SPREADING THE WEALTH:
BUILDING A TECH ECONOMY IN
SMALL AND MEDIUM-SIZED REGIONS

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EXECUTIVE SUMMARY

The tech boom of the 1990s created many successful companies, significant wealth, and expanded job opportunities in a new and growing sector of the nation's economy. However, the benefits of technology development have largely accrued to a relatively small number of regions nationwide leaving many other communities both envious of this success and interested in replicating it.

Communities in Washington state, where outgoing Gov. Gary Locke made technology-based development an explicit policy focus, provide useful case studies for how to broaden the impact of technology to a wider number of places. This study examines five Washington regions—Bellingham, Tacoma, Spokane, the Tri-Cities, and Wenatchee—that have chosen a technology focus for their local economic development efforts.

These five areas are located in different parts of the state, have varied economic bases, and somewhat different goals and strategies for expanding their respective technology sectors. Their efforts to grow or attract new companies provide insights on strategies that may be useful in other regions outside the major "techpoles" that want to pursue similar opportunities.

Although they are not likely to achieve the spectacular success of Silicon Valley, Seattle, Boston, or Austin, there is a role for an IT strategy in smaller cities. Based on a review of economic data, and in-depth interviews with company executives and economic development leaders in the five Washington communities, the authors have several suggestions on how communities around the country can enhance their own economies through technology-based development:

- **Invest in broadband and other telecommunications infrastructure necessary for technology development**. Adequate broadband capacity is a prerequisite for IT growth. Meeting demand can be achieved in creative ways based on an expansion of utility systems used for power system management, augmentation of public sector systems, negotiations with existing telecommunications companies, or fostering startup telecommunications operations.

- **Focus on "grow your own" strategies for technology development.** Given the history of the techpole regions in this country, entrepreneurial development deserves far more attention relative to marketing and recruiting-based strategies. The establishment of robust networking, mentoring, and startup capital programs, combined with improvements to infrastructure, education, and real estate offerings are key to enhancing the competitiveness of local firms.

- **Find ways to link research institutions to the local economy.** Research institutions play an important role in fostering and supporting technology-based development through the generation of commercially viable ideas, training sophisticated workers, and problem-solving for local companies. Branch campuses, cooperative extensions, and other outreach

programs can play an important role in bringing the benefits of the research university to smaller communities.

- **Continually monitor and evaluate strategies and results**. Regional leaders must carefully monitor and evaluate their efforts to ensure that the results achieved are commensurate with the resources invested to extend the benefits of technology into their communities. Understanding what is working, and what isn't, is essential to ensuring that program and policies evolve appropriately over time.

- **Work with state level research, education, and infrastructure efforts.** Local technology development strategies need to be supported by state level polices and programs that are tailored to each local community. Leadership at the state level is also necessary to provide a sense of direction and project a positive outside image that can powerfully complement local efforts.

Ultimately, the most successful communities will be those that employ a rich and varied mix of economic development strategies that capitalize upon local industries and assets. These small and medium-sized regions have a real opportunity to build a niche for themselves in the high tech economy, and to reap some of the benefits such development can generate.

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I. INTRODUCTION

Technology-based development swept the nation in the late 1990s, producing high rates of company formation, rapid growth of new tech companies, and an explosion—or, perhaps more accurately, a speculative bubble—in the stock market. A relative handful of metropolitan areas became homes for many of these software, internet, and telecommunications industries, accumulating the bulk of the benefits these firms helped produce. The recession of 2001 changed the picture radically, however, as Seattle, San Francisco/Silicon Valley, Austin, and other "techpoles" suffered from a technology-led downturn. This has left many people wondering how fast the technology sector will come back and what opportunities exist for additional cities to build their own clusters in the years to come.

It is not yet clear, however, whether many technology firms are eager to move out of already established techpoles, despite their relatively high costs. The 1990s wave of development was tightly clustered in these places largely because they supported technology-based startups with venture capital, strong research universities, a diverse urban lifestyle, and a strong local labor pool with the requisite skills in information technology. The lower costs and attractive smaller city amenities offered by other locations may not offset these very powerful agglomeration forces.

Still, regions around the country are designing strategies aimed at attracting the next wave of high tech development. These industries are environmentally benign, offer family wage jobs, and draw new income into communities. Given the slow growth of manufacturing in this country, it is no wonder that technology sectors have become the target of economic development officials in large and small communities nationwide.

