

*Telecommunications, Information Technology Industry, and Economic  
Development*

by

Roger Coupal  
Community Development Specialist  
Cooperative Extension Service  
Department of Agricultural and Applied Economics  
University of Wyoming  
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## ***Telecommunications, Information Technology Industry, and Economic Development***

### **I. Introduction**

Over the last few years the U.S. economic performance has exceeded expectations of many in government and private industry. Many believe that the emerging telecommunications industry is one of the reasons for the performance. Telecommunications has transformed American society at every level from the household, to the shop floor, to the boardroom. The trend shows no sign of letting up. Telecommunications has expanded its definition from telephone to include broadband services, high-speed data transmission, and various wireless technologies including cellular telephones and packet radio.

This rapid evolution in telecommunications has been driven by the technological changes taking place in the information technology industries in general. These geometric increases in computer processing speed and the development and expansion of the Internet have combined to confront the traditional regulated monopoly structure of telecommunications industry in this country. The Telecommunications Act of 1996 includes the traditional policy emphasis of universal service and comparable quality at comparable prices, but also mandates the FCC to promote more competition. While such policy mandates may accurately reflect the desires of society at large and of our elected representatives, it suggests public policy conflicts in the contradictory interpretations of these mandates. Deregulation may not mean comparable quality at comparable prices.

### **II. Demand for IT Services and Products**

Demand for telecommunications products and services has expanded and augmented the traditional telephone services. The percent of households with telephones has remained stable for many years at about 93 percent nationally even in rural areas, (NTIA, 1998). However, newer products and services have shown substantial growth. Household modem ownership jumped from 11 percent in 1994 to over 26 percent in 1997 and email subscribers jumped from 3.4 percent to 16.9 percent in that same period. Cellular telephone subscribership has doubled every three to four years since its beginning in 1985 and as of June 1998 had over 60 million subscribers (CTIA, 1998). UUNET, a large provider of Internet backbone services estimates that Internet traffic doubles every 100 days reflecting not only an increase in the number of users, but also the amount of use by households. Between July 1993 and July 1997 the number of Internet hosts increased over eleven-fold.

While the national growth in demand for information technology has been phenomenal, analysts and policy makers have been concerned about the distribution of access to information technology. According to NTIA, rural areas have kept up with the national average in terms of computer ownership with 35 percent of households owning

a computer versus under 37 percent nationally. However, rural areas are behind the national average in online services for most regions in the country (the northeast being the only exception,) which may have to do as much with understanding how to use it as it is cost of access. In 1997 17.8 percent of rural households in the west had online services versus 22.4 for the entire western population. This is important given the isolation of many rural communities, access to the Internet would more than compensate for the difficulties of isolation.

The increasing presence of the Internet is transforming workaday tasks of both firms and households. This transformation has been described by CEOPRAXIS, Inc. as a substitution of marketplace transactions with marketspace transactions (CEOPraxis, 1998). If firms do not have a presence on the Internet then they are increasingly isolating themselves from a growing potential market. Similarly, households more and more are looking to the Internet to purchase goods and services, or at the very least to compare prices with local businesses.

On the industry side competition has been driving innovation in the telecommunications and information technology industries at a rapid pace. Collectively known as the information technology (IT) industry, it is one of the faster growing groups of industries in the U.S. (See the Appendix for a listing by SIC code.) The industry includes computer hardware and electronic component manufacturers, communications industries, wholesale and retail trade in hardware and software, and software developers and services industries. The industry has grown from 4.9 percent of the nation's economy in 1985 to 8.2 in 1998. Growth in the industry's contribution to GDP is impressive, but is even more so when one considers the change in price accompanying this growth. IT prices have been dropping as the rate of change of computing and networking power has increased, which is an important distinction to other high growth industry groups where price increases have followed growth. The drop in prices in IT industries has been big enough and the size of the industry large enough, that it is credited toward lowering the nations inflation rate by 1 percentage point in 1996 (USDC, 1998). The IT industry's contribution to the nations growth has been equally impressive. A US Commerce Department study estimates that the IT industry accounted for 14.7 percent of the nation's growth in 1997. When one factors in the change in prices of products in those industries, the IT industry is estimated to have contributed to over a quarter of the nations real growth between 1992 and 1997.

