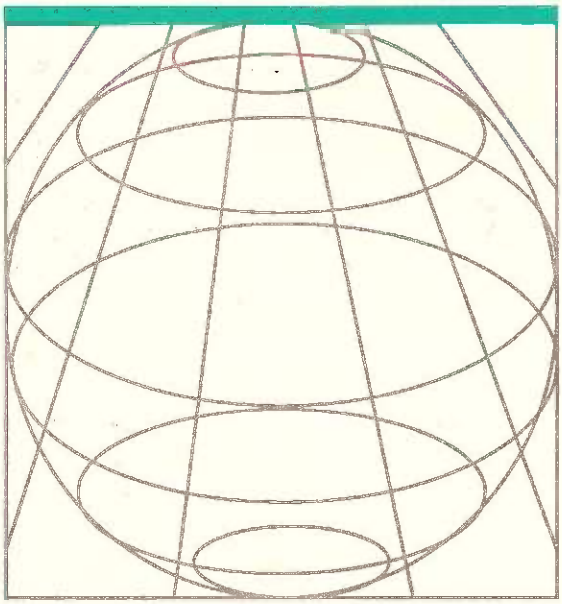

ADVANCED TELECOMMUNICATIONS FOR ECONOMIC DEVELOPMENT IN WASHINGTON STATE

Advanced Telecommunications for Economic Development in Washington State

A Working Paper from the Telecommunications Task Force — Economic Development Board

January 1989

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NOTE FROM THE AUTHORS

This is Version 4.1 of a working paper prepared for the Washington State Economic Development Board by its Telecommunications Task Force. The Task Force members are Nancy Williams of GTE Northwest, Vic Ericson of U S WEST Communications, and John Niles of Global Telematics. Opinions and conclusions in this draft are the responsibility of these individuals, and are not necessarily representative of any company or government agency. EDB Director Mike Fitzgerald contributed to this working paper also.

We appreciate the comments of the many people who reviewed and commented on earlier versions of this working paper, or who otherwise took time to speak with us on the issues involved:

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ABSTRACT AND SUMMARY OF RECOMMENDATIONS

This paper focuses on the implications of telecommunications in combination with computers (or, in one word, telematics) for economic development in Washington. Following an introduction, the first part of the paper is a brief description of the scope of telematics and what it means for economic development. In the last half of the paper, seven recommendations are presented and justified. In summary, they are:

1. EDUCATION AND TRAINING: Telecommunications can support productivity in education and training at all levels. The Telecommunications Task Force recommends that the leadership of Washington's current educational Telecommunications Network Planning Process (within Office of Superintendent of Public Instruction, and the Higher Education Coordinating Board) maintain close and continuing liaison with those who are working on education and training for achieving economic development goals. Furthermore, the Task Force recommends that the telecommunications industry in Washington take action to expand all policy makers' consideration of telecommunications-based delivery of education and training.

2. ECONOMIC DEVELOPMENT NETWORK INFORMATION SERVICE: Economic development organizations throughout Washington would function better, as well as be generally educated, through access to on-demand information from computer databases, combined with enhanced message communications. The Telecommunications Task Force recommends that the State Department of Trade and Economic Development, in concert with the Economic Development Executives of Washington (a professional association), establish a computer-based communications network linking economic development professionals throughout the State to each other, to information databases (market opportunities, site inventories), and to appropriate outside offices (trade missions).

3. RURAL OFFICE INDUSTRY DEVELOPMENT: The forces of the market economy are moving Washington State toward ever more development in the Puget Sound region, while many other parts of the State remain depressed. The Telecommunications Task Force recommends that the Department of Trade and Economic Development, or the Department of Community Development, initiate a demonstration project using State Government and charitable foundation funding to create jobs outside of the Puget Sound region which are linked through telecommunications to businesses in that region.

4. RESPONSE TO URBAN CONGESTION: In the Puget Sound region, traffic congestion has emerged as a problem of economic significance. Present efforts to deal with congestion focus mainly on adding transportation capacity, such as wider roads or rail transit. The Telecommunications Task Force recommends that Washington State organizations studying options for urban congestion relief — such as Metropolitan Municipality of Seattle (METRO), the Puget Sound Council of Governments, and the State Department of Transportation — recognize and apply the growing body of technology and research which links transportation and telecommunications.

5. TELECOMMUNICATIONS CAPABILITY: The Telecommunications Task Force finds that existing telecommunications infrastructure and available services in Washington are now generally sufficient to support business incubation, retention, and attraction. However, telecommunications capabilities and the economic environment are always changing, and business activity increasingly depends on the availability of sophisticated telecommunications capability. Therefore, the Task Force recommends that the Washington telecommunications industry — in cooperation with the economic development community — implement a program of education and site evaluations to ensure that telecommunications capabilities continue to support economic development requirements.

6. TELECOMMUNICATIONS REGULATION: The most important aspect of telecommunications regulation is the long-run resulting combination of performance and user cost of the public telecommunications network. Consequently, the Telecommunications Task Force recommends increased attention to developing public consensus on the best level of capabilities and costs of the future network. The Task Force further urges that the implementation of its other recommended applications — education and training, professional networking among economic development actors, rural development, and traffic congestion relief — be used to highlight the present status and future choices in the performance and price of the public network.

7. ESTABLISHING AN INSTITUTIONAL FOCAL POINT: Continuous public attention to the opportunities, problems, and issues of telecommunications technology for economic development is warranted, given the magnitude of the opportunities. The Telecommunications Task Force recommends that the Department of Trade and Economic Development establish a function to conduct program analysis and development for telecommunications in support of economic development in Washington. Cooperation with other states, or even participation in a multistate research center, would be desirable as well.

INTRODUCTION

The taming of the Columbia River by building dams is one of the most important chapters in the economic history of Washington State. When electric power began to flow from Grand Coulee Dam in 1941, an era of inexpensive energy began which continues to this day. Low cost power drew the energy-hungry aluminum industry to Washington, a development central to the success of the Boeing Company. Grand Coulee and other dams on the Columbia River work together as one of the world's largest integrated systems of hydroelectric generation, flood control, and land irrigation. Columbia River water moving to arid lands via electric pumps is of paramount importance to the success of Washington agriculture east of the Cascades.

Controlling the flows of electricity and water out of the Columbia River dams are systems of computers and telecommunications. The balancing of supply with demand for electricity and for water now rests on electronic data processing integrated with telecommunications.