These efforts may be paying off. A different kind of high tech development is emerging in small- and medium-sized cities, oriented around the technology needs of local companies in other sectors of the economy such as manufacturing, retail trade, finance and real estate, and business services. And even a handful of technology development companies are showing up in smaller regions, including cost-conscious firms, and entrepreneurs who simply prefer the lifestyle in these communities. As the technology industries mature, more technology-based companies are likely to emerge.

This paper provides an in-depth examination of the experience of small and medium-sized cities in Washington state that are working to encourage technology companies to take root in their communities. To set the context, the paper begins with a brief history and profile of Seattle's high tech development. It then focuses on five detailed case studies—the Bellingham, Spokane, Tacoma, Tri-Cities, and Wenatchee metropolitan areas—and reflects on the lessons learned from their experiences. A concluding section offers suggestions for creating technology-based development strategies in other regions of the country.

II. SEATTLE AND THE CASE STUDY COMMUNITIES: CONTRASTING ECONOMIC SITUATIONS

Washington state has a significant cluster of advanced technology industries, mostly located in the Seattle/Bellevue/Everett metropolitan area. Amazon, Boeing, Immunex[1], Microsoft, and RealNetworks are among the well-known firms in the major high tech sectors—aerospace, software and internet-based companies, and biotechnology. Biomedical devices, computer parts, search and detection instruments, and other advanced manufacturing sectors round out the list of high tech industries.

According to the Washington Technology Center, King County, including the cities of Seattle, Bellevue, and Redmond, houses more high tech jobs than any other county in the state (257,700 of 322,200 high tech jobs in the state in 1998, or 80 percent of the total). Approximately 106 high tech jobs exists for each 1,000 residents in King County, twice the ratio in the next highest metropolitan area. Across the Cascade Mountain range, no multi-county region has more than 15,000 high tech jobs, and the density of these jobs ranges from 9 per 1,000 residents in the central region to 49 per 1,000 in the southeast (home of the Hanford Reservation and a major federal research laboratory).[2]

Table 1. King County Economic Profile

	Population, 2000	Unemployment Rate	Per Capita Income, 1999
King County	1,737,034	2000: 3.6% 2003: 6.9%	$44,719
Seattle	563,374		
Bellevue	109,827		
Redmond	45,256		

Sources: Washington state, Employment Security Department and Office of Financial Management

King County's technology sector grew considerably in the 1990s. Computer and data processing employment, the sector that includes Microsoft and other pre-packaged software development companies, increased from 11,800 in 1990 to 60,800 in 2000. Biotechnology and biomedical products companies, and related non-for-profit or public research organizations, constitute a biotechnology cluster in the Seattle area; this cluster reached an estimated 15,800 jobs in 2001, including a 20 percent expansion among private biotechnology companies, which now comprise approximately 45 percent of the cluster total.[3]

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[1] Immunex, a locally-founded company, was sold to Amgen in May 2002; Amgen intends to maintain a significant research and development facility in Seattle on the brand new Immunex campus on the Seattle waterfront.

[2] Based on 2001 data. See the Washington Technology Center, *Index of Innovation and Technology* (2003), available at www.watechcenter.org.

[3]Washington Biotechnology and Medical Technology Online*, 2002 Washington Biotechnology and Medical Technology Annual Report*, available at www.wabio.com/industry/busdev/annrpt/annrpt_employ.htm (March 2002); Employees of Fred Hutchinson Cancer Research Center and other non-for-profit research organizations are included in the industry total, as well as employees of biomedical product companies who belong to the Washington Biotechnology and Biomedical Products Association.

The impressive rise of technology sectors in King County has had a number of impacts:

- rapid growth of population and employment in the cities of Seattle, Bellevue, Redmond and several surrounding jurisdictions that house the core technology firms;
- rapid growth of personal income, from $25,750 in 1990 to $44,719 in 1999;
- anew symphony hall, two new sports stadiums, and the Experience Music Project;
- new facilities and programs on university, college, and school campuses, many of them named for members of the Gates and Allen families (Bill Gates and Paul Allen founded Microsoft);
- an impressive array of tall buildings and corporate campuses that are transforming the urban landscape;
- a reputation as one of the up-and-coming technology centers in the United States; and
- some of the worst traffic congestion in the nation.[4]

These benefits (and costs) have been mostly confined to the Seattle region, however. Prior research by one of the authors suggests a number of reasons why:

- the **highly skilled labor pool**, which continues to grow due to migration from other states and diligent efforts of local colleges and universities to build up quality programs in computer science and engineering;
- concentration of **venture capital and "angel investor" resources** in the Seattle area, and their desire for clients to locate nearby to facilitate participation in company management;
- strong **inter-company and inter-sector linkages**; and
- reliance on **research institutions** located in Seattle.

