JOHN J. HELDRICH CENTER FOR WORKFORCE DEVELOPMENT

Seeking Strategies:

New Directions for New Jersey's Telecommunications Industry

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THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS

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The findings and conclusions in this report reflect independent research by the faculty and staff of the Heldrich Center. The authors are solely responsible for the content of the report and the interpretation of the results.

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Executive Summary

The telecommunications industry has played a leading role in the New Jersey economy for decades. Today, that vital sector is undergoing significant changes. However, the state has an opportunity to build upon its extensive telecommunications infrastructure to participate in the future growth of a broader communications industry.

Employment in New Jersey's telecommunications industry declined by one-third since 2001 due to industry restructuring, yet this sector still employs more than 42,000 workers in New Jersey. With a payroll in excess of $3.5 billion in 2005, telecommunications remains a powerful force in the state's economy. It also has the potential to be a source of new technological breakthroughs and further employment opportunities.[1] For example, while still undergoing consolidation and rapid change, Verizon Wireless has consolidated operations in Basking Ridge, bringing more than 1,900 new jobs to New Jersey, and Lucent/Alcatel will continue to base its U.S. corporate headquarters in Murray Hill.[2] At the same time, the recent merger of AT&T with SBC is expected to give AT&T's New Jersey facilities additional resources to launch an innovative new line of communications products and services.[3]

New Jersey employers, educators, and government officials share similar views about the challenges facing the telecommunications sector and offer solutions that may be the basis for cooperative state and private-sector action. This report summarizes the actions that key stakeholders believe would allow New Jersey to play a significant role in the future of communications technology.

The views summarized in this report, prepared by faculty and staff of the John J. Heldrich Center for Workforce Development at Rutgers, The State University of New Jersey, are based on state and national industry data, and interviews with more than a dozen industry, education, and government leaders about future directions for New Jersey's telecommunications industry.

Some of these themes were further explored at a May 2006 conference entitled "Rebuilding New Jersey as a Center of Telecommunications Innovation and Growth." Fifty key stakeholders — including employers, regulators, trade association leaders, union leaders, legislators and legislative staff, and educators — participated in these discussions.

Key Themes

New Jersey employers, educators, and government officials agree that several issues related to the **workforce** and **state government policies** must be addressed in order to spur growth in telecommunications.

- The principal workforce challenge is a shortage of qualified job candidates for critical occupations in the industry at several skill levels. Observers recommend education and training strategies geared to meeting the specific skill needs of the communications sector — from basic workplace literacy to advanced technical knowledge.

- The major state policy challenges include the need to reconsider the regulatory framework as it applies to the telecommunications sector. In other words, the state should develop policies that better balance controlling costs for services with fostering industry competitiveness in a transformed telecommunications sector.

- Leaders of New Jersey's private, public, and education sectors also believe the state must do more to encourage new communications research and closer cooperation between industry and higher education institutions.

Among the actions that New Jersey employers, educators, and government believe could strengthen the state's communications industry are:

- **Building workforce training partnerships** between telecommunications employers and New Jersey colleges, vocational-technical schools, comprehensive high schools, and K-12 schools.

- **Identifying specific mathematics, science, and engineering skill needs** of the communications sector to create more targeted education and training programs.

- **Re-examining state regulation of telecommunication services and products** in view of rapidly changing technology and new market competition from Internet and cable providers, while preserving the state's traditional role in assuring affordable basic services for the general public. The goal is a flexible regulatory system that balances affordable service rates with incentives that encourage continued investment and innovation in New Jersey's communications sector.

- **Investing more state and university resources in communications research** in order to sustain New Jersey's unique research infrastructure, offer cutting-edge curricula to a new generation of students and workers, attract more federal research dollars, and foster breakthroughs that new businesses can build upon.

- **Developing a comprehensive state strategy for preserving and enhancing telecommunications as a significant contributor to the New Jersey economy, as part of an expanding communications sector.**

Next Steps

New Jersey's telecommunications industry continues to provide critical infrastructure upon which all other industries depend. Its research and development capacity remains an important resource for the state and the nation.

New Jersey needs to develop a clear strategy to enhance its communications industry as it faces increased competition from national and international rivals. The suggestions offered by stakeholders and summarized in this report offer realistic options for policy changes that support continued industry innovation **and** the public interest.

Overview

For more than a century, the telecommunications industry has played a critical role in New Jersey's economy and workforce. The state's reputation as a center for innovation and economic growth is due in large measure to the emergence of companies such as American Telephone & Telegraph and New Jersey Bell as leading employers.

Yet, in the last decade, the telecommunications sector has undergone important changes that must be recognized in order to help the industry retain its capacity for world-class research and product development. Dramatic advances in technology have resulted in a major restructuring of the telecommunications industry worldwide. New Jersey employers, educators, and government officials must better understand these changes and work together on a new strategy to ensure that the state's telecom sector continues to innovate and grow as part of a broader communications industry.

Telecommunications employment has been the focus of a several projects undertaken in recent years by the Heldrich Center. Its 2004 conference on "The Future of the Telecommunications Industry in New Jersey" attracted many of the region's top legislators, regulators, industry representatives, and educators.

That session featured a presentation by Dr. Ken Dautrich of the Public Policy Department at the University of Connecticut. His research examined labor market trends and employment opportunities in the industry's wired and non-wired (wireless, cable, satellite) companies. His conclusions:

- The telecommunications industry is extremely important to New Jersey. Other states do not have comparable levels of telecommunications investment and infrastructure. Despite recent restructuring, two of the top four employers in the state are in the telecommunications industry;
- Dramatic structural changes within the past 10 years include a significant shift in economic activity from wired companies to wireless companies; and
- New Jersey needs a plan to protect the vitality of the telecommunications industry in the state. The state is losing its national market share in this sector.

This report updates and expands upon the challenges to New Jersey's telecom sector discussed at the 2004 conference.

Part I summarizes nationwide trends affecting the state's telecommunications employers and workforce.

Part II highlights current policy options and issues as expressed by industry executives, educators, and New Jersey government officials during in-depth interviews and a May 2006 conference convened by the Heldrich Center.

Part III outlines key conclusions that New Jersey stakeholders should consider in shaping an effective action plan for reenergizing the state's telecommunications industry as a vehicle for continued innovation and economic growth in the broader field of communications.

The Telecommunications Industry in New Jersey

Over the last decade, New Jersey's telecommunications sector lost a significant share of U.S. telecommunications employment. This was due in large part to the fact that New Jersey had a heavy concentration of jobs in the **wired** sector of the industry where job loss has been greatest since 1990.

Even so, New Jersey's telecommunications industry remains an important economic resource for the state. Each year, this sector contributes billions of dollars to the state's economy in the form of employee salaries, state and local government taxes, purchase of New Jersey-based goods and services, infrastructure investment, corporate philanthropy, and research activities.[4] In addition, New Jersey's other leading industry groups — such as pharmaceuticals, health care, and transportation — depend upon continued technological breakthroughs and services provided by the telecommunications industry.

Telecommunications Employment Patterns, 1990-2005

Employment in the U.S. telecommunications industry shifted significantly over three distinct periods between 1990 and 2005. Employment was stable through the early and mid-1990s, rose dramatically in the late 1990s into 2001, but dropped significantly after 2001. The rate of job loss nationwide has slowed in the past two years. (Appendix A describes this report's definition of telecommunications industry employment in detail.)

During the stable period from 1990 through 1996, the industry had 0.3% average annual job growth, compared with 5.5% average annual job growth from 1996 through 2001. Since 2001, the industry has lost jobs at an average of 6.4% per year. Job loss slowed to 4.4% in 2004 and 3.5% in 2005.[5]

These employment trends were driven by shifts within the telecommunications service sector,[6] which accounted for more than 80% of total telecommunications employment throughout the period. Figure 1 illustrates how expansion within telecommunications services throughout the 1990s drove the industry's overall expansion. Since 2001, both telecommunications service and manufacturing jobs have been lost.

