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ABSTRACT

Predictions of occupational growth to the year 2000 show how important the "new crafts" are becoming. Workers who possess the new crafts perform jobs that often involve sophisticated technical knowledge but are not done by people with bachelor's degrees. The growth of technical jobs in the middle of organizations threatens the familiar division between managers who hold a store of technical knowledge and workers who carry out their orders. The new technical workers need a different blend of formal education up to an associate's degree level and continuing training at work afterward. Research shows that the new crafts are growing from both above and below. Many tasks done in the past by managers and elite professionals are being handed to technical workers; low-skilled workers who had little autonomy or responsibility in their routine jobs are now analyzing and responding to data. Factors driving the growth of technical jobs are the trend toward larger and more bureaucratic corporations, expansion of science, and technological change. Changes in the workplace present enterprises with huge challenges--to change ideas about the way jobs are organized and managed. Schools face the task of preparing students for jobs that do not fit the old categories of managerial or entry-level work. Workers will have to readjust their attitudes toward education. (YLB)

EQW ISSUES

September 1992

The Challenge: To understand how the growth of technical jobs in the middle of organizations is changing the traditional ways of teaching skills and managing work.

	What does the research tell us?	What do we do about it?
Enterprises	Superior technical knowledge has shaken the traditional hierarchy in which managers know more than their workers.	Stop presuming that managers with college degrees have exclusive claim to superior knowledge and expertise. Find new ways to manage technicians as autonomous teams with exclusive control over a narrow but critical range of skills. Secure better access to technical training.
Schools	Traditional K–12 schools have difficulty preparing students for futures that do not include four years of college.	Link technical education with academically rigorous programs in math, science, and humanities. Link high school curricula with on-the-job training programs in local industries. Provide better counseling for non-college-bound students.
Workers	Workers do not have sufficient access to training programs that prepare them for technical positions.	Begin technical preparation in high school. Mix formal education and on-the-job training, including apprenticeships. Invest in personal skills training and re-tooling.
Public Policy	Too little attention is given to how changes in technical work are forcing the reconsideration of employment practices and regulations.	Redefine occupations and job-related skills. Ask how public funding might make technical training more readily available.

The New Crafts

Beth Moore is learning to be a medical technician. Unlike other 11th-grade students at her Boston school, Beth spends one day each week at a local hospital learning what it means to work in one of the fastest-growing occupations in the United States. She enjoys the change from a lecture by a teacher in a classroom. "Instead of having somebody talk at you, you get hands-on training," she says. "It is there in front of you, and you can see everything." Not only does she see the work of technicians, she also gains an unusual insight into how hospitals work. If asked the question, "Who works in hospitals?" most people would mention doctors and nurses. Few would think immediately of radiological technologists, medical records technicians, or scanning technicians.

Americans will be forced to think differently in the future because hospitals increasingly are becoming dominated, not by surgeons, doctors, or nurses, but by new types of workers. These workers possess what Stephen Barley of Cornell University terms the "new crafts," performing jobs that often involve sophisticated technical knowledge but that are not done by people with bachelors' degrees. Predictions of occupational growth to the year 2000 show how important the new crafts are becoming. Familiar jobs like truck drivers and secretaries fall well down the list of rapidly growing jobs. At the top are jobs that are largely unknown outside their own industries and professions, such as paralegals and surgical technologists. Scores of new jobs are being created without sufficient notice of how they are changing the nature of work.

It is tempting to overlook the significance of the new crafts. They do not fit easily with traditional thinking about how work is organized or how people are educated and trained to perform that work. The growth of technical jobs in the middle of organizations threatens the familiar division between managers who hold a store of technical knowledge and workers who carry out their orders. Managers will no longer hold a monopoly of knowledge and authority within enterprises. The new crafts also challenge the tradition of managers being educated at universities while workers below them rely solely on high school education. The new technical workers need a different blend of formal education up to an associate's degree level and continuing training at work afterward.

Many employers have yet to realize the full significance of this change, and those who do often experience difficulty in finding the skills to fill positions created by the emergence of increasingly technical crafts. But the job market continually points to change in the kinds of skills needed. Like other cities, Boston has been badly affected by the recession. Yet there is no sign that Beth will find it hard to get a job when she emerges from a four-year program that links the last two grades of school with two years at a community college. The six hospitals taking part in the program are searching for any new source of technicians; some have even recruited overseas because of the scarcity of techni-

