Mt. Auburn Associates

Rural Iowa and Telecommunications:

Opportunities for Economic Development

FINAL REPORT

Submitted to:

Iowa Department of Economic Development

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1.0 Introduction

1.1 The Telecommunications Revolution

As the business and popular press have informed us with ever greater frequency, a revolution in telecommunications is underway. Means of communicating are on their way that, ten years ago, one would have thought came out of a science fiction novel. "Seamless roaming," "digital compression," "interactive television," and "personal data communicators" all are phrases about to enter the popular lexicon. "Electronic shopping" is already here and rapidly growing.

Humans who are not within several feet of each other can now be linked by any number of:

- **transmission media**, such as fiber optic lines, wire cable, microwave, and satellites;
- **telecommunications delivery systems** built around transmission media, such as cable TV, wireless cable, cellular telephone, computers, and POTS (plain old telephone service); and
- **telecommunications institutions** that operate the delivery systems, such as Internet, the local phone company, your choice of long distance phone companies, the local cable company, Prodigy, Compuserve, and many niche service providers.

With many new products entering the market and others about to leap off the drawing board, the traditional lines between the voice, video, and data segments of the telecommunications industry are falling, and the boundary between the telecommunications and the computer industries is changing from a solid line to a dotted

one. "Multi-media" is the catch word, and the big names in telecommunications, computer hardware, computer software, and electronics -- Time Warner, TCI, US West, IBM, Apple, Microsoft, Silicon Graphics, Motorola, Sony, and Philips -- are forming new alliances, every week it seems.

With ever greater volume, voices are rising from the cacophony of telecommunications activity to call for an integrated, two-way network providing voice, data, and video service that could reach every home in the country. Essentially, this "National Informational Infrastructure" would transform the way people and businesses interact with each other. There seems to be emerging consensus that the fiber optic re-wiring of the country would be necessary, but would not need to include the "last mile" -- the distance from the street into homes and offices. This would be handled through existing coaxial cable and copper wire systems. Agreed-upon standards for the equipment and software to handle the "digital highway" are slowly being put together. Numerous technical difficulties remain, but are likely to be overcome in the near future. Perhaps the key unknown is the allocation of roles and responsibilities in the development and operation of the new infrastructure to be allocated among the federal government, state governments, telephone companies, cable companies, other types of telecommunications companies, and consumers themselves.

The implications for economic development of this creative chaos in the development and deployment of telecommunications equipment are unclear at this point, other than that how we live is likely to significantly change. Neither the ultimate form of the telecommunications infrastructure nor which organizations and persons will control content and transmission have been settled, and the range of possibilities is quite broad. The general consensus in the industry at present is "stay tuned" to see how it all ends.

Whatever the form of change, rural areas are likely to be profoundly affected. Recent improvements in telecommunications infrastructure and equipment already have led to visible changes, such as more home-based work and the dispersion of separable corporate activities to far flung corners of the country and the world. Significantly more change will occur. The advent of digital technology, enhanced radio-based communication, new high-capacity transmission and compression techniques, and sophisticated new signalling methods will make it possible for users in remote areas to participate in the Information Age on a level nearly equal to those in urban centers.

1.2 Study Purpose and Framework

In December 1992, the consulting firm of Arthur D. Little (ADL) provided the state of Iowa with an assessment of the role of telecommunications in the state's economic development, the need for upgrading the state's telephone infrastructure, and recommendations for a specific level and type of change. (The report was prepared for the Iowa Department of Economic Development and the Iowa Utilities Board, with funding from the U.S. Economic Development Administration and the Iowa Telephone Association.) Essentially, the consultants recommended that the state adopt a "moderate" deployment strategy, as follows:

- completion of cellular coverage within two years;
- electromechanical switch replacement;
- conversion of interexchange trunks for fiber;
- extension of SS7 signaling capability to local switches as they are converted to electromechanical;
- elimination of party lines; and
- fiber to the curb, T1 to the home, and fiber to the home at 3 percent per year.

The ADL report examined the telecommunications needs of *existing Iowa industries*, with a particular focus on business needs in rural Iowa. The purpose of this study is to take the findings of the ADL study a logical next step -- to ascertain the opportunities for *new types of economic activity* in rural Iowa as the recommendations of the ADL study are implemented. The consulting team sought to identify economic activity with a significant reliance on an enhanced telecommunications system, with the potential to create or access a larger market, and that would find rural Iowa a desirable business location. The team sought to identify potential targets for attraction, business startup, and expansion. In particular, the team sought to understand ways in which existing rural Iowa employers might significantly alter their means of operation through using telecommunications to expand markets.

The consulting team's initial step was to get an overview of the nature of the labor force in rural Iowa, on the assumption that the characteristics of the labor force are important in attracting new economic activity. The results, shown in Tables 1 to 3, indicate that:

- Rural Iowa's labor force is more highly educated than are workers in the rural U.S. as a whole. Over three-quarters of the workforce have a high school degree. Still, only 21 percent of the labor force have an associate's degree or higher, and only 13 percent have a bachelor's degree or higher. Rural Iowa is not a reservoir of college educated workers, and so will not be attractive to most firms looking for such talent.

- Manufacturing employs almost one in five workers in rural Iowa, retail trade employs 17 percent, farming employs 12 percent, and education employs 10 percent. The relatively high percentage of persons in education reflects a strong emphasis on public education.

- There is a wide diversity of occupational talent in rural Iowa. This diversity mirrors that found elsewhere in rural America, though with a much stronger emphasis on farming. Eighteen percent of the workforce are low- and mid-skilled, blue-collar labor; 14 percent are service workers; 13 percent are administrative support personnel (e.g., clerical); 11 percent are high-skilled, blue-collar; 11 percent are professionals; and 11 percent are farmers, foresters, or fishermen. For the most part, the predominant occupations tend not to require post-secondary education.

The consulting team then examined the potential for growth of telecommunications-based operations that would be spinoffs from or providing services to key existing Iowa industries. The premise behind this analysis, as noted in the RFP for this project, is that one potential source for new economic activity is from the management talent in existing industry. Using prior state-sponsored studies of Iowa industry, the consulting team identified and examined ten key Iowa industries to ascertain potential opportunities for telecommunications-based activity.[1] These industries were insurance, printing and publishing, agriculture, plastics, metal casting, avionics, health care, education, transportation, and banking.

The results of these industry analyses are provided as working papers under separate cover. The analysis of these industries, and further examination of the nature of the telecommunications revolution, led the consulting team to ascertain that an

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[1]The prior studies are Technology Transfer in Iowa: A Strategic Audit by Brandon Roberts + Associates, with Mt. Auburn, 1990; and Identification of Key Technologies and Industries for the State of Iowa by Battelle, 1992.

industry-based focus did not fully capture the range of possible telecommunications-based opportunities for rural Iowa. While linkage to an existing industry often was an advantage, the team perceived that there was a series of telecommunications-driven activities that cut across industries and that it would be more useful to the client to identify these basic activities and use them to think about and seek to exploit opportunities as broadly as possible. This approach also allows the client to gain a wide view regarding rural Iowa's competitive advantage and disadvantage in attracting various types of telecommunications-based economic activity.

Essentially, the team perceived that an enhanced telecommunications system encourages business development and expansion in four ways:

- First, enhanced telecommunications infrastructure and equipment allow firms to *"unbundle" discrete operations*, both back offices and professional staff, and place them in different geographic locations. In addition, it makes possible the "lone eagle" phenomenon, self-employed professionals moving to remote locations and serving customers by wire.

- Second, an enhanced telecommunications infrastructure allows firms to *expand the geographic size of the market.* Telemarketing, mail order, distance learning (interactive classroom TV), and remote analysis (e.g., health care exams and monitoring over closed circuit TV) are examples of such phenomenon.

- Third, telecommunications allows incredible *efficiencies in the gathering, analysis, and distribution of information.* These efficiencies are stimulating a multitude of business opportunities, such as interactive databases, electronic publishing, and sophisticated distance research (such as computer-assisted public polling and consumer surveys).

- Fourth, an improved telecommunications infrastructure allows for *more sophisticated telecommunications delivery systems*, such as telecommuting centers and interactive TV, to come into being. These new delivery systems, in turn, allow businesses to take advantage of larger markets, dispersion of personnel, and reduced information costs.

These four dynamics, individually and collectively, have spawned a wide variety of telecommunications-driven economic activity, as the examples provided above attest. Through its research, the consulting team identified ten types of emerging telecommunications-based operations, services, and products that stem from an improved telecommunications system. These are:

- *Back-office administrative and processing operations.* As is well known, companies are readily shifting back-office administrative and processing operations to sites other than corporate headquarters, connected by telecommunications. These operations may be internal to a parent company or may be "third-party" operations, serving a variety of clients.

- *Corporate professional services.* Corporations can locate key professional functions, both whole offices and individuals, to locations far from their main operations, customers, and suppliers. Self-employed professionals also are moving themselves to far flung locations, servicing customers by wire.

- *Interactive information media.* For buyers of information, interactive information media, such as on-line databases and audiotext, provide enormous efficiencies in information collection and dissemination. The number and size of firms providing such information are growing.

- *Electronic publishing.* Electronic publishing allows for customized paper products, such as fax newspapers, and new modes for delivering information, such as CD-ROMs.

- *Distance research.* Distance research takes advantage of telecommunications and computers to gather otherwise hard-to-get primary data. Distance research includes efforts such as public polling, consumer surveying, lead generation, and database development.

- *In-house telemarketing and mail order for small- and medium-sized firms.* More small- and medium-sized manufacturers and retailers realize the value of WATS and 1-800 systems for increased sales and improved customer relations and retention.

- *Distance learning.* With distance learning, interactive classroom instruction with the teacher and students in disparate sites can take place. Observers expect this field to greatly expand in the future.

- *Remote analysis.* Remote analysis is the monitoring and analysis of specific conditions from remote locations. Medical diagnosis, financial analysis, and equipment monitoring are examples of remote analysis currently carried out in Iowa today.

- *Telecommuting centers.* Public access telecommuting centers equipped with computers and the latest telecommunications technology can be important to many small and start-up businesses that cannot otherwise afford sophisticated telecommunications equipment. Thus, these centers can facilitate small business development and expansion.

- *Interactive television.* Perhaps the most heralded development expected to result from an enhanced telecommunications system is interactive television. This new development will allow multiple forms of information (video, data, audio) to be transmitted over an enormous number of channels and will allow interaction between the sender and receiver. It should provide significant opportunities for new programmers and services to develop.

In the sections following, each of these telecommunications-based operations, services, and products are discussed. In each section, the team provides an overview of the activity, key location factors in siting, a profile of the occupations involved, an assessment of the opportunities in rural Iowa, and recommendations for actions to take advantage of any opportunities. A synthesis of the findings and recommendations will be provided at the end.

Before proceeding, the team wishes to make two points. First, the telecommunications revolution is broader in scope than the wired environment. Wireless forms of communication, such as cellular, are having and will have a significant impact on daily life and economic development. (The just-announced acquisition of McCaw by AT&T gives added credibility to this observation.) The focus of the ADL study was the enhancement of Iowa's telephonic wire system. The charge of this study is to examine additional dimensions of the telephonic wire-economic development linkage. However, as will be seen in the text, discussion of telecommunications innovations outside the telephonic-wired environment is not avoided. In fact, limiting discussion to the telephonic-wired environment would have been artificial, as the types of business operations noted above do not use just one type of telecommunications infrastructure. At the same time, a systematic review of nontelephonic wire activity was not carried out. To gain a full sense of economic possibilities, the Iowa Department of Economic Development (DED) might consider a broader assessment at some point in the future.

Second, our review of the ADL study led us to conclude that its infrastructure upgrade recommendations do not take into account the full significance of recent technological and service developments. At the end of the report, the consulting team provides its views and additional recommendations regarding telecommunications infrastructure development that Iowa might consider.

TABLE 1

Educational Attainment

	RURAL IOWA	RURAL IOWA %	RURAL U.S. %
Persons 25 years and over:	1,013,276	100.0%	100.0%
Less than 9th grade	114,662	11.3%	14.3%
9th to 12th grade, no diploma	108,608	10.7%	16.5%
High school graduate (Includes equivalency)	415,617	41.0%	34.8%
Some college, no degree	161,284	15.9%	16.1%
Associates degree	77,826	7.7%	5.4%
Bachelors degree	95,215	9.4%	8.5%
Graduate or professional degree	40,064	4.0%	4.4%

Source: 1990 Census of Population and Housing, Summary Tape File 3A

TABLE 2

Labor Force Characteristics: Employment by Industry

	RURAL IOWA	RURAL IOWA %	RURAL U.S. %
Employed persons 16 years and over:	718,946	100.0%	100.0%
Agriculture/forestry/fisheries	86,594	12.0%	6.5%
Mining	1,323	0.2%	1.5%
Construction	36,385	5.1%	6.9%
Manufacturing, nondurable	53,230	7.4%	9.3%
Manufacturing, durable	80,982	11.3%	11.8%
Transportation	28,804	4.0%	3.8%
Communications/public utilities	12,578	1.7%	2.4%
Wholesale trade	31,120	4.3%	3.3%
Retail trade	119,401	16.6%	16.9%
Finance/insurance/real estate	30,588	4.3%	4.1%
Business and repair services	22,025	3.1%	3.3%
Personal services	18,594	2.6%	3.2%
Entertainment/recreational services	5,709	0.8%	1.0%
Professional & related services:	170,185	23.7%	21.7%
Health services	61,804	8.6%	7.7%
Educational services	69,391	9.7%	9.2%
Other professional services	38,990	5.4%	4.8%
Public administration	21,428	3.0%	4.5%

Source: 1990 Census of Population and Housing, Summary Tape File 3A

TABLE 3

Labor Force Characteristics: Employment by Occupation

	RURAL IOWA	RURAL IOWA %	RURAL U.S. %
Employed persons 16 years and over:	718,946	100.0%	100.0%
Managerial/professional/specialty	138,907	19.3%	19.8%
Executive, administrative, managerial	57,938	8.1%	8.6%
Professional specialty	80,969	11.3%	11.2%
Technical/sales/administrative support	182,558	25.4%	25.8%
Technicians	17,467	2.4%	2.8%
Sales	71,338	9.9%	10.1%
Administrative (inc. clerical)	93,753	13.0%	13.0%
Service	107,008	14.9%	14.2%
Private households	3,184	0.4%	0.5%
Protective service	6,608	0.9%	1.6%
Other service	97,216	13.5%	12.2%
Farming/forestry/fishing	78,741	11.0%	6.0%
Precision/production/craft/repair	79,773	11.1%	13.4%
Operators/fabricators/laborers	131,959	18.4%	20.7%
Machine operators,assemblers, inspectors	61,644	8.6%	10.1%
Transportation, material moving	36,174	5.0%	5.6%
Handlers,equip. cleaners,helpers,laborers	34,141	4.7%	5.0%

Source: 1990 Census of Population and Housing, Summary Tape File 3A

2.0 Back-Office Operations

2.1 Background and Trends

Advanced telecommunications networks enable companies in myriad industries to separate operations, locating labor-intensive, back-office functions to remote areas to capitalize on lower operating costs and the availability of an educated workforce eager to work. The practice of separating these functions is not a new one -- large companies have been segregating back-office functions for several years and many rural states have even focused economic development strategies on attracting these facilities. Recent trends in back-office location and function, however, suggest that back-office facilities will continue to provide economic development opportunities to rural communities.

