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Information revolution: Impact of technology on global workforce

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ABSTRACT

This paper explores the promises and perils of the Information Revolution and addresses the complex issues such as global labor force, impact of technology on both industrialized and third-world countries. The paper discusses the beneficiaries and losers of the information revolution and an outlook for global employment in the 21st century.

INTRODUCTION

Global unemployment has now reached its highest level since the great depression of the 1930s. Approximately more than 750 million human beings are now unemployed or underemployed in the world. This figure is likely to rise sharply between now and the turn of the century as millions of new entrants into the workforce find themselves without jobs, many of them victims of a technology revolution that is fast replacing human beings with machines in every sector of the global economy. After years of wishful forecasts and false starts, computer and communication technologies are making their long-anticipated impact on the workplace and the economy, throwing the world community into the grip of a technology revolution. Already millions of workers have been permanently eliminated from the economic processes, and whole job categories such as middle manager have shrunk, been restructured, or disappeared (Rigdon, 1994).

In the agricultural, manufacturing, and service sectors, machines are quickly replacing human labor and promising an economy of near automated production. In the coming years, new sophisticated technologies are going to bring civilization even closer to an automated world. The sweeping substitution of machines for workers is going to force every nation to rethink the role of human beings in the social process. Redefining the opportunities and responsibilities for millions of people in a society absent of mass formal employment is likely to be the single most pressing social issue of the coming century. The Information Age has arrived.

As the society continues to hear talk of better economic times ahead, working people everywhere remain confused over what appears to be a downsizing. Every day, U. S. corporations announce that they are becoming more globally competitive. Corporations' profits are steadily increasing, yet at the same time, they are announcing massive layoffs. Corporate downsizing and re-engineering continue to accelerate with no end in sight. On November 15, 1995, AT&T announced it was letting go more than 77,000 managers in an effort to cut labor costs and improve profit margins. The First Interstate Bankcorp recently restructured its operations, eliminating 9,000 jobs, more than 25% of its work force. United Carbide re-engineered its production, administration, and distribution systems to trim excess fat and in the process more than 13,000 workers were cut from the company payroll. Other companies such as Scott Paper, GTE, NYNEX Corp., IBM, and Arvin Industries are pursuing equally aggressive labor-cutting policies (Rigdon, 1994; Dobrzynski, 1995).

In the past when new technologies have replaced workers in a given sector or industry, new sectors have always emerged to absorb the displaced workers. Today, all three of the traditional sectors of the economy - agriculture, manufacturing, and service - are experiencing technological displacement, forcing millions onto unemployment rolls. The only new sector emerging is the technology or knowledge sector, made up of small elite entrepreneurs, computer programmers, professional educators, technicians, and consultants. This emerging sector is further aided by the insurgence of technologies such as electronic data interchange, computer-based communication technologies, PC and workstations, distributed databases, multimedia, computer-aided software engineering, groupware, workflow software, imaging systems, video conferencing, electronic messaging systems, client-server computing, and artificial intelligence. The world's new emphasis on information has caused a major paradigm shift in the business arena - globalization. Access to information has made national borders meaningless (Houghton, 1996).

These concerns raise several important questions as we enter the 21st century:

- What is the role of the human being in the social process?
- Is unemployment likely to be the single most pressing social issue?
- What are the pressing demands of labor force on the business corporation and vice versa?
- What are the "quality of life" expectations?
- How would the information revolution affect the economies of the labor-intensive, less developed nations?
- How would the information revolution affect the economies of the capital-intensive, developed nations?

The purpose of this paper is to explore the promises and perils of the Information Revolution and address the complex issues such as global labor force and impact of technology on both industrialized and third-world countries.

TWO FACES OF TECHNOLOGY

The Information Revolution is a powerful force for good and bad. The new information and telecommunication technologies have the potential to both liberate and destabilize the workforce in the coming decade. Whether the new technologies free us for a more leisurely life or result in massive unemployment will depend upon how we address the issue of productivity advances.

Earlier industrial technologies replaced the physical capability of human labor with machines for body and strength, the new technologies promise a replacement of the human mind itself by substituting thinking machines for human beings. Automated machinery, robots, and sophisticated computers can perform most of the repeated tasks. Multinational corporations have hastened the transition from human workers to machines due to increasing global competition and rising costs of labor. In Europe, where rising labor costs are blamed for a stagnating economy and a loss of competitiveness in world markets, companies are hurrying to replace their workforce with the new information and telecommunication technologies.