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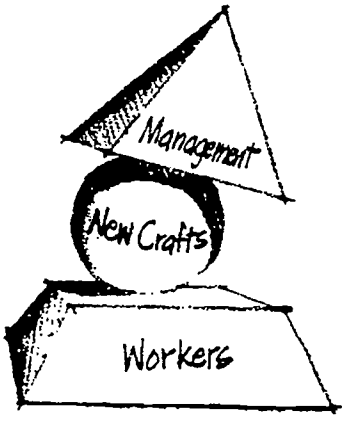


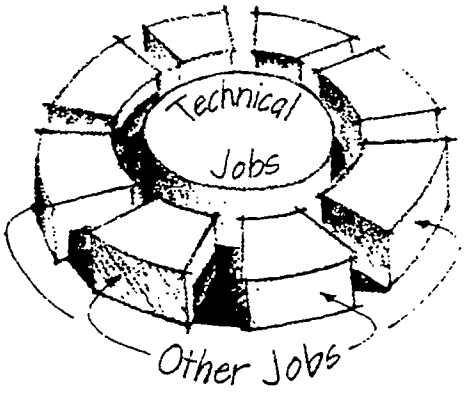
cal workers here. Beth and the other students on Project ProTech can expect offers for jobs that currently pay between $24,000 and $30,000 per year. They are likely to earn as much as those who go to four-year colleges, and they will be in demand by employers.

There will be hard challenges ahead as the economy switches from being dominated by manual workers to being dominated by professional and technical workers. Yet enterprises and jobs are already altering without such change being planned—the growth of professional and technical work will occur in America whether it makes life easier or harder. If those involved fail to adjust some of their traditional strategies and ways of working, the process of change could be a painful one. But it need not be so. Schools and employers have started to demonstrate some of the innovations in work and education that will smooth the process of change. The task is to build on such strategies to ensure that the economy of the next century is a suitable place for the new crafts.

A Changing Economy

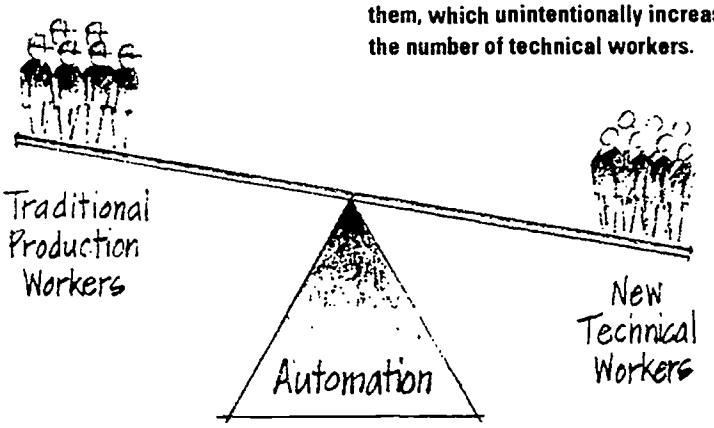
Stephen Barley's research has shed light on the new crafts and how their growth is changing the U.S. economy. Barley has examined how technical and professional jobs are expanding in health and other industries, and he has concluded that the new crafts are growing from both above and below. Many tasks that were done in the past by managers and elite professionals are being handed down to technical workers. An example is the paralegal—not a new job title, but one that is expanding both in sheer numbers and in its assumption of tasks and responsibilities once considered within the exclusive purview of attorneys themselves. At the same time, low-skilled workers who previously had little autonomy or responsibility in their routine jobs are now analyzing and responding to data for the first time.

The expansion of professional and technical jobs is altering the landscape of the economy in the same way that the industrial revolution changed it at the turn of the century. In 1900, 38 percent of the American workforce was employed on farms. But as industries grew, the first half of the century saw a rapid decline in agricultural employment. By 1950, only 12 percent of workers were employed in agriculture, while the industrial occupations had expanded. Forty percent of workers were then employed as craft workers or as laborers who produced goods. It was in this era that the familiar employment contours of the American firm were established, with a small number of managers overseeing the work of these less-skilled workers.



Moving from the periphery to the core of the labor force in the 1990s, technical jobs may account for more than 20 percent of the workforce by the year 2000.

The second half of the century has witnessed a second revolution in the structure of jobs, a change that is still occurring. The first component was America's demise as a manufacturing society. By 1988, the proportion of blue-collar workers—largely employed in manufacturing—had fallen from 40 to 28 percent as jobs in factories declined. But the decline was offset by a tremendous growth in white-collar work. The slice of workers employed in managerial, sales, clerical, professional, and technical jobs rose from 18 percent in 1900 to 56 percent in 1988. One of the main contributors to white-collar occupational growth was clerical employment, which accounted for only 3 percent



Corporations often try to reduce the costs of routine jobs by automating them, which unintentionally increases the number of technical workers.

of jobs in 1900 but increased to 18 percent in 1970.