First, a growing number of small- and medium-sized companies are now following in the footsteps of their corporate cousins. According to a 1991 Wall Street Journal article, many small firms are finding that shifting operations to faraway locales can save on taxes, satisfy employees, cut travel costs, or even locate an operation a couple of time zones closer to Europe. Second, there has been a dramatic increase in the number of firms that are now "outsourcing" back-office functions to third-party providers. Many of these third-party providers are now offering value-added functions in addition to traditional back-office activities. It is these third-party providers of traditional and value-added back-office operations that will provide opportunities for development in rural areas.

Measuring the size of the back-office "market" is impossible because it encompasses such a wide range of functions and because much of the economic activity is internal to firms in myriad industries. Business Week magazine estimated that outsourcing data processing alone was a $12.2 billion business in 1992 and forecast it to grow to $27.7 billion in 1997. Electronic Data Systems, founded by Ross Perot in 1962 and now owned by General Motors, is the largest provider with about 13 percent of the market. IBM and Computer Sciences are also big players. However, Business Week reported that there are "dozens of small outsourcers that are thriving in the shadows" by targeting specialized, niche markets.

Companies that are appropriate targets for third-party processors include:

- companies with large customer service operations;
- companies with large credit card authorization and billing departments;

- companies that require large centralized accounting and other types of recordkeeping and data processing operations;
- companies that handle a large volume of financial transactions; and
- publishing companies that print large volumes of data.

These activities can be classified into three general categories: customer service operations, forms/data processing, and printing. New technologies are revolutionizing the nature of all of these functions. In the publishing industry, for example, advances in desktop publishing coupled with the ability to transmit digital data via telephone lines or satellites facilitate the separation of prepress activities from printing operations. Currently, much of the information printed at distant locations is on magnetic tape shipped by mail. For example, Rolling Stone magazine is published in New York, but printed via magnetic tape in Oklahoma to take advantage of lower labor costs and a central U.S. location from which to distribute. In the very near future, compression technology, in conjunction with the strategic deployment of digital switching capabilities, could facilitate the extension of the services required for such publication activities throughout the state, and at very low costs. Eventually, as fiber optic networks become more ubiquitous and online transmission less expensive, remote printing will become much more attractive to the publishing industry.

In the area of forms processing, innovations at the microcomputer level have led to the development of sophisticated workstations capable of processing thousands of different forms. Forms processing software, or "formware," allows firms to custom design computer reports that can be transmitted over local and wide area networks using electronic data interchange (EDI). Imaging is another example of a new technology that has the potential to revolutionize forms processing activities. Imaging enables printed documents to be electronically scanned, converted to a digital format, and then stored on a database. Document images can then be accessed and manipulated on computer screens around the world. Imaging is slowly being adopted within certain paper-intensive industries, such as banking and insurance, but the full range of applications remains to be determined.

Despite the impressive capabilities of many of these new technologies, many firms are reluctant to implement them. Firms are discouraged by the large up-front investment required and the fear that the new technologies may soon become obsolete. The problem is most acute among smaller firms that lack the necessary capital. But larger firms, often uncertain about how to incorporate the technology into their

operations, are also reluctant to invest in new technology. This reluctance and the very rapid pace of change in the computer industry have led to the surge in outsourcing of back-office operations to third-party providers with state-of-the-art hardware and software.

Outsourcing labor-intensive, back-office functions also relieves companies of many human resource management issues and enables management to focus on its core business. In the banking industry, for example, experts believe that institutions can save between 20 and 30 percent in systems software support, computer operations, and telecommunications costs, and 30 to 50 percent in clerical back-office and administrative expenses by taking advantage of third-party processors' sophisticated workstations. Outsourcing also enables banks -- and other businesses that closely manage their return on assets (ROA) -- to reduce their asset base.

2.2 Occupational Profile

The skill requirements for back-office facilities vary depending on the type of service provided. Customer service facilities generally seek people with good voice and interpersonal skills, while forms and data processing employers look for people with clerical and basic math skills. Although data processing firms teach their employees to use the computer workstations, they prefer to hire people with some level of comfort with computer equipment. Finally, printing is a manufacturing function that requires employees capable of operating printing machinery and equipment. These skills are available in rural Iowa.

2.3 Key Location Factors

Just as advances in telecommunications and technology have led to the emergence of third-party providers of back-office functions, these advances have also freed these facilities from most locational constraints. The major locational criteria for a back-office facility are low operating costs (labor, real estate, and utilities), a supply of qualified workers, and access to a good telecommunications infrastructure. Proximity to the customer -- in this case the "front-office" -- is becoming increasingly irrelevant.

2.4 Opportunities for Rural Iowa

Iowa has a concentration of back-office facilities providing customer service, forms processing, and printing functions to "internal" clients, especially in the insurance industry. In addition to an increasingly powerful telecommunications infrastructure, Iowa offers these facilities a central location, a pool of educated, entry-level labor, and a low-cost operating environment. Although most of these facilities are in the larger urban areas, the trend may be toward smaller towns and more rural locales. One Iowa-based insurance company, the Principal Financial Group, suggested that the Des Moines market is tapped out as a source of back-office employees and the company is opening its new facilities in smaller cities in the state to access new labor pools.

The same factors that have made Iowa an attractive location for in-house, back-office facilities suggest that the state is also well-positioned to capitalize on the growth of the more innovative examples of third-party providers of back-office and value-added, back-office activities. This is supported by the fact that, within the past year, a number of highly innovative, third-party providers of back-office services has been established in Iowa. Some examples are discussed below.

Forms Processing. A perfect example of new technology creating an outsourcing opportunity in Iowa is the Shared Image Facility that EDS recently established in Des Moines. The $3 million facility will offer clients in the insurance industry access to state-of-the-art imaging technology. All standardized documents and applications mailed to an insurance company client will be rerouted to the Center and scanned by a machine into the client's database. Documents can then be accessed and manipulated by multiple users in separate locations simultaneously. While the Center is eventually expected to serve a national market, EDS chose to locate it in Iowa due to the concentration of insurance firms, its target client base. The Center only recent started operations, but EDS expects that it will employ about 70 people within two years.

Customer Service. SmartPay is another example of a Midwest-based provider of value-added, back-office services. Established last year in Council Bluffs (but soon to relocate to Bellevue, Nebraska), SmartPay enables consumers to automatically pay bills using a touchtone telephone. To subscribe to the service, an individual merely submits the names of the entities he or she wishes to set-up on the system (e.g., Joe's Fish Market, American Express, etc.) and SmartPay does the rest. SmartPay identifies the payee's bank account and then establishes an account for the customer (the payer), who then can initiate payments to the designated payees using a touchtone telephone to call a toll-free (800) number. SmartPay markets the service to financial institutions, which in turn

market it to their customers in their own corporate name. SmartPay allocates a different 800 number to each financial institution, and calls to each number are handled in the name of the host institution.

SmartPay currently serves customers in eight states, but expects to expand its services nationwide. The company, which leases voice and data lines from AT&T, originally chose Council Bluffs to be near Omaha, Nebraska, a national hub for electronic banking, and to take advantage of start-up funding offered by the state of Iowa. The company could be located in a more rural setting, but it is less expensive to locate near a "point of presence," the point where a long-distance trunk terminates. The company sees several advantages to its Midwest locale. The region provides a pool of employees who speak with a "flat accent," which is particularly important because SmartPay employees will eventually answer telephones in the name of banks located across the country. The Midwest also provides a central location from which to serve a national market, thereby minimizing its long-distance charges.

SmartPay seeks employees with computer programming, organizational, and customer service skills. The company has been successful in hiring customer service people locally, and management spoke highly of the work ethic among its workforce, but has had more difficulty finding good technical people in the area. SmartPay currently employs 47 persons and is projecting 80 to 100 employees by year-end. Management believes that employment could reach 300 persons within a couple of years.

Unfortunately for Iowa, SmartPay is implementing its expansion plans by moving across the river to Bellevue, Nebraska. It is investing in a new building and advanced computing systems, financed in part by a large tax break from Nebraska. In a unique move, Nebraska is paying off Iowa's previous investments in SmartPay, both incentives and seed capital.

Printing. Unlike forms processing and customer service operations, printing is an established industry and one with a significant presence in Iowa. The rapid pace of technological change in the printing industry is both a threat and a source of opportunity to the 550 to 600 printing firms in the state. Printing firms that keep pace with technological changes have the opportunity to expand their services to a much larger market. Those that fail to invest in technology, however, risk losing market share.

Some of Iowa's larger printing plants, such as those operated by the Wall Street Journal and R.R. Donnelly, are using the latest technology to meet the printing needs of their parent companies. Iowa's independent printers need to adopt similar capabilities. As remote printing becomes more widespread, Iowa's low-cost environment and central location provide these firms with sources of comparative advantage over other regions.

2.5 Strategic Actions

Facilities such as the EDS Imaging Center or SmartPay's innovative new service, that rely on state-of-the-art technology to offer value-added, back-office services to firms both inside and outside Iowa, offer significant potential for rural Iowa. The key will be to extend these new technologies to revolutionize back-office activities in other industries as well, particularly those industries that make sense within the context of Iowa.

An imaging facility serving the trucking industry may be one example. Trucking is both document and telecommunications intensive; shippers assign every carton, container, and crate on each truck a bill of lading and delivery receipt that often includes several attachments. Some shippers are already using the technology themselves. Consolidated Freightway, Inc. in San Francisco, for example, uses imaging to manage the more than 200,000 documents that its drivers deliver to the company's truck terminal each day. Consolidated uses a high-speed network to transmit image data and voice and data communications between each consolidation facility and its central facility. Adopting the imaging center concept to the trucking industry would be a natural fit in Iowa.

Iowa is also well-positioned to provide other value-added services to the trucking industry. The Transportation and Logistics Program at Iowa State University provides a supply of skilled graduates trained to integrate telecommunications and technology to improve transportation scheduling and logistics. The program is one of only a handful in the country. Developing a third-party facility that provides logistics planning and back-office processing to the trucking industry may be an idea that merits further study.

This example of the trucking industry suggests that Iowa should prepare a strategic plan for attracting back-office operations. This plan would identify key trends in the location and operation of back offices, industry type by industry type; analyze Iowa's competitive strengths and weaknesses in attracting them; and suggest a series of steps that Iowa and its regions could carry out to improve its competitiveness and attract more business.

With regard to Iowa's existing printing industry, telecommunications presents opportunities and threats. First, as will be noted in the section of electronic publishing, new media are being created to replace, or at least supplement, print media. Second, many of the smaller printing firms lack the knowledge, the capital, or both, necessary to

upgrade their technology and remain competitive. Technology transfer services targeting these firms could help the state's printing industry to stay competitive and expand to larger markets. The Iowa Department of Economic Development and the Graphics Technology Center of Iowa are already taking steps in this direction.

3.0 Professional Services

3.1 Background and Trends

Just as innovations in telecommunications technology enable companies to separate back-office functions and locate them in low-cost regions, enhanced telecommunications enable medium- and large-sized corporations to establish or relocate their headquarters, or members of their professional staff, to the small towns and rural communities of their choice, often far from their corporate operations, customers, and suppliers. The drive to do so is a combination of a search for low-cost living, a safe, serene, and often picturesque environment, and a realization that being in the same room with co-workers and clients is not as necessary as it once was. As the senior vice-president of a highly regarded supermarket chain headquartered in Boise, Idaho put it, "As long as you have telecommunications and computer technology, you can run a company from anywhere."

The extent of this phenomenon is difficult to gauge, but examples of medium- and large-sized corporations run from small towns and rural locales are becoming increasingly numerous. Wal-Mart Stores, Inc. manages its national chain of more than 1,900 discount department stores from Bentonville, Arkansas. The retailer relies on a private satellite system installed in 1986 to communicate with its stores and to facilitate ordering and inventory management.

PC Connection, Inc., a mail-order firm for computer software and accessories, is managed from a remodeled mill and Victorian inn in Marlow, New Hampshire. The company established its warehouse in Wilmington, Ohio, however, to facilitate its next-day-noon delivery policy. According to Patricia Gallup, PC Connection's president and co-founder, it is the instantaneous communications between facilities facilitated by computer and telecommunications technologies, particularly electronic mail and facsimile transmission, that have made this arrangement successful.

Mrs. Fields Cookies, headquartered in Park City, Utah, is equally committed to technology. Each of its over 700 units are linked to the headquarters by computers that relay hourly information on sales, product costs, customer counts, and other vital statistics. Other examples of national firms managed from remote locations include the Rocky Mountain Chocolate Factory in Durango, Colorado and a number of national software and consulting firms in Ketchum, Idaho.

In a related phenomenon, many corporate and self-employed professionals are packing up their contracts, computers, and modems and moving out of their urban offices to live and work in the setting of their choice. A group of 12 junk bond analysts for Duff and Phelps, a Chicago bond rating firm, chose to move their entire division to Montpelier, Vermont.