If high tech is to spread out to the rest of the state, these currently centralized assets must be replicated in other areas, or other applications of advanced technology with more diverse siting requirements must be discovered and developed. Washington's governor has recognized this fact, and has declared in several speeches that he wants to be governor of "One Washington," making geographic diversification of high tech a major policy priority. He created a statewide innovation economy strategy the Office of Technology Advisor to broaden the benefits of technology-based development statewide.[5] The goal is to raise per capita income and bring down unemployment rates outside the Seattle area by encouraging technology-based development in the five case study communities, and elsewhere in the state.

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[4] The Road Information Program, available at www.tripnet.org/state/s040301.htm (March 2002).
[5] See the Governor's Innovation Economy website at http://www.governor.wa.gov/innovation/ (September 2003).

Table 2: Economic Summary for Seattle and Five Case Study Communities

	Seattle	Bellingham	Spokane	Tacoma	Tri-Cities	Wenatchee
Population of City	563,374	67,171	195,829	193,556	115,525	33,613
Population of County	1,737,034	166,814	417,939	700,820	191,822	99,219
Per Capita Income	$44,719	$23,228	$24,368	$25,289	$25,004	$25,483
Unemployment Rate **2000** **2003**	3.6 6.9	5.7 6.1	5.6 6.6	5.3 8.0	6.4 7.0	8.9 6.4
Traditional Industries	Aerospace, international trade, shipbuilding, business services	Resource processing	Services to mining, forestry & agriculture region, energy	Heavy manufacturing; rail & marine transportation	Food processing, transportation; nuclear technologies	Agriculture, food processing, energy
Technology Employment	150,000	3,252	11,972	7,970	8,281	829
Largest Technology Sectors	Aerospace, software, biotech, electronics/ instruments, telecom.	Adv. tech. mfg., IT, engineering	Adv. tech. mfg., engineering, energy, IT	Adv. tech. mfg., commun-ications, engineering, IT	Engineering research lab	Adv. tech. mfg.
Technology Dev. Focus	Software, biotech	IT	IT, biotech, energy	IT	IT, energy, biotech in ag	IT, adv. tech. mfg.
Research Institutions	Univ. of Washington, Fred Hutch-inson Cancer Research Center	Teaching-oriented university	Heart institute, limited research univ. presence	Limited research univ. presence	National laboratory; limited res. univ. presence	

Just how the governor's goal is to be accomplished is not yet clear, however, despite publication of a strategic plan by the Technology Advisor. The plan carries no funding package with it to make real its suggestion that a technology-based economy is the future of all parts of this state. The 2003 legislative session focused on ways to cut back state services and avoid raising taxes during a recession that severely impacted revenues. New programs such as a technology-based development effort were not even put on the agenda for consideration.

The ability of smaller cities in Washington to attract technology-based development, then, will need to be accomplished with limited assistance from the state of Washington, whose spending power has been trimmed by citizen initiatives and whose fiscal situation has been weakened by a national recession, made still worse by a sharp drop in employment at The Boeing Company. Instead, these cities' efforts will depend more on the independent actions of local private and public leaders than on any initiative launched from the state capital. For that reason, we have based this

investigation around interviews with local leaders in five communities that have embraced the goal of building a more vital economy in their own region based on technology companies. A number of their strategies look promising, and, while considerable differences exist among the communities, there are also sufficient similarities to suggest the importance of a few key elements that will need to be addressed in any community's technology-based development strategy.

Washington state is not alone in having much of the New Economy concentrated in a single metropolitan area. Austin, TX; Atlanta, GA; Northern Virginia; and Boston, MA are among the places that have a similar concentration of technology development in a single metropolitan area with other communities in the same state wondering how they can get a foothold in these new and rapidly growing industries. Other regions in Michigan, Ohio, Pennsylvania, and other states are developing biotechnology or information technology strategies to complement existing strengths in manufacturing. The strategies and lessons of Washington communities may therefore be of great interest all across the nation.