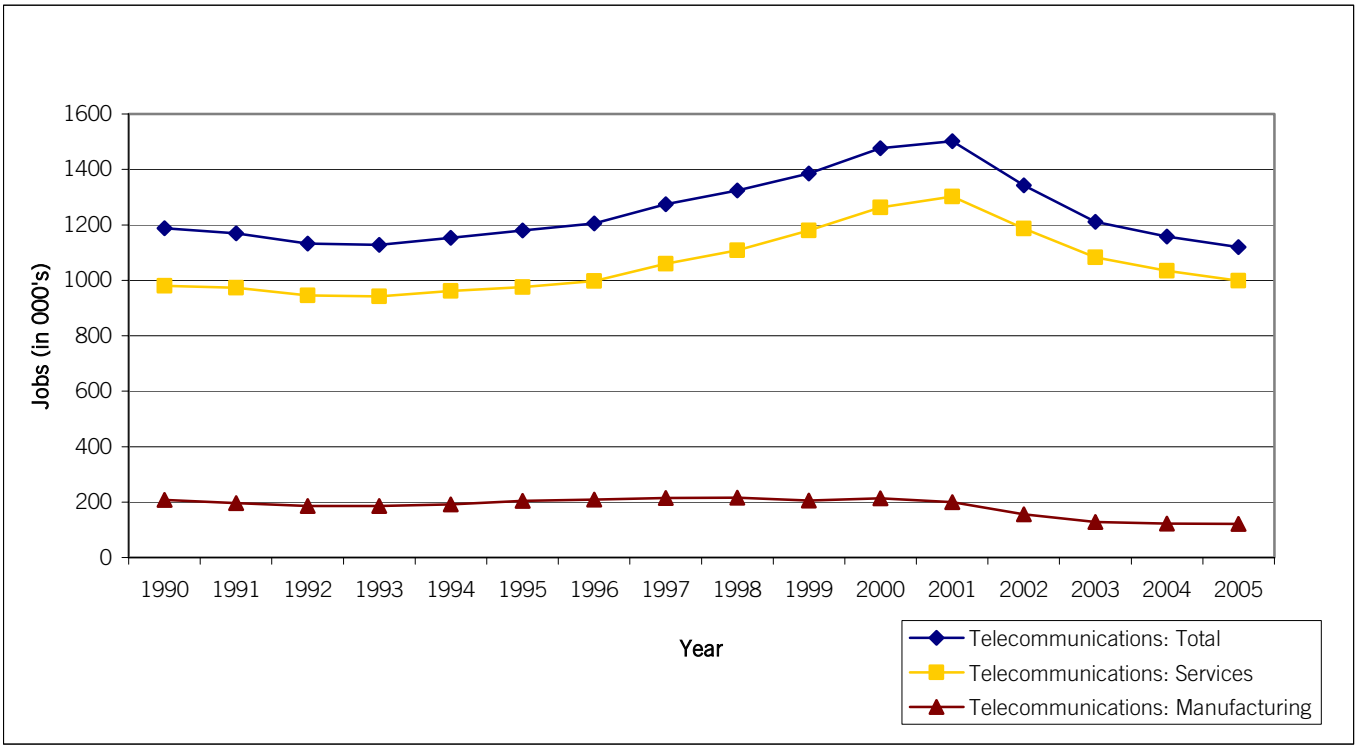
Telecommunications manufacturing employment numbers for New Jersey are not available for the full period from 1990 through 2005, due to a change in the method by which the federal government classifies industries.[7] Because telecommunications service jobs account for 95% of all telecommunications jobs in New Jersey, this report will focus on telecommunications **service** jobs.[8]

Over the past 15 years, New Jersey's trends in telecommunications employment have mirrored national trends, but with more intense job losses and milder job growth. (See Figure 2.)

The beginning of the 1990s was a period of slight contraction within the New Jersey telecommunications industry, with 1.2% annual average job losses. The late 1990s did see some telecommunications expansion in New Jersey, but only at an average rate of 1.7% annually. Further, the period since 2001 has seen a higher rate of job loss than the national average — 9.5% annually in New Jersey, compared with 6.4% nationally. Between 2001 and 2005, New Jersey lost nearly 20,000 telecom jobs, or one-third of the telecom jobs the state had in 2001.[9]

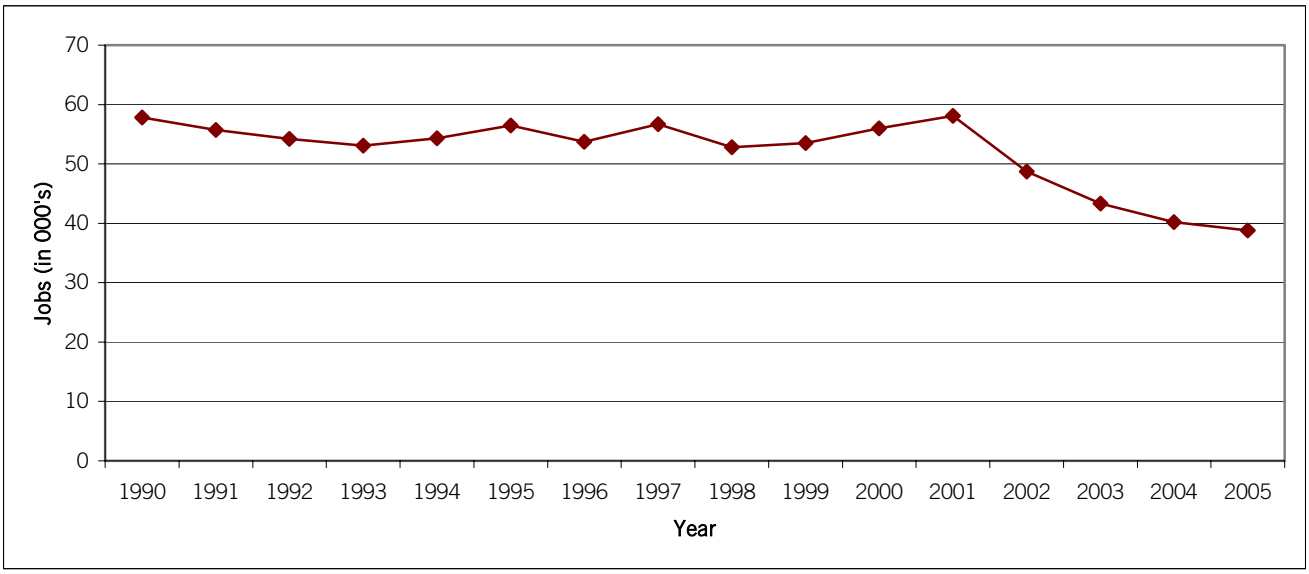
As in the nation, however, New Jersey's telecom job loss has slowed. Between 2004 and 2005, the state lost 3.5% of its telecom jobs, compared with a 16.2% loss in 2002 and an 11.1% loss in 2003.[10]

Figure 1. U.S. Telecommunications Employment, 1990-2005



Source: Current Employment Statistics survey program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/ces/home.htm.

Figure 2. New Jersey Telecommunications Employment, 1990-2005



Source: Current Employment Statistics survey program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/sae/home.htm.

Fifteen years ago, about two-thirds of telecommunications employment nationwide was in the wired sector. Today, employment is evenly split between wired telecommunications and other telecommunications. (See Figure 3.)