The intense competition has also spilled over into the traditional local telephone services covered by the Baby Bells and regulated by the FCC and state public service commissions. A recent study by Monaghan and Associates (Monaghan and Assoc., 1998) estimated that as much as 25 percent of some lucrative metropolitan markets in US West territory were captured by telecom services other than US West by bundling local services with non-regulated emerging telecommunication services. Penetration of traditional local telephone services by non-regulated carriers can have important implications to rural users. Presently rural areas are subsidized by urban households and businesses in metropolitan areas. Cutting the regulated local carrier out of lucrative areas without letting the local provider compete on an equal basis could ultimately mean increases in costs for rural areas.

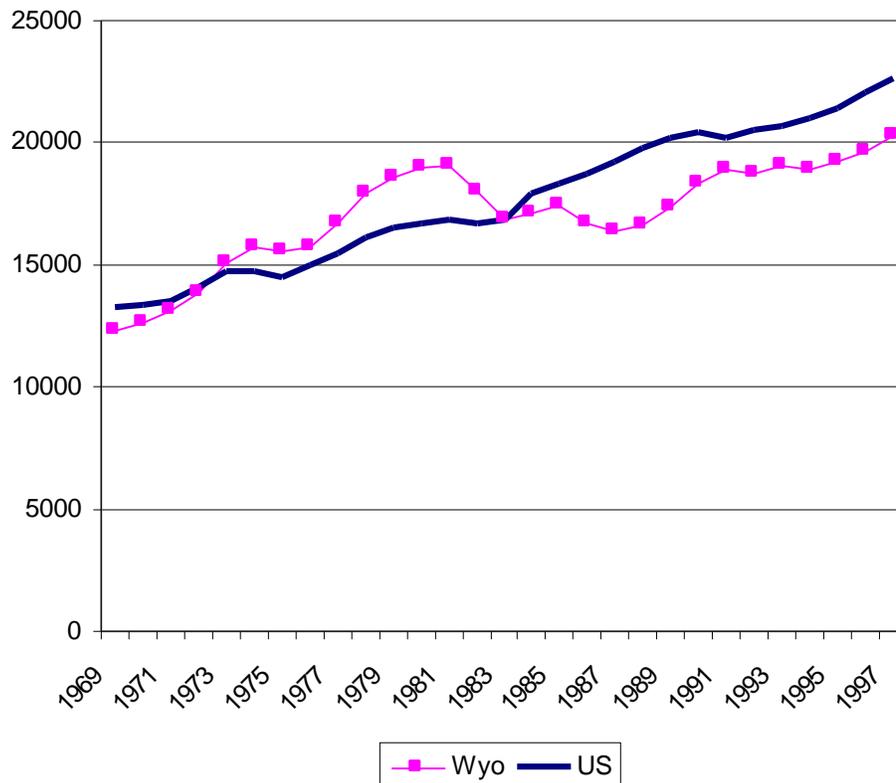
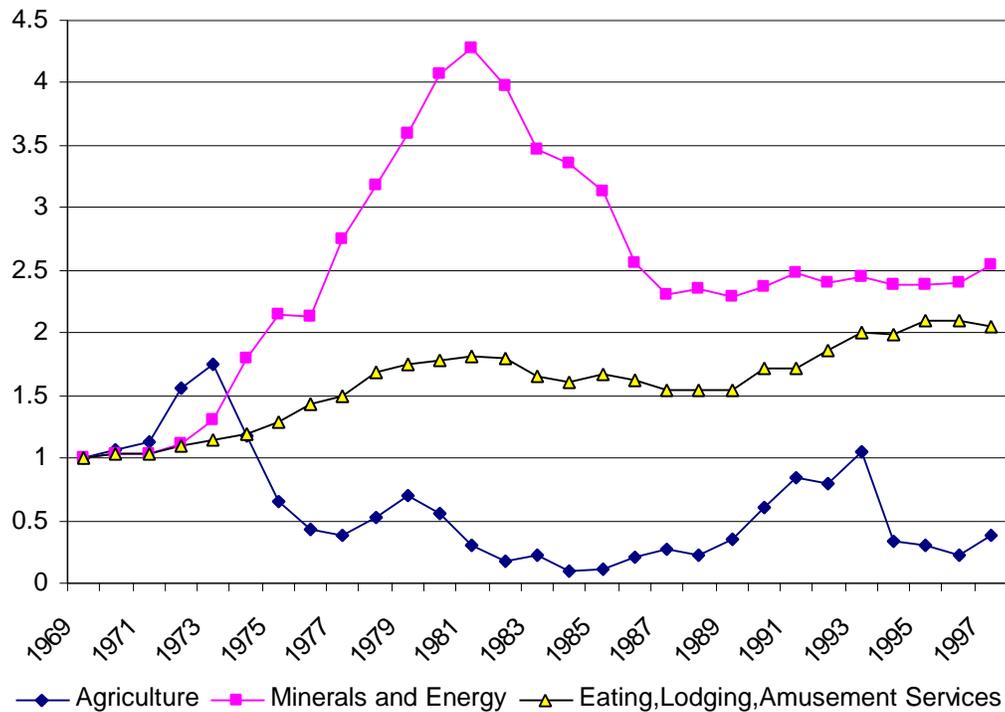