> Computers in the Bonneville Power Administration's control centers in Vancouver, WA and Moses Lake send signals every few seconds to 10 of the most important of the 55 dams in the Columbia River system. BPA computers continuously monitor hundreds of points along 14,000 miles of high voltage transmission lines. Computer-generated signals, plus voice and teletype communications over a network of 141 microwave towers, control the hydroelectric power output and water level at all of these dams.
>
> At Grand Coulee Dam, a networked set of 34 computers spread over the entire complex monitors 22,000 separate points on generators, switches, pumps, and other equipment.
>
> A separate computerized network is now being installed to control the flow of water to the agricultural irrigation districts around Moses Lake. On some farms, irrigation is already controlled by computers which measure temperature, wind, and moisture and then send signals to valves to release an optimal amount of additional water to the crops.

Modern society's increasingly sophisticated use of computers and telecommunications in combination is coming to be described worldwide with new terms such as "informatics," "telematics," or "C & C," short for computers and communications. "Telematics," a term used in this report, was coined in France in 1978, to characterize a new focus for economic development in that country. In Washington State, telematics now provides indispensible tools for the skilled managers, engineers, and technicians who are responsible for the operation of hydroelectric and irrigation systems.

But telematics, of course, goes much further. The communication and management of information has become central to the functioning of manufacturing complexes, to financial institutions, to government at all levels, and increasingly to all of the other organizations affecting Washington's economic vitality.

> The Boeing Company, for example, is in the process of installing the world's largest private digital communications network to link all of its facilities in Washington State and elsewhere. The $100 million network will tie together all of Boeing's telephones as well as its computers. Even before the completion of this new network, Boeing's telematic capabilities marketed through Boeing Computer Services make it the largest computer company in Washington State.
>
> Washington's leading forest products firm, Weyerhaeuser, has also evolved internal information processing and communications capabilities of such magnitude and sophistication that the company markets them to other businesses.

The computerized, electronic linkages between banks, brokerage firms, portfolio managers and other financial institutions worldwide are common knowledge, ranging from the multi-bank cash dispensing terminals found near the front door of many urban grocery stores, to the sophisticated worldwide networks which allow

instantaneous shifting of money in response to foreign investment opportunities.

In wholesale and retail commerce, telecommunication of orders, through electronic document transmission from stores to wholesalers, or consumer use of 800 telephone ordering services, is becoming common. The validity of credit card transactions is frequently checked by electronic linkages to remote computers.

Other sectors are affected as well. The Government of Washington State, in line with a national trend, has consolidated hundreds of millions of dollars in information processing and telecommunications assets into one central agency, the Department of Information Services.

The merger of computers and telecommunications into the combined technology of telematics is becoming increasingly evident in commerce at all levels. Any business, big or small, equipped with a personal computer attached to the telephone network can obtain access to worldwide messaging and to information retrieval from hundreds of databases. In large companies, computing power is being dispersed to small computers attached to networks. Optional additions to a small computer make it a telephone answering machine, or a document facsimile terminal. Outside the office, mobile telephones and laptop computers appear to be on the road to wide usage by business people who move around in their work.

Various industries at different times in history have been characterized as labor-intensive, raw materials-intensive, energy-intensive, or capital-intensive. In the present era all economic activity is becoming more and more information-intensive. Understanding and using information is increasingly the key to economic progress, because it is a way of "adding value" just as surely as the transformation of materials through resource extraction, manufacturing, and shipment.

> Closely related to the idea of information as an economic resource are the notions of knowledge and technology as central to development of the economy. Increasingly well-educated, skilled, knowledgeable people applying faster, smaller, more powerful computers and communications pathways such as fiber optics cables and satellites are driving the availability and usefulness of information in the economy.

Thus, as the management of the basic institutions of Washington's economy — hydroelectric power, agricultural irrigation, and the largest corporations — are increasingly dependent on telematic systems, so too is much of the other economic activity in the state. The emergence of electronic information technology is not as immediately visible to the eye as the construction of massive dams, but *the economic effects of creating and channeling millions of information flows will equal and exceed the profound effects of taming the mighty Columbia.*

THE MANY FACETS OF TELEMATICS

A broad and growing array of technology makes up telematics. The boundaries of this field of technology application are moving outward so fast, and the combinations of potential within the boundaries are so complex, that comprehension of the full scope by one person is nearly impossible. The following is a quick tour.

One can divide telematics into NETWORKS, DEVICES that are attached to the network, and SERVICES available through the network.

NETWORKS:

One set of networks are the public telephone systems, made up of the local telephone exchange systems (such as those operated in Washington by U S WEST Communications, formerly Pacific Northwest Bell, and GTE Northwest), and long distance telephone systems (such as those operated by AT&T and MCI). These public systems were designed primarily for the communication of voice telephone calls, but are now being expanded to handle transmissions of computer data, and, (on special circuits) video pictures.

A second set of networks are operated privately by large organizations, such as Boeing's inhouse system, the K-Mart satellite communications system for authorizing credit card purchases by customers, the Bonneville Power Administration network for controlling hydropower, or the Washington State University microwave network for transmitting televised instruction from Pullman to several other cities in Washington. These networks which bypass the public telephone system are built to control costs and to provide special capabilities perceived to be not available in the public telephone network.

A large proportion of data communications, such as the signals that flow from automated teller machines (cash dispensers, such as The Exchange and Cirrus) travel over a combination of public telephone circuits and private bypass connections. Data communications traffic is now growing much faster than voice traffic in public and private networks.

Other kinds of networks include:

- Private telecommunications systems inside buildings and within campuses of related buildings.
- Local area networks (LANs) that connect computers to one another.
- Broadcast and cable television networks and radio networks that in addition to carrying traditional entertainment, news, and sports usually have extra capacity that can be used for data transmission and other special purposes.
- Cellular mobile telephone service, and paging services, extend the reach of the public telephone system to vehicles, the Washington State ferries, airliners, and other locations outside of buildings and phone booths.

DEVICES attached to NETWORKS:

The range of terminals and instruments that can be attached to a telecommunications network for sending and receiving information through it is staggering: telephones, answering machines, facsimile (FAX) machines for sending document images, computers and associated devices such as printers, video equipment, cash registers, burglar alarms, smoke detectors, water level monitors, traffic counters, fetal monitors, and ankle bracelets on criminal offenders confined to their homes, to name just a sampling of the possibilities.

For that matter, entire buildings can be "plugged into" telecommunications networks. For example, so called smart buildings are specially pre-wired and computerized for a variety of advanced telecommunications and data

management services, such as energy control; the resulting services are called shared tenant services, meaning anyone in the building can purchase them. For example, a smart building might include access to favorably-priced long distance telephone service, or have plug-in sockets and special central switching facilities for transmitting data between any computers in the building.

Going further, GTE has extended the idea of the smart building into the SmartPark℠, meaning a commercial or industrial complex that is especially prepared at the time of construction for high capacity telecommunications connections to the larger public networks. The first of these parks in the Northwest is Seaway Center in Snohomish County.

