Korea, Taiwan, Japan, and Mexico have all entered the market with goods that once had been supplied mainly by American firms. And these countries have often been able to produce products at prices considerably lower than those of American producers. One very recent example of this is the Yugoslavian made automobile, the Yugo, which sells for $3,990 and is now being introduced to American markets.

The lower prices of foreign goods can be attributed to a number of factors. The factories that produce these commodities are, for the most part, more modern than the average American factory and can take advantage of newer, more efficient technology. Perhaps even more important (especially for labor intensive industries such as textiles, clothing and electrical goods) is the wage differential between the foreign worker and the American worker. Due to the higher U.S. standard of living and because of the presence of strong unions in many of the traditional industries, the American worker receives a much higher wage than does his foreign counterpart. A steelworker in Korea is paid less than half the wage received by an American steelworker. The autoworkers building the Yugo receive an average monthly wage of only one hundred dollars (Automotive News, p. 39).

Some of these U.S. industries have in recent years awakened to the realization that their economic viability may be in jeopardy. In an attempt to regain their competitive edge over foreign producers, many domestic producers have undertaken programs to update the techniques of production to take advantage of newer and more efficient technology, while trying at the same time to reduce the number of workers needed to produce the same quantity of goods.

A. Automation and Employment

Automation in the workplace will have serious effects on the number employed in affected industries. "Automation will cause a 20 to 25 percent decline in the factory workforce over the next decade," says Thomas G. Gunn, managing director of Arthur D. Little's
computer-integrated manufacturing group ("The Factory of the Future," p. 69). One internal study performed by General Electric states that it is now economically feasible for the company to replace half of its 37,000 assembly workers with machines ("The Factory of the Future," p. 69).

According to industry representatives, approximately 1.7 jobs are lost for every new robot introduced to the automobile factory ("Automation and the Workplace," p. 13). The United Automobile, Aerospace and Agricultural Implement Workers of America (the UAW), one of the few unions that attempts to anticipate the effects of automation, expects its membership to drop to 800,000 by 1990 (compared to its 1978 level of one million), even assuming a 1.8% annual increase in domestic automobile sales ("Changing 45 Million Jobs," p. 65). Harvey L. Poppel, a senior vice president with Booz, Allen and Hamilton, Inc., predicts that 38 million of the more than 50 million existing white collar jobs will eventually be affected by automation ("Changing 45 Million Jobs," p. 65). Paul A. Strassman, vice president of strategic planning for Xerox Corporation's Information Products group, estimates that 20 to 30 million of these jobs will be affected by as early as 1990 ("Changing 45 Million Jobs," p. 66). What these figures imply is that there will be a large number of employed whose jobs are changed, if not eliminated, due to the introduction of automation in the factory.

B. Plant Closings

In the process of updating the techniques of production, many firms have totally scrapped some existing facilities. Plant closings in the past two decades have become a common occurrence in such industries as steel, textile, and automobile manufacturing.

In the United States there has traditionally been less than six months of advance notice given in cases of impending plant closures. In a small number of extreme cases, workers have received no more than one week of advance notice. The absence of an adequate period of advance notice makes it difficult to efficiently register the newly released workers for unemployment insurance, let alone give the state, local government, or union the time to try to develop a comprehensive plan to minimize the shock on the worker or the community.

Once a worker has been laid off or dismissed due to contraction of the workforce or an outright closing, there exists little or no support from the previous employer in the search for a new job. The worker is literally "out in the cold," with only his severance pay, unemployment benefits, and often—in the case of those with outdated skills and insufficient resources to acquire new skills—very little chance of finding a decent job. A study of Ford workers in Mahwah, New Jersey performed by Cornell University revealed that 18 months after the plant closing, 56% of those affected were still unemployed (Batt, p. 8).

C. Health and the Unemployed

The impact of plant closings on the unemployed consists of far more than just economic hardship. Numerous studies have revealed that unemployment is an extremely stressful state for most workers (Fottler and Schuler, p. 10). Although unemployment insurance and other pecuniary benefits to the unemployed have helped to reduce the economic problems involved, sociologists have become more aware of the non-economic effects brought about by work deprivation and unemployment. Those who have been hit by layoff or termination often show signs of bitterness, anger, shock and disappointment. Along with the decrease in their standard of living, those affected reveal signs of the classic symptoms of stress-related illness: distrust, pessimism, and psychological depression. These problems are in turn associated with family problems, including divorce, child abuse, and an increase in the suicide rate (Fottler and Schuler, p. 10). As Sherri Hall, a public administrator in Rockford, Illinois, told the Washington Post of her experiences with the jobless looking for work, "We are having repeated cases of men—women, too, but especially men—breaking down in the intake center, crying or swearing, because they have
Statistics compiled for the state of Michigan showed that during the period of high unemployment between 1979 and 1980, child abuse increased 37 percent, substance abuse 10 percent, and suicide 27 percent (Fottler and Schuler, p. 10). It seems reasonable to assume that such increases were not limited to Michigan alone. When people were asked to rate the degree of stress which was associated with various events in life, job loss was rated forty-seven points on a scale of one hundred, placing the stress induced by job loss below the death of a close relative but above most other events in life (Fottler and Schuler, p. 10).