Clerical employment, however, does not explain the continuing rise of white-collar work. After peaking in 1970, the share of clerical jobs in the workforce fell slightly to 16 percent in 1988. Service-sector expansion does not account for this trend either: despite the expansion of the service sector during this century, employment in service occupations rose by only 4 percent. Professional and technical work now accounts for a substantial share of employment growth. Since 1900, the proportion of workers in professional and technical jobs has risen by 12 percent, with three-quarters of that increase occurring since 1950. There are now 2.8 times as many professional and technical jobs in the economy as there were four decades ago.

This growth is set to continue for the foreseeable future. The federal government's forecasts show a 26 percent expansion in professional and technical jobs between 1988 and 2000. By the turn of the century, they will become the largest single occupational category—23 million people will be employed in these jobs. Even by these estimates, professional and technical work will account for one-quarter of all new jobs created in the 1990s. Some economists argue that the government is underestimating the change. and technical jobs may account for more than 20 percent of the workforce by the year 2000. The 1990s may be a decade in which professional and technical employment moves from the periphery to the core of the labor force.

There are several factors driving the growth of these new jobs. One is the trend toward larger and more bureaucratic corporations. As hospitals, accounting firms, and law practices have grown, the professionals they employ have become more specialized and have increased in number. A second factor is the expansion of science. Advances in the life sciences, such as immunology, biology, and molecular biology, have led to a burgeoning demand for scientists, engineers, and technicians. These professionals also have grown increasingly specialized and have tended to "hive off" some routine work to an array of technicians. In the health industry, medical and radiological technologists are just two of the resulting jobs created.

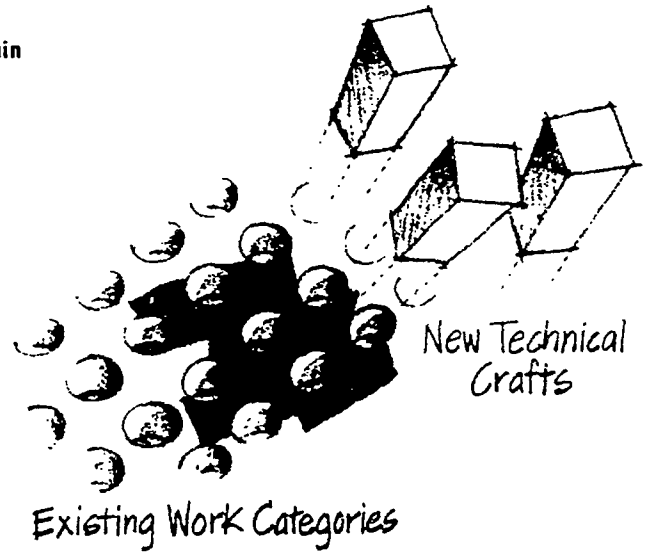
Probably the most important factor behind the growth of technical jobs is the third: technological change. Modern technologies have created a range of new occupations with high technical content. The computer alone now employs 1.4 million workers in jobs such as systems analysts and programmers. Yet an even bigger effect of computers has been to change the mix of skills in existing jobs and to shift the balance toward technical work. Corporations often try to reduce the costs of routine jobs by automating them. But such strategies often unintentionally increase the number of technical workers. Blue-collar workers who previously had to carry out only low-skill functions now have to analyze technical data and make informed decisions.

Enterprises, Schools, and Individuals

These changes in the workplace, signaled by the growth of the new crafts, present enterprises with huge challenges.

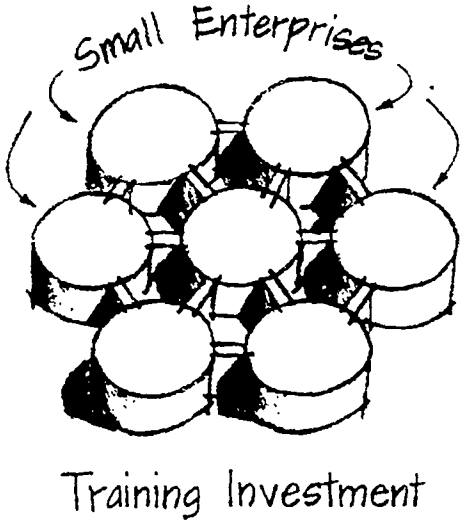
The first challenge is to change ideas about the way jobs are organized and managed. American employers in this century have relied on a "vertical" division of labor in which managers exercise control over workers lower in the hierarchy by using superior knowledge and expertise. But technical and professional jobs do not fit easily into this hierarchy. Many technicians have greater knowledge of their work than their managers, and those in senior positions are given wide autonomy. Employers may find it necessary to adapt their managerial styles to reap the full benefit of workers who are highly adept in a narrow but crucial range of skills.