Among self-employed professionals, this trend is even more widespread. The Center for the New West, a Denver-based think tank, refers to these footloose professionals as "lone eagles." As part of the Center's research on the subject, it is developing a telecommuting hospitality index that communities can use to rate their attractiveness to telecommuter entrepreneurs. The index will focus on small cities, towns, and communities with populations of 2,500 to 50,000. Popular locations for lone eagles include resort areas such as Taos, New Mexico; Aspen, Colorado; and Kalispell, Montana. But according to the Center, many low-profile, rural communities are becoming equally popular. The Center cites Gunnison, Colorado, which is experiencing a substantial in-migration without any new industry, as an example. Although some of the population growth in Gunnison could be due to an influx of retirees ("wise old owls") and employees working in small businesses, it is thought that lone eagles account for a significant percentage, particularly since small businesses rarely import labor.

3.2 Occupational Profile

The general occupational profile in this category is, by definition, professionals and management level staff. For the most part, the professionals come to the rural area as part of the relocated operation. Lone eagles tend to be highly educated and often work in information-based industries such as consulting and finance.

3.3 Key Location Factors

The establishment or relocation of corporate professional services to remote locations is facilitated by the same telecommunications services that have enabled companies to relocate back-office operations. The non-telecommunications criteria that professionals evaluate for site selection, however, are entirely different. Quality of life, not the availability of local talent, is the primary criterion. Simply put, lone eagles choose communities in which they most want to live. Corporate executives behave similarly when selecting a site for a corporate headquarters, but are also sensitive to a state's tax and regulatory environment.

Quality of life in a rural area encompasses the availability and cost of a range of basic goods and services, and recreational and cultural amenities. Good schools and quality health care are high on the list. Also important are access to a major metropolitan area, a major highway, good air transportation, and a reliable overnight delivery service. The Center for the New West reports that same-day delivery of the Wall Street Journal or New York Times is another factor. But the rural locations that are most attractive to professionals tend to be those with high-amenity values, that are typically scenic regions with lakes, mountains, or shorelines suitable for recreation.

AMCA International, a large Canadian conglomerate, chose Hanover, New Hampshire as the site of its U.S. headquarters because the town of 9,000 permanent residents and 4,000 Dartmouth College students offered New England charm with many of the amenities of large urban areas. According to its chairman, AMCA International wanted a setting where people "could do some constructive thinking, work in a relaxed environment, minimize commuting time, and, generally speaking, not be subject to all the problems that locating in a big city automatically entails -- crime, busing, and distractions of one kind or another." The location is also centrally located among the company's major markets, which include Boston, New York, and Montreal.

Ms. Gallup of PC Connection boasts about her window views of the mill pond, the waterfall, and the pine trees. And quality of life was the reason Randy and Debbi Fields, co-founders of Mrs. Fields Cookies, decided to relocate to Park City from the San Francisco Bay Area. The Fields viewed Park City, which has first-rate public schools, as a more desirable place to raise a family.

3.4 Opportunities for Rural Iowa

The potential for inducing large numbers of corporate professionals to rural Iowa does not appear to be great. One lone eagle, a native Iowan in Cedar Rapids who consults to the telecommunications industry, cited excellent air transportation, quality of life, and the need to be in the central time zone as key factors in his decision to keep his business in Iowa. But, as noted above, the rural locations that are most attractive to professionals tend to be those with scenic amenities such as lakes, mountains, or shorelines. Iowa's central U.S. location, low cost of living, and good telecommunications infrastructure represent marketable assets, but it is not clear that these assets are sufficient to provide the state with an overall comparative advantage in the market for corporate professionals. The experience of Iowa firms that rely on highly trained professionals, such as agricultural biotech, is they have difficulty in attracting and keeping such professionals in the state.

Even so, there are some areas of rural Iowa that should be attractive to "lone eagles." Specifically, northeast Iowa and Dickinson County have significant natural amenities.

3.5 Strategic Actions

While rural Iowa is not typically ranked at the top of lists for executive relocation, there are measures that the state can take to enhance the advantages the state does have. First, the state can sponsor a strategic audit of rural Iowa communities with an eye to more fully identifying those areas that could be most attractive to lone eagles, wise old owls, and corporate operations. If a sufficient number of communities appear attractive, the state might take out ads and sponsor articles in periodicals most likely to attract eagles and owls (such as Modern Maturity) and corporate site searchers (such as site location monthlies). Articles could profile the self-employed and relocated executives who came to Iowa for quality of life. The state also might assist regional development organizations in attractive regions in taking action on their own.

4.0 Interactive Information Media

4.1 Background and Trends

The convergence of telecommunications technology with advances in computer hardware and software has created a burgeoning market for the electronic collection and distribution of information. To serve this rapidly growing market, companies in diverse industries are developing an array of services that enable customers to electronically retrieve information. Examples of interactive information media range from a simple audiotext service providing daily horoscopes over the telephone to sophisticated on-line computer networks, such as Prodigy, that are accessed by a personal computer and modem, and provide subscribers with real-time access to a host of information services. In addition to firms specializing in electronic information services, such as America Online and CompuServe, firms in the publishing and telecommunications services (i.e., phone companies) industries are active participants in the field.

Interactive information media constitute a subset of a larger group of electronic information services that includes information delivered via CD-ROM, magnetic tape, floppy disk, facsimile, and satellite. As a group, electronic information services generated revenues of $11.6 billion in 1992 and the U.S. Industrial Outlook 1993 forecasts the market to maintain a compound annual growth rate of at least 15 percent over the next five years. Non-interactive information media are discussed in the next activity overview, which focuses on electronic publishing.

The two major interactive information formats are online and audiotext:

On-line Services. On-line delivery, which is particularly well-suited to delivering large volumes of information in real time, is the dominant format, with over 6,000 on-line services accounting for 67 percent of the entire electronic information services market. According to a recent Business Week article, only about one-third of the 11 million modem-equipped PCs subscribe to on-line services, suggesting a large, untapped market. Companies in this category include both host services and database producers. The largest on-line service is currently Prodigy Services Corp., a joint venture between Sears and IBM, that has two million subscribers. Subscribers to Prodigy are able to access databases compiled by a range of database producers.

Other large players include CompuServe, Inc., a unit of H&R Block, Inc. with 1.3 million subscribers; Genie Services, a unit of General Electric Co. that has 400,000 subscribers; and America Online with 285,000 subscribers. Internet is another large

network targeted to the academic and research communities. Opportunities for smaller firms appear limited to database producers, since the large conglomerates dominate the market for host services. The fact that there are over 6,000 on-line services serving a $7.8 billion market suggests that there are opportunities for smaller firms; it is the large players, however, that are aggressively introducing new services and garnering news headlines.

Audiotext. Audiotext is a relatively low-cost, low-risk way to provide 24-hour information services to both consumer and business markets. Audiotext services, which are accessible by a touchtone telephone, are well-suited to the delivery of limited amounts of information that can be updated frequently. Newspaper publishers use audiotext services to provide weather, sports, and news updates, as well as voice personals and classified advertisements. Recently, the Baby Bells were authorized to provide gateway services and also to acquire 5 percent ownership participation in information provider firms. To date, the newspaper companies have successfully helped to maintain intact the prohibition of the provision of information services by the Baby Bells. The news firms contend that it is unfair competition for the phone companies to provide the conduit and the information services.

Audiotext services generate revenues in a number of ways. The advent of 900 number calling services enables providers to charge per call and per minute fees subject to limitations established by government regulation. As a result, anybody with a marketable idea can readily establish a service. Most of the audiotext services provided by newspapers are supported by voice advertising; users of these services merely pay for the local telephone call. Finally, audiotext services can also be established on a toll free (800 number) basis. This may be most appropriate for businesses seeking to provide customer service information or updated product availability and prices to customers.

4.2 Occupational Profile

Similar to a newspaper, an information service provider requires an editorial staff versed in the particular subjects in which that service specializes. Accordingly, a service that provides financial news via audiotext or on-line delivery requires people capable of accessing and interpreting up-to-the-minute changes in the financial markets. Technical people are also required to facilitate transmission of the information. This may involve computer operators, database managers, and equipment maintenance staff. In the case of audiotext, however, outside vendors typically install the initial hardware and software, and further technical requirements are minimal.

4.3 Key Location Factors

Most large electronic information services are spinoffs or divisions of print publishing companies or data processing service businesses. The exception is Washington, D.C., where the federal government fostered the development of electronic information services. Conceptually, location factors for providers of information services vary according to several criteria, including the types of information provided, the location of the target market, and the mode of delivery. Similar to more traditional businesses, however, information providers fall into two broad categories: those that locate near their "supply" of information and those that require proximity to their target market. A company interested in providing information on the latest events on Wall Street to a national market, presumably via on-line delivery, would be well served by locating in New York City. Similarly, a company interested in providing agricultural information would be better suited to a rural environment with a pool of talent knowledgeable about agriculture.

On the other hand, many services succeed by targeting information to a very localized market for which there is limited competition. For these firms, it is proximity to their market, which could be virtually anywhere, that is the determining factor. Weather reports, voice personals, or today's menu at the local diner are good examples. In addition, advances in telecommunications enable these local services to complement local news with late-breaking stories from around the globe. For these providers, audiotext services make the most sense and may represent the only viable format in sparsely populated markets.

4.4 Opportunities for Rural Iowa

With analysts projecting strong growth in the information services area for some time to come, there will continue to be opportunities for new entrants into the industry. The location factors above suggest two categories of information providers that make sense in the context of rural Iowa. The first are those firms that provide on-line information to a national market on topics for which Iowa may offer certain competitive advantages. The fact that there are now over 6,000 sources of on-line information suggests that there are already significant opportunities for entrepreneurs to assist businesses and consumers access this massive, but increasingly complex, wealth of data. Academic libraries, including those at the University of Tennessee and the Massachusetts Institute of Technology, already offer database search services on a fee basis. Similar services targeted to specialty sectors of the agricultural or business communities in the farm belt offer opportunities to for-profit businesses as well.

One model that Iowa may wish to examine is the Teltech Resource Network Corporation of Minneapolis. Teltech helps industrial scientists extract useful information from massive databases by relying as much on its "meatware," its expert staff, as its sophisticated computer hardware and software. Each Teltech analyst has a scientific background and is well-versed in searching the roughly 1,600 databases to which Teltech has access. The company also provides other value-added services, including access to a network of several thousand experts to provide expert opinions on contradictory information and lists of potential suppliers of products discovered during a particular search. Teltech charges a monthly subscription fee of $200-500, depending on the size of the customer, along with a per-call fee. Clients include over half the companies on the Fortune 500 list, including eight of the top ten in aerospace, electronics, and pharmaceuticals.

Service operations similar to Teltech could be targeted to Midwest industries with a strong Iowa presence, such as OEM manufacturing, insurance, printing, or agriculture. At one level, the market for agricultural information appears saturated. Most American farmers are equipped with computers and modems connecting them to on-line databases and services such as AGRICOLA, AgriData, and CMN. Broadcast Partners is a Des Moines firm already broadcasting agricultural information via satellite (not an interactive medium); the firm is looking to non-agricultural markets, however, for future growth and has been hindered by its Iowa location (see Section 5.0 for details). At the same time, there may be opportunities for high value-added Teltech-type operations in agriculture.

The second type of information service that may offer opportunities in rural Iowa is one targeting local markets, such as the audiotext services offered by the Cedar Rapids Gazette. The Gazette offers an ad-supported service that provides news, weather, sports, and financial information that is updated throughout the day. Each message is preceded by a 15 second advertisement from the sponsor and there is no charge to the consumer (except for the local telephone call). Recently, the company introduced a second free service, AutoLink, which provides used car listings for individual sellers and dealers. The Gazette's audiotext services have been so successful that the newspaper established a separate subsidiary, Gazette Audiotex Co., which now provides audiotext services to newspapers in Iowa City, Waterloo, and Dubuque, as well as for the Cedar Rapids Gazette.

The job creation potential of this type of service, however, is limited. Despite the success of Gazette Audiotex, which now receives about 400,000 calls per month, its staff has only grown from three to nine persons.

4.5 Strategic Actions

Value-added, on-line information services may offer a real opportunity for rural Iowa, particularly in agriculture. The state should ascertain the feasibility of such operations. If there appears to be feasibility, the state should consider promoting the creation of such operations. This could be done in any number of ways, including: showcasing the model to the appropriate industry people in Iowa to stimulate startup and investment; discussing the possibility for one or more of the state universities to provide such a service; offering a tax incentive for the development of such a service; subsidizing small business users of such a service (as Minnesota did, with a very positive ratio of benefits to costs); and issuing an RFP to develop such a service (with state financial and technical assistance promised).

Audiotex has limited job development potential for rural Iowa. However, it could serve as an enhancement to rural quality of life. The state might consider entering discussions with Gazette Audiotex about extending service to rural areas. There would be a need for commercial ad agents in the rural areas.

5.0 Electronic Publishing

5.1 Background and Trends

Advances in digital technology are paving the way for innovative new ways to distribute published materials to consumers using electronic media, either as a means of transmission for a printed product or as the final format of the publication. The capacity to digitize data -- text, voice, and video -- enables publishers to organize multimedia publications quickly and flexibly, and to transmit them virtually anywhere in real time. Examples of electronic publishing as a means of transmission include on-demand printing of textbooks at college bookstores and fax newspapers customized to niche markets. New media created as a result of electronic publishing include materials distributed via on-line computer services and CD-ROM.

Although the boundary between electronic publishing and electronic information media is blurred, electronic publishing is differentiated by the fact that it involves the transmission or repackaging of an entire publication, generally at the initiation of the provider. In the case of electronic publishing creating new media, the electronic communication is normally unidirectional, from the provider to the seller. Interactive information media, on the other hand, involve the electronic retrieval by the user of select information from a database. Accordingly, it is the large publishing houses that are investing in the more sophisticated electronic publishing applications. These include large newspaper, periodical, and book publishers, such as Time Warner and Knight-Ridder.