III. METHODOLOGY

We selected several of the larger cities in Washington state outside the core Seattle/Bellevue/Redmond region for this investigation. The cities included are Spokane, second largest city in the state; and Takoma, third largest; as well as two medium-sized cities, Bellingham and Wenatchee. In addition, we also visited the Tri-Cities area that includes Richland, a city built around the specialized technology at the Hanford Reservation, home of production reactors used in creating fissionable material for atomic bombs during World War II, and site of major research programs at a vibrant national laboratory today. While this group of cities does not constitute a scientific sample, it includes all of the major centers of technology-based development in this state except for Vancouver, Washington, which is functionally part of the Portland, OR metropolitan area. Understanding the dynamics of development in Vancouver requires a larger investigation of Portland, a task that we felt was too large for this project.

To ensure that we gathered comparable information in each of the five communities, and that we covered the full range of issues and strategies that may be important, we used two key tools in our investigation:

- an interview guide we developed based on prior work on regional development strategies; this guide led interviewees to describe strategies in which they were involved, the rationale for this approach, and any evidence of the impacts of the strategy; and
- a checklist of strategic elements in a statewide technology strategy; use of this ensured that we did not overlook any important element in the local strategy.[6]

Interviews were conducted with five to ten leaders from the public and private sector in each case study community based on a loose snowball sampling strategy. We identified a knowledgeable local contact and asked that person or organization for help in identifying other key actors in that area. In each location, we quickly identified a key individual or organization that seemed to have a rich network of contacts in the technology community in that area. This person or organization then assisted us in arranging appointments for a site visit that typically occupied two full days. The site visits included interviews with company and organization representatives at their business offices or in small groups convened in an informal focus group setting to go through the elements of local strategy and to gain an understanding of the local economic context. In addition, we have drawn on state and local websites and prior research for additional information about the local economic context and trends.

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[6] The elements of this checklist are listed on the website referenced in footnote 5, and summarized in the conclusion on pages 36-37.

IV. Five Community Case Studies

A.   Bellingham: Extending IT Along the I-5 Corridor

1.   Current Economic Base

Bellingham is located just a few miles south of the U.S./Canadian border in the northwest region of Washington state, about 90 miles north of Seattle. The city is located on the edge of Bellingham Bay, with viewpoints in residential neighborhoods overlooking the San Juan Islands. Mt. Baker and the Northern Cascade Mountains loom to the east, making for a spectacular setting. The city is home to 67,000 residents, and it houses Western Washington University, a campus with 12,500 students.

The local economic base was built around major resource-based manufacturing companies for many years, including a pulp and paper plant on the waterfront adjacent to the central business district, and an oil refinery and aluminum smelter located nearby. The pulp and paper plant and the aluminum smelter closed their doors, however, releasing several thousand blue-collar workers and forcing the region to plan a transition to a new economy.

Table 3. Bellingham Economic Profile

	Population, 2000	Unemployment Rate	Per Capita Income, 1999
Whatcom County	166,814	2000: 5.7% 2003: 6.1%	$23,228
Bellingham	67,171		

Source: Washington state, Employment Security Department and Office of Financial Management

2.   Potential for Technology-Related Development

The new economic base of the Bellingham area is likely to be built on advanced technology. As of 2002, a total of 224 advanced technology establishments employed over 3,200 workers in Whatcom County. As the local economic development agency director notes, physical infrastructure constraints and difficult regulatory hurdles for redevelopment of older manufacturing sites limit the appeal of Bellingham for major new manufacturing operations. However, the university, as well as excellent K-12 schools, a community college, and a technical college, provides a solid base for building an information technology cluster. Forbes magazine rated Bellingham the 19th best smaller city for business in the United States in May 2000 after a surge of technology-based business investments in the area.