Corporations have spent millions of dollars in the 1980s and the 1990s on computers and other automated equipment. It has only been in the past few years that these expenditures have begun to pay off in terms of increased productivity, reduced labor costs, and greater profits. As long as management attempted to transplant the new technologies onto traditional organizational structures and processes, these tools were unable to perform effectively and to their full capacity. Recently, however, corporations have begun to restructure the work force to make it compatible with high-tech culture through "reengineering" (Ehrbar, 1993). Reengineering services, which in 1990 were a \$5.4 billion business, are expected to increase to the \$14.6 billion mark by 1995. Among the business corporations that have pursued the path of reengineering are Banc One, Hallmark Cards, IBM, American Airlines, McKisson, Ford, and Connecticut Mutual Life Insurance (Larabee & Mehta, 1996; Davenport & Stoddard, 1996; Davis & Mehta, 1996).

"Reengineering" is a management approach that emphasizes the need to simplify work processes so that company objectives are attained in an efficient and cost-effective manner. Major reasons cited for business reengineering are more efficient and streamlined operations, improved customer service, increased productivity, and cost reductions. Reengineering is sweeping through the corporate community as companies are quickly restructuring their organizations to make them computer friendly. In the process, they are eliminating layers of traditional management, compressing job categories, creating work teams, training employees in multi-level skills, and streamlining administration (Garvin, 1995; Turban, McLean, & Wetherbe, 1996).

Reengineering has been used quite successfully in the manufacturing sector and is now finding its way into other fields such as marketing and customer relations. The decline in manufacturing jobs is part of a long-term trend that has seen the increasing replacement of human beings by machines at the factories. In the 1950s, 33 percent of all U. S. workers were employed in manufacturing, while today, less than 17 percent of the work force is engaged in manufacturing (Ducker, 1993). Although the number of manufacturing jobs has declined, manufacturing productivity has gone up. Annual productivity, which was growing at about 1 percent per year in the early 1980s, has climbed over 3 percent due to computer automation and the restructuring of

the work place. From 1979 to 1993, productivity increased by 35 percent in the manufacturing sector while the work force shrank by 15 percent in the manufacturing sector (Flint, 1993).

We are being swept up into a powerful technology revolution that offers the promise of a great social transformation. The new high-technology revolution could mean fewer hours of work and greater benefits for millions. For the first time in modern history, large numbers of human beings can be liberated from long hours of labor in the marketplace, to be free to pursue other activities. However, the same technological forces could easily lead to growing unemployment. The future depends on how the productivity gains of the Information Age are distributed.

WORK FORCE IN THE UNITED STATES

In the past, when new technologies replaced workers in a given sector, new sectors have always emerged to absorb the displaced workers. However, today all three traditional sectors of economy - agriculture, manufacturing, and service - are experiencing technological displacement, forcing millions out of job market.

The technology revolution is not normally associated with agriculture. Yet some of the most impressive advances in automation are occurring in agriculture. While public attention of late has been focused on the effects of technological displacement in the manufacturing and service sectors, an equally profound technological revolution is changing the nature of farming and in the process, raising serious questions about the future of the farm labor around the world.

The technological changes in America have transformed the country from a largely agricultural society to an urban, industrial nation, in less than one hundred and fifty years (Turban, McLean, & Wetherbe, 1995). In 1850, 60 percent of the working population was employed in agriculture. Today, less than 2.7 percent of the work force is engaged directly in farming. Since World War II, more than 15 million people have left farming in America (Myron, 1993). Innovation of automatic sprinkler systems, tractors, harvesting machines, internal combustion engines, new plant breeding techniques, etc., has lead to spectacular gains in productivity with the fewer people needed in the farming.

Some of the breakthroughs in reengineering and technological displacement are occurring in the automotive industry. Automated technology is rapidly transforming the automobile industry around the world by laying off massive numbers of blue collar workers on the assembly line. Auto makers view labor-displacing technology as their best hope to reduce costs and improve the bottom line. General Motors hopes that by eliminating one-fourth of its work force and reengineering its operations, it can save more than \$5 billion a year by 2000.