There are two types of electronic publishing activities facilitated by telecommunications and digital technologies:

Providing Paper Documents via Telecommunications. The ability to store information digitally and to transmit that data quickly and accurately using telecommunications services is leading to significant changes in both the production and delivery of printed materials. In its simplest application, telecommunications technology enables publishers to divorce publishing and prepress activities such as writing, editing, and layout, from the printing of the final product. The Wall Street Journal, for example, transmits data and graphics to its Des Moines printing plant via satellite. Used in this way, telecommunications technology merely facilities the geographic separation of a back-office function. But if this capability is extended such that the publisher can provide materials directly to the consumer via telecommunications, a new product or service is created.

One example of this capability is fax newspapers, which fall into three general categories: fax-on-demand, broadcast fax, and hybrid fax. With fax-on-demand, a user dials a service and orders a report, which is then sent directly to his or her fax machine. The report could contain current information, such as the day's sports scores, or the information could be extracted from a database. Broadcast fax services provide a homogeneous product to all subscribers on a regular basis. Dow Jones & Co., for example, offers JournalFax, a late afternoon newsletter of business and financial news highlights and closing statistics delivered through fax mailbox systems and to corporate users. Similarly, the Washington Post publishes Capital Fax, a morning newsletter that provides summaries of the day's Washington Post news stories. Finally, hybrid fax allows users to develop a profile and then have only information that meets that profile sent out by the originating company. Dow Jones, for example, offers Facts Delivered as a clipping service, but determining a profile that provides just the information needed is reported to be difficult.

The on-demand textbook pioneered by McGraw-Hill is another innovative application of electronic publishing as means of enhancing the printed product. Recognizing that college professors often pass up textbooks in favor of developing their own materials drawn from a variety of texts, McGraw-Hill developed a custom electronic publishing system called Primis (for Prime Information System). Primis includes a database with over 70,000 pages of text from a broad array of sources covering multiple disciplines. Colleges nationwide can mix and match materials to create unique texts available within 72 hours from a centralized printing facility. Or colleges (such as the University of California at San Diego) can purchase or lease the system to create on-campus custom publications, an option that offers professors the opportunity to supplement the Primis database with their own materials.

Publishing in New Media. The fastest growing trend in electronic publishing is the publication of materials in electronic format as either complements to or substitutes for traditional printed publications. Experts in the publishing industry speculate that most publications will someday be delivered in electronic form, but it is not yet clear exactly when or how. At the moment, CD-ROM publications are the most widespread application of electronic publishing technology. CD-ROM discs, in which lasers etch information as tiny pits, offer 100 times the capacity of floppy disks, and are best-suited for large quantities of information that do not require frequent updating.

So far, the bulk of CD-ROM users have been big corporations, universities, government agencies, and public libraries. For example, the U.S. government now distributes 1990 Census data on CD-ROM, while Pro Quest offers libraries full-text

articles from the Wall Street Journal and New York Times on CD-ROM. In the case of the Wall Street Journal, one CD-ROM contains the full editorial content of articles published between approximately January 1991 to April 1993. Users can execute key-word searches, such as "telecommunications" and "Iowa," and retrieve every article in which both words appear in a matter of minutes.

The ability to enhance CD-ROM publications with sound and video is transforming CD-ROM from an oddity into a popular and versatile format for a variety of book and magazine publishers as well. Macworld magazine's list of the ten best CD-ROMs (March 1993 edition), for example, includes titles ranging from The New Grolier Multimedia Encyclopedia to Poetry in Motion. Merriam-Webster's CD-ROM edition of the Ninth New Collegiate Dictionary, which is already on the market, contains all 160,000 entries in the printed version along with a mouse-activated speech component that gives the correct pronunciation of each word.

CD-ROM publications, however, may only represent a low-cost, intermediate step that will eventually be replaced with on-line publications delivered to any modem-equipped computer. Ziff-Davis, a large PC publishing house, is already offering an on-line version of its new book on DOS version 6.0, PC Magazine DOS 6 Techniques and Utilities. The paper form of the book is 1,035 pages and costs $39.95. The on-line version costs only $12.95 plus database connection charges, but takes two-and-a-half hours to download. Because on-line delivery offers publishers the ability to constantly update information, it is particularly attractive to the newspaper industry, which is in the business of providing up-to-the-minute information to subscribers.

Following the highly publicized failure of a number of on-line newspaper services in the 1980s, including Knight-Ridder's ViewTron and Times Mirror's Gateway service, newspapers abandoned the notion of electronic newspapers. Knight-Ridder, for example, a publisher of 28 daily newspapers and active in the field of electronic business services, discontinued ViewTron in 1986 after three years and $50 million. The company attributed ViewTron's failure to the fact that the services were expensive, slow, and clumsy. Newspaper publishers also discovered that readers prefer their news in print, which is portable, disposable, and easy to scan, rather than on a computer screen that requires them to scroll awkwardly through a story.

Now, however, new technologies have caused these companies to once again explore opportunities for on-line products. The new services being developed will exploit advances in digital technology to be faster and more innovative. And rather than providing an electronic version of the printed product, firms are working to develop unique new products. Knight-Ridder, for example, is in the process of

developing a multimedia newspaper. The planned format will include graphics, video, and voice (probably computer-generated). Although it is still in the development stage, the possibilities are vast. Text stories, for example, could be supplemented by complete videos activated merely by using a mouse to click on a still photo. Knight-Ridder plans to broadcast the newspaper from its existing facilities rather establish new sites, with the choice of a broadcast medium -- public broadband networks (ISDN or fiber optics), cable television networks, or microwave radio signal -- to be determined solely by economics.

5.2 Occupational Profile

The shift toward electronic publishing is not expected to change the skill requirements within the publishing industry. Skills such as writing, editing, and layout will remain at the core of the industry, although advances in desktop publishing applications are increasing the technical component of these activities. One industry expert suggested that there will be a slight shift in the distribution of employees from printing operations to more technical applications. In addition, some new skills will be required. Knight Ridder, for example, foresees the need to hire people with television production experience to help produce and integrate audio and video into its multimedia newspaper.

5.3 Key Location Factors

As mentioned above, it is the largest publishers that are most active in the field of electronic publishing, and these publishers perceive it as a natural extension of existing activities performed within existing facilities. In the case of newspaper services and other applications that rely on current information, electronic publishing activities are generally located in proximity to their information sources. Niche producers of CD-ROMs can exist anywhere. Proximity to key sources of information or a target audience, e.g., agriculture, can be important.

5.4 Opportunities for Rural Iowa

Electronic publishing is unlikely to present significant economic development opportunities for rural Iowa. It is primarily the large publishing houses in major cities, such as Time Warner and Knight-Ridder, that are exploring the more sophisticated

applications, such as CD-ROM and on-line, multimedia products. These companies tend to view electronic publishing as an extension of their existing activities performed within existing facilities.

Areas that may provide opportunities are those services that capitalize on rural Iowa's particular strengths and those that target very localized markets. Broadcast Partners, a Des Moines-based company specializing in providing agricultural information via satellite to subscribers in 44 states, is an example of a company capitalizing on Iowa's agricultural knowledge base. The company's primary service is FarmData, which provides market data, weather, and agricultural news to agricultural producers. In addition, Broadcast Partners offers Market Pulse, which targets the commercial side of the agricultural market, and Market Pulse Metals Service, which provides spot prices and other market information for recycled metals. And, in conjunction with Reuters, the company provides an energy market service targeted to large oil producers.

Although it is not married to a particular delivery medium, 100 percent of the company's services are currently delivered via satellite using KU band technology. (In contrast to C-Band technology that is used for satellite television, KU technology is for data only.) It is solely a broadcast format, involving unidirectional transmission from one provider to multiple users. The company's decision to locate in Des Moines was primarily driven by the fact that its primary owner is a Des Moines-based, agricultural products company. The company reports that its Iowa location provides editorial staff with agricultural expertise, but has hindered its entry into non-agricultural markets because its Des Moines address suggests to potential customers that it is agriculturally focused. Agricultural services account for 90 percent of its current business.

The company currently employs 70 full-time and 15 part-time persons divided among four functions: editorial, technical, administrative, and operations. All of the company's management were hired from out-of-state, as were most of its technical staff, and the company continues to have problems recruiting technical expertise locally. It has also been difficult to import technical talent to Des Moines. Management reported that these problems would be exacerbated in a more rural setting.

Some of the simpler electronic publishing applications, such as fax newspapers, may also provide opportunities for Iowa entrepreneurs. Fax newspapers offer small-scale entrepreneurs an affordable opportunity to create news products tailored to niche markets, defined by local geography or industry. Fax newspapers can consist of original materials on regional topics, or they can cull stories from the national press relevant to the regional market.

5.5 Strategic Actions

Electronic publishing does not present significant opportunities for economic development in rural Iowa. The occupational structure and locational needs of the industry do not lend themselves to rural Iowa operations. Experience shows that even urban Iowa has problems sustaining such industry outside the realm of agriculture.

The experience of Broadcast Partners suggests that the state may need to focus resources on technical training programs. As technology becomes increasingly important to industry in general, the demand for competent technicians and computer operators will continue to rise.

The state also could encourage niche producers of specialized CD-ROMs. Means for doing so are the same as those suggested for encouraging producers of educational CD-ROMs, provided in Section 8.0.

6.0 Distance Research

6.1 Background and Trends

As Iowa knows quite well, telemarketing -- outbound calls to sell a good or service -- is big business and will keep getting bigger. The technology needed to support effective telemarketing is fairly well known. It includes the use of digital switching for transmitting data, "data-quality" lines for transmitting electronic data, and the ability to get extra lines quickly during peak periods. The existing copper network already can support, in conjunction with the strategic deployment of digital switching, the provision of "data quality" lines to nearly the entire state.

With enhanced telecommunications infrastructure and computer capabilities, part of the expected growth in telemarketing will be an expansion of activities beyond just the straightforward selling of goods and services. Telemarketing companies are already expanding their activities to include what is broadly known as *distance research*, using telecommunications to gather primary information and data from disparate sources of information. Distance research includes efforts such as public polling, consumer surveying, test marketing, lead generation, and data customer database development. Distance research now relies very much on computer assistance -- to review and select prospects based on their specific characteristics (such as the type of car they own), to make the calls, to keep track of the results of prospects called, and to build the database. Computer technology has greatly enhanced industry efficiency and capacity to serve clients. In addition, telemarketing firms expect that with the advent of interactive communications, they will be able to offer education and training in the field of telemarketing to businesses that want to operate their own distance research (and telemarketing) efforts. Some firms also build a prospect list for client firms that want to do their own telemarketing.

6.2 Occupational Profile

Rural areas, particularly in the Midwest, have been favored by telemarketing firms because they offer friendly, accentless, underutilized labor at an inexpensive wage. These employees serve as telephone operators. The centralized geographic position within the country is also an asset for calling across the country. The demand for telemarketing operators in the Midwest will likely stay strong, especially given the projections for growth in the industry.

An expansion of telemarketing into distance research activities will require that telemarketing operators be capable of using computers. It is not expected that operators will need highly technical computer skills, but be capable of receiving training in various computer applications.

The telemarketing industry expects to increase its use of employees who can design and analyze questionnaires, as well as develop software applications for survey analysis. Training in these areas is available through Iowa education institutions. A key issue for telemarketing firms seeking to operate full-scale facilities in rural locations will be their ability to attract or develop pertinent talent in these places.

6.3 Key Location Factors

The availability and cost of telecommunications services, as well as labor, have been the two key factors affecting the location of telemarketing firms in the past. Two additional factors will likely impact location decisions in the future, particularly headquarter operations. First will be the ability to apply and utilize computer equipment and software. A firm's ability to design and analyze questionnaires and other research instruments will allow it to serve additional customer needs. Many companies currently return their data to the client for their own analysis and interpretation.

Second, as firms seek to expand their activities, marketing their own services will become more important. Some of the smaller, rural-based firms now rely on brokers and others to do their marketing. Some suggest that telemarketing firms will increasingly open offices and even headquarter operations in more metropolitan areas in order to market to potential clients. Telecommunications allows the firms to have their calling facilities located anywhere and then transfer data easily between headquarters and the calling centers.

The ability of independent calling-centers to exist on their own, relying on others for marketing and analysis, is unclear. A key challenge to that existence will be the almost branch plant-like calling facilities of large telecommunications firms located in metropolitan areas. Already a company such as Intellisell, headquartered in Omaha and only four years old, has four calling centers in Iowa, plus numerous others in Nebraska and Kansas. All marketing and analytical activities are performed at its headquarters.

6.4 Opportunities for Rural Iowa

As indicated above, rural Iowa already has a competitive advantage in the development and location of telemarketing calling centers. Rural Iowa is likely to remain an attractive area for telemarketing calling centers, whether independent or branch plants, with distance research capacity. Several opportunities exist for business and job development.

First, existing calling centers, particularly those that are independent and locally-operated, can expand their operations in several ways. They can move into additional activities, as well as take on new responsibilities including marketing and data analysis and interpretation.

Second, larger telemarketing firms can be encouraged to decentralize more of their high-wage operations into their various calling centers. This would mean that calling centers would undertake a broader set of activities and, in essence, operate almost as individual profit centers based on their abilities to attract and address the needs of clients.

Third, the efforts of telemarketing firms to train client firms in the application of telemarketing techniques suggest a niche area that may be well suited for Iowa. The state's community colleges offer useful experience in the area of industry training and the delivery of training through means of telecommunication.

6.5 Strategic Actions

To successfully take advantage of the opportunities described above, Iowa might consider several actions. First, the state, working through its business management assistance programs, might consider organizing and working with small, independent telemarketing firms to assist them in analyzing future business opportunities that can lead to new higher value work. Once the feasibility of such efforts is fully explored, the state might consider offering training resources to encourage the firms to expand their skill base and operations.

The state should also seek to encourage large telemarketing firms to expand the activities of their Iowa-based calling centers. Kansas has recently initiated a program that rewards businesses that invest in new technologies and the upgrading of their workforce. A similar Iowa program could be directly targeted to calling centers that

expand their breadth of operation and increase the level or sophistication of activities conducted within each center. The best measure for such improvement would be the creation of high skill and wage positions.

Finally, the state can assist larger telemarketing firms in developing a training component of their business. As noted earlier, some telemarketing firms hope to use telecommunications-based computer training to assist client firms develop their in-house distance research capabilities. Iowa's community colleges have experience developing training programs for industry. Facilitating a connection between the community colleges and telemarketing firms interested in developing this aspect of their business could lead to new business activities and jobs in Iowa.