Figure 1. Real Per Capita Personal Income, 1992=100, Wyoming and the U.S.

The American economy is transforming itself at an rapid pace, and the implications of this transformation on Wyoming are important. The State's traditional economic bas have performed poorly in the past few years due to changes in international demand and supply. Per capita personal income has grown at a rate two-thirds the national rate since 1985, Figure 1. The State's traditional basic industries: Agriculture, minerals and energy, and tourism have all experienced declines or slow growth since the mid-eighties relative to the rest of the nation, Figure 2. Agriculture's largest sector, the livestock sector has been suffering from historically low prices for their commodities. The minerals and energy industries have also experienced historically low prices in recent years as a result of over production in international markets and flagging demand in the Asian markets. (The only exception is electric power and natural gas, which are a small part of that industry group, but have performed well due to deregulation and technological innovations.) Finally, our other major basic industry, tourism has performed poorly. Tourism sectors: eating and drinking establishments, hotels and lodging, and amusement and recreation services grew at a rate of less than one percent per year since 1981, while the same sectors have grown at over 3 percent per year nationally. While all these industries will continue to be the major contributors to income and employment in the state, the

analysis suggests the need to diversify our economy and focus more state and local attention on smaller but higher growth industries.

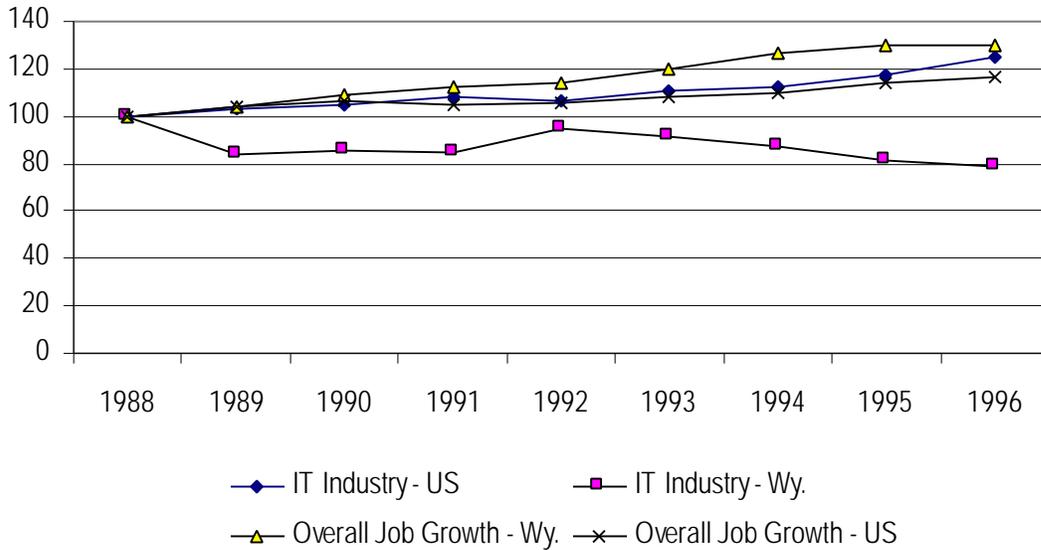


Source: REIS

Figure 2. Index of Real Growth in Industry Earnings for the Traditional Basic Industry Groups in Wyoming. 1969=1.0