In industry after industry, companies are replacing human labor with machines, and in the process changing the nature of industrial production. The increasing automation of steel production has left thousands of blue collar workers jobless. Old-style smokestack industries like steel and auto in Rust Bowl states like Pennsylvania, Indiana, Ohio, and Michigan will never again employ thousands who used to toil in their huge manufacturing plants. While U. S. economy

generated 18 million new jobs between 1982 and 1989, there was a net loss of jobs in manufacturing of more than half a million; and in the 1990-1992 recession, 1.1 million manufacturing jobs were eliminated almost overnight. Among the hardest hit were food, rubber, electrical equipment, and autos (Forester & Morrison, 1994). In almost every major manufacturing activity, human labor is being steadily replaced by machines. Manufacturing, which accounted for 27% of those working in the U. S. in 1920 will employ as few as 12% by 2005. Precisely the same trends are being witnessed in Europe (O'Reilly, 1992).

For more than forty years, the service sector has been absorbing the job losses in the manufacturing industries. Until recently, most business leaders, economists, and politicians remained confident that the trend would continue. Their hopes are now being tempered as new information technologies begin to make major inroads in the service sector itself, raising productivity and displacing labor across the entire expanse of service-related industries. Bar codes and laser scanners have replaced legions of data-entry and inventory clerks. Computerized information systems knitting global corporations into unified wholes have swept away layers of middle managers whose job was to gather, package, and transmit information.

THE DECLINE OF THE GLOBAL WORK FORCE

The impact of the technology revolution is being felt all over the world. In every advanced economy, new technologies and management practices are displacing workers. In Japan, where the term "unemployment" is barely uttered, fierce global competition is forcing companies to tighten their operations, throwing workers into unemployment lines for the first time in recent memory. Although Japan claims an unemployment rate of only 2.5 percent, some analysts point out that is the number of discouraged unemployed workers and unrecorded jobless is added to the totals, the figure might be as high as 7.5 percent (Schlesinger, 1993). While concerns over unemployment are mounting in Japan, the same fears have reached a near fever pitch in Western Europe, where one in nine workers is currently without a job (Berry, 1996; Holman, 1996).

The issue of technological displacement is fast moving to the fore in European political debate. By the end of the current decade, only one of six European workers will be employed in manufacturing, down from one in four in 1960. The loss of manufacturing jobs is due in large part to the introduction of new labor-saving, time-saving technologies and restructuring of production practices along the lines already well advanced in the United States and Japan. Every Western European nation is experiencing worsening unemployment. France's unemployment is at 11.5 percent, and in England it has topped 10.4 percent. Denmark's unemployment is approaching 11.3 percent while in Spain, once among the fastest-growing countries in Europe, one out of five workers has no job. German unemployment hovers at 4 million people.

In Europe, the unemployment problem is likely to be further exacerbated by the drop in public employment. During the 1980s public-sector jobs totaling 5 million accounted for most of the job growth. Now because European nations are thinning their budgets in an effort to lower government deficits and debt, the prospect of government's hiring displaced manufacturing and

service workers and acting as an employer of last resort is no longer politically feasible.

The technology revolution is also spreading quickly into the third world. Global companies are beginning to build high-tech, state-of-the-art plants and facilities in countries throughout the third-world countries. Companies in third-world countries are investing heavily in automated technology in order to ensure speed of delivery and quality control in an evermore competitive global market. The decision to locate a plant in a developing nation is as much influenced by the desire to be close to a potential new market as labor-cost differential (O'Reilly, 1992).

THE IMPACT OF TECHNOLOGY PROGRESS

Almost every business leader and economist continues to assert that the dramatic technological advances will have a trickle-down effect, reducing the cost of products, stimulating increased consumer demand, creating new markets, and putting more people to work in better-paying, new high-tech jobs, and industries. While stockholders have greatly profited from new technologies and advances in productivity, benefits have not "trickled down" to the average worker. For a growing number of unemployed or underemployed people, the concept of trickle-down technology is of very little comfort.

Today, millions of working men and women around the world find themselves trapped between economic eras and increasingly marginalized by the introduction of new labor-saving technology. The information technology, also known as infotech, will shape how workers do their jobs in the future. By the year 2010, infotech will affect many positive changes, but it may also lead to job loss, depersonalization, or boredom (Hines, 1994). The current wave of reengineering and automation is only the very beginning of a technological transformation that is destined to greatly accelerate productivity in years ahead while displacing increasing numbers of workers in the global economy. The rapid progress of information technology combined with reengineering and downsizing requires the work force to know how to ride the computer wave in order to remain competitive (Arnott, 1995).