As the above discussion indicates, distance research has potential for expansion in rural Iowa. The possibilities are large enough that the state should find it beneficial, prior to carrying out the above steps, to carry out a strategic assessment of the industry in the state -- which firms are in Iowa, what functions they perform, the nature of their competition and their competitive advantages and disadvantages, and coming changes and opportunities in the industry. Gathering such information will lay the groundwork for the steps suggested above and likely bring to light other ideas as well.

7.0 In-House Telemarketing and Mail Order

7.1 Background and Trends

Enhanced telecommunications services have stimulated a major increase in mail order operations. Firms rely on a combination of wide area telephone service (WATS) for outgoing calls, and 1-800 numbers for inbound calls. In turn, they can ship out goods the very same day using one of a variety of carriers, such as United Parcel Service (UPS) and Federal Express.

Business Week expects 1-800 services to reach $6 billion this year. The growth is expected in part because developments in switching software permit 1-800 users to change long-distance carriers without having to get a new number. That creates new opportunities to switch carriers to take advantage of competitive rates or locations without losing the 1-800 number associated with the business. Iowans are in a unique position to take advantage of this flexibility (or "800 portability") given the high percentage of digital switching technology in place in both rural and urban areas, and also given the already wide availability of equal access to long-distance carriers.

While selling directly to the customer over the telephone is a proven marketing strategy, businesses are discovering they can use telecommunications for reasons other than locating customers and selling goods and services. They are using the technology to develop closer relationships with their customer base. Telephone contact with customers is as important for locating customers as it is for providing technical support to customers. This is a trend that is likely to continue in the future.

Telemarketing is rapidly becoming a major marketing strategy for a wide range of industries. Historically, two types of companies were telemarketing intensive. The first is the telemarketing service firms, or firms that exclusively conduct telemarketing sales functions for other corporations, such as North Central Telemarketing, Inc., in Sioux City, Iowa. These firms do contract work for a wide variety of industries, including food service retailers, banks, credit card protection companies, and membership sales companies.

The second type of company that typically uses telemarketing is the large Fortune 500 companies. These are companies that could contract their telemarketing out to service providers, but prefer to keep the functions in-house. However, they may chose to spatially separate the telemarketing functions and locate them in more cost-effective areas. Companies such as American Express, Procter & Gamble, and Coors, have invested millions of dollars in toll-free, 800-telephone networks.

Recently, a number of newer companies have built their successes on selling their wares over the telephone. Probably the best known examples today are found in computers. Total market for mail order PCs was estimated to be $4.6 billion in 1992, according to Business Week. Nearly 30 percent of all PC sales are expected to be from mail orders by 1995. Two of the direct marketing giants in this field are Dell Computers, located in Austin, Texas, and Gateway, located in North Sioux City, South Dakota. Both companies have shot to the top of the PC market selling hundreds of millions of dollars worth of computers over the telephone. Many of the large computer companies, like IBM, Apple, and Compaq Computer Corp., are expected to get into direct marketing in the future, although they face problems reconciling this approach with their well developed dealership networks. IBM recently announced the creation of Ambra Corp., its answer to Dell.

Beyond the realm of computers, other small- and medium-sized companies are beginning to recognize the opportunities in linking manufacturing and telecommunications sales and services. For companies with a geographically dispersed client base, the ability to stay in close contact with their customer base is becoming increasingly important. Many of these firms are adopting more specialized and flexible manufacturing processes designed to produce small batches of special orders. This flexibility allows them to build to order, respond to changes in customer demand, and become more competitive. Telecommunications technologies, including telemarketing capacity, are a very important part of this trend towards flexibility and close customer relations.

Rural-based companies serving specialized markets that have a dispersed customer base rely on the combination of WATS-UPS services to enable them to operate from small (and often rural) communities. Their business depends upon finding customers and maintaining close contacts with them. This requires intensive telephone use. One of the major barriers to succeeding in business in a rural location is the distance from a large market. However, 1-800 services are a means to extend markets beyond local boundaries. The ability to ship out products overnight is equally important.

7.2 Occupational Profile

Much has been written about the suitability of the Iowa workforce to telemarketing operations. Telemarketing personnel typically have some post-secondary education or training. They possess important qualities like job loyalty, strong work ethic, good diction, and reading skills. Telemarketing operations seek people who do not

have strong regional accents, are comfortable speaking on the phone, and use a conversational, soft-sell style. In many instances, telemarketing requires previous sales ability and computer proficiency.

As noted, telesales forces can be geographically separate from the manufacturing and warehouse operations. However, a number of manufacturers choose to have all in one location. In such cases, the non-telemarketing occupations related to a particular manufacturer will reflect the particular nature of that operation. Clearly, however, rural Iowa has a workforce suited to and familiar with telemarketing and manufacturing.

7.3 Key Location Factors

Mail order manufacturers typically desire a central location, low labor costs, access to overnight shippers, and access to the particular skills necessary in manufacturing a specific product. Because labor is the major cost involved in a telemarketing operation, areas with lower labor rates are highly suitable to telemarketing operations. Besides the other desirable labor characteristics mentioned above, companies favor the low turnover rates generally found in non-urban areas. After labor, the cost and quality of the telecommunications infrastructure are also critical. Large telemarketing operations prefer locating near POPs (or point of presence) for one of the major long distance carriers, which keeps costs lower. Besides cost competitiveness, the infrastructure must be reliable as well. Because of their dependency on the telephone, firms cannot afford interruptions in service.

In certain instances, the regulatory structure affecting telecommunications and industry may be important as well. South Dakota's law lifting the ceiling on credit card interest rates helped it attract Citicorp's credit card operation.

7.4 Opportunities for Rural Iowa

While rural economic development strategies aimed at attracting mail order/telemarketing businesses are not new, some approaches have received less attention than others. The most common and well understood strategies involve recruiting telemarketing service firms to rural areas. However, promoting telemarketing to *existing* niche manufacturers and speciality retailers in rural communities has received less attention. Telemarketing has useful applications for these types of firms. It can help them identify customers, strengthen customer relationships, and expand their markets.

Iowa has many companies that would fit this description. Most of the shortline farm equipment manufacturers serve small niche markets that are dispersed. A 1-800 service could greatly benefit these companies by allowing them to locate and service customers in a wide area.

Manufacturers are not the only companies that rely on a dispersed clientele. Retailers may stand to gain from telemarketing approaches as well. Retail employment in small rural communities has been declining steadily over the last 20 years, mostly because they are losing their local market due to outmigration and competition from regional malls. However, some rural communities may have significant niche retail markets, such as the Amana Colonies in Iowa. These businesses may be interested in 1-800 services to promote their businesses, identify new markets, and attract tourists to their region.

Individually, these manufacturers and retailers may not be able to afford 1-800 services. However, if organized into an association of firms, they might be able to collectively afford the service and thereby more effectively promote their businesses. A 1-800 number with a call forwarding facility would allow members to share the load of incoming calls on a rotational basis.

7.5 Strategic Actions

To assist niche manufacturers, state and local governments could work through existing industry associations or networks to identify opportunities for shared telecommunications support and services that could be affordable and enhance competitiveness. They should attempt to identify successful examples where individual firms or association of firms have used these services successfully. A number of individual businesses already use 1-800 numbers in Iowa. The Amana Furniture Shop uses this service, as does Mad Butcher's Salsa, produced in Grundy Center, Iowa, and now exported to Canada. These examples should be studied further and their lessons promoted throughout the state to appropriate audiences.

Government could help to form regional alliances and partnerships involving companies, utilities, and industry associations to share telemarketing approaches such as incoming 1-800 numbers. The state could work through its various business management assistance programs to reach out to firms. These programs would include but not be limited to the SBDCs and export assistance programs geared to smaller companies.

8.0 Distance Learning

8.1 Background and Trends

Telecommunications is playing an increasing role in the fields of education and worker training. The ability to transmit voice, data, and video over long distances has enabled educators and businesses to deliver instructional material more efficiently and effectively, as well as reach geographically isolated places. New innovations in telecommunications now allow instructions to take place interactively in "real time" therefore enabling teachers to conduct lessons with students in other locations just as if they were in a classroom setting. Telecommunications is increasingly viewed as a mechanism to improve the quality of education.

Three general types of distance learning stand out:

- the transmission of traditional educational courses from one location to other sites throughout an area;
- the provision of on-site, customized worker training to a specific business in the area; and
- the communication of specialized information, including public service messages and materials, to the public at large.

There are numerous ways of facilitating distance learning. For example, educational courses have been broadcast into schoolrooms for years, particularly through the Public Broadcasting System (PBS). Now courses can be prepared and transmitted interactively via fiber optic cable, satellite, or microwave in "real time." Course materials can be prepared and transmitted locally or can be acquired from other providers anywhere in the world and delivered locally. Thus, school systems could access a Japanese language course conducted in Tokyo and deliver it to students locally. With Iowa Communication Networks (ICN), Iowa students will be able to receive two-way interactive instructions through local educational facilities. In the future, they will likely be able to access such instructions in their home.

Similar types of distance learning are taking place among businesses. Rather than sending employees to a different location for classes or specialized instructions, businesses are bringing the instructions to the work-site via telecommunications. The

same methods as described above apply. In addition, it is expected that significant training will be conducted through networks of computers that will allow computerized instructional material to be delivered directly into a trainee's desktop computer.

Most specialized information is currently transmitted via print and sometimes via broadcast. For example, although public health services broadcast messages about certain issues, they generally offer specific instructional material in a printed form. In the future, the public will be able to receive instructional health care material and information on other specialized subjects (e.g., how to fill out your tax return) via telecommunications. A typical way may be through the local library where an on-line system can access the public health department to get the latest video instructions on prenatal care. Materials of this type can now be received by voice, fax, modem, or, in more limited cases, video-voice transmissions.

The dominant players in distance learning have been educational administrators and educators. They have controlled curriculum, course content, and instructions. Their efforts are supported by educational publishers and other suppliers providing complementing materials. Broadcasters also have been key players, offering supplementary courses through telecommunications. PBS, the most common form of distance learning, has existed for almost 30 years.

Today, with expanding technology, there are multiple interests and participants in distance learning efforts. These include:

- local and state education institutions, including parent associations, school boards, state agencies, and, in Iowa, Intermediate Service Units;
- professional educators in public and private systems, including higher education and vocational institutions;
- educational publishers and others that prepare materials for instruction;
- educational broadcasters and telecommunication operators; and
- telecommunications and computer hardware/software providers.

The role of private telecommunications and computer hardware/software providers is becoming well established in distance learning. AT&T, the Baby Bells, independent local telephone exchanges, PBS, cable and satellite operators, IBM, GTE, and many others have staked out their claims in transmitting and providing equipment for

distance learning courses. The competition is intense. Large education publishing houses such as Harcourt/Brace, Macmillan, and others are also adjusting their products to be compatible with distance learning efforts. Less certain is the future control over design and production of courses.

Educational institutions -- high schools, community colleges, and universities -- now prepare and conduct courses via telecommunications throughout the country. These institutions expect to continue to be the primary providers of distance learning courses, and they will work with educators to develop additional skills for such efforts. The educational systems' monopoly on distance learning will likely be challenged. Local schools and even universities will be confronted with possible competition from large media, communications, and educational organizations that have specialized expertise and economies of scale in producing distance learning courses. Already companies such as Whittle Communications, Turner Broadcasting, and Hughes Aircraft Corporation have entered the market.

This competition is likely to extend into specialized areas. For example, while the University of Iowa Hospital may currently have an advantage in offering doctors a course in a new surgical procedure, in the future doctors will be able to easily access such classes from other institutions like the Mayo Clinic and Johns Hopkins. The ability to receive instructions from top-rated schools will likely be a more significant factor than local affiliation. Geographic proximity will be neutralized as an influencing factor in selecting an instructional course.

Cost and quality will be the key factors confronting local educators as they decide whether to maintain their own instructional capabilities or rely on outside suppliers. The outside suppliers will likely be large corporations, although there may be some niche opportunities for specialized small providers of course material. For instance, a Maryland couple just recently produced a multimedia CD-ROM on American history by using no more than a home computer system. They sold the piece to a private firm that specializes in distributing such CD-ROMS, including an interactive encyclopedia. It is anticipated that such material can be used to complement classroom instruction or be used for course instruction, self-education, or entertainment.

A similar set of conditions and issues will confront the industry training field. This is particularly so in Iowa, where the community colleges have taken significant steps to be the key providers of industry specific education and training.

8.2 Occupational Profile

Current educators expect to be the preparers and deliverers of distance learning courses. In addition to their current educational skills, they will need certain skills in media communications and the use of computers and software for data and image manipulation and transmission. Educators or others will also need to be proficient in using telecommunications equipment.

The training community will confront a similar set of skills needs as the educators. In addition, these skills will have to be integrated with the ability to assess business training needs and translate them into practical training courses. Such a merger of skills can be accomplished by broadening the occupational profiles or linking individual professionals to a common endeavor.

Iowa has taken positive steps in both areas. The university system is a recipient of a federal STAR grant that it is using to train educators to use distance learning and to develop appropriate curriculum and course content. Several of the community colleges now offer programs in communications media that helps train both teachers and technicians. The community colleges have also developed specific centers to deliver specialized worker training to local firms.

8.3 Key Location Factors

Clearly, the very nature of distance learning is to minimize location as a factor in teaching and training activity. For the most part, instruction can be sent from and received in any location. Thus, the key locational factor is the location of the "talent," the instructional team.

Iowa already has a strong public education-based distance learning system. Consequently, it does not seem appropriate for Iowa to attempt to attract for-profit firms in the distance learning field, such as large communications or media firms. To do so would directly threaten existing jobs within key institutions such as the education system. The primary issue for Iowa is how to assist current educators in adapting their professions and activities to correspond to the future efforts in distance learning.

At the same time, the fact that most Iowa students will likely be involved to some degree in distance learning classes means that they will become familiar and even adept at using sophisticated telecommunications equipment and corresponding computer

technologies. Iowa will thus be producing graduates with specific technology-related skills and experience. This is an asset that can prove to be very attractive to firms in almost any sector, as they seek locations with an educated, skilled, and technology literate workforce. Iowa's ICN system should give it a competitive advantage over other states.