### III. Wyoming's IT Industry Performance

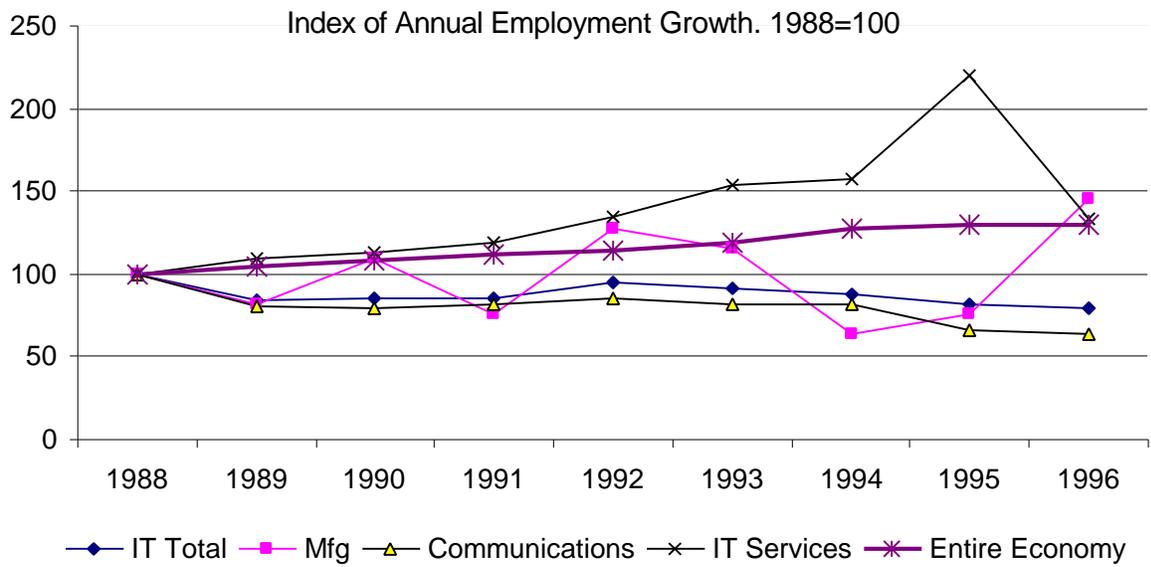
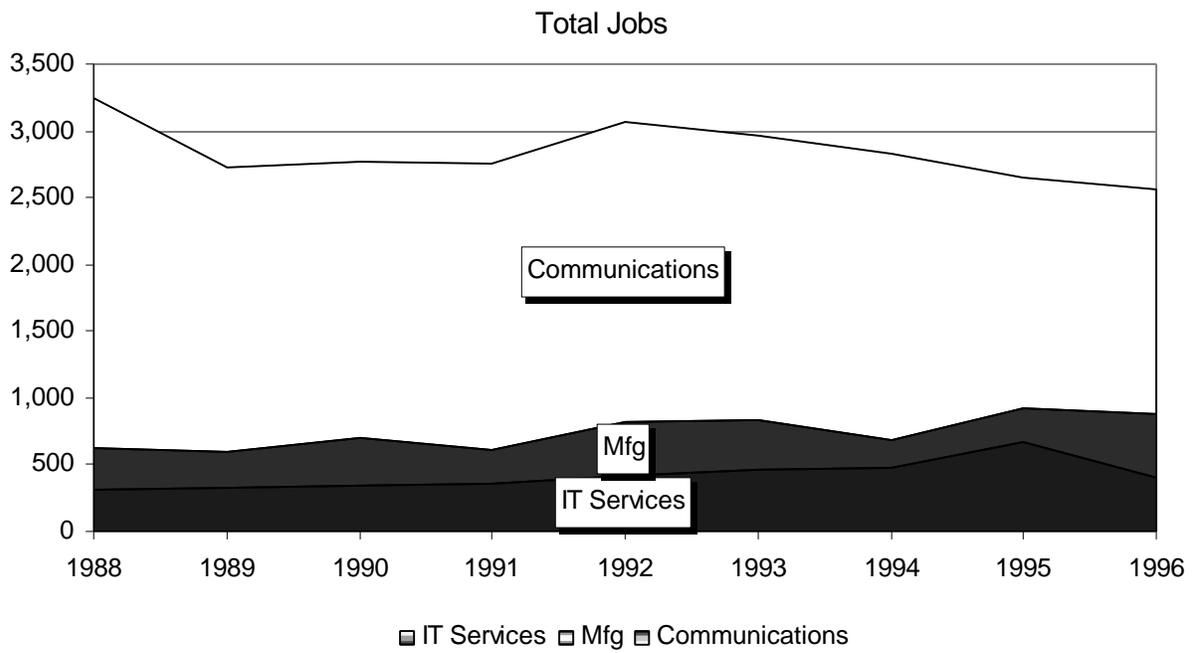
Given the rapid growth in the IT sector nationally and the poor performance of the State's traditional economic base, an important question is how the IT industry has performed in Wyoming. The IT industry in Wyoming has not performed as well as the general economy, Figure 3, unlike its national counterpart which has out-paced the national economy in general. However, the composition of our IT sector is different than the composition nationally. The IT industry provided a 2,560 jobs in 1996 representing approximately two percent of the State's total employment. Communications workers represent the largest share of the industry employment, with small manufacturers second and IT trade and services third, Figure 4. Communications jobs have been declining at a rate of 4.5 percent per year since 1988 and thus overshadowed increases in the smaller IT service and manufacturing sectors. The two industries have grown 4.2 and 5.6 percent respectively.