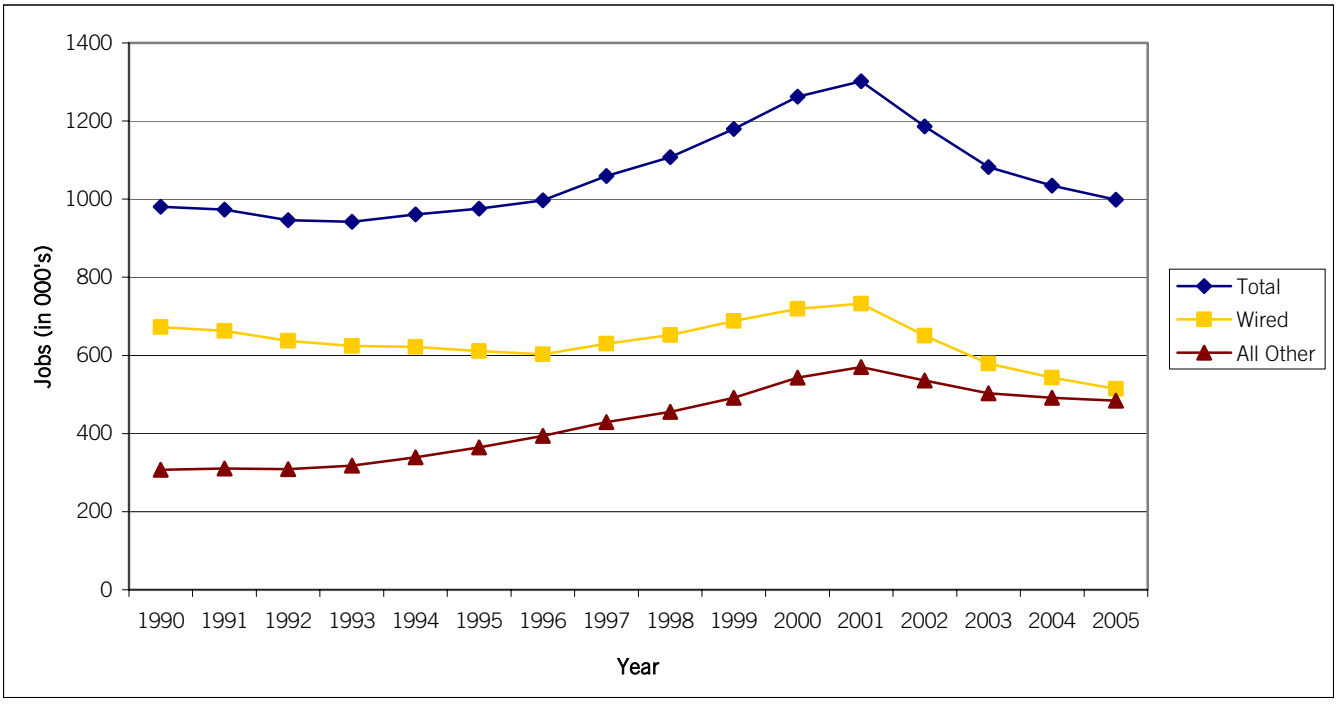
The wired telecommunications sector includes traditional telephone companies, while the non-wired sector includes wireless/cellular, cable, satellite, and other telecommunications. The growth of non-wired firms has been fueled by both rapid technological innovation and by greater competition in local markets following enactment of the federal Telecommunications Act of 1996.[11]

As was the case for the United States overall, New Jersey's wired-based sector has lost job share compared with the wireless/cable/satellite sector. (See Figure 4.) While the wired sector still holds close to 60% of telecommunications jobs in New Jersey (compared with 50% for the nation), the state's job loss rates in wired telecommunications have been much greater than those nationwide.[12]

Since 2001, New Jersey has lost 44% of its jobs in the wired telecom sector, compared with a 30% loss for the United States. Indeed, New Jersey **lost** wired telecom jobs during the 1990s period of expansion, while the U.S. wired sector was still growing.[13] Large job losses at major wired telecommunications firms AT&T and Lucent in New Jersey contributed to this drop in wired employment.[14]

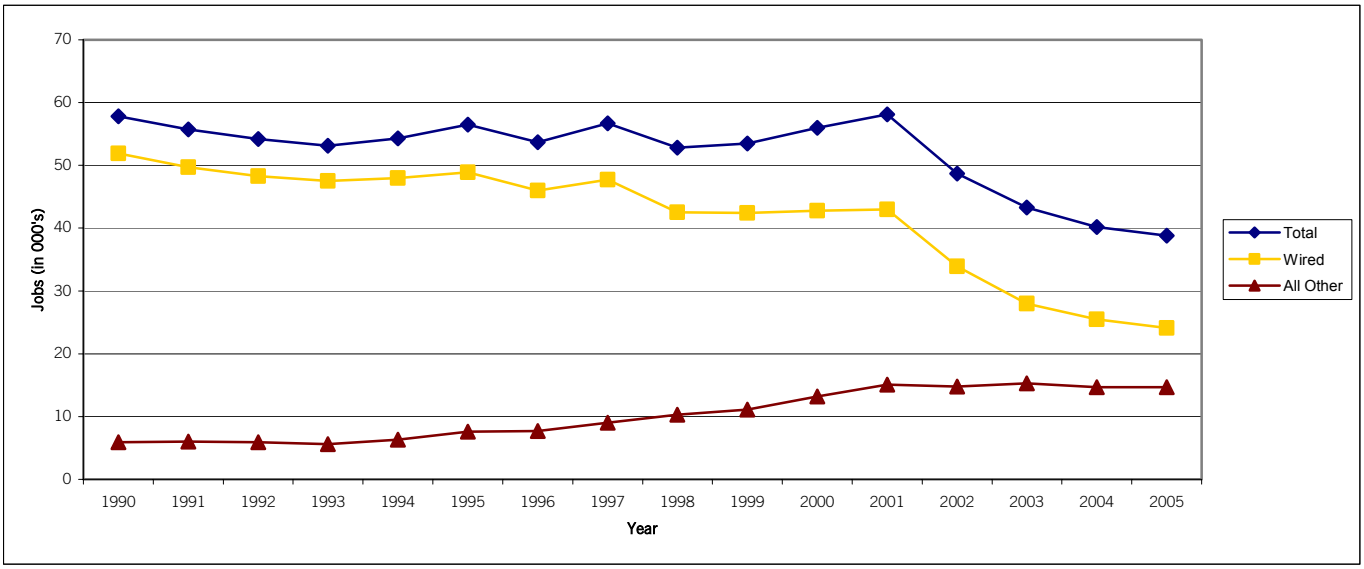
Due to slower telecommunications job growth in the late 1990s and its more severe job loss since 2001, New Jersey's share of U.S. telecommunications has declined steadily since 1990. (See Figure 5.) Once holding 5.9% of total U.S. telecom jobs, New Jersey has now dropped to only 3.9% of the national share. This drop has occurred while New Jersey's share of all private-sector jobs has remained fairly constant.[15]

Figure 3. U.S. Employment in Wired and Non-Wired Telecommunications Services, 1990-2005



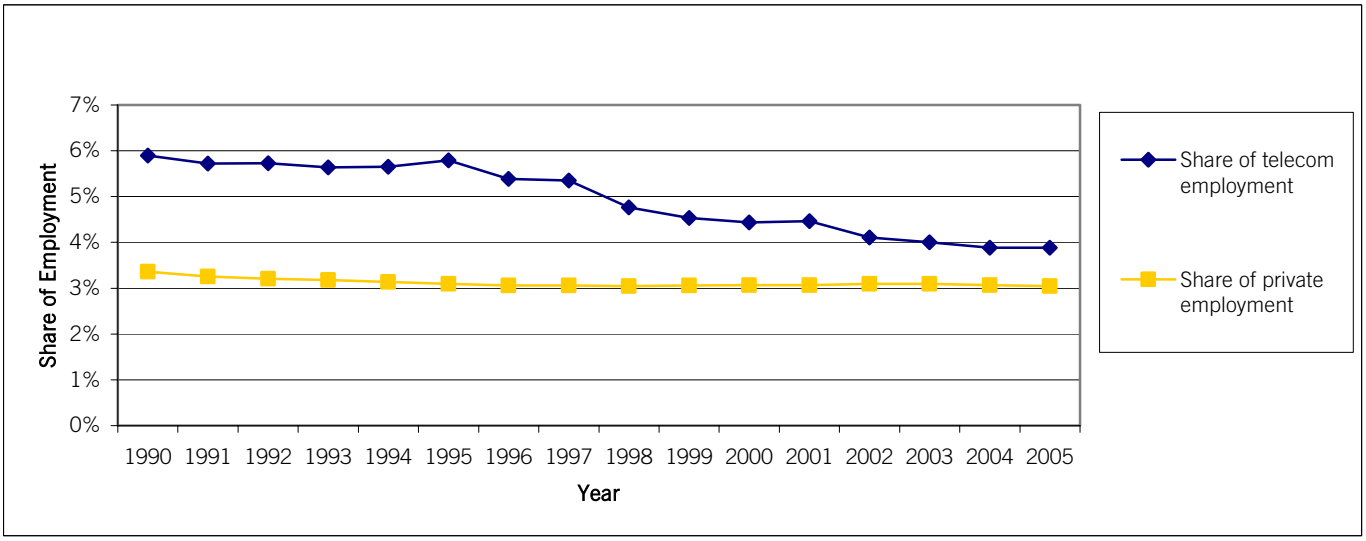
Source: Current Employment Statistics survey program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/ces/home.htm.

