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TECHNOLOGY AND THE FUTURE OF CENTRAL BUSINESS DISTRICTS

by GAIL GARFIELD SCHWARTZ, PH.D.*

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Technology is only one factor that will determine the future use of land in the Central Business District ("CBD"). Its impact will appear in the context of broad economic forces and attendant sociological forces.

I. CHANGES IN THE JOB MIX

The change that will undoubtedly influence some CBDs more than others is the continued decline of manufacturing employment. This decline occurs as the nation's economy becomes increasingly dominated by services, and as manufacturing itself becomes more capital intensive. This is a continuation of a process that has been going on for three decades. In 1983, fewer than eighteen percent of all jobs in the United States were manufacturing jobs, and less than twenty-five percent of the gross national product was derived from manufacturing. By 1990, only twelve to fifteen percent of the work force may be involved in hands-on manufacturing. This decline, relative to the economy as a whole, has occurred because the number of service sector jobs has increased very rapidly while the number of manufacturing jobs has increased slowly, and has not been caused by an absolute decline in manufacturing jobs. In the next decade, however, the absolute number of manufacturing jobs will fall dramatically due to automation and robotization.

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Change in the job mix has had different outcomes on different cities, and subsequent changes will also affect different cities in different ways. For example, during the period 1960-1975, cities in the northeast and north experienced the sharpest decline in manufacturing, but the northern industrial cities maintained higher than average shares of manufacturing in their economic mix. This meant that working incomes tended to be relatively high, because many manufacturing industries paid well. Moreover, industrial cities were extremely vulnerable to the business cycle; during recessions their unemployment rate tended to exceed the national average.

Fewer cities will face this particular predicament in the future; a 1982 study classified only forty-five cities as primarily industrial.¹ Moreover, industry will operate differently than it has in the past; automation will create a clean workplace. A machinist operating a computer controlled machine can come to work in a white coat because there is little need to handle greasy parts. Many machining and other manual tasks will be automated.

II. AUTOMATION AND NEW LOCATIONAL CHOICES

The automation and robotization of manufacturing will again allow manufacturing plants to locate in the CBD. Electronics, biomedical, and machining firms could use CBD sites, but the ability to do so depends on changes society has not yet begun to address. Such growth requires a plan for hazardous waste disposal and major changes in zoning ordinances to permit "clean" manufacturing in commercial and mixed-use zones.

Changes will occur in the way services are performed, which will affect CBDs negatively and positively. The impact of the changes will depend in part on existing service industry concentrations and on the size of major firms. The increasing size of service organizations is a decentralizing factor. It allows economies of scale that may require sprawling structures. Large organizations internalize many services that smaller organizations purchase from outsiders, such as legal, accounting, and printing services. Firms may also provide support services such as restaurants "in-house." This means that large organizations reduce demand for space units even though they may need only fractionally less space than they would need if they used external services.

A. CHANGE IN THE WORK PROCESS

The new communications and electronic data processing technolo-

1. T. NOYELLE & T. STANBACK, *THE ECONOMIC TRANSFORMATION OF AMERICAN CITIES* (1983).

gies will change locational decisions, but not in predictable ways. Most of the activities that will "drive" CBD economies are service functions housed in offices of various kinds: headquarters of manufacturing firms; accountants' offices; legal offices; insurance offices; and so on. Technology allows the physical separation of units of these firms. Banks, insurance companies, and other organizations that process large amounts of data every day often separate "back office" activities from the front office. Firms process information in remote offices often hundreds, or even thousands, of miles away from downtown offices providing the basic service to clients. Electronic communications permit the separation of other functions too. Managers need not work in the same building as the employees who deal with clients. Business can separate support departments, like accounting, from sales or production. Organizational divisions can communicate via electronic mail instantly, thereby reducing the need for face-to-face communications. Moreover, if necessary, firms can achieve face-to-face conversation through video-conferencing.

Like all businesses, office firms try to cut costs in order to raise profits. Managers can reduce costs by increasing the efficiency of office workers, particularly by automating as many tasks as possible. Office automation began in 1900, with the introduction of the typewriter. In 1910 photostats were introduced and in 1920, microfilm. In the 1950s and 1960s, electric typewriters advanced office automation dramatically. The microchip of the 1970s, however, is revolutionizing office productivity. Electronic word processing enables even poor typists to produce perfect copy in a reasonable time period and saves hours of proofreading and correcting time. Secretaries can complete their work much faster, with greater accuracy and consistent quality. Electronic printers and new laser printers create perfect "hard" copy ten to twenty times faster than a typewriter.