SERVICES through NETWORKS:

Services available through networks, many of which (beyond ordinary voice calls) are made possible by computers, include:

- Remote access from any place within an organization, to its central computers for any function that the computer can perform, including manufacturing automation, financial accounting, or product ordering. Federal Express, for example, schedules its package pick-ups and deliveries through a central computer in Memphis that is linked via radio signals to all of its trucks nationwide.

- Information retrieval from databases, either through a personal computer, or through push button telephones. For example, the indexed full text of most major daily newspapers is available through such databases. A local telephone call in Seattle with a push button phone can access an audio database of news, weather, sports, and stock prices. At least two such "audiotex" services are now available in Washington State.

- Voice mail, which is a kind of central answering machine service with advanced features. Large companies use this primarily, but a small business can have this service with a $200 addition to a personal computer.

- Document transmission, also known as electronic mail, either in the form of page images (facsimile) or saved keystroke characters (such as word processing files). Any personal computer can be enhanced to access these worldwide communication services.

- Video, either intermittent "freeze frame" through ordinary phone lines, or full motion with the quality of commercial broadcasts, through special high speed networks. Many corporations now have private video networks for internal communications.

The common denominator in this world of telematics is information. Increasingly, all forms of information — voice, data, still graphics, and video — will be stored, processed, and communicated in a digital format, that is, in the ones and zeros, the bits and bytes that are comprehended by computers. Compared to an analog format, digital information is more amenable to error correction, higher transmission speeds, and more efficient use of networks. For some of the same reasons, the digital format compact disc (CD) is replacing the analog format 33 1/3 long playing (LP) record for reproducing high fidelity music. Similarly, digital television, and the digital telephone are on the way also. In telematic parlance, the bandwidth of telecommunications networks can increase as a result of digitization, which means increases in the speed, quantity, and fidelity of information flows.

THE MEANING OF TELEMATICS FOR ECONOMIC DEVELOPMENT

Several studies have shown that the level of telecommunications correlates positively with the level of economic development. For example, the number of telephones (or computers) per capita in a nation increases as the gross national product per capita increases. As another example, small businesses in the western United States that use relatively more telecommunications services show higher rates of growth than those that use a lower level of telecommunications services. It's hard to say which causes which, the telecommunications usage or the economic strength, but it's clear they rise together.

However, neither logic nor research indicates that the availability of telecommunications capability is high on the list of factors that stimulate or inhibit the economic growth of a region in Washington. One reason is that the level of telecommunications capability in the State — as throughout the USA generally — is relatively high on an absolute scale. *Businesses assume that telecommunications is available when they need it, and indeed, it usually is.*

Additionally, other considerations in a region, such as the availability of entrepreneurial, managerial, and technical skills, and investment capital, are much more variable than telecommunications services. Similar variability from place to place occurs in quality of life, natural environment, transportation, costs of services, and the presence of previously established competition. All of these variables are more persuasive in business decision making than the level of telematics.

One can no longer imagine conducting business of any scale without telephones and computers. Yet, other resources are essential also. *In short, telematics is a necessary ingredient, but not the only ingredient,* determining the path of economic activity.

> Outside of economic development, there are many implications for public policy in the ongoing expansion of telematics. Any technology can lead society down paths which are not good. Analysts and philosophers who are focused on the future have pointed out that telematics could lead to such horrors as electronic sweat shops, privacy invasions, social isolation, excessive concentrations of economic power, reduced opportunities for individuals, or a societal split between information rich and information poor. We will not address these issues, except to note in passing that we don't think any of these outcomes are inevitable if public interests maintain awareness and work to prevent them through appropriate public policies.

Returning to economic development policy making, we will focus next on three kinds of economic resource FLEXIBILITY that are supported by telematics —- in the location of business activity, in people's requirement for work-related travel, and in peoples' use of work time.

FLEXIBILITY IN ACTIVITY LOCATION

The various activities of a business usually require close coordination. The ability through telecommunications to move large amounts of information quickly, over any distance, relaxes the need for business activities to be next to each other for sending and receiving work products, and for management coordination. So, for example, there is a nationwide trend for "back office" operations, those where face-to-face customer contact is not required, such as the data processing department of a bank, to be located in outlying parts of a metropolitan area. In suburbs, commercial rents are often cheaper, appropriate facility space is ample, and affordable housing for employees is closer.

Telematics facilitates either decentralization or centralization of facilities and control. For example, in the 1988 Department of Community Development study of rural office development, a case study of office industry in Wenatchee, WA uncovered two instances where advances in telecommunications helped to decentralize information-intensive service activities. Two other examples from Wenatchee demonstrated how telecommunications, by reducing the need for face-to-face contact at branch offices, was leading to

centralization of activity in larger metropolitan centers.

While telematics supports many possibilities, the net sum of all costs and preferences in facility location seems to be yielding a two-part trend: First, business activity is centralizing toward the larger metropolitan areas, such as the Puget Sound region. Second, at the same time, there is decentralization within metro areas toward the outlying suburbs. This trend is evident in the economic growth on the east side of Lake Washington in King County, in South Snohomish County, and in the Green River Valley of South King County. Between 1970 and 1980, Seattle's share of employment in King and Snohomish Counties dropped from 53% to 47%, a downward trend that Puget Sound Council of Governments has forecasted to continue for the remainder of the century.

The flexibility afforded by telematics toward either centralization or decentralization means that sophisticated mixtures are possible. For example, a Washington-based bank can locate as much of its headquarters staff as it wants in downtown Seattle, secure in the knowledge that excellent electronic communication of voice, data, and document images to branch offices throughout the State is possible. Face-to-face meetings with major downtown customers, attorneys, accountants, and other professionals are facilitated for headquarters staff. At the same time, document and data processing can be carried out in suburban satellite operations, which can still be monitored and controlled through electronic connections to downtown.

An example of operating over an even wider sphere is Mrs. Fields' Cookies, headquartered in Park City, Utah. This $100 million company runs 500 company-owned stores in shopping malls across America and five other countries. Computers in each store report hour-by-hour sales levels at the end of each day to a central computer in Utah that monitors all operations. Each decentralized in-store computer carries out many routine functions, such as ordering dough, and specifying how many cookies to bake. Store managers use the company's standardized software as a time-saving tool, so that they can concentrate on personal contact with customers and employees. At the same time, each store manager has immediate voice and electronic mail messaging with chief executive officer Debbi Fields, who a decade ago ran store number one by herself. Her company is now a mixture of both centralization and decentralization, supported by a very elegant telematic design.

Some small communities, like Park City, Utah, are the location of nationwide businesses, counter to their usual preference for sites in the larger metropolitan areas. This decentralization is made possible by telematic linkages to the rest of the nation. The CitiCorp Credit Card Processing Center in Sioux Falls, South Dakota is a prominent example. Small, telematics-intensive firms in Washington with a national market include Metron, Inc. in Wenatchee, an information brokerage firm, and Adscope in Goldendale, an advertising tracking firm.