Figure 4. New Jersey Employment in Wired and Non-Wired Telecommunications Services, 1990-2005



Source: Current Employment Statistics survey program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/sae/home.htm.

Figure 5. New Jersey Share of U.S. Telecommunications Employment, 1990-2005



Source: Current Employment Statistics survey program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/ces/home.htm.

Furthermore, among states with large telecommunications workforces, New Jersey lost a greater share of telecommunications employment than any other state over the past 15 years, even when controlling for population growth outside of the northeast.[16] While New Jersey still has a high concentration of telecommunications jobs, it now ranks fourth behind Georgia, Virginia, and Texas. (See Table 1.) In 1990, New Jersey had the highest concentration of telecommunications jobs in the nation.[17]

Clearly, the wealth of telecom jobs New Jersey enjoyed at the beginning of the 1990s was the result of its concentration in jobs within the wired sector. (See Table 2.) In 1990, New Jersey had almost 8% of the nation's wired telecom sector jobs. By 2005, this number had dropped to below 5%.[18]

Table 1. Telecommunications Industry Clusters: States with the Highest Concentrations of Telecommunications Employment in 1990 and 2005 (ratio of share of U.S. telecommunications employment to share of total U.S. employment)

Rank	1990	2005
1	New Jersey	Georgia
2	Georgia	Virginia
3	Virginia	Texas
4	Texas	New Jersey
5	California	Florida
6	Florida	California
7	New York	Illinois
8	Illinois	New York
9	Ohio	Pennsylvania
10	Pennsylvania	Ohio

Source: U.S. Bureau of Labor Statistics, U.S. Department of Labor.

Table 2. Wired Telecommunications Industry Clusters: States with the Highest Concentrations of Wired Telecom Employment in 1990 and 2005 (ratio of share of U.S. wired telecommunications employment to share of total U.S. employment)

Rank	1990	2005
1	New Jersey	Georgia
2	Alabama	New Jersey
3	Georgia	New York
4	New York	Florida
5	Florida	Alabama
6	Washington	Indiana
7	Minnesota	Minnesota

Source: U.S. Bureau of Labor Statistics, U.S. Department of Labor.

While employment in the U.S. telecommunications industry overall has declined, the number of research and development jobs in the industry has actually **increased** over the past five years — a dramatic 70% rise between 1999 and 2004. (See Figure 6.) Most of the lost jobs in the industry have been managerial and administrative ones.[19] (An occupational breakdown for New Jersey alone is not available.)

Compared with other states, New Jersey has traditionally had a relatively deep reservoir of workers in the telecom industry's current national growth occupation — research and development. The key to adding both research capacity and overall industry job growth in the state may lie in retaining and adding to these research jobs. The other occupation category that has grown in the industry over the past five years is sales jobs.

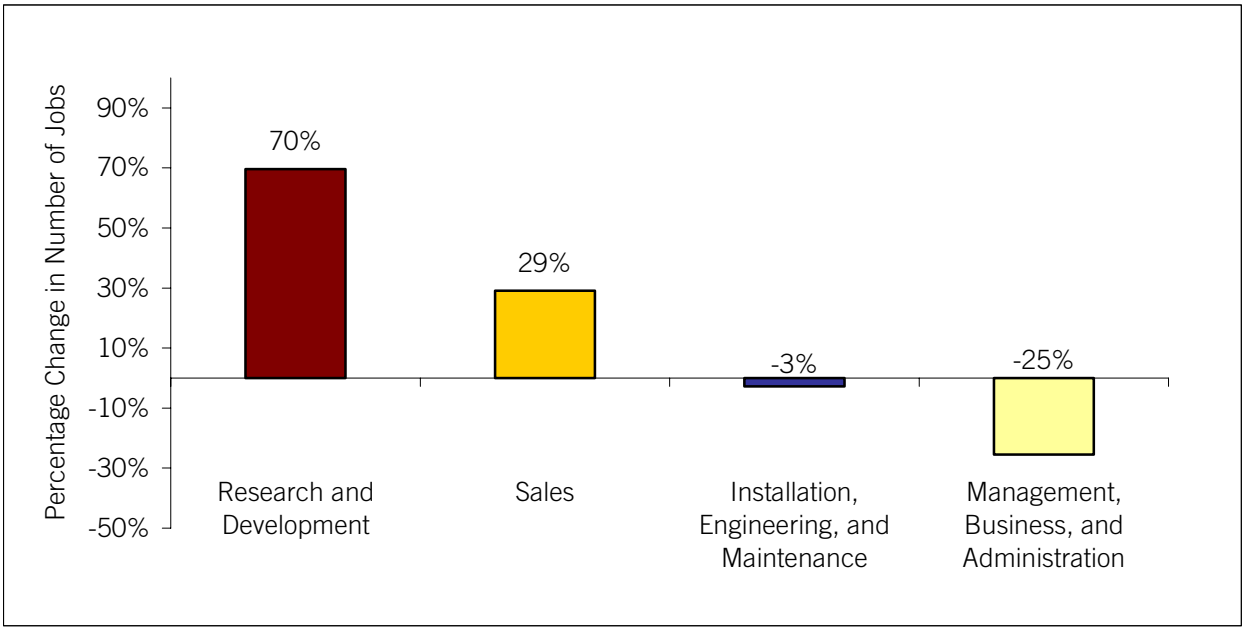
Summary

Most — perhaps nearly all — of the job losses experienced by New Jersey telecommunications companies since 1990 could not have been prevented by state policymakers. Nationwide, job losses affected managers and administrative staff, but took place alongside significant increases in research and development jobs.

Compared to the nation as a whole, the Garden State still enjoys a strong telecom sector. More than 42,000 workers in New Jersey remain employed in telecommunications, telephone apparatus manufacturing, and wireless equipment manufacturing, with quarterly wages and salaries in excess of $800 million.[20]

New Jersey's highly skilled workforce, its proximity to major economic markets and research colleges and universities, and its long history of telecommunications innovation still give it powerful advantages as a communications hub. If the state can link its **research and development capacity** to the important **non-wired service sector**, it can benefit from the industry's next generation of technological breakthroughs and opportunities for growth. What is needed most at this critical time is a coherent communications industry strategy that can guide New Jersey policymakers.

Figure 6. Changes in U.S. Telecommunications Employment by Occupation Category, 1999-2004



Source: Occupational Employment Statistics program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/oes/home.htm.

Seeking Solutions to Rebuild New Jersey's Telecommunications Industry

The most up-to-date government statistics do not fully capture the fast-moving trends reshaping the telecommunications industry. The Heldrich Center therefore supplemented its 1990-2005 research data by conducting in-depth interviews throughout April and May 2006 with more than a dozen industry, education, and government leaders interested in the future of New Jersey's telecommunications industry. Their comments helped to spotlight a range of policy options for reasserting the telecom industry's strategic role in state economic development.

The industry employer group included eight representatives from New Jersey-based employers and trade associations. Perspectives from New Jersey state government came from the staff of four key executive offices and commissions as well as the chair of the New Jersey Assembly Committee on Telecommunications and Utilities. The education group included top leaders of four organizations representing New Jersey schools and colleges.

Each individual was interviewed separately. They were all asked to comment on the changes affecting New Jersey's telecom industry since 1990, new directions the sector might explore, the greatest challenges ahead, and possible solutions that employers, educators, and government could offer to help strengthen an expanded communications industry. (The interview methodology and a list of interviewees can be found in Appendix B.)