**Figure 3.** Index of IT Industry Employment Growth for Wyoming and the United States 1988-97, Employment in 1988 =100.

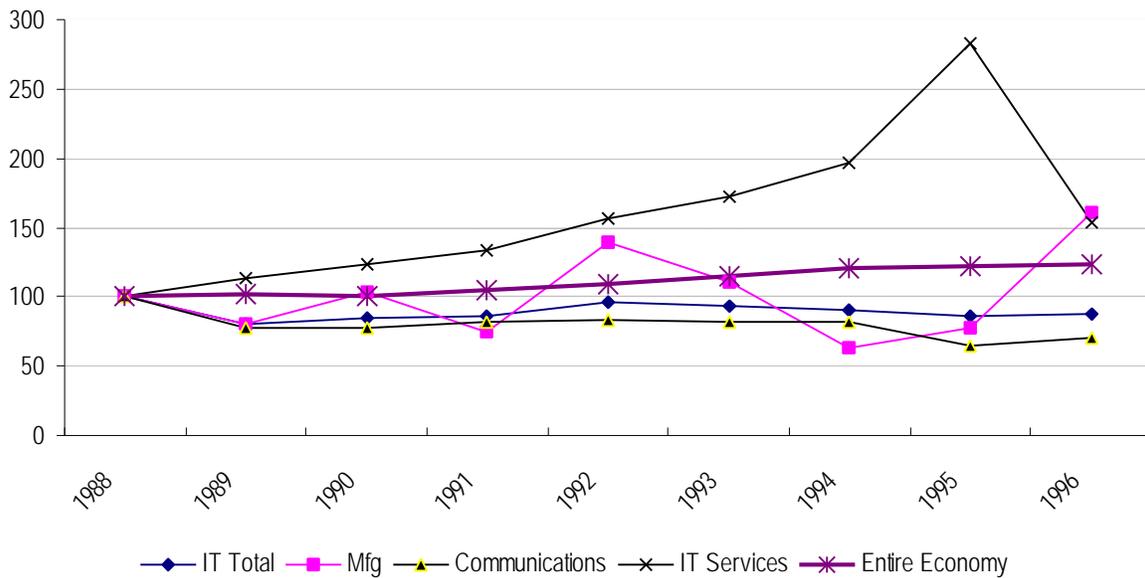
Both manufacturing and communications sectors exhibit substantial economies of scale, are prone to industry clustering, and tend to locate near large metropolitan areas to take advantage of labor-pooling and information spillovers. Furthermore, traditional communications sectors have gone through a period of substantial adjustment due to the break-up of AT&T in the mid-eighties and technological innovations since then. As a result, the communications industry has trimmed their workforce substantially since the mid-eighties, Figure 4.