The location of manufacturing facilities in foreign locations where labor and other costs are lower, is certainly aided by the availability of high-bandwidth communications reaching worldwide. This permits plans, budgets, work orders, and other information to flow between the plant and headquarters.

Thus, telematics reduces the negatives of Washington's geographic distance from the major markets of the USA. Shipping refrigerators out of Washington has not become any easier lately. On the other hand, physically small information products, such as software packages, are easy to deliver nationwide from Washington locations. The same is true of reports and data which can be reduced to electronically-delivered messages.

At the same time, telematics reduces the positives of Washington's so-called Pacific Rim proximity to the Orient. While Seattle may be one day closer to the Orient by ship, telecommunications from Tokyo can go just as easily to Denver or New York City. Non-stop air service to Japan from many U.S. cities further reduces the meaning of Washington's supposedly superior Pacific Rim location.

If it is easy to export information-based services from Washington to the rest of the world because of telematics, then it is also true that Washington businesses can just as easily import services from other parts of the world. This is one meaning of the global economy.

As a final point under locational flexibility, the option of having some employees of a business perform work

from home is expanding, partly because of the ability to closely tie such "telecommuters" to central business facilities through telematics. Since 1982, the number of U.S. corporate employees working at home has grown from 20,000 to 600,000. According to the Census Bureau, 15,000 workers at 350 U.S. companies work with computers at home-based clerical jobs.

For example, J.C. Penney has 126 telephone order takers working at home in Atlanta, GA, Columbus, OH, Grand Rapids, MI, Milwaukee, WI, and Pittsburgh, PA. Incoming calls to Penney are routed to employees' home workstations by computerized dispatching technology which balances the workload across all those telecommuters on duty. Ninety percent of the workers in this arrangement find the working conditions better than they expected.

All of these new flexibilities in the location of work can be summed up with the term "flexplace," in a way analogous to the more familiar concept of flextime.

FLEXIBILITY IN TRAVEL

Closely related to flexibility in work location is the growing potential of substitution of video teleconferencing for face-to-face meetings, and for image and electronic message transmission as a substitute for deliveries of physical documents. These substitution effects can cause particular trips to become unnecessary. For example, using electronic mail at a business may mean that the truck of the overnight package service does not have to stop there as often to make pickups. On the other hand, there is evidence that both telecommunications and business travel are rising in modern society overall. Rather than eliminating travel, telematics brings changes in the mix of purposes for which travel is necessary.

Similarly, flexplace has some potential in the long run for reducing pressure on transportation resources devoted to daily peak period commuting between home and the workplace. Marginal changes in the use of roads by the commuting workforce would make a major difference in any city. In the summer of 1984, local governments in the Los Angeles area took extraordinary steps to promote temporary ride sharing, flexible working hours, and truck restrictions on the freeways, in order to keep traffic moving during the Olympics. Traffic volumes were reduced or shifted in time by three to five percent, while congestion was reduced by 40% or more.

FLEXIBILITY IN USE OF TIME

Flexplace also leads directly to flexibility in the use of time. The ability to do productive work at home usually means the ability to work outside daytime hours. The availability of cellular phones in cars means work time is available while on the road. Similarly, the use of small computers permits a wider range of tasks to be performed at other than the usual times.

Computers give business the ability to send telecommunicated messages in the immediate present for delivery at a later time when the recipient requests delivery. Called asynchronous communication, the feature adds another dimension to time flexibility. Already, the capability of the telephone to be a "voice mail" message machine is becoming accepted as a part of routine telephone usage, beginning with the wider use of ordinary answering machines. As the global economy becomes realized, computer-based asynchronous communications gains in importance, since work coordination extends across many time zones.

These flexibilities in location, travel, and time usage mean new choices and opportunities, and new competitive challenges, for organizations, for individuals, and for the economy as a whole.

On the one hand, telematics facilitates cooperation. For example, joint ventures between geographically-separated firms are facilitated by the availability of high quality telecommunications linkages.

On the other hand, telematics facilitates nationwide, and worldwide, competition. Firms with a high-level of

telematic applications sophistication, such as American Express, Federal Express, and Mrs. Fields' Cookies are becoming impressive competitors worldwide. Mail order firms with strong 800 telephone service and order tracking are cutting into local retailing. Eddie Bauer, based in Washington State, can sell its products in the East, while L.L. Bean, based in Maine, can easily sell its products in the West. USA Today — delivering copy to printing presses nationwide by earth satellite — brings new competitive pressure to bear on local newspapers.

ISSUES AND RECOMMENDATIONS

The unprecedented flexibility in resource use which is now allowed by the combination of telecommunications and computers suggests many opportunities for improving Washington's economy. In our judgment, the following seven recommendations — from a longer list of possibilities — provide an excellent balance between risk and return in moving the State economy to a better level of development. The implementation of these recommendations would stimulate consideration and accelerated development of other telematic applications not specifically mentioned here.

Educational and training applications

Policies and programs for education and training amount to one of the State's most important economic development efforts. Consequently, telematic support of education and training emerges as a priority recommendation of the Task Force. Fortunately, work on this area of application is already underway and can be linked to economic development goals.

The Task Force recommends that the leadership of Washington's educational telecommunications network planning process maintain close and continuing liaison with policy makers and program planners focused on education and training for achieving economic development goals.

There are a growing number of examples of telematic applications in support of education and training:

- The University of Hartford, Connecticut is linking its early childhood education specialists with the kindergarten classroom in a low-income area public school, to monitor and assist in the education of disadvantaged children.

- The Ag Ed Network, an online vocational agriculture instruction service is used by 24,000 vocational agricultural students in 50 states. Ten states have state-funded programs linked to the network. 850 lessons and projects are in the curriculum, with daily updates of current events.

- The National Technological University uses a satellite communications network to link professors at 22 participating universities with working engineers at 70 places nationwide.

- The Washington Higher Education Telecommunications System, operated by WSU, provides upper division and graduate courses in Richland, Seattle, Spokane, and Vancouver, via microwave.

- The Televised Instruction in Education program from University of Washington uses cable TV and videotapes to deliver engineering courses to Puget Sound area firms.

- Educational Services District 101 in Eastern Washington delivers courses to rural high schools via satellite.

Some of these examples suggest that an important impact can be made on the number and design of new college branch campuses needed in the future in underserved regions of Washington.

Since May, 1987 there has been a State Government effort underway, mandated by legislation, to plan a unified statewide telecommunications network for public K-12 schools and institutions of higher education. The purposes of the network will be to increase access to educational opportunities; to improve the quality and effectiveness of teaching and learning; and to enhance the professional growth and development of faculty and staff.