Reflections on Telecommunications Industry Changes Since 1990

The New Jersey employers interviewed said that, due to the changes in telecommunications during the past 15 years, companies in the industry are no longer "utilities" in the traditional sense. More competition now exists as new service providers enter the market, with lower labor and benefit costs than those of the older regulated firms.

Changes in technology are leading to dramatic changes in the industry's workforce needs, including more specialized skill requirements. One observer noted the rapid increase in the number of cellular phones from 1 million in 1990 to 200 million in 2006.

Telecommunications research and development has moved away from "hardware" such as circuit boards and similar components. These items are now widely available as low-cost commodities. The new focus is increasingly on software-based switching and related features, especially as voice and data services converge.

The new software systems, digital switching, fiber, and wireless transmission all require fewer workers to maintain. Product and service reliability has soared, as has worker productivity. Repairs are far less common.

While revenues from the telecommunications sector are likely to rise, direct employment in the industry may not. Nevertheless, there are still high-demand jobs in several areas within the industry, including:

- Installation of fiber optics and broadband technology;
- Customer service, with increased expertise on a range of products and services, including digital remote control, high-speed Internet, satellite, Voice-Over-Internet, wireless, and entertainment;
- Network/systems engineering; and
- Marketing/sales of new wireless products.

Employers expect competition will increase within the industry for qualified candidates with relevant skills.

While most corporate leaders believed many of the negative changes since 1990 were inevitable, they asserted that New Jersey state government could have done more in recent years to support telecommunications. For example, more could have been done to encourage small entrepreneurs in the field to locate start-up operations in the state. Employers also complained that telecommunications utilities continued to be regulated as "monopolies" long after their businesses have been transformed by increased competition. The success of wireless services was held up as an example of a new telecom initiative

that thrives in the absence of traditional regulatory limits.

In contrast, most **state government officials** attributed the weakened position of New Jersey's telecom sector to inevitable structural changes brought about by competition or management decisions that had a negative impact on New Jersey-based firms. They acknowledged the changing environment, but stressed the ongoing need to preserve customer access to affordable services.

New Jersey **educators** viewed the changes in the industry since 1990 largely as the result of technological advances and globalization trends. Moreover, these respondents argued that the impact on dislocated workers would not have been as severe if there had been a timely and targeted statewide effort to retrain those who lost their jobs for other growing occupations.

Educators argued that greater state support for training programs geared to the changing telecommunications industry would have produced more qualified workers with high-demand technical and engineering skills. Significant public and private investments in training for the industry's technical field services, customer services, and other critical staff positions are still needed according to both corporate and educational leaders.

New Directions for New Jersey's Telecommunications Industry

Expansion of broadband and wireless services will dominate the industry's future, according to New Jersey's telecommunications **employers**. The number of companies offering television, music, voice, and data transmission services will also grow, but the impact on employment will depend largely on future levels of investment in related infrastructure and new customer service offerings.

Industry observers cited **small businesses**, **financial employers**, and **fiber optic technology** as three factors that could drive demand for New Jersey-based infrastructure and customer services. Start-up firms demonstrate a clear preference for wireless equipment and services. The more small businesses being launched in New Jersey and nationwide, the greater the opportunities for New Jersey's wireless sector employers. An even greater impact will be felt from local investments made by New York City-based banking, trading, and financial support services. Finally, the statewide expansion of fiber optic service may be the industry's greatest potential source of new job growth overall.

According to the employers interviewed, other job opportunities will exist in areas such as:

- Call centers/customer service (especially for bilingual staff),
- Operations,
- Research and development,
- High-level technical sales,
- Engineering,
- Data product development, and
- Development of wireless video applications.

Yet, job growth in these areas will take place during a period in which demand for increased productivity may limit overall employment growth. Outsourcing — to operations in other states or countries — is still a viable option for some companies' customer service needs. Similarly, companies will strive to introduce new products and services that do not require the installation of new infrastructure, thereby avoiding the need for new full-time staff.

Employers believed another continuing trend within the industry will be expanded use of project teams, built and rebuilt around each member's core skills. Multi-tasking by field staff will increase as well, as these positions add customer service skills to technical skill requirements.

Finally, employers have seen more growth opportunities in 2006 than they did two years before. However, employment opportunities still favor well-educated workers who can be part of the development side of the industry rather than entry-level job seekers.

New Jersey's **government officials** and **educators** agreed with many industry employers that the state's telecommunications sector will not see any significant net increase in overall employment in the next three to five years. However, there was also consensus across the private, public, and academic sectors that new jobs will continue to be created in selected niche areas. Most observers in government and education also agreed that industry payrolls will continue to make significant contributions to the New Jersey economy despite recent employment losses.

Continued growth was anticipated in occupations related to **wireless services**, **fiber optic installation**, and the creation of **specialty software** to support new communications services. A limited number of new jobs related to **Voice-Over-Internet Protocol** technology and **Broadband Over Power Line** service may also be created. At the same time, New Jersey's growing infrastructure of state-of-the-art broadband service may create additional jobs in industries — other than communications — that depend on high-speed networks and applications to operate.

Finally, **employers and government officials** expressed concern that New Jersey's research and development infrastructure is not fully appreciated as a potential platform for launching a new generation of communication products and services. The communications industry is expected to witness new breakthroughs and investments in the years ahead, but they will increasingly occur **outside** of New Jersey. If current trends continue, traditional centers of innovation such as Bell Labs may eventually be relocated to be closer to new manufacturing facilities. One business representative noted that research and development for cable services does not currently take place in the state, and will not in the future.

Challenges for New Jersey's Telecommunications Industry

The employers, educators, and government officials interviewed for this report compiled a long list of challenges facing telecommunications firms in New Jersey. Despite some differing perspectives, several areas of consensus related to **workforce** and **state policy** problems emerged as special challenges that New Jersey must address. These challenges, identified in the interviews, are summarized below.

Several interviewees stressed that workforce solutions must be a critical part of any comprehensive growth strategy for telecommunications. New Jersey's telecommunications industry could succeed in efforts to develop more complex products and services, only to find that the state is unable to supply a local workforce with the higher skills needed to support these breakthroughs.

Telecommunications Industry Challenges

	Employers	Educators	Government
Lack of qualified job candidates	■	■	■
Candidates without basic skills	■	■	■
Lack of education and training for specific industry needs	■	■	■
High cost of living in New Jersey	■		■
High cost of labor	■		■
Inadequate preparation of New Jersey students in mathematics, science, and engineering	■		■
Aging incumbent workforce	■		
Need for more female, minority applicants	■		
Inadequate transportation infrastructure	■		
Failure of employers to cooperate on joint research efforts			■
Loss of New Jersey students to out-of-state colleges			■

Source: Interviews, April/May 2006.

Those interviewed predicted high demand for managers with supervisory and operations experience. New Jersey employers are also likely to face special difficulty in finding qualified technical workers with skills in Internet Protocol, network construction, data integration, software development, engineering, and finance. Finally, there was concern about companies' ability to recruit sales staff with adequate technical skills, and workers with security clearance.

In addition to workforce concerns, observers from New Jersey's private and public sectors also emphasized the great impact that **state policy** can have on the future of the telecommunications sector. Employers, in particular, stressed the importance of having tax and regulatory structures that evolved along with the rapid changes of the regulated community. Educators and government officials highlighted the role the state can play in fostering new partnerships to support the industry.

Several educators, employers, and government officials voiced concerns that the state has given inadequate policy consideration for the special needs and concerns of small start-up communications firms. Much of the new job creation and innovative breakthroughs was expected to occur within these small companies. Policies that make it unusually costly or complex for these firms to operate in New Jersey will undermine future employment opportunities if "the next Microsoft" is encouraged to settle in another state.