Trade and services portion of the IT sector in our state have seen the largest gains. So while the bad news is that the States' IT industry performance seems to be lagging in some of the large employment industries like manufacturing and communications, the good news is that the state is gaining in the IT service and trade sectors. These sectors have a lower tendency to cluster than manufacturing, (though those forces are not totally absent there either, the planned relocation by Aspen Tree Software is a recent example.) So the potential for expansion in the IT sector is better than it would have been by simply relying on the manufacturing communications components. These industries not only sell to customers outside the state but service business and households inside the state, which suggests that like our national counterparts, Wyoming businesses and households are becoming increasingly dependent upon and attracted to telecommunications.



**Figure 4.** Employment and Growth in the Individual IT industries in Wyoming, 1988-96, Bottom panel 1988 Employment =100

The change in the number of jobs is an incomplete measure of the economic performance of the IT industry. These sectors typically generate relatively high paying jobs (compared to many other trade and service industries) so their impact on the State's income will be higher. The IT industry generates around \$100 Million annually to the state economy through employee compensation. Growth in real annual employee compensation for the IT Services and manufacturing are significantly higher than the growth rate for the entire state with communications sectors declining Figure 5.

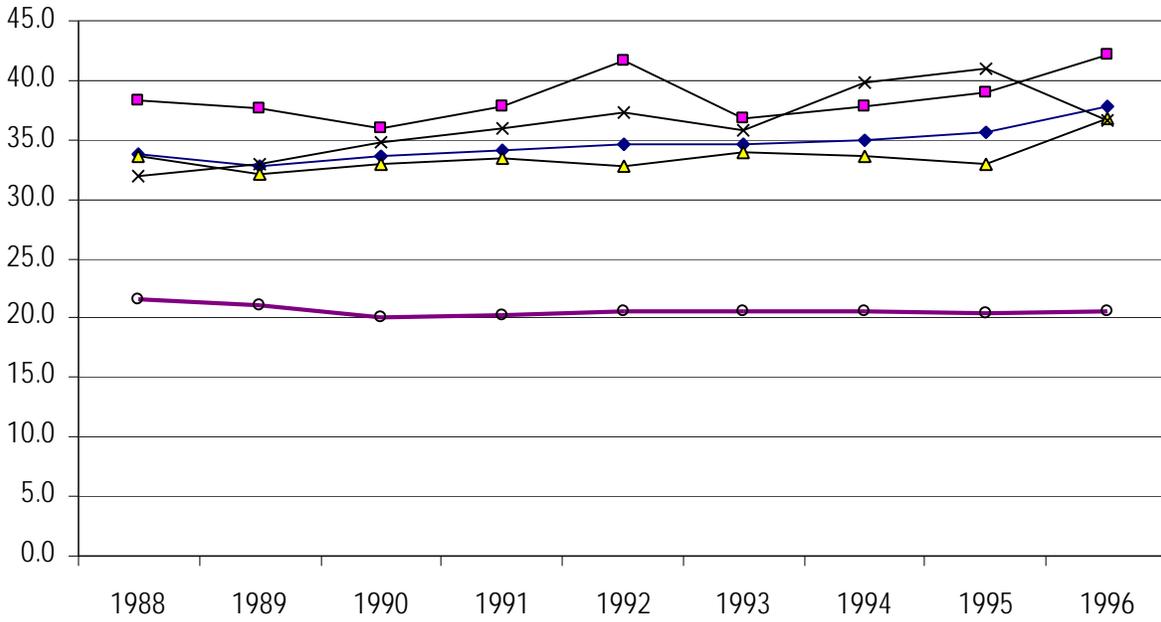


Source: County Business Patterns

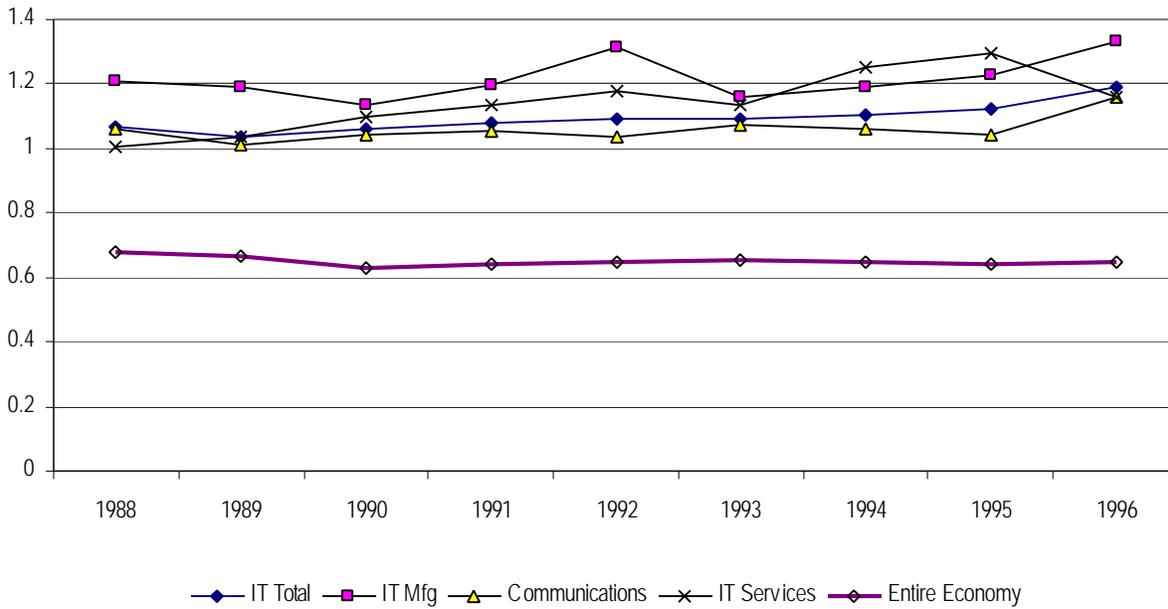