A study performed by Cobb and Kasl detected linkages between job loss, psychological conditions, and physiological conditions (Fottler and Schuler, p. 10). When compared to a control group, the one hundred men included in the two-year study showed higher blood pressure readings during the period prior to, during, and immediately after the period of unemployment. As stable employment was found, the blood pressure of the participants fell to a normal level. Problems with cholesterol, diabetes, peptic ulcers, gout, and heart attacks followed similar patterns. The results of this research show that the costs of unemployment are physical, as well as psychological and economic.

III. New Jobs and Opportunities

Having discussed some of the negative impacts of technology, such as an increase in plant closings, layoffs, and the related physical and psychological effects of such occurrences, it is time to consider some of the positive aspects of technological change and innovation. Although technology is having a negative effect on employment in many industries, at the same time it is creating jobs in other industries. In 1980 it was estimated that there were 10,000 workers involved in the robotics industry in one form or another ("Automation and the Workplace," p. 15). That figure included everyone from the assembly line worker to the designer, engineer, company president, clerical help, and all of the support people needed in a developing industry. In 1960, by way of contrast, employment in the robotics industry was negligible.

It has been estimated that the ten fastest growing occupations will generate nearly one million new jobs over the next fifteen years (Bureau of National Affairs, p. 50). Many of these positions will involve the production, sale, use, or repair of computers. Jobs in the fastest growing occupation, that of computer service technician, are expected to increase by 97% over this period, a figure which translates to 53,000 new positions (Bureau of National Affairs, p. 50).

Although there are new jobs opening in the economy as a result of new technology, many individuals who have been displaced from old jobs are finding that they are unable to fill these positions. Skills that were once highly regarded in the old production environment have become obsolete vis-a-vis the skills needed to exist in a high-tech environment.

Changes in the composition of job opportunities have the potential, of course, to cause serious social damage. History shows that change does not always occur smoothly. Employment expansion in growing industries or regions may not offset in the short run (or even in the long run) the losses of employment in contracting industries and regions. As a result, large scale structural imbalances in the supply and demand for labor may be created.

There are at least two dimensions to the contraction and expansion of employment referred to above: a temporal one and a spatial one. The temporal dimension refers to the fact that the appearance of new job opportunities may not keep pace with the disappearance of other job opportunities. The spatial dimension pertains to the possibility that the destruction and creation of employment may not occur in the same region, leaving large imbalances in the supply and demand for labor. Such uneven development is more likely to occur if the displacement process emerges rapidly or abruptly, as it has in the past.
IV. What Should Be Done?

The studies of the effects of unemployment show that the problems affect many more people than just those who have lost their jobs. The costs of unemployment to society as a whole are enormous when one considers the resultant increase in unemployment benefits paid and the increase in health problems and their related costs. Moreover, the costs to industry may not be limited to the unemployment benefits that must be paid by the employer. For example, the courts have recently become more receptive to damage suits based upon stress related problems. Courts have ruled in at least six states that emotionally ill employees are eligible for compensation for stress associated with employment. In one case, an executive brought a successful suit against his employer, claiming that his heart condition was due to the demands of his position (Fottler and Schuler, p. 10). As of yet, there have not been any court awards for stress problems related to layoffs, but the possibility does exist. Also, even in the case of plants that do not close down completely, worker morale is often reduced to a low level, with the remaining workers living with the constant fear that they may be the next to lose their jobs. And lower morale usually results in lower productivity.

But what are some of the ways which will allow for a smoother transition from the workforce of yesterday to the workforce of tomorrow? One of the keys to easing the transition is through education. As technological innovations become increasingly prevalent in the processes of production, the need for a better educated populace becomes correspondingly stronger. This linkage is not, of course, unprecedented. Formal education was once perceived to be a luxury which few could afford, but changes in workplace operations gradually changed the role of education in the life of the common man.

Manufacturing-related work has also dramatically changed the structures of the organizations and institutions which provide education and training. Two hundred years ago, the new production techniques of the Industrial Revolution required a large force of literate workers capable of functioning on the production line, supervising manufacturing operations, keeping administrative records, and performing various other functions. These requirements helped to give birth to a widespread system of free public education in the United States. More recently, the term "technological literacy" has become common and has been used to denote a basic level of fluency with technology in its various forms going beyond a mere familiarity with the computer. Some experts suggest that literacy in technology will soon be required of all members of the workforce as broader and more extensive applications of information technology are made in offices and plants.

That steps must be taken to ease the transition from the traditional production job to the new production environment is clear. One course of action would be for government, industry, and labor to formulate a set of coordinated policies to move workers out of non-competitive industries and into retraining programs which would provide a better matching of unemployed workers and jobs. It might be noted in this regard that the way in which the United States has traditionally administered its system of unemployment benefits differs dramatically in philosophy from that followed by many other industrialized nations. In the United States the payment of unemployment benefits often serves to keep the person psychologically attached to the employer while waiting for reemployment at the local plant—an outcome which may never materialize. Also, unemployment benefits consist primarily of income support as opposed to assistance in the job search. By way of contrast, in the United Kingdom unemployment compensation is structured so as to sever the employment relationship and encourage the worker to leave an ailing industry and find a new career. Also, in the French system of unemployment compensation, income support is secondary, and the emphasis is placed upon retraining and the search for a new job.