One industry veteran believed that state leaders had neglected the telecommunications sector for many years while pursuing other high-tech sectors, overlooking the industry's potential for growth in new areas of development. He believed New Jersey's own Innovation Zone program could adopt elements of the "technology innovation zones" and "knowledge enterprise zones" in states such as North Carolina, Pennsylvania, and Texas, and create a special economic environment for communications breakthroughs. Possible options include: state matching grants for colleges and universities that undertake communications research, sharing state college laboratory space with small start-up telecom firms, forming research partnerships between telecommunications companies and faculty, and expanding industry internship opportunities for students.[21]

State Policy Issues Affecting New Jersey's Telecommunications Industry

	Employers	Educators	Government
Modifying regulations as market competition increases	■	■	■
Supporting research incubators and joint industry-education partnerships	■	■	■
Supporting training programs designed for **small** telecom firms	■	■	
Lowering corporate and property tax rates	■		■
Revising Federal Communications Commission limits on telecom	■		
Reducing state reporting requirements	■		
Linking telecommunications with other New Jersey sectors identified by the state as key "growth industries"		■	

Source: Interviews, April/May 2006.

Recommendations for Strategic Action

Employers, educators, and government officials interviewed for this report suggested a wide range of specific actions that New Jersey's private, public, and education sectors might adopt as part of a state communications strategy. Many steps address the workforce and state policy challenges identified by Heldrich Center researchers.

Taken together, these recommendations offer a number of options for making the state a more successful environment for communications innovation and growth. The following summary of solutions also indicates where New Jersey's private, public, and education sectors could play a cooperative role in implementing possible solutions.

Communications Industry Workforce Solutions

	Role for: Private Sector	Public Sector	Educators
Form telecom industry partnerships with New Jersey K-12 schools, vocational-technical schools, high schools, and colleges	■	■	■
Document specific skill needs for high-demand telecom jobs for educators at all levels	■	■	■
Create internship opportunities for students and faculty in mathematics, science, and engineering	■	■	■
Promote telecom technical careers and career paths through career fairs, science competitions, etc.	■		■
Contribute industry staff time and equipment to help schools develop updated curricula to reflect workplace skills	■		■
Create more scholarship aid for qualified candidates taking industry-specific coursework	■	■	■
Enlist schools/colleges to conduct personnel audits to determine training needs of incumbent telecom workers			■
Share school lab space, research facilities, and "clean rooms" with small communications firms			■
Introduce mathematics, science, computer science, and engineering concepts at earlier grades		■	■
Create magnet schools or career academies for engineering and technology topics relevant to communications		■	■
Accelerate training in communications technology through high school and college and on to graduate study		■	■

Source: Interviews, April/May 2006

State Policy Solutions Related to New Jersey's Communications Industry

	Role for: Private Sector	Public Sector	Educators
Develop more flexible regulations that encourage introduction of new communications services and products	■	■	
Balance regulatory role with support for economic development of new areas of the industry	■	■	■
Support research incubators and joint industry-education partnerships in communications sector	■	■	■
Develop comprehensive state strategy to encourage communications growth	■	■	■
Better educate legislators and regulators about the changing nature of the telecom sector	■	■	■
Offer more state support to faculty and students engaged in research areas relevant to communications	■	■	
Promote industry use of state customized training grants and the New Jersey Economic Development Authority's "Technium" program for emerging technologies		■	

Source: Interviews, April/May 2006.

In assessing these options, New Jersey can draw upon the experiences of other states. For example, Pennsylvania and New York sponsor incubators for small communications firms. Industry-specific training programs are under way in California, Florida, North Carolina, Pennsylvania, Tennessee, and Virginia. Meanwhile, Maryland, New Mexico, Ohio, and Texas are adopting policies to make their states "hubs" for selected industries that could serve as models for elements of a New Jersey communications strategy. For example, Ohio's Department of Development provides $1 million to $2 million grants in pre-seed money to provide critical capital to technology start-ups in their early stages of development. Ohio has also granted more than $100 million to firms pursuing commercialization of biotechnology research.[22]

In order for New Jersey to develop an effective communications strategy, the individuals interviewed suggested that the state government coordinate participation by its key agencies as well. Several of those interviewed encouraged the Governor's Office of Economic Growth to coordinate efforts by the Commerce Commission, Department of Labor and Workforce Development, Department of Education, Commission on Higher Education, State Employment and Training Commission, and the Economic Development Authority to adopt a single economic development strategy to coordinate their resources in support of New Jersey's evolving communications sector.

Finally, those interviewed noted that New Jersey should also support the communications sector by drawing upon research institutions such as Rutgers University, Princeton University, the Stevens Institute of Technology, and the New Jersey Institute of Technology. More training partnerships should be established between the communications industry and county colleges or vocational-technical schools. Successful New Jersey partnerships already include industry programs at Camden County College and vocational-technical schools in Union and Monmouth counties. These partnerships already host promising industry-specific programs in health care and biotechnology.

The statewide Verizon Career Connections program, staffed by the Heldrich Center, also brings top state education and business organizations together to jointly educate students, teachers, parents, and school counselors about high-demand skills and careers in New Jersey. A strong message about the continuing importance of communications could be conveyed through this influential statewide network.

Summary

There was consensus among many of the employers, educators, and government officials interviewed that a coordinated state strategic plan was necessary for New Jersey to preserve and enhance its communications assets. While New Jersey educators and government officials no longer view the sector as a source of significant job growth overall, they agree with telecommunications employers that there are special niches that will create excellent job opportunities for years to come.

There are also many observers who believe that the state's research and development infrastructure can be preserved and expanded if state regulations begin to reflect the sector's new competitive environment and if state training programs are strengthened to address new industry-specific skill requirements.

Conclusions

On May 5, 2006, the Heldrich Center hosted a discussion with more than 50 top New Jersey employers, regulators, trade association personnel, legislative staff, educators, and others interested in the future of the state's telecommunications sector. The session, titled "Rebuilding New Jersey as a Center of Telecommunications Innovation and Growth," was led by Dr. Carl Van Horn, Director of the Heldrich Center. (See Appendix C for the conference agenda and a list of participating organizations.)

Comments from the conference participants, combined with this report's background research and interviews, form the basis for the following conclusions:

- **New Jersey must develop a proactive, pro-growth strategy to encourage future innovation in the communications sector.**

During the past 15 years, New Jersey's falling telecommunications employment and its declining share of telecom jobs nationwide have resulted from a number of different factors, including changes in technology, increased foreign and domestic competition, new business structures, changing workforce demographics, and the regulatory framework at the state and federal levels. Most of these developments were beyond the control of the state's employers or government officials.

However, many observers believed that a more proactive approach to **workforce development** and **regulatory reform** by New Jersey's public and private sectors could help sustain and grow the communications industry in the state's economy in the years ahead.

- **State policymakers should recognize that New Jersey's communications sector continues to serve as a critical foundation upon which job growth in other industries will depend.**

Communications remains an important sector whose health will directly influence the growth potential of other key New Jersey industry sectors. Telecom's vital **infrastructure network** remains an important state resource as does its **research and development capacity**.

These are significant assets that must be recognized as such. A participant at the May 2006 summit noted that for every high-paying telecommunications job (paying $100,000 or more annually), three related support jobs are needed. In other words, New Jersey's remaining telecommunications presence remains a valuable resource for creating a vibrant communications sector in the years ahead.

- **Closer cooperation between the communications industry and New Jersey's schools and colleges can do much to address the sector's workforce challenges.**

Educators, employers, and government officials see great benefits from closer cooperation between New Jersey's education system and the communications industry. Participants in the May 2006 conference said that students with relevant skills in high schools, vocational-technical schools, and county colleges have not always been encouraged to explore telecom work opportunities. One attendee suggested that New Jersey colleges and universities create more courses and degrees with a specific focus on future communications skill needs.

New Jersey communications employers should also make a more determined effort to engage the significant talent pool of students and faculty at four-year academic institutions such as Princeton University, Rutgers University, and the New Jersey Institute of Technology through expanded internship and mentoring opportunities. Many highly skilled students are currently lost to employers and research institutions in other states after graduation.