Increasing strains will be created within enterprises that respond to the new technical crafts by trying to force them into existing work categories and manage them in the old vertical way.



Increasing strains will be created within enterprises that respond to the new technical crafts by trying to force them into existing work categories and manage them in the old vertical way. Employers ignoring new ways of organizing work in teams of autonomous technical workers will risk alienating their new core workers. Finding different ways of managing the new crafts will be as important as developing strategies for the skills they require. Most U.S. managers are currently drawn from four-year colleges, while formal education is less important to most craft workers, who acquire many skills informally while at work. But the new crafts often require a blend of formal education to the associate's degree level, with further on-the-job training.

Many small enterprises may need to cooperate in groups to make the training investment worthwhile.



This means that employers will not easily be able to acquire the new craft workers straight from schools or four-year colleges, as the experience of the Boston hospitals shows. Instead, they may require new forms of apprenticeship. Beth Moore is being educated and trained while gaining the kind of work experience that acquiring new craft skills requires. Her preparation has involved a partnership between employers, schools, and a community college. Only by supporting individual formal education with the opportunity to train in this type of

technical work will employers gain enough technicians. Many small enterprises may be unable to support this type of training by themselves. They will need to cooperate in groups to make the investment worthwhile.

American K-12 schools traditionally have not done well at preparing non-college-bound students for entry into the workforce. The practice of most high schools has been simply to offer students outside the college-prep track a less demanding form of academic education in the general track or in vocational education, which prepares students only for low-skilled jobs. Schools have lacked support from employers to achieve much more for what has been called the "forgotten half" and the "neglected majority." But the growth of the new crafts means a fresh task for schools in preparing students for jobs that do not fit the old categories of managerial or entry-level work. Without sacrificing academic rigor in the core subjects in math, science, and humanities, schools can present students with programs of learning that prepare them explicitly for meaningful work upon graduation.

The Boston ProTech program is an example of a "two-plus-two" initiative that provides an alternative to the general track of traditional vocational education. The participating high schools select students with an interest in the career field and provide them with an integrated curriculum in which math and science are taught in the context of the health industry. The courses at high school are linked to a further two years of part-time study at a community college. This approach underlies many current efforts to provide an alternative to traditional vocational education or the general track. Schools are starting to try new approaches to giving students focus and reason for their senior studies.

One promising innovation is "tech prep," a new type of high school curriculum that tries to prepare students for further education and work in technical fields. At its minimum, tech prep involves the articulation of courses between schools and community colleges to allow school students to start the foundation academic studies for technical jobs. But tech prep can range up to a "four-plus-two" program of the kind being tried in Owensboro, Kentucky. Students in this program start preparing in the ninth grade for post-secondary education in process control technology and computer technology. By the time they reach community college, they have the academic base to study trigonometry and computer applications.

In the past, the first few years of work for many American young people amounted to not much more than trial and error. The tradition of the youth labor market was that high school graduates would test a variety of jobs in their first few years of work, often while carrying on some part-time further education. But the labor market for youngsters with no more than a high school education has become more unforgiving. It is harder to find a well-paying job without further education, partly because low-skilled jobs are being

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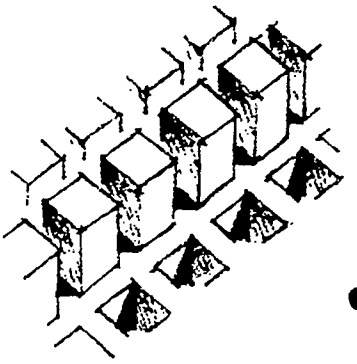
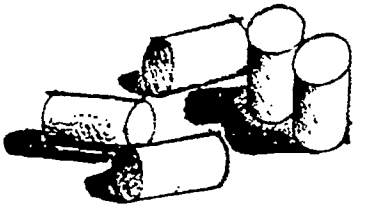


New Craft Jobs



Traditional Jobs

replaced by the new crafts. That means young people are now faced with a challenge to find the mix of education and on-the-job training that will qualify them for new jobs. They may only meet these requirements by better preparing themselves for work at school.

Workers who have left school will need to readjust their attitudes toward education if they want to find work in one of the new crafts. For production workers faced with technological changes that will eliminate their old jobs, it means returning to school, supported either by their employers or by themselves, to learn the new skills. One of the biggest challenges will be a more subtle one: the need for managers who are accustomed to handling subordinates in traditional hierarchical organizations to adjust to new types of work organization. The growth of the new crafts means managers will have to find new methods of motivating and working with technical employees, whose efforts need to be integrated with those of other workers.