Staff of the Superintendent of Public Instruction, and the Higher Education Coordinating Board, are working with advisory commissions made up of educators and a business review team to finish the plan by the end of

1988. Representatives of the telecommunications industry serve on the business review team, but economic development professionals are not well represented in the educational network planning effort.

Economic development interests focused on educational telecommunications networks would likely emphasize support for vocational training and retraining, adult continuing education, career inservice training, college placement, career and labor market education, economics curricula, and other work force and small business support. Economic development specialists would probably also recommend special attention in support of the State's community college programs, a key point of delivery for skill training and retraining of the present workforce.

> A further point of interest is the productivity of educational programs. Improving productivity means achieving a higher level of educational results with the limited resources that are available. There is significant potential for upgrading the productivity of teaching by greater use of student instruction through networked computers. For example, an elementary school teacher can monitor the progress of an entire large classroom of children through individual computers linked to the teacher's own desk. In high school and college-level technical courses, the skills of a scarce supply of math and science teachers can be extended to provide individualized attention to a greater number of students. Infrequently offered courses — those too advanced or specialized to be appropriate for many in a school population — can be offered through a combination of telecommunications, paraprofessionals, and a minimum number of highly paid, hard-to-find specialists.

To capitalize on these potentials, the Task Force recommends that the Washington telecommunications industry take action to expand all policy makers' consideration of telecommunications-based delivery of training and educational services.

PREFERRED VISION FOR THE YEAR 2000: Washington as the nation's leader in achieving higher productivity and more equity in the delivery of education and training through use of telecommunications and networked computers.

Economic development network information service

At the same time that computers and telecommunications are becoming vital for business and industry generally, information technology has an important role in supporting economic development organizations. Economic development councils, chambers of commerce, government economic development agencies, port districts, cooperative extension, and other organizations working on development throughout the State could function better — as well as be generally educated about telecommunication and computer capabilities — through access to on-demand retrieval of pertinent information, and from enhanced communications with each other.

In response to this potential, the Task Force recommends the establishment of a computer-based communication network linking economic development professionals throughout the State. We would envision the network at a minimum providing text messaging, document transmission, and information retrieval from databases.

Many economic development organizations in Washington have one or more small computers for applications such as word processing and document preparation, financial analysis of projects, or information storage and retrieval in databases. These same computers can be attached to the telephone network (with modems), and used for sending and receiving information beyond the confines of the office where the machine is located. For example:

- There are hundreds of computer-searchable databases that can be reached for information on companies, sites, markets, products, research, and technology. Information from these national and international databases can be delivered instantly through computers to Washington's economic development executives and professional staff.

- There are now several million electronic mailboxes nationwide, that is, computers that are attached to the telephone network and capable of receiving messages, documents, and even images from other computers. These electronic mailboxes increasingly provide connection to older forms of electronic communication, such as telegrams, TELEX, and facsimile.

An important telematic application developed in the 1980s is the professional network information service. Such services combine electronic messaging and databases fine-tuned for use by groups of people with common professional interests crossing organizational lines. These services are now available for many professions, including doctors, lawyers, bankers, engineers, scientists, entertainers, government officials, ... even private detectives and rock musicians have their own services. As an example, a professional network information service for people working on AIDS contains databases summarizing the latest research findings, and allows news of developments to be broadcast quickly to the desks of health professionals around the nation. An analogous service would be useful for economic development professionals.

Indeed, there are network information services for economic development professionals. For example, one network called EDEN is operated by the Queens Overall Economic Development Corporation in New York City and is used for coordination of specific research and technical assistance projects. A different network with a similar name, EDIN, operates in Indiana to provide statistics, site data, and services information. The State of Ohio operates an electronic service, TIE-IN, to provide technology transfer from university research and development efforts. The States of Michigan and Oregon use computer networks to promote use of local businesses, facilitating an import substitution strategy. The State of Colorado is just beginning to implement a computerized information service focused on economic development activities.

> Locally, the State of Washington Business Assistance Office in Olympia has begun a computer-based information service to provide access to resource information, and foreign trade opportunities. Economic Development Council of Seattle and King County uses and provides its members with access to a computer databank called BIZ NET.

With all of the foregoing experiences available for learning, the time is ripe for implementing a second generation information service to serve organizations throughout Washington State which are working on economic development. The Department of Trade and Economic Development (DTED), in partnership with the Economic Development Executives of Washington (EDEW) could provide leadership. Their leadership would need to transcend the competition between communities within the State, and facilitate a cooperative network-building effort focused on global competitiveness for the region as a whole.

This recommended network serving economic development professionals in every community would provide new exposure to telematic technology, a learning experience which could drive the development of new electronic services for businesses and other clients of economic development organizations.

In particular, after economic development professionals are using a telematic service for communication and information retrieval in support of their own activities, they are more likely to take note of applications that would benefit key Washington industries. For example, would the Washington bed and breakfast industry benefit from access to a common computerized reservation system? Could the promotion and sales of certain Washington- grown agriculture specialty products benefit from expanded direct electronic access to overseas marketing representatives? Could the Seattle-based Northwest Venture Group, or M.I.T. Enterprise Forum transmit their meetings to outlying areas of Washington, where the accelerated development of entrepreneurialism is desirable?

The development of the recommended network for economic development professionals can be accomplished with current levels of telephone service and the present array of small computers already in place, or in stores. Washington-based firms have the know-how to implement this proposed network.

Access to this electronic information service could be extended in non-competitive areas of service to other states in the Northwest, in support of regional cooperation programs. Lest this seem too idealistic, we note in concluding this section that the European Business and Innovation Center Network, headquartered in Belgium, links high-tech development agencies in seven different countries.

PREFERRED VISION FOR THE YEAR 2000: Washington's economic development professionals finding additional productivity and innovation through electronic connections to each other, and to human and database resources worldwide.

Rural office industry development

The forces of the market economy are moving Washington State toward ever more development in the Puget Sound region, with resulting congestion and other environmental impacts. At the same time, some other parts of the State remain depressed. This dynamic is causing widespread interest in sharing some of the economic prosperity of the Puget Sound region with other parts of Washington.

Possibly, in the long run, telematics could support "remote siting" or "corporate extension" of Puget Sound area economic activity in other areas of the state. It is important for policy makers and corporate leaders to learn whether this possibility can be initially realized through public interest intervention (government or charitable) in normal market processes, and then sustained by virtue of cost and productivity advantages.

We recommend that the Department of Trade and Economic Development, or the Department of Community Development, initiate a demonstration project to use State Government and charitable foundation funding to create jobs outside of the Puget Sound region which are telematically-linked to economic activity in that region.