Table 4. Bellingham Advanced Technology Employment, 1st Quarter 2002

	Units	Employment
Advanced technology manufacturing*	38	1,127
Telephone communication	15	821
Computer and data processing services	68	294
Medical and dental laboratories	19	78
Engineering & architectural services	59	791
Research and testing services	25	140
Total advanced technology industries	224	3,252

*Includes Plastics, drugs, metalworking machinery, computer and office equip., electrical equip., communications equip., electronic components, motor vehicles, aircraft, search and navigation equip., measuring instruments, and medical instruments.
Source: Washington Employment Security Department

Bellingham's IT-based cluster of companies got started with two branch operations of Seattle-area companies. Wall Data established a branch operation in Bellingham that later became NetManage through a buyout. Attachmate established a branch in Bellingham as well. Both companies provide intranet software applications.

These two establishments are among the three largest IT companies in Bellingham, along with locally-grown Dealer Information Systems (DIS), initially an agricultural machinery distributor that now provides software and hardware for agricultural and construction equipment dealers nationwide. As these three companies became visible actors in the local business community, other companies were formed. A Bellingham branch of the accounting firm Moss Adams has established a specialized technology-focused practice; this firm has identified over 80 technology-based clients in the Northwest region of the state (Whatcom, Skagit, and Island counties), in such fields as business services (20 firms), industrial machinery and equipment (17 firms), electronics (16 firms), instruments (14 firms), and other manufacturing companies (15 firms).

In addition, proximity to Vancouver, British Columbia provides an opportunity to attract firms from Canada that want a base of operations in the United States. Technology firms with origins in Canada are providing a substantial growth impetus in Bellingham. One interesting example of this phenomenon is a startup company making a tiny scanner that can be inserted into a human lung to assess medical conditions. The technology that this company is commercializing was developed at the University of British Columbia. However, company leaders feel that a U.S. location is advantageous given differences in health care financing between the two nations.

3.   Emerging Strategies and Partnerships

Bellingham's leadership is making a concerted effort to encourage further development of a small but promising group of existing technology companies. This region's strategies include improving broadband access, strengthening networking within the local technology community and with the major associations in Seattle, recruiting firms away from Seattle based on lifestyle factors and lower business costs, and improving business services.

a.   Broadband Access

As the IT segment of the local industry base grew, major issues emerged with respect to broadband access. Bellingham is the largest city in the region, and it is served by one telephone company, while the rural areas in Whatcom and adjoining counties (Skagit and Island) have traditionally been served by a second major telephone company. These two systems were not providing broadband access in the area as of the mid-1990s. In fact, these companies were having trouble keeping up with new requests for ordinary dialtone service. A major technology company building a new plant on the north side of Bellingham was unable to get telephone service on schedule, and when the local Economic Development Council (EDC) moved into a new downtown office in 1997, no telephone service was available in the new office for a week.

Under the leadership of the EDC, a committee of concerned business people, plus representatives of the university, port, city, and county, began to work on this issue. This "Telecommunications Solutions Group" was able to persuade the two major telephone companies to provide DSL service, linking their systems to provide connectivity throughout the region, and to establish a basis for Competitive Local Exchange Carriers (CLECs) to enter the market. Three CLECs entered this market over the next year. As the system has evolved, Bellingham now has excellent broadband access including two major fiber optic trunk lines joined in a Point of Presence (POP) facility, linking the U.S. fiber network with the Canadian network to the north. Direct fiber optic-based services were brought into a new technology-oriented business park, Barclay Village. Much faster responses to requests for new dialtone service are an added benefit.

b.   Networking and Capacity Building

IT-based businesses in the area have created another venue for collaboration among technology businesses. The Technology Alliance Group (TAG) is an emerging business association with 40 to 50 regular attendees at monthly meetings. TAG goals include defining the technology education and training needs of local companies, and promotion of the cluster. This group—whose members include companies, service providers, and education institutions—has affiliated with Seattle-based WSA and is now a local chapter of this statewide software/internet company business association.[7]

TAG has identified two key shortcomings in the IT cluster in Bellingham. One is a lack of lawyers in the area who understand the unique needs of technology firms, and a second is a shortage of venture capital in the area. No immediate solutions to either problem have been identified. Over time as the technology cluster expands, a local legal services firm is likely to develop specialized capacity in technology fields such as intellectual property protection. On the capital issue, an attempt was made to craft a local solution. Local business leaders joke that they see venture capitalists every day—they are flying overhead on their way from Seattle up to

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[7] A non-profit industry association formerly known as the Washington Software Alliance; WSA was created with assistance from a state economic development agency in the late 1980s.