The 2005 annual report of the New Jersey Technology Council concluded that the state's economy has not generated enough science and engineering jobs to remain competitive with industry centers elsewhere. Meanwhile, approximately 90% of research and development funding in New Jersey comes from private-sector sources. New Jersey lags other states in securing federal grants for research or providing direct state investment in promising new technologies.[23] As a result, the New Jersey Technology Council determined that New Jersey companies secure fewer patents and spin off fewer start-up firms, which over time means fewer jobs and lower productivity in the state's communications sector.

Educators expressed an eagerness to form partnerships with interested employers, recognizing that even entry-level jobs in the evolving communications industry require higher-level work skills than in the past. They recognize that even successful field technicians today must have knowledge of many products and services, while operating in office and residential settings that require stronger customer service and entrepreneurial skills.

Business management, customer service, and technical work are increasingly part of the same job descriptions, as employees are expected to multi-task. Research and development skills are also at a premium nationwide, which should be an area where New Jersey has a distinct advantage.

- **New Jersey's telecommunications industry needs to work collaboratively with state and local officials to make the overall communications sector an important part of the state's overall economic strategy, and re-evaluate current state regulations in light of increased market competition.**

Just as telecommunications employers should work more closely with New Jersey schools and colleges, conference participants felt that state and local government officials should meet and talk with major groups within the telecom industry — wired, wireless, and especially broadband. New Jersey's telecom employers expressed a strong interest in an in-depth discussion with state regulators about the industry's specific challenges. They believe that working in partnership with the state to develop solutions would benefit the industry and state residents. These discussions could lead to a specific industry action plan developed jointly by New Jersey's government, private sector, and academic institutions.

Finally, many of the individuals interviewed spoke about the need for new incentives for small communications businesses in the early stages of development, which are widely seen as potential sources of job creation, technological breakthroughs, and new commercial applications for industry research in the next three to five years.

- **Telecommunications companies must do more to pool resources and pursue new opportunities with other industry sectors.**

New Jersey should do more to identify and encourage cross-industry collaborations. An example of this approach is the Technology Council of Central Pennsylvania,[24] a state initiative linking firms from the communications, biotechnology, information technology, medical, and other industries with representatives from state government, regional educational institutions, and nonprofit organizations.

- **New Jersey needs to adopt a clear proactive strategy to support the revived economic growth of its overall communications sector.**

Many commentators suggested that New Jersey's communications sector could be strengthened by a specific economic growth strategy focused on the unique circumstances of the industry. State agencies engaged in economic development, education, and job training could coordinate their limited resources to support the entire industry, not just individual corporations.

Some states have had such statewide policies and the agencies to maintain them in place for years. For example, Massachusetts established the Massachusetts Technology Collaborative in 1982, an organization responsible for developing the state's high-tech industries through facilitating academic, government, and private-sector partnerships.[25] A state-level advisory council on communications policy was also established, composed of experts from industry, government, economic development organizations, and higher education institutions. The group periodically monitored and adjusted the state's overall communications policy, including issues of broadband connectivity and infrastructure.[26]

Appendix A: Definition of the Telecommunications Sector

The data included in this report were organized using industry definitions from the North American Industrial Classification System (NAICS). The definition of the telecommunications industry used in this report combines NAICS code 517 (Telecommunications), which includes telecommunications services, with NAICS codes 33421 (Telephone Apparatus Manufacturing) and 33422 (Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing), which each include the manufacture of telecommunications-related equipment.

- NAICS 517: Telecommunications, defined as the industry "primarily engaged in operating, maintaining, and/or providing access to facilities for the transmission of voice, data, text, sound, and video."[27]

- NAICS 33421: Telephone Apparatus Manufacturing, defined as the industry "primarily engaged in manufacturing wire telephone and data communications equipment…These products may be standalone or board-level components of a larger system. Examples of products made by these establishments are central office switching equipment, cordless telephones (except cellular), PBX equipment, telephones, telephone answering machines, LAN modems, multi-user modems, and other data communications equipment, such as bridges, routers, and gateways."[28]

- NAICS 33422: Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing, defined as the industry "primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment."[29]

This definition of the telecommunications industry excludes three NAICS codes that could be included as part of a more expansive definition of the industry. Jobs from these codes were excluded primarily because it is not possible to extract only the telecommunications-specific data at the presently available level of detail (i.e., all three codes include both telecommunications-related activity as well as other types of non-telecommunications activity). Additionally, data from each of these industry codes are not available at the state level.

NAICS codes excluded from definition:

- NAICS 33592: Communication and Energy Wire and Cable Manufacturing, defined as the industry that "comprises establishments insulating fiber optic cable, and manufacturing insulated nonferrous wire and cable from nonferrous wire drawn in other establishments."[30] National employment in this industry varied between 22,000 and 34,000 between 1990 and 2005, and stood at 22,000 in 2005.[31]

- NAICS 23713: Power and Communication Line and Related Structures Construction, defined as the industry that "comprises establishments primarily engaged in the construction of power lines and towers, power plants, and radio, television, and telecommunications transmitting/receiving towers."[32] National employment in this industry varied between 77,000 and 141,000 between 1990 and 2005, and stood at 134,000 in 2005.[33]

- NAICS 811213: Communication Equipment Repair and Maintenance, defined as the industry that "comprises establishments primarily engaged in repairing and maintaining communications equipment without retailing new communication equipment, such as telephones, fax machines, communications transmission equipment, and two-way radios."[34] Employment levels for this industry are not available at a national level. Employment in the "miscellaneous electronic equipment repair and maintenance" NAICS sector, which also includes consumer electronic and precision instrument repair and maintenance, varied between 57,000 and 62,000 between 1990 and 2005, and stood at 58,000 in 2005.[35]

Appendix B. Methodology for Industry Expert Interviews

In preparing for this study, the Heldrich Center sought to supplement the latest statistical data on the U.S. and New Jersey telecommunications industry with detailed comments from industry experts. The primary goal was to compare and contrast the perceptions of leading New Jersey representatives from industry, education, and state government who have been interested in the future of the state's telecom sector.

The methodology for the study included:

- Creation of a uniform set of interview questions asked of each survey participant,
- Telephone interviews with top managers and trade association executives working with New Jersey's leading telecommunications companies,
- Telephone interviews with New Jersey state officials, and
- Telephone interviews with top executives from New Jersey's higher education and vocational-technical education organizations.

Telephone interviews with national experts were conducted between March 2006 and May 2006 and included:

Karen Alexander
Executive Director, New Jersey Cable Association

Maxine Ballen
President and CEO, New Jersey Technology Council

Joe Basile
Sprint/Embarq

Carl Billek
Associate General Counsel, IDT

Dr. Robert Bowman
New Jersey Council of County Colleges

Assemblyman Upendra Chivukula
Chair, New Jersey Assembly Committee on Telecommunications and Utilities

Martha Delehanty
Vice President, Human Resources
Verizon Wireless

Connie O. Hughes
Commissioner, New Jersey Board of Public Utilities

John McGovern
Avaya

Angie McGuire
Governor's Office of Economic Growth

Dr. William Mink
Dean, Camden County College

Chris Nurse
Law/Government Affairs, AT&T

Jane Oates
Executive Director, New Jersey Commission on Higher Education

Clint Odom
Vice President, Regulatory Affairs, Verizon New Jersey

Sherri Preische
Executive Director, New Jersey Commission on Science and Technology

Robyn Roberts
New Jersey Ratepayer Advocate Office

Judy Savage
Executive Director, New Jersey Council of Vocational-Technical Schools

Seema Singh
New Jersey Ratepayer Advocate Office

Richard Wagenblast
Supervising Technical Operations Analyst, New Jersey Board of Public Utilities

Chris White
New Jersey Ratepayer Advocate Office

New Jersey Telecommunications Research Project

Interview Questionnaire for Industry Experts

I. Workforce History

A. How has the nature of the telecommunications workforce changed over the past 15 years? In the United States? In New Jersey specifically (driving forces: changes in manufacturing, industry structure)?

B. Could any of the employment decline have been prevented?

II. Workforce Issues

A. What direction do you see the industry moving in, with regard to the number of jobs, number of firms, or types of jobs available?