The focus of this interest in rural development is usually office industries, such as communications, finance, insurance, real estate, business services, and legal services. Typically the primary focus is support operations which can provide services such as word processing, data entry, or telemarketing to other firms, or else "back office" divisions of information intensive firms such as financial and insurance companies. Businesses such as telemarketing and medical records transcription are also an opportunity for rural areas.

> As an illustration of how telematics can deliver job opportunities to disadvantaged regions and populations, consider JobLink, a program operated by a consortium of non-profit community agencies and the Pacific Bell telephone company in the Watts area of Los Angeles. JobLink is a telecommuting project bringing computer training and jobs to people who are often considered unemployable. The work is data entry and word processing for downtown firms. Instead of traveling to sites distant from their homes, participants go to a neighborhood work center and send finished work to clients over telephone lines. In the first year, the project has trained and employed over 40 people.
>
> As a second example, rural, non-metropolitan siting of information-intensive business is an explicit and somewhat successful strategy being pursued in rural Minnesota by the Northspan Group, Inc. Examples of such businesses are medical records transcriptions, insurance claims processing, and telemarketing. Northspan matches labor and other resources in small Northern Minnesota communities against the functional requirements of Minneapolis-St. Paul metro area firms. Northspan places special emphasis on labor categories where the Twin Cities show skill shortages and resulting high wages. After several years of effort, Northspan is seeing some success, for example, the placement of a remote data processing center for an insurance company in International Falls (population 6,000).

Furthermore, there are occasional examples of information-intensive businesses incubating through the efforts of entrepreneurs who choose to locate their new business in a rural community. Great Plains Software in Fargo, North Dakota, and Figi's Data in Marshfield, Wisconsin come to mind as recent start-up businesses which have become big even while located in rural centers.

Trying to put new service jobs in rural areas where the economy does not tend to cause them naturally is a long and difficult job. The biggest obstacles are not technological and economic, but sociological and political. People have habits, preferences, and needs which are likely to be slow in changing. Success will not be sudden, nor dramatic. The goal is to make incremental economic improvements in smaller communities, while not disrupting their characteristic quality of life.

The Washington State Department of Community Development commissioned a study of rural office development in Washington, which was completed in February, 1988. This study recommended that the State Government promote rural office development.

In consultation with the chief strategist of the Minnesota effort, we suggest that project funding plus technical assistance be initially provided to an economic development agency in a community which has the highest probability of incubating or attracting additional office sector development. Students of rural office development have recommended that larger places, or those with colleges, have the best chance of success in attracting office sector development. Spokane, Pullman, or the Tri-Cities area are the places that we recommend as the best candidates for the initial focus of this effort.

The demonstration effort could stimulate several sources of office sector development: expansion of existing businesses in the demonstration site; incubation of new businesses by local entrepreneurs; attraction of branch offices of companies not now located in Washington; or corporate extension of Puget Sound businesses into the demonstration site.

Furthermore, an internal state government demonstration of the potential for remote siting of jobs would also be useful in exploring whether the concept is feasible. In Minnesota, with economic development of a depressed region as a justification, and as a result of political pressure from regional interests, the State Department of Revenue is opening a data processing center in the Iron Range city of Ely (population 5,000). The center, employing approximately 20 people, will be linked via telecommunications to the state capital in St. Paul, over 200 miles to the south.

Movement of some State Government operations into outlying areas could be stimulated with a program similar to the Illinois Rural Fair Share Program, in which that state's Governor mandated that at least 25 percent of all expenditures of government departments be allocated to rural areas.

PREFERRED VISION FOR THE YEAR 2000: Washington's people and communities — statewide — electronically linking to the sources of economic growth, wherever they are, and the folks who prefer a more rural lifestyle not necessarily having to relocate to urban centers to work and live.

Response to urban congestion

In the Puget Sound region, traffic congestion has emerged as a problem of economic significance. In April, 1988, the Seattle-King County Economic Development Council reported its well-founded suspicion that traffic is causing higher transportation costs, less employee tolerance of commuting, and tardiness. The EDC will verify these costs with a survey of area businesses scheduled for release in late summer, 1988.

As an example of what can happen, analysts at the Southern California Association of Governments estimated that in 1987 individuals and businesses in the Los Angeles area wasted $23 million a day sitting in traffic congestion...that's six billion dollars per year!

A reduction in automobile congestion would yield a more efficient use of gasoline, a development significant to the economy of Washington State, which imports all of its petroleum.

Local efforts now underway to deal with congestion in the Everett-to-Olympia corridor focus mainly on adding transportation capacity: more roads, wider roads, more buses, and even rail transit. An additional approach is to consider the impact of telematics.

The Task Force recommends that Washington State organizations studying options for urban congestion relief — such as Metropolitan Municipality of Seattle (METRO), the Puget Sound Council of Governments (PSCOG), and the State Department of Transportation — recognize and apply the growing body of technology and research which links transportation and telematics.

Recently, there has been a surge in recognition by transportation professionals worldwide, of the potential for telematics to affect transportation and congestion.

For example, a Subcommittee on Telecommunications and Travel Interactions is in the process of formation at the Transportation Research Board of the National Research Council. The World Conference on Transport Research Society (WCTRS) has already formed an identically focused Special Interest Group. And the Federal Highway Administration is beginning to focus attention on telematics, such as with a panel discussion at their June, 1988 Future of Transportation Conference, and in a report titled "Advancements in Telecommunications and Computer Technology Affecting Highway Travel."

Examples of applications and impacts of telematics on transportation include:

- Urban traffic flow management via remote monitoring and information display systems. Automatic vehicle identification (AVI) systems permit toll collections (such as at parking lot entrances) without vehicles having to stop.

- Ridesharing and small vehicle transit which are dynamically scheduled for more flexible, convenient public transportation.

- Changing land-use and travel patterns facilitated by telematics.

- More flexible use of space and time by workers, stimulated by the use of home and neighborhood work stations that permit a tradeoff between moving people to work, and moving work to people.

These possibilities deserve much more serious consideration in the planning of systems for relief of traffic congestion. People who understand and can apply telematic technologies should be included on the research and planning teams working to resolve congestion in the Puget Sound region. The experiences of other places applying traffic flow control and telecommuting, such as cities in Southern California, should be followed closely and evaluated carefully to see if such applications, customized for the Seattle area, would be beneficial.

PREFERRED VISION FOR THE YEAR 2000: In the Puget Sound region, the realization of an urban life-style based on flexplace, with congestion at manageable levels because telematic information movement allows people to travel more efficiently and even less often as part of their daily work life.

Telecommunications capability

Lack of telecommunications capability is sometimes perceived as an obstacle to the realization of economic development goals, especially in rural counties and small towns.