8.4 Opportunities for Rural Iowa

New business opportunities for rural Iowa in distance learning are minimal. In general, rural Iowa does not offer the talent base for distance learning other than that which already exists at community colleges. Rural Iowa is not a competitive site for attracting for-profit distance learning efforts of any size.

One area of potential business opportunity is consulting in either the development of instructional material or software to deliver instructions. Although the competition with large corporations in this field will be tough, individuals or small companies (such as the Maryland couple) that can technically develop courses may be able to tap specific niche markets based on their specialized expertise. These products could be sold directly to the local or state systems around the country. The opportunities can include specific courses or complementing educational materials.

Another possible job creator is the distribution and servicing of telecommunications equipment for distance learning. This will either require the formation of new businesses or the expansion of current businesses into an additional area of work. The most likely candidate for this type of new business activity is the local telephone company. In addition, most facilities that are connected to ICN will likely require at least one technical staff in the field of telecommunications technology.

In distance learning, enhancing the competitive position of current educators and instructors should be the primary concern of the state. Educational employment is a significant economic activity in rural Iowa. The advent of new suppliers in the field, whether they are local cottage industry consultants or large communication conglomerates, could replace current workers to some degree. As there is little reason to expect that rural Iowa will have a competitive advantage in attracting large communications, media, publishing, or educational organizations that offer distance learning courses, local job losses in education would likely be filled by new private sector providers operating outside of Iowa. (On the other hand, it is possible that the cost of education could be reduced by utilizing outside providers.)

8.5 Strategic Actions

Iowa can take four types of strategic actions to address development opportunities with regard to distance learning. First, it should provide support to the state's universities and community colleges to fully develop courses that educate educators and technical workers in the skills and tools for distance learning. Current efforts like the STAR program and the communications media programs in the community colleges must be maintained and kept abreast of the latest in telecommunications technology. Iowa must ensure that local educators can produce courses and products of a quality and cost that can withstand outside competitors. (It also might want to test the correctness of this approach by carrying out a cost-benefit analysis of providing services in-state versus importing courses from elsewhere.)

Second, the opportunity to foster the development of cottage or small business-based education courses or products should not be ignored, even though the opportunities may be limited. Through several means, the state should encourage niche market educational product development. These include: developing and publicizing a set of case examples (role models) of successful ventures in this area; conducting a match-making service for those with technical and production skills and those who have specialized substantive expertise that may be of value in course materials; offering tax incentives for individuals or small businesses in rural areas that invest in equipment and related expenses for such activities; and offering special procurement considerations to individuals or small firms that are attempting to sell such products to the state or local educational systems. (A similar set of recommendations goes for the broader CD-ROM market discussed in the section on electronic publishing.)

Third, the state should identify and support the development of distance learning activities in sectors in which the state has some competitive advantage, such as agricultural biotechnology and insurance, key learning areas in which the state has specific expertise. The purpose of such support would be to export the distance learning activities outside the state, through both interactive educational classes and specialized training for users in the field. The state could support the packaging, marketing, and transmitting of that knowledge in a usable format. As a first step, the state might consider targeting several expert areas and holding exploratory sessions with the substantive experts and state experts in distance learning. A product of these sessions could be a feasibility analysis for developing and exporting distance learning products from key industry sectors.

Finally, if it is not already doing so, the state should market distance learning capacity available through ICN and the community colleges to existing and potential employers in rural Iowa. The public distance learning system is an important component of rural Iowa's resource base for economic development.

9.0 Remote Analysis

9.1 Background and Trends

The monitoring and analysis of specific conditions no longer requires on-site attention. Innovations in telecommunications, combined with the applications of computers and complementing software, allow for remote analyses and problem solving. The uses of telecommunications range from a simple voice inquiry and response to an on-line hook-up that continually receives and analyzes data from a remote facility.

The health care industry is a primary beneficiary of this technology. For several years, patients have been able to call into experts and receive medical advice over the telephone. Today, patients can access interactive medical databases, send records and x-ray materials to experts anywhere, and receive personal care in remote locations through on-line video, voice and data, or telemonitoring hook-ups with doctors elsewhere. The use of telecommunications is primarily designed to improve the health care system by both enhancing the quality of care and reducing the cost. For rural Iowa, the most important implication is the continuing provision of health care services in places where basic and specialized services are becoming uneconomical.

Certain elements of the service industry use telecommunications for remote analysis. The most common is the credit card industry, where applications can be taken and processed over the phone, providing an immediate response. One major Iowa organization, American College Testing (ACT), is expanding its business to take advantage of improvements in telecommunications. The company now has the capacity to accept applications and provide responses electronically over the phone lines. For example, in the area of college financial aid, a person can fax a short background application describing his financial aid needs and current economic situation and receive a faxed reply within 24 hours. The faxed application is electronically linked to an ACT computer program that sorts and analyzes the relevant data and issues a determination on his eligibility for aid.

Remote analysis is also being used in manufacturing. The Neural Applications Corporation of Iowa City monitors the operations of several steel plants outside of the United States relying on the transmission of data via wire. Sensing devices on-site track certain manufacturing activities continually and send data to the companies' computers, which then analyze and determine whether various systems are operating efficiently and effectively. Responses are primarily transmitted back to the manufacturer through voice instructions, but the company expects to eventually use its computers to issue self-correcting actions automatically.

One commonality among these activities, besides their ability to receive data electronically, is the use of substantive experts to design and operate systems for the analyses. In health care, it is applying the expertise of doctors across a broader territory. In both the service and manufacturing sectors, it is using substantive experts to configure computers and design software to conduct specific analyses. In each area, professionals are using telecommunications to expand the breadth and economies of their expertise. Such applications are available to many industry sectors and current trends suggest that they will likely become quite prevalent in industries such as insurance and banking.

9.2 Occupational Profile and Location Factors

As suggested above, there is no specific occupational profile for remote analysis. The activity is integrally tied to the substantive activities of any given firm. Although a common factor among all the above cited examples is the use of computers and attendant software, the application is dependent upon the experts within a firm adapting such technology for their own use.

Because remote analysis, by definition, is not dependent on the location of the analyzer, it can functionally operate from any location. Thus, the key locational factor is the site of the expertise.

9.3 Opportunities for Rural Iowa

Remote analysis is expected to play a key role in the delivery of rural health care. However, it is unlikely that many new business activities will be generated from this change. Rather, the primary activity will be existing health care institutions adopting new telecommunication technologies. For instance, in order to save hospital costs, technology is being developed for self-monitoring of various conditions. This keeps the patient at home and allows data to be transmitted routinely on his condition. Remote analysis for health care could lead to some increase in rural health care employment if it brings value-added and new business. There also may be some limited new business opportunities, such as the distribution and servicing of telemonitoring and transmitting equipment, but they are not likely to be significant in size.

The ability to transmit data and images electronically can offer many new ways of doing business in various industry sectors, including several important to rural Iowa such as equipment manufacturing, plastics, avionics, and metal casting. For example,

metal casting companies in other areas of the country are already transmitting design and part specifications electronically. Eventually, they expect to work interactively over the wire to mutually design and analyze plans before committing to an order. Companies that have these capabilities will have a competitive advantage over firms that do not. In addition, remote analysis will also allow firms to operate in markets and places that were in the past unfeasible because of distance. The University of Iowa is working with major farm and construction equipment manufacturers to create a state-of-the-art Integrated Product and Process Design (IPPD) consortium that will strongly rely on remote analysis.

9.4 Strategic Actions

The application of remote analysis to business operations is a growing trend made possible by telecommunications. There is little systematic information on how remote analysis can be of value to industry, especially on a sector by sector basis. What is needed, and can be of value to Iowa firms, particularly those operating in rural areas, is the compilation of examples of how remote analysis has been used by businesses in various industry sectors. Providing information and concrete examples will likely stimulate existing firms to take steps that will strengthen their competitive positions and possibly expand their business markets. It is recommended that an effort of this type be undertaken on an industry by industry basis and involve experts affiliated with the state's business management assistance programs.

With regard to the health care sector specifically, the state might encourage and assist health care providers to utilize telecommunications technology for remote analysis, both as a potential job generator and as a boon to rural quality of life and access to services.

10.0 Telecommuting Centers

10.1 Background and Trends

Computer and telecommunications technologies have become critical components to the success of manufacturing and service businesses, both small and large. These technologies are particularly important to rural businesses; with current technology, rural regions can access the information, ideas, and markets needed to grow, innovate, and remain competitive in today's economy. Startup and small businesses, however, are often unable to afford the technology they need to be competitive. Along with under-capitalization, lack of adequate technology is believed to be one of the leading causes of the high failure rate among startups.

To help aspiring entrepreneurs and small businesses overcome these hurdles and access the computer and telecommunications services they require, several rural communities in the United States are in the process of establishing telecommuting centers. These are mixed-use facilities equipped with computers and the latest telecommunications technologies that are made available to local firms, organizations, and individuals. A new phenomenon in the United States, the concept for telecommuting centers originated with the telecottages pioneered in Sweden during the mid-1980s.

Sweden's telecottages operate as electronic town halls open to the general public and providing various services to local businesses, including translation, bookkeeping and other financial administration, desktop publishing, fax service, advice on purchasing hardware and software, plus programming and support services. The telecottages also provide training in computer equipment and information retrieval from databases. The first telecottage opened in Harjedalens, a mountainous area of northern Sweden, in 1985. As of January 1992, there were more than 40 such centers in operation and another ten under development. The telecottages are generally self-supporting following the initial investment and many are now organized as limited companies with managers or villages as principal shareholders.

In the United States, the recent interest in telecommuting centers is coming from two very different directions. In urban areas, telecommuting is seen as a strategy to improve air quality by reducing highway traffic. Some large urban employers, mandated to develop trip reduction plans by the Clean Air Act of 1990, are encouraging employees to telecommute from their homes, while others are establishing private

telecommuting centers for their employees who live in the suburbs. In a few urban areas, public authorities (e.g., BART in the San Francisco Bay Area) are establishing public telecommuting centers.

In rural states, however, as in Sweden, communities are exploring telecommuting centers as a strategy for economic development. Though still under development, these are the facilities that provide Iowa with potential models. Kentucky's telecommuting project is one of the most ambitious. Through the Kentucky Science and Technology Council in Lexington, the state is establishing pilot centers in Pikeville and Elizabethtown. The facilities will include phone, fax, and video and document processing equipment, including scanning. The potential clients include entrepreneurs, information-driven rural companies or organizations, health care deliverers, satellite offices of corporations, colleges and universities, and state and federal offices. According to Kris Kimel, executive director of the Kentucky Science and Technology Council, the centers are not a business recruitment tool, but are intended to develop rural capacity. Mr. Kimel said that the forecasts suggest that the facilities will be self-supporting after three years. The first facility is expected to be operational by late summer 1993.

The city of Oberlin, Kansas is also in the process of establishing an electronic community center modeled after the Swedish telecottages. Unlike Kentucky, Oberlin views its facility as a vehicle to attract jobs to the area, particularly high-tech, high-paying jobs. The center will provide interactive videoconferencing equipment, and access to computers, computer training, and other business services. The facility was originally slated to provide desktop publishing capabilities as well, but the city scrapped the idea as soon as a small publishing firm opened in town.

According to Jerry Fear, the city administrator, the center will be a rural business incubator without walls. The city is targeting the facility to entrepreneurs and has already modified its zoning ordinances to accommodate home-based businesses, but there are still unresolved issues. In particular, the fact that the facility connects to a state-owned T-1 digital network is posing a problem since the state-owned network can only be used for public purposes. Mr. Fear noted that the facility will also be used by local schools, and a local hospital is seeking grant funds to use the site for a medlink program. The city expects the facility to be up and running by September 1993.

10.2 Occupational Profile

Telecommuting centers themselves are not viewed as significant sources of employment. Kentucky expects each of its facilities to employ about four persons, including an information broker capable of accessing various information services and conducting appropriate searches, a center manager, and support staff. In Oberlin, Kansas, the planned facility is expected to employ only two persons.

Although not direct generators of employment, telecommuting centers are tools designed to retain and strengthen local organizations and to create new business opportunities in a region. Telecommuting centers can benefit an array of private and public activities; private consultants, small manufacturers, local government, local schools and community colleges, and health care facilities are among the potential beneficiaries. The centers expand the number of businesses that can utilize the advantages of an enhanced telecommunications system -- to disperse personnel, to reduce costs, and to expand market size.

10.3 Key Location Factors

Rural telecommuting centers are an emerging phenomenon in the United States, so there are no agreed upon criteria determining which locations will ultimately prove successful. In selecting its pilot sites, the Kentucky Science and Technology Center evaluated a range of factors, including the telecommunications infrastructure, the size of the local economic base, and the diffusion of firms and the population density. Pikeville has a population of about 21,000, and the surrounding county has a population of about 75,000. Elizabethtown, which is about two-and-a-half hours from the nearest urban center, is roughly the same size as Pikeville, although the surrounding county is somewhat larger.

10.4 Opportunities for Rural Iowa

The economic development potential for telecommuting centers in rural communities is untested. The location criteria evaluated as part of Kentucky's feasibility study suggest that rural Iowa is well-positioned to capitalize on a sophisticated telecommuting facility. Such a center would provide an important service to public organizations, including schools, health facilities, and local government, and to small businesses in the region. The facility also offers rural communities the potential to attract new businesses to the region as Oberlin, Kansas is hoping to do.

10.5 Strategic Actions

Developing a telecommuting center would require a substantial commitment of public funds. The Kentucky Centers require $250,000 in technology alone. The Oberlin, Kansas Center will be a $2 million facility, half of which was bequeathed to the city by an elderly widow for the express purpose of building a public purpose building. Based on Kentucky's forecasts, however, the expectation is that these facilities can be self-sufficient within three years.

For Iowa, a first step would be to conduct a comprehensive market study to determine the feasibility and appropriate location for one or more telecommuting centers. The study conducted by the Kentucky Science and Technology Council, which was funded by the EDA ($40,000) and the Appalachian Regional Commission ($25,000), could serve as a useful model. An alternate approach is for the state to provide seed money to regional development agencies to carry out a feasibility analysis for their respective regions, followed by a competitive grant process for demonstration center funds. A third possibility is to issue an RFP to private firms to develop one or more centers, which would have state support for the early years but would be expected to be self-sufficient after a period of time.