But the real "telerevolution" is the paperless office. Computers, word processors, and magnetic and photosensitive recording materials eliminate the need to put copy onto paper, thereby driving paper from the office scene. Thanks to fiber optics, office personnel automatically print, sort, and collate as many copies as desired. Fiber optics consist of hair-thin glass strands that conduct digitally coded information as pulses of light. Fiber optic technology transmits the information at the speed of light, is immune to electromagnetic interference, and minimizes signal loss. Far more efficient and economical than copper cable, light-wave communications can send a message at speeds over 90 million light pulses per second. A single lightguide cable can carry 240,000 telephone calls at once. Fiber optics have replaced conventional telephone wires in the northeast corridor, the most heavily burdened communications channel in the country, and are rapidly being installed in

other parts of the United States. "Intelligent" computers can "read" typed copy and transfer it to their memory and data storage systems. "Intelligent" copiers/printers operate at speeds in excess of twenty pages per minute, and have the capacity to merge materials "filed" in a computer or printed on paper. Laser transmitters, which provide dependable, speedy transmission, will also be widely used.

The high speed and accuracy made possible by these convergent technologies will hasten the substitution of electronic communications for physical transportation of information, and also will permit the reduction of some face-to-face communications. Superiors can convey instructions and subordinates can fulfill assignments or ask questions without actually meeting. Facts and documentation can be moved photo-electronically, more rapidly, and eventually less expensively, than by mail or in person. Desktop transceivers that can send and receive at the same time will soon be able to transfer a full page of text in milli-seconds.

Potentially, spoken mail systems can replace telephone communications, as well as hard copy communications. Spoken mail uses computers to store and forward digitalized voice communications, eliminating the need for memos and correspondence. This advancement in office management will eliminate jobs and the need for worker space as well as enhance the ability of workers to perform their jobs from remote places.

These technologies are spreading rapidly. Small firms can install them because the costs are falling. New minicomputers and microcomputers are more portable than large mainframes and fill the needs of many firms. The influence of these machines on work sites will occur much more quickly than was the case with the electronic typewriter and telephone.

The decentralizing effects of transmitting telephone dictation to remote stations are evident. Not only does this tend to disperse job sites, it also tends to reduce the number of workers needed to perform a given amount of work. The most advanced centralized dictation systems use microprocessors and display terminals to monitor work status. This capability allows firms to reduce the number of supervisors needed to manage a large number of word processors, and more importantly, the need for multiple offices with their own typing staffs.

The new relationship between workers and the equipment supporting them will determine the space needed by an office, and whether the space is best located in the CBD or elsewhere. In the 1970s, each office worker required an average of two hundred square feet of office space. A microprocessor requires more room than a typewriter, but reduces filing space and could eliminate the space required for mainframes. To-

morrow's offices will use a more flexible, open arrangement than is used today, with computer work stations available in centralized locations. Since workers will not have to spend as much of their day in one place, offices may provide smaller personal spaces for each worker. Space per worker will not necessarily increase and might decrease.

B. DECENTRALIZING FORCES

A more important consideration than the amount of space needed per worker is the location of the work space. Will people continue to travel to the office every day? Or will many people work at home two or three days a week, knowing that their office can reach them by telecommunications, and that they can transmit the results of their work to whomever needs it without assistance and within a few minutes? Even now, professionals who like to spend their summers at the seashore can do so easily. With "his and her" computers, which cost less than three thousand dollars and are accessible by telephone modem to their offices, they can do research, write, and hold conversations about complicated subjects with colleagues sweltering back in the city office. Will this capability destroy the office as a work place?

C. CENTRALIZING FORCES

What centralizing forces might exist to offset the decentralization permitted and encouraged by technology? The answer is found in psychological, sociological, and economic precepts.

Ask friends whether they like to work at home, and some will say "yes," most will say "sometimes," and some will say "no." Those who say "no" explain that they need the stimulation of talking to fellow workers. Those who say "yes" say they need the luxury of quiet and long periods of time in which to concentrate without interruption. Those who say "sometimes" want a little bit of both in their work lives. They may also enjoy the change of pace, or the ability to get in a long game of tennis during the middle of the day.