(Telecommunications "capability" means physical infrastructure — such as cables and central switches — and telecommunications services — such as local calls, long-distance, and high speed data communications — delivered through the infrastructure. Lack of capability usually means users' unwillingness or inability to pay the quoted price for obtaining a particular service. That price may include the cost of one-time work to alleviate

an infrastructure deficiency.)

Counter to this perception, the Task Force finds instead, that in Washington *existing capability throughout the State is generally sufficient to support further economic development.* We have not found evidence that telecommunications deficiencies have been a significant obstacle to business incubation, retention, and attraction in Washington. However, both telecommunications and the economic climate are evolving; the possibility of deficiencies emerging is real. *We therefore recommend that the Washington telecommunications industry — in cooperation with the economic development community — implement a program of education and site evaluations to ensure that telecommunications capabilities continue to support economic development requirements.*

We have not conducted a formal survey, but a continuing scan of the media has not picked up many reports of deficiencies. At the State Government Business Assistance Hotline, a negligible number of callers focus on telecommunications issues. Statewide, a study of household telephone service by Washington State University Social and Economic Sciences Research Center in fall 1986 found 89% of urban county respondents rating local telephone service as good or excellent, and 82% in rural counties. In the same survey, improvements in roads and highways were rated by six times as many respondents as more important to the future well-being of the community than were improvements in the local telephone system.

The Washington Utilities and Transportation Commission (WUTC) reports that long-distance service is available from every telephone in the State, and single-party line service is available (although not always purchased by the consumer) in all but one telephone exchange. Services such as call-forwarding and call-waiting, whose availability depends on the installation of modern switching equipment in the telephone central office, are widely available. U S WEST Communications (formerly PNB), covering about 78 percent of business customers in Washington, is committed to installing electronic switching in the central offices of every community it serves by the end of 1989.

The most commonly noted telecommunications problem in rural areas of Washington is the incidence of multi-party telephone lines. The 1986 WSU study reported that 6% of Washington households statewide, but 24% in the non-city parts of rural counties, were still served by multi-party lines. This is of economic significance in those cases where business calls are made from home, which in 23% of these same rural homes is over half of all local calls. Multi-party lines mean more interrupted or delayed calls, no ability to have advanced features such as call waiting, and difficult conditions for attaching computers to the phone line for data communication. For farmers, and other home-based businesses, these conditions could be a constraint on development and growth. As it turns out, however, most multi-party lines are in the homes of elderly people who have not converted to single-party lines since they became available. While cost of conversion from multi- to single-party lines is a household issue identified by the WSU study, the Grange and U S WEST Communications have agreed on a new approach to make single-party lines more affordable in rural areas. Furthermore, new radio technologies for bypassing land lines are becoming available.

> With sufficient funding, missing but needed telecommunications capability in support of commercial and industrial activity can generally be installed in timely coordination with other developmental schedules (e.g., for construction of buildings). This statement is made in light of the telecommunications capabilities that are moved quickly into position by the broadcast networks at sporting events, or by the military in support of field operations. The high capacity telecommunications system of Bonneville Power Authority reaching to isolated dams also illustrates the feasibility, with enough funding, of telecommunicating from remote locations.

So, the crux of the issue of telecommunications adequacy is the cost of implementing particular additional capabilities at specific sites when they are needed. For start-up, or otherwise small businesses, the issue of cost can be significant. To manage the instances of business people or economic development interests not being able to obtain the capabilities they need at a reasonable cost, *the Task Force recommends a mechanism which focuses attention on these troubling instances as they arise*. This approach contrasts with conducting periodic

infrastructure inventories, or establishing comprehensive monitoring procedures, which we believe are unnecessary.

The mechanism we recommend is as follows: economic development commissions, chambers of commerce, port districts, and other organizations engaged in economic development activities should document and report any instances where costs of providing telecommunications capability in their geographic region emerge as an obstacle to the incubation, attraction, or retention of a business. These organizations should send their reports of such instances to the economic development oversight function of any telecommunications firms whose services are involved.

The largest service providers, such as U S WEST Communications, GTE Northwest, AT&T, and MCI, *should publicize to the economic development community who their point of contact on economic development concerns is.* Additionally, the Washington Independent Telephone Association (WITA) — a trade association representing all of the local telephone service companies in Washington besides U S WEST — may want to assist smaller telephone companies in the implementation of this recommendation.

- Telecommunications firms and WITA should each systematically collect and evaluate information on those instances where lack of telecommunications capability is reported to be a hindrance to economic development. Reports from community-based economic development organizations would naturally be a leading source of information, but all sources with data and comment should be heard.

- When lack of telecommunications capability is identified as an obstacle to a particular case of economic development, the telecommunications firms involved should give priority attention toward the goal of satisfactory resolution. In addition to working directly with the economic development interests directly involved in the case, the involved firms should make the facts, determinations, and resulting actions in each case known to interested members of the community, so that public policy modifications can be considered. There is a direct parallel here with the treatment of public works infrastructure such as roads, bridges, and sewers.

In parallel with this focus on evaluating the economic development implications of telecommunications capabilities at particular sites around the State, *we recommend that firms in the telecommunications industry increase their educational efforts toward economic development professionals.* The process outlined above for dealing with concerns about particular sites will generate case study data, which are invaluable to understanding how the telecommunications industry supports economic development. The perspective which community-based economic development professionals have on traditional public works infrastructure such as roads and sewers should be brought over to telecommunications infrastructure, which is every bit as essential to development.

More data on the level and quality of telecommunications networks and services in Washington State will be generated in 1988 by the Washington Utilities and Transportation Commission, to be reported in early 1989. As a secondary recommendation, we urge economic development professionals to provide input to WUTC staff conducting the study (Susan McAdams, 206/586-1195) on their local business community's perceptions of telecommunications capability. At the same time, that study should actively solicit local views on telecommunications from economic development professionals in smaller communities

PREFERRED VISION FOR THE YEAR 2000: A statewide public telecommunications infrastructure and set of service offerings second to none, offered at attractive prices, with above average use by Washington's smaller businesses.

Regulation of telecommunications

The Washington Utilities and Transportation Commission (WUTC) carries out economic and service regulation of the State's telecommunications industry. The WUTC's regulatory actions impact the economy of the State through effects on decisions made by regulated telecommunications firms: decisions such as service prices, the level of investments in telecommunications infrastructure, and what services are offered. This action by the State Government obviously influences the development of the economy. The WUTC Chairman is appropriately assigned by the Governor to be part of the "Economic Development Cabinet" of state agency heads.

From the point of view of economic development, what is most important about choosing the form of telecommunications regulation is the long-run combination of performance and user cost of the public local exchange network which results from WUTC action. *Consequently, the Task Force recommends that work on determining regulatory policy include increased focus on developing a state-wide consensus on the shape of the public network — what services should be available, and what should they cost?* Focusing on this end result of regulation is something that economic development specialists and telecommunication users in general can discuss and work to reach consensus on, even if the best regulatory path to the goal is uncertain.