One of the important issues facing both the work force and the business firm is training. Not only will the work force have to undergo major training to learn the progressive technology and to cope with the technology revolution in the future, but it will also have to be knowledgeable with all facets of the business. The technology progression will require an employee to be a "hybrid" — a person who understands the needs of the business as well as the technology and its potential. For example, the success of the IT projects at Esso have been attributed to the "hybrid" people working on these projects (Bird, 1995). If the current technology progress continues, the authors of this paper agree with Peter Drucker's forecast that most of the work force will be "knowledge" workers.

While the impact of the technology is both positive and negative, one must be optimistic about the future. The information technology systems will change the nature of jobs as well as how workers perform their jobs in 90 percent of the workforce by 2010. Information technology, a combination of technologies - computer networks, imaging technology, massive data storage,

and artificial intelligence - will have revolutionary effects on the jobs as workers learn to utilize them more skillfully and effectively (Hines, 1994).

With the advancements in the technology revolution, more and more firms are investing in training their work force through either in-house training programs or a school and outside consultants or agencies. For example, according to Arnott (1995), Bell Atlantic began to outsource its computer training three years ago by contracting with several trainers in each area, whereas Motorola invests \$140 million a year to train employees in-house through its Motorola University. Furthermore, the role of trainers in corporate America is significantly changing due to time constraints imposed on them by the clients/firms and the availability of new learning technologies. Andersen Consulting's use of interactive multi-media training, AT&T's use of electronic performance support, and Hewlett Packard's use of the Internet are all examples of use of new technologies by these companies to boost employee performance (Caudron, 1996).

Many business organizations encounter a crucial dilemma today - i.e., the changing rules in the global marketplace. In both industrial and developing nations there is growing awareness that the global economy is heading toward an automated future. According to McLagan and Nel (1995), among other forces, information technology and communication are changing the rules of workplace. Changes cannot be successful in today's dynamic world, if the organization structure does not change. The information and communication technology will definitely lead to more production with less human labor. A survey of 429 product and service companies show information technology tops the list of investment targets of 58 percent of the CEOs, capturing 63 percent of their capital investment plans (Collins, 1995). Business firms willing to change with changing times - technology progress - will survive and succeed in the 21st Century.

CONCLUSION

There are both the beneficiaries and losers of the information revolution trend. The information technology will provide the business community (small as well as large business firms) with increased productivity, reduced labor costs, new markets, and reduced overall costs of doing business, which, in turn, will provide them with the competitive advantage in the global marketplace and greater profits. The consumers as well as the end users of the information and technology will benefit from a variety of products and services to choose from, improved product quality, better customer service, and speedier delivery of products, thus, in turn, increased customer satisfaction. The global work force will benefit from flexible work schedules, fewer hours of work, and freedom from long hours of labor allowing more time to pursue a leisurely life-style. On the other hand, the information revolution will produce downsizing and reengineering which in turn will result in mass layoffs and unemployment. Downsizing and reengineering will also require retraining of the existing labor force - an added cost to the business organizations everywhere.

We are rapidly approaching an historic crossroads in human history. Global corporations are now capable of producing an unprecedented volume of goods and services with a smaller workforce. The new technologies are bringing us into an era of near workless production at the

same time world population is increasing. The clash between rising population pressures and falling job opportunities will shape the high-tech global economy in the next century.

The world's new emphasis on information has caused two major paradigm shifts in the business arena: (1) globalization and (2) the work force as a competitive advantage. Both of these shifts are a result of the information revolution. Access to information, abundance of information, access to markets due to technology progress, and availability of new technologies have made national borders meaningless. One might conclude that we are now living in one global village. In addition to globalization, insurgence of a skilled labor force is inevitable. The new technologies coupled with knowledge-based, information-based, and technology-based systems will shape the brain power of the future global work force, which, in turn, will create new technologies. A skilled work force will become the competitive advantage and the key factor for success for the business firms in the 21st Century.

The Information Revolution which includes information technology and technology in the work place is changing the rules in the global marketplace. Today, the organization unwilling to change with the changing rules will neither succeed nor survive for a sufficient period of time to enter the 21st Century. Therefore, it is safe to conclude that businesses which will dominate the economy in the future will be information-based, technology-based, or knowledge-based organizations.

While the earlier industrial technologies replaced the physical capability of human labor with machines for body and strength, the new technologies promise a replacement of the human mind itself by substituting thinking machines for human beings. In the 21st Century, the challenge facing the leaders of the nations and the business corporations is to lead the information revolution to globally benefit all nations and all societies through increased economic growth, job opportunities and employment, social transformation, a better standard of living and life-styles, and harmonious human relations.

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