11.0 Interactive Television

11.1 Background and Trends

Interactive TV is expected to dramatically expand and alter the way in which people receive information and entertainment in their homes. Digital technology will allow a vast increase in the amount of programming that can be brought into the home. In fact, industry proponents envision a future in which users will be able to "surf" through 500 or more TV channels. In addition, all types of information can be sent -- voice, image, video, and data. Moreover, technology exists to allow data to be exchanged interactively and simultaneously. That is, not only will our TVs receive signals, they will also send signals out if we command them to do so.

There is much speculation and uncertainty about interactive television at this time. It is not known exactly what interactive television will look like, who will pay for it, nor whether (and how) people will use it. The technology and applications are just emerging and too new for accurate forecasting.

In theory, these developments will empower viewers to become more active users of information and entertainment. For example, interactive TV will enable us to select the programs we watch when we want to watch them. It will also introduce the element of participation, such as guessing "whodunit" and how in murder mysteries. Similarly, sports fans will be able to interact with sports games, and game show fans will be able to interact with their favorite game show as well as compete against other interactive television players around the country.

Besides entertainment, a whole host of new services is being developed for the new interactive technology. In addition to renting movies without leaving home, users could do their banking, shopping, and make travel arrangements from home. A variety of civic applications are being explored as well, such as interactive town meetings and electronic community information boards to publicize and discuss upcoming events.

Less well explored are business-to-business services, but clearly in the long run the sky's the limit. Almost any service now provided by telephone wire could be provided with a video dimension through interactive TV. Real time consulting using artificial intelligence "expert systems," dialling up "how-to" videos, accessing video reports on various esoteric subjects, and videoconferencing are examples that just scratch the surface of possibilities.

While the technological capacity is available, the infrastructure to transmit digital information into the home and office is not. Transmission technology may occur through a variety of means, including satellite, coaxial cables, cellular, or optical fibers. Transmission requires a variety of gadgets, including hardware and software, to take the incoming digital information and transform it into comprehendible pictures and sounds. It must also perform the reverse function so that information can be sent back out as well. Transmission also requires communications standards that have yet to be developed.

Currently, only a minuscule share of the homes are outfitted for interactive service, and growth is expected to be relatively slow. According to H. Wayne Huizenga, chairman of Blockbuster Entertainment Corp., no more than 20 percent of U.S. households will be outfitted for fully interactive service by the year 2000. Still, much activity is going on. Companies like TCI and Time Warner are investing $2 and $5 billion respectively on full-service, interactive fiber systems. The world's first full-service network (FSN) is being installed by Time Warner in suburban Orlando, Florida. The system will be fully interactive serving about 4,000 customers. The service will include traditional CATV, expanded video-on-demand, full-motion video home shopping, distance learning, and interactive gaming. By 1994, regional Bell operating companies could be deploying the receivers and delivering video-on-demand and other interactive TV services over copper wires using compression technology.

Companies in a wide variety of industries are forming partnerships to take advantage of the new technology. The technological developments involved in interactive television are causing a convergence of several industries, including media, entertainment, computer, software, telecommunications, and cable. The players in this emerging telecommunications-intensive industry include many familiar and powerful names. Entertainment and media giants like Time Warner, Disney, Sony, Nintendo, and Sega are involved. So too is the nation's largest cable operator, Tele-Communications. AT&T, as well as a host of the Baby Bells, are also staking out positions. Finally, computer hardware companies, such as General Instrument and Intel, are developing the hardware to receive and send digital information. Microsoft and Apple, among other software companies, are aggressively developing software to control interactive systems.

Despite the risks and uncertainties involved in the new technology, the potential to earn huge profits is luring most electronics and communications industry players into the race to develop interactive TV. Estimates of the potential size of interactive TV markets vary widely. Broadcasting and Cable, a trade journal, estimates that interactive television transmission and service revenues will rise from $681 million in 1991 to $1.65 billion in 1996. Bain and Co. predicts the interactive TV market will reach $6 billion by 2002.

11.2 Key Location Factors

The interactive television market appears to be one that will mostly result in a reorganization of leading companies in traditional electronics and communications industries. The new technology is creating markets for new equipment (hardware and software, as well as a variety of other electronic gadgets) and programming. Most of this economic activity is already being captured by the above-mentioned companies, which are mostly located in states like California, New York, and Massachusetts. It appears unlikely that existing or startup companies in Iowa will produce either the equipment or software to power interactive television. And these industries are unlikely to relocate to Iowa, given the location factors they traditionally prefer.

While the core of the interactive TV industry is not likely to stray far from home, there will be a tremendous need for new programming and much of that will be local. So proximity to local markets will be the key locational factor for much of the programming side of interactive TV. Programmers will have a need for a skilled technical workforce -- to develop the program concept, provide and operate any software, operate equipment, and be the on-air talent, if such is needed.

11.3 Opportunities for Rural Iowa

Interactive television offers two possibilities for new economic activity. First, there may be an opportunity to create new programming tailored to speciality markets in Iowa. Second, there may be opportunities for local manufacturers and retailers to expand their markets by advertising on interactive television home shopping channels.

If interactive TV leads to the creation of 500 or more channels in the near future, then there will be a considerable programming vacuum to fill. The large entertainment programming companies like Sony or Disney know this vacuum exists and are scrambling to fill it. Along with an increase in the number of channels, the nature of the programming is likely to become much more highly specialized and tailored to small niche markets. A number of speciality markets for both interactive entertainment and service programming likely exists in Iowa.

Aggressive and creative persons familiar with a combination of multimedia, television production, rural life, and agriculture may be in a position to develop unique programming for Iowans. However, many programs would be produced in urban

locations where television studios exist. Even if new programming were created in Iowa, it would probably not employ a large number of people. Besides a producer, director, and small administrative staff, there would be one or two camera people as well as the hosts or actors and actresses. Still, there are likely to be some rural-related opportunities, such as electronic auctions, local sports, and singles shows.

With the vast increase in channels and programs, it is anticipated that television advertising may become less expensive in the future. In addition, as programming becomes tailored to smaller speciality markets, it is possible to target advertising more easily and effectively. Finally, the popularity of interactive home shopping is already well demonstrated. These factors suggest that it may be possible for Iowa retailers, distributors, and manufacturers to expand their markets as well as better target their advertising campaigns through interactive television.

New products, such as video yellow pages, might enhance product marketing for some companies. Because interactive television allows someone in the home to send information out to other system users, it is even possible that small entrepreneurs could videotape their own products using a home video camcorder and send out the advertisement on the system to select markets. This technology may create unique and new opportunities for rural entrepreneurs to locate and reach customers outside their traditional marketing area.

11.4 Strategic Actions

Established interactive television capacity in rural Iowa is some distance in the future. Once in place, interactive TV could be a means of selling rurally-produced products and a stimulus to creating some local programming jobs. The technology will be primarily targeted to the home, though business uses are clearly possible, though not well defined at this point. Also, interactive TV can enhance rural economic activity by being an attractive amenity as much, if not more, than being a direct job creator. Being able to shop in Fifth Avenue stores via TV, and other such urban-oriented amenities, may help to reduce outmigration to some degree.

Perhaps the most effective near-term step the state could take is to facilitate the extension of interactive TV to rural areas. It might encourage cable TV companies and local phone systems to create a demonstration project for rural areas, just as is being done for urban areas in Florida now.

Eventually, interactive TV will come to rural Iowa. As the time for interactive TV gets closer, the state could consider a program of technical assistance to small businesses interested in developing programming, as well as to retailers interested in creating more effective advertising. In the long-term, of particular interest could be Iowa-based business-to-business video services. The state should stay aware of the potential markets for such services (agriculture and insurance being ones that come immediately to mind), and consider ways of getting a jump on the market as the possibility of business-to-business video draws near.

12.0 Perceptions and Recommendations Regarding Telecommunications Infrastructure Development in Rural Iowa

12.1 The Arthur D. Little Report

In its recently completed Study of the Role of Telecommunications Industry in Iowa's Economic Development, Arthur D. Little (ADL) describes Iowa's telecommunications infrastructure as a "strong telecommunications foundation," while pointing out ways in which that infrastructure could be strategically improved. Iowa's strengths include its relatively extensive deployment of digital-based systems, fiber optics (particularly in terms of interoffice facilities), cellular service, and cable television facilities. ADL identifies as weaknesses in the current configuration of the Iowa network the continued utilization of analog switches, multiparty lines and analog trunks, and insufficient Signalling System 7 (SS7) capabilities. In general, ADL provides a snapshot of Iowa's place in the general transition from an analog-based to a digital-based telecommunications environment.

ADL also provides a comparative analysis of Iowa's neighboring states. This analysis identifies a higher percentage of multi-party lines among Iowa's rural residents than in one neighboring state, and also a comparatively slow pace in the deployment of SS7, a requisite digital signalling system that, as part of an increasingly digital network, is essential in extending useful services to rural economic enterprises and other vital community institutions such as schools and hospitals.

ADL notes that US West, the regional Bell holding company serving Iowa, projects that by 1994 all switches in the network will be Stored Program Control (SPC), including predominantly digital switches. Digital switches are able to be upgraded to incorporate SS7, and the key services such as Integrated Services Digital Networks (ISDN) that are supported by this signalling technology.

In several key areas, Iowa's rural residents have access to better service offerings than do rural inhabitants of other states, primarily due to the existence of innovative telecommunications entities such as Iowa Network Services (INS). ADL notes that the state and its citizens have already made significant investments in an enhanced rural telecommunications network through its investment in ICN, the investments of INS, the smaller independent telephone companies' investment in fiber and digital switches, and the aggressive deployment plans of US West. However, many Iowans face continued preponderance of multiparty lines and are still functioning in an environment wherein the transmission of a fax or the connection of a modem are practical impossibilities.

Thus, ADL provides a picture of a rural telecommunications infrastructure that is in many respects advanced compared to other states, but that still requires significant upgrades if all of Iowa's residents are to participate in the economic opportunities offered by the information age. Iowans who are not provided an economically viable means of attaining standard modern service capabilities are not being adequately served by the current configuration of the network, and further infrastructure and service enhancements in these areas would help advance economic development efforts in rural areas of the state.

ADL suggests that the net societal benefits of increased cellular coverage, electromechanical switch replacement, and deployment of SS7 all fall within the minor-to-moderate range, but that given the relatively low costs of implementing these infrastructure upgrades, they may well be justified. ADL also finds that although the net societal benefits of eliminating party lines are negligible to minor, such an upgrade would appear to be justified. A related finding of the report is that conversion of interexchange trunk to fiber carries a relatively minor net societal benefit, and that given the revenue requirements, an aggressive approach with regard to this specific upgrade may not be justifiable.

In our view, several of the specific infrastructure upgrade recommendations contained in the ADL report do not take into account the full significance of recent technological and service developments for the wired environment. Consideration of these developments leads us to suggest a modification of these recommendations. In this section, we explore potential avenues for strategic improvement of the Iowa telecommunications infrastructure, and recommend what we believe will be the most beneficial and economical means of providing new and useful services to those participating in the continuing economic development efforts of rural Iowa.

12.2 Recommendations for Service and Infrastructure Development

Following is a brief discussion of certain key technology and service issues that arise from the ADL report, including recommendations for modifying ADL's emphasis on some aspects of infrastructure development.

Narrowband ISDN. Although ADL cites the option of pursuing Integrated Services Digital Networks (ISDN) as a means of providing useful "information age" services, it does not flesh this out as an example of an inexpensive option that could make new and useful services available at very low cost to nearly all of Iowa's residents,

both urban and rural. While ADL acknowledges that "(a) range of applications for the general public (i.e., residential end-users) may best be served by the ISDN platform" (p. VII-17), the report does not go on to explore how ISDN, in conjunction with compression technology, could bring these advanced services to nearly all areas of the state at relatively low cost. Indeed, ADL implies that ISDN is inherently limited in its ability to bring modern high-speed broadband technologies to the state.

The deployment of narrowband ISDN in digital central offices is a relatively inexpensive matter and enables users to use an existing copper telephone line to receive and send both voice and data. Narrowband ISDN, as a means of supporting data communications at relatively low speeds, is particularly suitable for small business users. Also, it is likely that full-motion video transmission at a quality level fully adequate for video teleconferencing and "picturephone" type applications will be supported by Basic Rate ISDN and other relatively low-speed data applications in the very near future. The deployment of ISDN does not entail significant costs over and above the standard network upgrades already planned for the Iowa network (i.e., other than the Integrated Service Line Unit (ISLU) deployed in switches) and, thus, carries a relatively low price tag for individual small business users.

Also, Iowa economic development practitioners may want to further explore the potential for quickly and inexpensively extending ISDN, via a foreign central office (FCO), to customers served by non-capable switches, effectively connecting users to ISDN-capable switches. Although not discussed in any depth in the body of the ADL report, this approach could make what is arguably the most important service capability, i.e., data communications, available to nearly everyone in the state. Thus, once all *existing* digital switches have been upgraded to ISDN (again, a relatively small investment), *nearly all* rural users in need of integrated data and voice communications will be able to subscribe to this service. This approach quickly extends data communications to rural enterprises and also avoids the replacement of perfectly functioning recent-generation analog stored program control switches simply for the purpose of making certain new digital services more widely available.

The ADL report acknowledges the potential of ISDN, suggesting that if Iowa adopts ADL's recommended definition of a moderately aggressive deployment strategy, the state will be served by the type of switches and SS7 capabilities that are necessary to accommodate ISDN. This recommendation can be enhanced by considering how FCO connections can effectively enable such a strategy at much lower costs than would otherwise be possible, as well as how compression technology (see below) could bring advanced services such as high-speed data communication to these same areas served by ISDN-capable circuitry and switching systems.