These preferences also depend on the nature of the job being performed, and the age of the worker. Older, more settled people, especially those who do creative work, who hold professional or managerial positions, may prefer the solitude of working at home. Younger people, who are looking for mates, and who have relatively routine tasks to perform, may prefer the social life of the office. Parents of young children might be most appreciative of the opportunity to work at home. Overall, however, the vast majority of the work force probably would not prefer to work at home all the time. For many people, the office, the laboratory, or the factory is a place to socialize, as well as a place to earn a living.

As a first step in predicting the effect of technology on CBDs, assume that every worker would like to go to the office three days a week and work at home two days a week. If this were permitted for all workers in a firm, it could, theoretically, reduce the size of its office by forty percent, thereby saving rental costs. But there is another cost associated with this scenario. If the work force of the future is to operate from many scattered locations, then each location must be equipped with electronic machinery to prepare, send, and receive information. If every worker has the option to work at home forty percent of the time, every worker might need a complete home work station. A company could equip one location with work stations usable by more than one worker for less than the cost of equipping each worker's home with a great deal of expensive equipment. Thus, management would not favor equipping each worker's home. Consider also that the equipment must be maintained and serviced. If the company pays for servicing, it would incur greater expense with many scattered sites than with one central site.

Every decision to decentralize workplaces will be accompanied by some very careful cost analyses. Provisions for home work stations might well become the subject of negotiations between organized labor and management. Workers might agree to consider this as a fringe benefit, or they might demand that the company provide work stations as a reward for the increased productivity made possible by the reduction in commuting time.

How the technological possibilities work themselves out in the distribution of work and space will not be clear for another fifteen to twenty-five years. Historically, it has taken fifty years to realize the full ramifications of a new technology, and even though the pace of innovation is faster than ever before, the strong weight of existing commitments will influence decision makers for some time. For example, firms have long term leases; they will not want to provide remote equipment for workers if this would result in underutilizing space they have already rented.

Another centralizing force will be the aversion of many managers and supervisors to "losing control" over subordinates, and a natural apprehension that decentralization of work stations will cause such a loss of control. This is evidenced from past experiences with staggered work hours, an eminently rational idea in congested cities, but one that only a small proportion of firms and government agencies have adopted. Another psychological factor must be considered. Professional and technical workers may not want to miss a day in the office for fear of being outperformed or betrayed by their rivals. This fear of losing a competitive edge may arise in organizations that experience a great deal of competition for advancement.

Finally, there is the question of the information-transfer purpose to consider. While it is certainly true that new abilities to transfer information reduce the need for face-to-face communications, one must look a little deeper into the type of information being transmitted, the parties who are transmitting it, and, most importantly, the thought processes of those who determine the location of the workplace.

Some information is for the record, and other information is not for the record. Some of the information for the record is factual, and some of it is opinion or interpretation. Likewise, some of the information not for the record is factual—for example, information that has not yet been announced, such as that a certain individual will be appointed to a key position, or that a corporation is intending a major merger. Additionally, some of the off-the-record information is opinion or interpretation, such as the opinion that a certain individual is not suited for a particular job, that a firm is likely to declare bankruptcy, or that a certain firm's chief fiscal officer is suspected of embezzlement. Wall Street lives on rumors, predictions, and bits of information that do not appear on the computer screens.

In some respects off-the-record information is more important than information on-the-record. It enables corporate leadership to open a new market, to defend itself against unwanted takeovers, to seize a profitable new investment opportunity, to undermine a rival's advertising scheme for a product, and, more generally, to be competitive. Although for many enterprises record keeping and the transmission of routine information is important and necessary to profitable operation, off-the-record information transmittal is critical because it enables one firm to do better than another, or one individual to outperform others in the field.

Conveying off-the-record information is a transaction that must be entirely private. The provider of information does not want anyone other than select recipients to have the information. The provider wants each recipient to believe that he or she is exclusively privy to the information. The receiver wants to be the only person who knows the information, or one of the few. Both provider and receiver want to have the advantage of subliminal communications—seeing the expression on the other's face, hearing the exact tone of voice, and observing the “body language” that accompanies the words actually spoken. Privileged communications, or its illusion, is an economic and social force that will help the CBD retain its importance even as the fifth technological revolution advances. Larger cities, which have the largest concentration of regional and national market activities, will likely feel the strongest effect of the need for privileged communications in the CBD.

III. REAL ESTATE FACTORS

The private real estate market and local government policies will determine the future of CBDs in the United States. Real estate developers naturally want CBD land used for the highest income-producing use, which generally is office use. Yet, as office markets become saturated in many CBDs, developers may be more willing to construct new housing, especially for the affluent, young, and small households comprised of "Yuppies," especially if the community offers financial incentives.