In theory, there are many possible combinations of price and performance toward which the public network could be guided through regulatory policy. Price and performance, overall, will trade off. The more the performance, the higher the cost. There are also issues of optional versus standard capabilities. As an overly simple example, consider push-button dialing, which permits the telephone to communicate with a computer for selective information retrieval. Is push-button dialing important as a universal feature, given a certain level of overall cost, or should this be an individual subscriber option?

What are the essential elements of equal access by service providers such as long-distance providers? How reliable should the local network be? What, exactly, should basic universal service mean? These questions and others should be answered in the context of cost and benefit. It's not too early to begin considering voice mail and electronic mail as potential "universal" services in the information age. Economic development professionals should participate in the discussion.

> Focusing attention on desired goals for the public network is particularly important for start-up and other small businesses, which are a key target for economic development activities. Small businesses are more dependent on the public network than larger businesses. The latter's higher volume of telecommunications traffic more easily supports devising private "bypass" alternatives to the public network, if the public network is not at a satisfactory price-performance point. Small businesses in general have to take what the public network has to offer.

The Task Force further urges that the implementation of its other recommendations — applying telecommunications to education and training, to professional networking among economic development actors, to rural development, and to traffic congestion relief — be vehicles for highlighting choices in the shape of the public network. *Are these important applications for economic development easy or difficult as a result of current public network capabilities and costs?* Let's try to implement them, and see.

Assuming that a consensus can be reached on what the price- performance goal for the public network should be, the larger question is how to reach the goal through regulatory policy. This is a large, difficult issue. The task of settling this question is a multi-year, multi-player process underway in many states and at the Federal level as well. The WUTC, and Washington's major telecommunications providers, are already fully engaged in this process, under the terms of a 1985 law, the Regulatory Flexibility Act.

In late 1987 the WUTC began studying whether additional economic incentives could be built into the State's regulatory framework. Evidence from the regulatory experience in New York, Iowa, and other states is under consideration as this document is being written. The Task Force endorses the current examination of incentive

regulation by the WUTC.

> As regulatory fine-tuning goes forward in Washington State, our earlier recommendation for examining telecommunications and economic development on a case-by-case basis can be extended as follows: If and when situations are uncovered in Washington State where lack of telecommunications capability is determined to be hindering economic development, then we would recommend that the WUTC and the telecommunications industry seek out and analyze any evidence that state-level regulatory policy is a causing agent. Appropriate regulatory modifications, if needed, would be stimulated by the data resulting from these particular cases.

We emphasize that the quest for appropriate telecommunications regulation in Washington requires an extended learning and negotiating process among the users and providers of telecommunications services, with the WUTC serving as facilitator and arbitrator. The process includes learning about technology and about economics. These two topics are difficult enough when considered independently, and are even more difficult when intertwined. Those with an interest in statewide or community-level economic development can usefully contribute to the negotiations by focusing on what the capability and cost of the public telecommunications network should be. Furthermore, the next recommendation describes an additional resource for designing Washington's regulatory climate.

PREFERRED VISION FOR THE YEAR 2000: A telecommunications regulatory climate built on a steady, even process of industry-government negotiation; a climate yielding a public network which supports the applications and opportunities for flexibility described in this paper.

Establishing an institutional focal point

As this report illustrates, the scope of concern with respect to telematic technology and economic development is unusually broad, complex, and dynamic. Given these characteristics, and considering the importance of the topic, basic social responsibility demands an organizational mechanism for continuous public attention to the opportunities, problems, and issues of telematic technology for economic development.

Our recommendation is that the State Department of Trade and Economic Development establish a function to conduct program analysis and development on the issues of telematics for economic development in Washington.

The responsibilities of the function should grow over time to include:

- Maintaining cognizance of the full scope of telematic technology at a level consistent with understanding the implications for economic development policy.
- Proposing policies to assure the adequacy of Washington's telematic infrastructure and services in supporting economic development.
- Identifying local obstacles to the continuing improvement of telematic support for economic activity.
- Liaison with, and participation in appropriate local, state, and federal regulatory proceedings, to make sure that economic development interests of the state are represented.
- Providing recommendations to modify government regulation of telecommunications when the public interest and the state economy would be enhanced by such action.
- Determining the economic development implications of proposed state and local taxes on telematic services.

- Providing input to the state Department of Information Services (DIS) on economic development impacts of its activities.

- Promoting understanding and useful applications of telematics in smaller communities, and in small businesses.

Unfortunately, there are not many models for the function recommended here. There are individual professionals in the Minnesota State Planning Agency, and the University of California's Berkeley Roundtable on the International Economy (BRIE) who perform some of the functions recommended above for their states. Washington State, by virtue of its professionally well-regarded Utilities and Transportation Commission (WUTC) and Department of Information Services (DIS), and because of the active involvement of the telecommunications industry in economic development, has a positive environment for establishing the public interest function recommended here.

The Task Force's judgment is that the WUTC and DIS would not be good candidates for housing the recommended function, because of the necessary regulatory focus of the former, and the government support mission of the latter.

The existing organization which is the best candidate for establishing the public interest function recommended here is the Washington State Department of Trade and Economic Development. The State's universities should be surveyed for interest and capability in becoming a research site for the staff activity that would be required to focus on the agenda above.

Additionally, there is great potential for interstate cooperation in carrying out this recommendation. Since other Northwestern states face issues and opportunities similar to those raised in this paper, resources for research analysis could be pooled in a regional center for great efficiency and effectiveness.

PREFERRED VISION FOR THE YEAR 2000: Washington as a nationally-recognized center of expertise in exploiting the capabilities of telematics for widely-shared economic benefit.

CONCLUSION

Telecommunications can be intensively applied to support the processes and programs of economic development in Washington State, as well as to enhance the State's underlying economic climate.

- In summary, for the economic development process, the recommendations above encompass an information and communication network for economic development professionals, and the targeting of rural areas for information-intensive industry development.

- In support of the economic climate, the recommendations of the Task Force address both the telecommunications and transportation infrastructure of the State, which we believe can be interrelated in significant ways. We also suggest that economic development interests participate more fully in efforts to improve the State's telecommunications networks for education and training.

- Finally, we recommend that modest but ongoing State Government resources be dedicated to deepening our understanding of the implications of telematics for economic development. We believe there should be more effort toward creating a shared vision of the capabilities which the public telecommunications network should provide. The public interest will be served if there is some measurement and evaluation — from an economic development point of view — of the government and business responses to the opportunities and challenges of telematics.

The human intellectual effort required to plan and build telematic systems is as significant to the present epoch of economic development as the taming of the Columbia River was to an earlier one. The results for Washington State will be even more far-reaching.