**Figure 5.** Index of Real Growth Rate in Employee Compensation for the IT Industry and the Entire Economy, 1988-96 (1992=100). Annual Employment Compensation in 1988=100.

Besides being a high growth part of the national economy, Wyoming's IT industry jobs tend to be higher paying than most other positions. Average earnings per job in IT industries in Wyoming are higher than average earnings per job for the entire economy, Figure 6 top panel. Earnings per job for the industry varied from 58 percent to over 80 percent higher than the economy-wide average earnings per job in Wyoming. Earnings per job for the IT Manufacturing and service sectors generated consistently ranked higher than the communications sectors. Earnings per job not only were higher than the average across industries in the state, but higher than their national counterparts. The lower panel of Figure 6 estimates the ratio of real average earnings per job for Wyoming relative to the United States. While economy-wide average earnings per job in Wyoming is consistently lower than the nation as a whole, our IT sector actually has performed consistently higher than the national counterparts.

Ave. Earnings per Job for the IT Industry and the Rest of the Wyoming Economy



Ratio of Average Earnings in Wyo. to the U.S.



Source: County Business Patterns

Figure 6. Average Earnings per Job in Wyoming's IT Industry and Relative to the U.S.

#### **IV. Paths to Economic development - Closing the digital divide in Wyoming**

The proceeding analysis provides a motivation for Wyoming to pay closer attention to this small but dynamic part of our economy. The Internet industry itself will be an important contribution to the State's economic performance. The goods and services it provides will affect every other industry in this state and across the nation. As a state we cannot rely on large communications industries and manufacturing firms to provide growth. Localization economies and clustering in IT centers will continue to discourage the consideration of Wyoming as a home. However small, high-growth firms do provide an opportunity. The State should to foster growth and development of these small, high-growth entrepreneurial firms.