B. How does the telecom industry relate to the state's overall economic health?

C. What are biggest problems facing the telecom industry in New Jersey?

D. What is the nature of leading workforce problems: shortages/mismatches of talent, etc.?

III. Solutions

What can the public sector, private sector, or education sector do to support the growth of New Jersey's telecom industry (e.g., jobs, health, firm retention/attraction)?

Appendix C. Agenda and List of Participating Organizations, "Rebuilding New Jersey as a Center of Telecommunications Innovation and Growth"

Agenda

9:00 a.m. Registration/Coffee and Networking

9:30 a.m. Welcome/Overview

Assemblyman Upendra Chivukula
Chair, New Jersey Assembly Committee on Telecommunications and Utilities

Dr. Carl Van Horn
Director, John J. Heldrich Center for Workforce Development
Chair, New Jersey Economic Development Authority

Presenting the latest research on changes within New Jersey's telecommunications sector since Rutgers' 2004 conference on "The Future of New Jersey's Telecommunications Industry."

10:00 a.m. Break

10:15 a.m. Group Discussion

Led by Jeff Stoller
Deputy Executive Director, John J. Heldrich Center for Workforce Development

- The latest business and technological trends affecting the industry
- Changing skill needs within the industry
- Innovative state policies to support industry growth

11:30 a.m. Action Steps

A summary of possible steps toward developing a state economic strategy that addresses the special challenges of New Jersey's telecommunications industry and its future workforce.

11:45 a.m. Adjourn

List of Participating Organizations

Alliance for Employee Growth and Development
Assembly Majority Office, State House
AT&T
Avaya
Board of Public Utilities, Office of Cable Television, Bureau of Inspection and Enforcement
Communications Workers of America Local 1062
DataNet Communications
IDT Corporation
J. Fletcher Creamer & Son, Inc.
New Jersey Board of Public Utilities
New Jersey Cable Telecommunications Association
New Jersey Commission on Science and Technology
New Jersey Community College Consortium for Workforce and Economic Development
New Jersey Council of County Vocational-Technical Schools
New Jersey Division of the Ratepayer Advocate
New Jersey Technology Council
The New York Times Company (Diversity and Recruitment Advertising)
Ocean County College, Center for Business Education and Training
Office of Congressman Frank Pallone
Office of Governor Jon S. Corzine
Passaic County Community College
Rothfelder Stern, L.L.C.
School of Management and Labor Relations, Rutgers University
Sprint
Stevens Institute of Technology
Union County College
Verizon New Jersey

End Notes

[1] New Jersey Employment and Wages Covered By Unemployment Insurance, Fourth Quarter 2005, New Jersey Department of Labor and Workforce Development, www.nj.gov/labor/lra/.

[2] Verizon news release, May 4, 2006, http://newscenter.verizon.com.

[3] BPU ruling (August 7, 2005), www.state.nj.us/bpu/wwwroot/telco/TM0502068_ 2005004.pdf.

[4] New Jersey Cable Telecommunications, http://www.cablenj.org.

[5] Current Employment Statistics program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/ces/home.htm (accessed June 29, 2006).

[6] This report divides telecommunications employment between telecommunications services and telecommunications manufacturing. The telecommunications service sector includes jobs related to the operation of facilities that transmit voice, data, text, sound, and video (i.e., the establishments that provide consumers and businesses with their telephone, Internet, television, and other data transmission services). The telecommunications manufacturing sector covers jobs related to manufacturing telephone and data communications equipment, including radio, television, and wireless communications equipment. A more detailed discussion of the industry sectors included and excluded from the report's definition of telecommunications employment is included in Appendix A.

[7] In 1997, the U.S. Census and the U.S. Bureau of Labor Statistics switched from using the Standard Industrial Classification System to the North American Industrial Classification System (NAICS). NAICS is viewed as more accurately representing the current relationships between industries in the North American economies. Unfortunately, the classification codes corresponding to telecommunications manufacturing do not correspond perfectly between the two systems (i.e., it is not possible to produce "apples-to-apples" comparisons or analysis between the two systems for this industry). The Bureau of Labor Statistics has recreated historical data using NAICS on a national level, but the same data are not available for all states on a detailed industrial level, including New Jersey.

[8] Current Employment Statistics program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/ces/home.htm (accessed June 29, 2006).

[9] Ibid.

[10] Ibid.

[11] Kenneth Dautrich, "The Changing Structure of the Telecommunications Industry in New Jersey" (paper presented at "The Future of the Telecommunications Industry in New Jersey," New Brunswick, NJ, December 2004).

[12] Current Employment Statistics program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/ces/home.htm (accessed June 29, 2006).

[13] Ibid.

[14] Dautrich, "The Changing Structure of the Telecommunications Industry in New Jersey."

[15] Current Employment Statistics program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/ces/home.htm (accessed June 29, 2006).

[16] Table 1 shows states ranked by "location quotient," a metric that measures the ratio of a state's share of an industry's total workforce to that state's share of total private employment in all industries. Thus, in 1990, New Jersey's ratio of telecommunications share to total private employment share was higher than any other state in the nation. In 2005, New Jersey ranked fourth.

[17] Current Employment Statistics program, U.S. Bureau of Labor Statistics, U.S. Department of Labor, http://www.bls.gov/ces/home.htm (accessed June 29, 2006).

[18] Ibid.

[19] Current Employment Statistics program, U.S. Bureau of Labor Statistics, U.S. Department of

Labor, http://www.bls.gov/ces/home.htm (accessed June 29, 2006).

[20] Employment and Wages Covered By Unemployment Insurance, Fourth Quarter 2005, New Jersey Department of Labor and Workforce Development, www.nj.gov/labor/lra/.

[21] Peter Key, "Innovation Zone Wins Second-Year Funds as Others Form," *Philadelphia Business Journal*, July 28, 2006, http://austin.bizjournals.com. Also, "Innovation North Carolina, Fall 2004, *www.businessnc.com*, and "In the Zone," *Princeton Business Journal*, December 28, 2004, www.pacpub.com.

[22] "ODOD Releases RFP for Third Frontier Pre-Seed Fund Initiative," August 4, 2006, www.thirdfrontier.com.

[23] New Jersey Technology Council, 2005, http://www.njtc.org.

[24] For more information, see http://www.tccp.org.

[25] For more information, see http://www.mtpc.org/AgencyOverview/whatwedo.htm.

[26] Alliance for Public Technology, *A Nation of Laboratories: Broadband Policy Experiments in the States,* http://www.apt.org/publications/reports-studies/broadbandreport_final.pdf (accessed June 29, 2006).

[27] NAICS 517: Telecommunications, http://www.census.gov/epcd/naics02/def/NDEF517.HTM#N517 (accessed June 29, 2006).

[28] NAICS 33421: Telephone Apparatus Manufacturing, http://www.census.gov/epcd/naics02/def/NDEF334.HTM#N33421 (accessed June 29, 2006).

[29] NAICS 33422: Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing, http://www.census.gov/epcd/naics02/def/NDEF334.HTM#N33422 (accessed June 29, 2006).

[30] NAICS 33592: Communication and Energy Wire and Cable Manufacturing, http://www.census.gov/epcd/naics02/def/NDEF335.HTM#N33592 (accessed June 29, 2006).

[31] U.S. Department of Labor, Bureau of Labor Statistics, Current Employment Statistics program, http://www.bls.gov/ces/home.htm (accessed June 29, 2006).

[32] NAICS 23713: Power and Communication Line and Related Structures Construction, http://www.census.gov/epcd/naics02/def/NDEF237.HTM#N23713 (accessed June 29, 2006).

[33] U.S. Department of Labor, Bureau of Labor Statistics, Current Employment Statistics program, http://www.bls.gov/ces/home.htm (accessed June 29, 2006).

[34] NAICS 811213: Communication Equipment Repair and Maintenance, http://www.census.gov/epcd/naics02/def/ND811213.HTM#N811213 (accessed June 29, 2006).

[35] U.S. Department of Labor, Bureau of Labor Statistics, Current Employment Statistics program, http://www.bls.gov/ces/home.htm (accessed June 29, 2006).

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