Compression technology may serve as a transition technology between the current uses of the copper network and the perhaps inevitable deployment of fiber optics throughout the network. Enormous advances have been made in the art of video compression such that full-motion, VCR-quality video can be transmitted over DS-1 (1.544 mbps) digital bandwidth facilities. Given that video transmission requires the greatest amount of capacity, compression technology's ability to transmit video indicates that this technology is also able to readily handle high-speed data communications, and of course voice, over the existing copper network. In most cases, existing copper subscriber lines are capable of supporting DS-1 services. Within a few years, as microprocessor speeds increase and costs decline, it is likely that full-motion video transmission at a quality level fully adequate for video teleconferencing and "picturephone" type applications can be supported over even lower-speed services, such as ISDN Basic Rate Interface service and perhaps, with faster modems than those currently offered, over existing dial-up analog voice-grade lines. Clearly, the need for a broadband infrastructure capable of supporting video signals will be significantly reduced when such alternative technologies are introduced into the mass market.

BETRS. The advent of alternative wireless technologies such as Basic Exchange Telecommunications Radio Systems (BETRS), a radio signalling system that transmits digital signals, holds the potential to offer new and more flexible services to rural areas at low cost. As noted in the United States Office of Technology Assessment's *Rural America at the Crossroads: Networking for the Future*, rapid technological change and a more competitive industry environment have perhaps rendered obsolete and unsustainable past modes of providing rural areas with needed telecommunications infrastructure and services. BETRS is a prime example of this technology-driven phenomenon, given the enormous potential cost savings involved in providing not only basic but also very high-speed data services over radio rather than wire-based networks. BETRS systems are projected to be able to support up to 45 mbps transmission capacity, for less than one-third of the cost of traditional wireline systems.

RANs. The state of Iowa may also want to consider in a more in-depth fashion the potential further development of Rural Area Networks (RANs), which, as has been partially implemented by the Iowa Network Services, could lead to all of rural Iowa enjoying the same benefits extended to customers served by this innovative carrier. RANs, which are designed on the basis of a ring architecture, link up as many users within a community as possible, including businesses, educational institutions, health providers, and local government offices, thus making it possible for rural areas to access a community of interests comparable to urban areas.

Satellites. Finally, Iowa may want to further consider the use of satellite technology as a means of facilitating the development of economic enterprises such as Farm Data, the primary service of Broadcast Partners, a Des Moines-based company specializing in providing agricultural information via satellite to subscribers in 44 states. Given the success of this enterprise, it may be useful to explore how satellite technology could be further pursued to bring about similar opportunities for both rural and urban residents of the state.

The above discussion highlights our conclusion that certain types of infrastructure enhancements and service arrangements could yield benefits for Iowa considerably beyond those identified by ADL. For example, whereas ADL states that benefits from electromechanical switch replacement and deployment of SS7 all fall within the minor-to-moderate range, these upgrades might be viewed as the *most* significant options when one considers that the full range of ISDN services would be supported by an aggressive replacement of these switches and implementation of SS7 technology. This is also true of ADL's assessment that conversion of interexchange trunk to fiber carries a relatively minor net societal benefit. In fact, interoffice fiber is an essential prerequisite to extending ISDN's enormous service potential, especially when considered in conjunction with compression technology, to nearly all areas of Iowa.

Thus, whereas ADL's general recommendation to pursue a moderately aggressive deployment strategy would effectively extend ISDN capabilities to *many* areas of the state, full consideration of the service potential of ISDN may result in a much more focused recommendation to aggressively and strategically deploy these technologies so that *nearly all* of the state could enjoy these service options.

In summary, ADL provides a useful framework for analyzing Iowa's progress to date into the increasingly digital telecommunications environment of the 1990s. This framework, however, can be augmented by a more in-depth consideration of service capabilities such as those represented by ISDN, BETRS, a more focused approach to the strategic deployment of digital switching and signalling systems such as SS7, and a more in-depth consideration of satellite and other wireless technologies that may hold promise for Iowa.

Finally, we should mention ADL's policy recommendations with regard to the implementation of Extended Area Service and the modification of service restrictions as they relate to cable-TV provision of telephone services in rural areas. In these areas, we generally support ADL's recommendations.

EAS. ADL notes that Extended Area Service (EAS), or the expansion of the area within which a call is considered to be local, holds some promise as a means of providing toll-free access to several exchanges' communities of interest. Exchanges determined to be prime candidates for the economic development benefits engendered by EAS have not yet received approval for such service. We agree with ADL's recommendation that the Iowa Utility Board (IUB) reconsider its existing EAS policy so as to remove unnecessary barriers to EAS approval, or at the very least implement a policy by which EAS requirements can be met on an expedited basis.

Cable TV. Iowa is in a unique position to extend the most advanced telecommunications capabilities to most of its rural areas, given the relatively extensive deployment of digital switching and even fiber to the curb by its small independent rural carriers (i.e., serving less than 15,000 lines). ADL points out that the FCC is currently reviewing a proposal to amend the rural exemption to permit telephone companies to provide video programming directly to subscribers in areas of less than 10,000 persons. At present, the Cable Communications Policy Act of 1984 allows telephone exchange companies that provide service in rural areas having a population of less than 2,500 lines. The removal of this exemption would further extend the ability of small telecommunications companies to provide services including full-motion video to these sparsely populated areas, and, in conjunction with a recent FCC decision to allow telco provision of both dial tone and video dial tone, enable rural areas to begin to implement such key upgrades in the very near future.

13.0 Conclusions

The United States is mid-stride in taking a quantum leap forward in telecommunications capacity and capabilities. New means of communicating by voice, data, and image, and technological improvements in existing means that offer orders of magnitude jumps in capacity, are appearing in an everwidening stream. These technological breakthroughs, in turn, are leading to breakdowns in the traditional segregation of corporate markets, as IBM, Microsoft, US West, AT&T, and Time Warner are beginning to intermingle and joust with one another on a regular basis.

The implementation of ADL's recommendations for Iowa's telecommunications infrastructure, as modified and expanded by those made in the last section, should provide rural Iowa with a first-class telephonic communications system, one that provides a platform for active participation in the national economy in the last decade of the 20th century. This report has examined a wide array of telecommunications-based economic activities that could utilize the proposed system with regard to their potential for development and expansion in rural Iowa. On the basis of the analysis, the consulting team believes that five of the activity areas should receive priority attention from the state -- back-office operations, distance research, distributor-based telemarketing and mail order, interactive information media, and telecommuting centers. These five areas are chosen for one or more of three reasons -- they build on the existing advantages of the rural labor pool (back-office operations, distance research); they build on existing strengths and operations in agriculture, manufacturing, and retail (in-house telemarketing, interactive information media); and/or they seek to use the telecommunications infrastructure to enhance the competitive positions of existing Iowa firms (in-house telemarketing, telecommuting centers). A summary of the findings and key strategic actions for the five areas is as follows:

- *Back Office Operations* -- Experience shows that Iowa is a very attractive site for back office operations. In addition to an increasingly powerful telecommunications infrastructure, Iowa offers these facilities a central location, a pool of educated, entry-level labor, and a low-cost operating environment. Although most of these facilities are in the larger urban areas, the trend may be toward smaller towns and more rural locales. The same factors that have made Iowa an attractive location for in-house, back-office facilities suggest that the state is well-positioned to capitalize on the growth of the more innovative examples of third-party providers of back-office and value-added, back-office activities. To best assess how to capitalize on these opportunities,

Iowa should prepare a strategic plan for attracting back-office operations. This plan would identify key trends in the location and operation of back offices, industry type by industry type; analyze Iowa's competitive strengths and weaknesses in attracting them; and suggest a series of steps that Iowa and its regions could carry out to improve its competitiveness and attract more business.

- *Distance Research* -- Rural Iowa already is an important location for telemarketing operations, because of the state's central location and friendly, accentless, inexpensive, and underutilized labor. With enhanced telecommunications infrastructure and computer capabilities, U.S. telemarketing companies are now expanding their activities beyond the straightforward selling of goods and services to include what is broadly known as *distance research*, which includes activities such as public polling, consumer surveying, test marketing, lead generation, and data customer database development.

  Rural Iowa is an attractive location for such distance research activity. The possibilities are large enough that the state should carry out a strategic assessment of the industry -- which firms are in Iowa, what functions they perform, their competitive advantages and disadvantages, and coming changes and opportunities in the industry. Gathering such information will generate a number of ideas and lay the groundwork for expanding the industry. Steps could include organizing and working with small, independent telemarketing firms to assist them in analyzing future business opportunities that can lead to new higher value work; encouraging large telemarketing firms to expand their breadth of operations and increase the level and sophistication of activities conducted; and assisting larger telemarketing firms to develop a training service that enables client firms develop their in-house distance research capabilities.

- *In-House Telemarketing and Mail Order* -- While large, centralized mail order operations, such as Dell and Lands End, have received national attention, distinct and usually overlooked opportunities exist in expanding the sales of *existing* small niche manufacturers and speciality retailers through telemarketing. Rural Iowa has many companies that could benefit from telemarketing, such as shortline farm equipment manufacturers and clusters of retail shops in areas such as the Amana Colonies. While these manufacturers and retailers may not be able to

afford 1-800 services individually, they might be able to collectively afford the service if organized into an association of firms. A 1-800 number with a call forwarding facility would allow members to share the load of incoming calls on a rotational basis. Government could work through existing industry associations or networks to identify and promote opportunities for shared 1-800 services that could be affordable and enhance competitiveness.

- *Interactive Information Media* -- Online data and information services are expanding nationally at a rapid rate. There may be opportunities in rural Iowa for promoting on-line information services with significant value-added components, combining a massive number of databases with expert assistance in accessing them and using the results. One model for this is Teltech in Minnesota. Service operations similar to Teltech could be targeted to Midwest industries with a strong Iowa presence, such as OEM manufacturing, insurance, printing, or agriculture. The state should ascertain the feasibility of such value-added information service operations. If there appears to be feasibility, the state should consider promoting the creation of such operations. This could be done in any number of ways, including: showcasing the model to the appropriate industry people in Iowa to stimulate startup and investment; discussing the possibility for one or more of the state universities providing such a service; offering a tax incentive for the development of such a service; subsidizing small business users of such a service (as Minnesota did, with a very positive ratio of benefits to costs); and issuing an RFP to develop such a service (with state financial and technical assistance promised).

- *Telecommuting Centers* -- To assess the potential for helping aspiring rural Iowa entrepreneurs and small businesses access computer and telecommunications services they require but often cannot afford, the state should conduct a comprehensive market study to determine the feasibility and an appropriate location for one or more telecommuting centers, mixed-use public facilities equipped with computers and the latest telecommunications technologies. Alternately, the state could provide seed money to regional development agencies to carry out a feasibility analysis for their respective regions, followed by a competitive grant process for demonstration center funds. A third possibility is to issue an RFP to private firms to develop one or more centers, which would have state support for the early years but would be expected to be self-sufficient after a period of time.

While the five remaining activity areas also offer possibilities for rural economic development, we do not see the potential payoffs being as large as with the first group. Still, we believe opportunities in this group can be fruitfully and cost-effectively addressed. We have provided a series of relatively low-cost recommendations for these areas:

- *Professional Services* -- There are areas of rural Iowa, such as the northeast part of the state, that can take advantage of the nationwide phenomenon of professional services relocating from urban areas to rural areas with significant amenities and using telecommunications to attract and serve clients over a wide region. In the competition for such professionals, Iowa does not rank high. Even so, the consulting team thinks the state should sponsor a strategic audit of rural Iowa communities with an eye to more fully identifying those areas that could be most attractive to professional operations. If a sufficient number of communities appears attractive, the state might take out ads and sponsor articles in relevant periodicals regarding the quality of life in Iowa. It also might assist regional development organizations in these regions in taking action on their own.

- *Electronic Publishing* -- Electronic publishing does not present significant opportunities for economic development in rural Iowa. The occupational structure and locational needs of the industry do not lend themselves to rural Iowa operations. Experience shows that even urban Iowa has problems sustaining such industry outside the realm of agriculture. The state could take steps to encourage niche producers of specialized CD-ROMs.

- *Distance Learning* -- New business opportunities for rural Iowa in distance learning are minimal. In general, rural Iowa does not offer the talent base for distance learning other than that which already exists at community colleges. Rural Iowa is not a competitive site for attracting for-profit distance learning efforts of any size. Even so, Iowa can take several strategic actions to address development opportunities with regard to distance learning, including encouraging niche market educational product development; promoting the development of distance learning activities in sectors in which the state has some competitive advantage, such as agricultural biotechnology and

insurance; and marketing distance learning capacity available through ICN and the community colleges to existing and potential employers in rural Iowa.

- *Remote Analysis* -- Opportunities for rural Iowa to promote job creation through remote analysis activities, such as video-linked health clinics, do not appear major at this time. However, remote analysis opportunities vary greatly sector by sector, so the full range of possibilities is unclear. Consequently, the state should undertake a compilation of examples of how remote analysis has been used by businesses in various industry sectors. Providing information and concrete examples will likely stimulate existing firms to take steps that will strengthen their competitive positions and possibly expand their business markets.

- *Interactive Television* -- Established interactive television capacity in rural Iowa is some distance in the future. Once in place, interactive TV could be a means of selling rurally-produced products and a stimulus to creating some local programming jobs. The technology will be primarily targeted to the home, though business uses are clearly possible, though not well-defined at this point. Perhaps the most effective near-term step the state could take is to facilitate the extension of interactive TV to rural areas, perhaps by encouraging cable TV companies and local phone systems to create a demonstration project.

Our recommendations for promoting specific types of economic activity are not meaningful if the necessary telecommunications platform is not in place. We strongly suggest that IDED thoughtfully review the infrastructure observations and recommendations provided in Section 12.0 and share these with the Iowa Utilities Board.

The United States is on the edge of a brave new world in telecommunications. How this revolution will restructure our work and personal lives is unclear, but the fact that it will have a significant impact is evident. Those states that are proactive in anticipating and utilizing new telecommunications capability, wired and non-wired, will be a step ahead in economic development. The ADL study, and this complementary volume, focus on Iowa's telephonic infrastructure. Because the range of new telecommunications media and delivery systems goes well beyond the telephone, we think it important to repeat our earlier observation -- IDED should strongly consider sponsoring a broader study that examines the breadth of the telecommunications revolution and its implications and potential for Iowa economic development.