Most state and local governments can offer a wide range of incentives. In addition to these specifics, local governments will want to review the regulations that govern development. These regulations must protect the public interest with respect to health and safety, but they must not inhibit development by applying unnecessarily rigid restrictions.

The Council on Development Choices for the 1980s stated that permitting higher densities and allowing residential and commercial space to intermingle in one building, or within one block or neighborhood, is essential to the continued health of the nation's cities. That is undoubtedly the case, especially since the "nuisance" factors, which originally led to the zoning ordinances that rigidly separate land uses, will have far less significance in the future than they had in the past. Mixed-use zoning will encourage residential and technology-dependent activities in CBDs.

To encourage developers to provide extra amenities, such as plazas, arcades, and pedestrian paths, local governments may permit developers to build bulkier buildings than normally would be permitted by the local zoning ordinance. These zoning "bonuses" have become standard operating procedure in many cities. Since the amenities make a structure more attractive to tenants, they are intrinsically desirable. Their presence will help increase rents, maintain a building at full occupancy, and retain technology-dependent firms in them. The degree to which additional benefits help or hurt a developer's income and return on investment cannot be reduced to hard and fast rules, but instead must be determined on an economic basis in every case. Thus, some costs of delay are associated with zoning bonuses.

Transfer of development rights to discourage development on some sites is another tool that may be used more widely in the future, especially to encourage mixed-use. In states with weak zoning, however, the market will determine the development of a site.

IV. BALANCING FORCES

Undoubtedly, many "pull" factors work against CBDs, and they are

accumulating at a faster pace than ever before. The mobility of people will be trivial compared to the mobility of information. This will certainly have a major impact on CBDs, because the need for interaction among the practitioners changes although the activities located in the CBD do not change radically. Interaction can be face-to-face transactions or communications by various media.

An organization that does not require face-to-face communications will not leave an existing location in the CBD for that reason alone. For one thing, the costs of relocation are too great. Other factors would have to offset those costs. Factors to consider include savings in rent or ownership costs, savings in labor costs, an improved labor pool, or lower taxes. If all of these other factors are greater outside the CBD, the likelihood of eventual relocation is rather high. As a general rule, taxes are less onerous for businesses in suburban areas than in large central cities, a condition which is a problem for central cities. Central cities generally have to pay more per capita (or per dollar of personal income) than suburban areas for social services and public transportation services. Thus, they have to impose heavier taxes than suburban areas unless, of course, federal and state legislatures add to their subsidies for central city services. As yet, few central cities have mechanisms for allocating the cost of services provided to suburban residents who work in the CBD but do not live there. Few suburban areas are eager to see their state legislature create such a mechanism. Since suburban and rural representation in most legislatures is very strong, this solution to cities' problems faces a difficult battle in most places.

Over the long run, decentralization eventually can have a favorable impact on central cities, and urban decline could even reverse itself. This would happen if the decreased demand for CBD space drove land and space costs down to a level equal to or less than land and space costs in outlying areas, and other factors were favorable. Both factors must be present because land value diminution does not seem to be sufficient to halt urban decline. City-lovers have long hoped that land value diminution alone would halt the exodus from older central cities. This has not happened, however, at least not in Newark or St. Louis, two cities that have been hard hit by emmigration of businesses during the last few decades. For the same reasons that the process of decentralization took many years, the process of recentralization, if it does work, would take many decades. Organizations make relocation decisions infrequently, and inertia generally favors the present site. A firm seeking an initial location or a branch site might prefer a CBD site if it were less expensive, close to theaters and restaurants, and historically attractive. But a comfortably established suburban firm, with extra land for expansion located within a short commute of its labor force and its chief executive officers, would be very reluctant to move back to

the central city unless major factors, other than space costs, made that move advantageous.

All of the possibilities outlined in this speculation depend upon other social factors as well. Many people look upon their office as a place to make friends and socialize. Many managers like to have their peers and subordinates close by, where they can keep an eye and an ear on them. These psychological and social factors have an intangible economic value whose impact cannot be predicted, but probably is quite large. Within the next ten to fifteen years it does not seem likely that the nation will turn into a network of electronic cottages.

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While there are many books and articles on cities in general, there are relatively few dealing only with central cities, and hardly any dealing with technology and CBDs. This paper is adapted from my own *Where's Main Street, U.S.A.?*, funded by the Eno Foundation for Transportation, Inc., Westport, Connecticut, 1984.

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