Recently in the United States, the President's Commission on Industrial Competitiveness has suggested a restructuring of unemployment compensation. A subsidized
retraining program through the implementation of a voucher system would be established (Bureau of National Affairs, p. 58). If a worker was unemployed for a period of thirteen weeks, the voucher benefits could be used to subsidize the training expenses incurred by a firm that will hire the unemployed worker. The Commission has also recommended the institution of a program of comprehensive services directed toward putting the displaced worker back into the workforce. The services included would be job search assistance, help in the preparation of cover letters and resumes, counseling as to where the best opportunities exist, training, and even limited relocation assistance.

A coalition of Eastern and Midwestern legislators has also proposed a new financing mechanism that would be available for workers to draw upon in order to pay for their own retraining (Bureau of National Affairs, p. 60). This plan would create a voluntary, self-financing system with funds contributed by both employers and employees. The funds would be used to pay for retraining and relocation expenses for workers who have lost their jobs. The coalition has also proposed changes in the current system of unemployment insurance which would increase the number of unemployed who are obtaining retraining while collecting benefits and would encourage firms to provide for work-sharing or part-time employment instead of wholesale layoffs of employees.

Along with the suggested modifications to the government's unemployment compensation system, industry also might consider restructuring the way in which it grants various benefits to released workers. For example, where severance pay is provided to former employees, it is usually unrelated to assisting the worker in securing alternate employment through relocation or retraining. For example, in the case of a plant closing a worker must, in most cases, remain with a firm up until the point of the actual plant closing if he hopes to receive severance pay. On the other hand, if a worker were to be permitted to leave the firm after the notice of the impending closing but prior to the actual closing yet still remain eligible to collect severance pay, the worker might be encouraged to use this period to enroll in a training program or relocate to an area with a greater potential for employment. Still other ways in which industry could assist in job search for the unemployed would be to establish information networks detailing current job openings (and the necessary skills to fill those openings) and forecasting future demands for workers.

It is obvious that a coordinated policy with the ultimate goal of retraining workers and placing them in new jobs is considerably more desirable than the patchwork of income maintenance programs which has evolved in the United States. U.S. policymakers might take a close look in this regard as to how the Canadian government and Canadian industry aid the unemployed. Canadian law requires advance notification of an impending plant shutdown. This advance notice is intended to provide the time necessary both to plan a course of action and to minimize the impact of the closing. A Canadian Federal agency, the Manpower Consultative Service (MCS), then provides its expert advice to the company, union, and the workers. Operating as a team, the three parties use all of the available resources to find job openings for the workers whose jobs will be lost through the shutdown. The company, through its network of suppliers and customers, tries to find suitable alternative job opportunities. The union helps to determine locations where hiring is actually taking place. The MCS draws upon the job data compiled by the government. Inventories of worker skills, interests, hobbies, and willingness to relocate are then prepared. All in all, Canadian experience has shown that the involvement of the company and the union, with the government providing appropriate technical support, can be more effective than the traditional use of job service offices for the unemployed.

V. Conclusion

As the technology of production spreads to more third world nations, the inability of American industry to compete with cheap sources of labor will become more pronounced and cause additional layoffs and plant closings.
in certain industries. As the United States economy takes advantage of increasing developments in technology, the inability of the displaced worker to find a job in the new production environment will become even more pronounced.

If the displaced worker is to be assisted more effectively in finding a way into the new high-technology based economy, a coordinated policy of retraining, relocation, and job placement must be developed. Industry must cooperate by providing additional advance notice of impending plant closings in order to allow for periods of training and job search. Industry must also provide the training necessary for the unemployed to be able to work in the high-tech economy of the present and the future. Government must use its legislative powers to encourage industry to retrain the worker and to redirect the educational system to provide the background needed to exist in the new economy.

If the problems of technologically related unemployment are as serious as I have stated in this paper, why is it that policies similar to these have not yet been initiated? I believe that one reason is that the current administration is of the belief that less regulation of industry will be beneficial to the economy. Also, the present national budget deficit is causing the government to find ways of cutting back on expenditures, instead of beginning new federally financed programs. Business is also reluctant to support legislation which would lessen its autonomy in decision making. Moreover, the costs involved in the implementation of retraining and job assistance programs may be seen as too high a price for business (especially in declining industries) to bear.

Finally, there is little coordination between labor, business, and government with respect to the long range planning of skill requirements. In fact, the occurrence of coordinated efforts between these groups has rarely been seen in the United States. Instead, it has been our custom to respond to changing skill requirements only when a crisis has already occurred (as when the Soviets launched Sputnik and schools once again began to stress math and science). With respect to the growing imbalance between jobs and skills, I can only hope that government, industry, and labor take the necessary steps to correct the problem before it reaches crisis proportions.

REFERENCES