The Economy of the New Crafts

All these challenges suggest that the economy of the new crafts will not be easy to accept for employers, schools, or individuals. Each is accustomed to a world ruled by two divides: one between managers and workers and one between education and work. Instead, they are facing a workplace dominated by technicians and professionals who are neither managers nor workers who can be managed in traditional ways. They have complex technical knowledge and exercise initiative, yet they manage their own work rather than that of others. These same workers bridge the old gap between education and work. They have to be taught their work through a blend of formal education and learning at the workplace. This education will continue as the technology changes.

Employers, educators, and workers have little choice about whether they want to adjust to the economy of the new crafts: the change will occur anyway. But the price of failing to respond could be high for each participant in the new economy. Employers will be faced with shortages of workers to fill their vacancies and will have to pay higher and higher wages to attract technical and professional workers.

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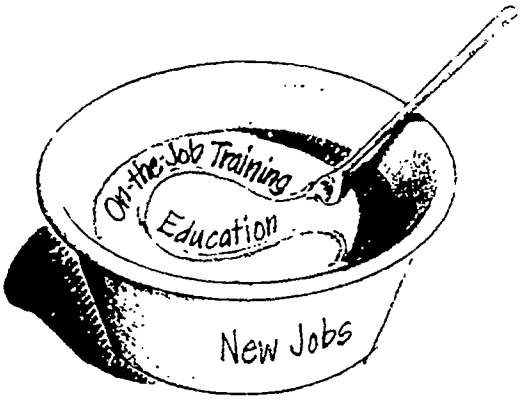

Schools will increasingly be failing their pupils by turning them out without enough education to procure well-paying jobs. Finally, individuals who do not train for the jobs that are growing in enterprises like the Boston hospital where Beth Moore works will be unable to gain a foothold in the economy. The growth of the new crafts presents everyone with a difficult challenge, but the consequences of ignoring the challenge could prove even more troublesome.

—John Gapper
Harkness Fellow
of the Commonwealth Fund, New York

Illustrations by Brian Miller

The National Center on the Educational Quality of the Workforce

EQW is a partnership between one of this nation's premier business schools and one of its leading graduate schools of education. Established by the University of Pennsylvania's Wharton School and Graduate School of Education under a cooperative agreement with the U.S. Department of Education, **EQW's** program of research and policy analysis takes as its principal challenge the renewal of American competitiveness through leveraged investments in the quality of the nation's workforce.

The **EQW** research agenda focuses on four broad questions:

1. What do employers need to know to better use the skills their workers bring with them and acquire in the workplace?
2. How can schools and other providers become more effective suppliers of skilled and disciplined workers?
3. How can workers develop more complete skills portfolios that combine the competencies and disciplines a productive economy requires?
4. What is the best role for public policy in the development of a work-related education and training market that efficiently links consuming firms, supplying schools, and educated workers?

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The Center is chartered by the University of Pennsylvania and receives its principal funding from the U.S. Department of Education, Office of Educational Research and Improvement. It is affiliated with the New York State School of Industrial and Labor Relations at Cornell University, the International Centre for the Study of East Asian Development in Kitakyushu, Japan, and the Pew Higher Education Research Program, sponsored by The Pew Charitable Trusts. **EQW's** co-directors are Professor Robert Zemsky of the Institute for Research on Higher Education and Professor Peter Cappelli of the Wharton School's Center for Human Resources.

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The research for this issue included the following:

Stephen Barley, *The New Crafts: The Rise of the Technical Labor Force and Its Implication for the Organization of Work*. National Center on the Educational Quality of the Workforce, 1991.*

John Bishop, *Is a Skills Shortage Coming? Review of BLS Occupational Projections*. Cornell University Working Paper, April 1992.

Peter Cappelli, *Are Skill Requirements Rising? Evidence from Production and Clerical Jobs*. National Center on the Educational Quality of the Workforce, 1991.*

Arnold Packer and William Johnson, *Workforce 2000: Work and Workers for the 21st Century*. Hudson Institute.

Dale Parnell, *The Neglected Majority*. American Association of Community and Junior Colleges.

George Silvestri and John Lucasiewicz, "Projections of Occupational Employment 1988-2000," *Monthly Labor Review* 112, 1989.

U.S. Department of Education, *Combining School and Work: Options in High Schools and Two-Year Colleges*.

U.S. Department of Labor, *Learning a Living: A Blueprint for High Performance*. A SCANS report for America 2000.

* *EQW Working Papers*

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