All industries from tourism to agriculture will increasingly rely on the information technology created in this industry. Consequently to formulate a coherent economic development strategy that draws upon the strengths of the national economy, the state should enhance programs that support firms dependent upon telecommunications infrastructure. The State should identify policies that support and develop information technology industry, and enhance its use in all other industries. Components of such a program would entail the following:

- Assess and inventory the extent of the telecommunication infrastructure in the State. Identify potential alternative technologies and costs, including wireless technologies. Large high-density users such as educational institutions, large industrial facilities, and government may offer growth potential.
- Develop a strategic plan involving telecommunications companies, Internet Service Providers, and businesses and institutions that depend heavily upon the Internet. These would include on the private side software developers, electronic hardware companies, and back – office operations that rely on quality high-speed access into the Internet backbone. In the public sector important players include State and local agencies , the University , and community colleges. The plan should identify communications infrastructure needs across the state and assess the need for expanded Internet training and education programs. Finally, the plan should identify specific issues and barriers that information technology industry firms view as contributing to a poor business climate for this emerging industry.
- Assess the demand for telecommunications services in specific regions in the State, taking advantage of existing linkages with high-density users like a major industry facility, the University and Colleges, and government agencies. This way communities and businesses may be able to piggyback on existing infrastructure at lower costs than in investing in duplicative structures.
- Expand extended education and employee training programs in telecommunications, Internet use, web-based marketing, and technology transfer programs. Programs like the University's Technology transfer program and Cooperative Extension Services Internet Masters Program as well as other University and Community College Internet training programs should be expanded. Not only do we need to foster new businesses in the It industry, but existing businesses and industries should increase their own understanding of the Internet.

Portions of a program similar to that outlined above are already being developed at the University of Wyoming and Community Colleges. However the development is piecemeal and combining a set of programs that begin with an evaluation of the communications infrastructure and a plan on how to improve it, and end with education programming could tap into synergies that otherwise may be missed. The State should address the perception of a poor business climate for this group of industries and can ill afford a policy of benign neglect to an industry that is growing at a phenomenal pace in the rest of the nation.

**For more information:**

Organizations and Agencies involved in Supporting Rural Telecommunications Development:

**AeRie - Applied Rural Telecommunications, An Economic Development Resource Center**

<http://bcn.boulder.co.us/aerie/>

Aerie provides rural communities throughout the United States and the world a toolkit of resources to help them meet their economic and community development goals using telecommunications. Aerie offers a directory of economic development resources, an overview of basic telecommunications concepts, a schedule of upcoming conferences and events, and background information on rural infrastructure.

**RuralTeleCon `99**

<http://www.ruraltelecon.org/>

RuralTeleCon `99. 3rd Annual National Rural Telecommunications Conference, October 10-13, 1999 - Aspen, Colorado, USA. Annual conference co-sponsored by a broad coalition of federal, state, private foundation, and corporate organizations (NTIA, EDA, USDA/RUS, USDA/Cooperative Extension, National Rural Development Partnership, Aspen Institute, Kellogg Foundation, Rural LISC, Association For Community Networking.

**Telecommunications Policy Web site. TelecomPolicy.net**

<http://telecompolicy.net/>

A public service web site by the United Telephone Association on community telecommunications issues.

**TIAP. Telecommunications Industries Analysis Project.**

<http://www.tiap.org/>

A research consortium that conducts and reports impartial research in the areas where network planning, business financials, and public policy (regulation and legislation) intersect.

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Digital Divide". Office of Policy Analysis and Development. U.S. Department of Commerce.  
<http://www.ntia.doc.gov/ntiahome/net2/falling.html>.
- UUNET USA. <http://www.usa.uu.net/>. 3060 Williams Drive. Fairfax, VA 22031, USA

## APPENDIX

Appendix Table A1. IT Industry SIC code and Name

SIC Code	Name of Industry
3571	Electronic computers
3577	Computer peripheral equipment, n.e.c.
3660	Communications equipment
3670	Electronic components and accessories
3825	Instruments to measure electricity
4810	Telephone communication
4820	Telegraph and other communications
4830	Radio and television broadcasting
4840	Cable and other pay TV services
4890	Communication services, n.e.c.
5045	Computers, peripherals and software
5734	Computer and software stores
7371	Computer programming services
7372	Prepackaged software
7373	Computer integrated systems design
7374	Data processing and preparation
7375	Information retrieval services
7376	Computer facilities management
7377	Computer rental and leasing
7378	Computer maintenance and repair
7379	Computer related services, n.e.c.