Vancouver, BC. To encourage some of them to seriously examine local deals, an entrepreneur in the area attempted to create a locally-based fund to provide initial financing for startups and hopefully leverage additional investments from non-local venture funds. This entrepreneur was unsuccessful in attempts to augment his resources with contributions from other wealthy individuals living in the area. These other local investors were not comfortable investing in with a portfolio largely composed of risky technology-based startups.

c.   Education

Education institutions are key actors in building a technology cluster. Bellingham is blessed with a good K-12 system and three institutions of higher education: Bellingham Technical College, Whatcom Community College, and Western Washington University. An active Tech-Prep Consortium draws the high schools together with the community and technical college around several skill development initiatives, including one in information technology. Specific foci include web design, video production, and computer maintenance and repair. Local companies praise this effort but are more cautious in their characterization of the university's contribution to the local economy.

While Western's computer science and engineering programs get high marks from employers in the Seattle area, a number of Bellingham area leaders feel that this university is somewhat disconnected from the firms in its own region of the state. Some firms feel that it is difficult to attract student interns; some report success in hiring graduates while others feel that the graduates are more likely to head south to the rapidly growing technology cluster in the Seattle area. One entrepreneur reported a specific frustration in trying to attract job candidates with a background combining computer science and environmental studies, despite strong programs in both areas at Western. The mixed reviews of Western indicate the need for continued work on partnership development by TAG and other business leadership groups in Bellingham.

4.   Summary and Comments

A number of local leaders feel that lower costs plus a high quality of life give Bellingham an advantage in recruiting firms to relocate from the Seattle area. The area has no serious traffic congestion problems so far, and plenty of room to expand. One local leader called Bellingham "a success waiting to happen," and the EDC is working to make it happen by organizing networking events in the Seattle area to inform companies about location options, support from educational institutions, and the overall quality of life in Bellingham. The local Technology Alliance Group's chapter affiliation with WSA is likely to enhance the reputation of the area and bring in new services to encourage the IT sector.

Compared to several of the other regions profiled below, Bellingham has many favorable locational attributes. Further, as the waterfront area gets redeveloped in the wake of closed manufacturing facilities, Bellingham will have very attractive close-in sites to market to new firms, as well as a new high tech industry park at the northeast edge of town. The area may well see some

success in luring branch operations or smaller, cost-conscious companies from the Seattle area. However, the entrepreneurial development system in Bellingham is weaker than in other regions, especially compared to Spokane, which stands out in this regard. The serious nature of this shortcoming is perhaps under-appreciated in Bellingham compared to the Tri-Cities, a region that has come to the conclusion the excellent schools, available real estate, and strong technology will not foster much technology development in the absence of strong entrepreneurial development.

B.   Spokane: Building an Inland Technology Empire

1.   *Current Economic Base*

Spokane is the hub of a region traditionally known as the Inland Empire. As the second largest city in Washington state and a service center for an agriculture, forest products, and mining region lapping over into Northern Idaho and even Montana, Spokane is firmly associated with a resource-based economy in many people's minds. Rail links and Interstate 90 provide east/west transportation connections for the movement of goods and people. Spokane International Airport allows easy access to the Seattle and Salt Lake City hubs in the national and international airport networks. Despite its substantial size, Spokane has maintained a smaller city feel. It enjoys lower housing costs than the Puget Sound region, and a generally high quality of life built around skiing, boating, fishing, camping, and many other outdoor activities.

Table 5. Spokane Economic Profile

	Population, 2000	Unemployment Rate	Per Capita Income, 1999
Spokane County	417,939	2000: 5.6% 2003: 6.6%	$24,368
Spokane City	195,829		

Sources: Washington state, Employment Security Department and Office of Financial Management

However, the region's economic performance has lagged behind that of the Puget Sound in terms of job creation and income growth. Agriculture has not been a source of employment growth for many years; productivity advances and stringent competition in the grain markets that are the mainstay of eastern Washington agriculture have removed possibilities of job growth in this sector. Mining in adjacent northern Idaho has also been severely impacted by international competition, tighter environmental regulation, and depleted deposits, resulting in several major mine closures. Since the 1980s, forest-based industries throughout the Northwest have been constrained by new sustained yield standards and tighter regulation of forest practices to protect various environmental values and endangered species. Thus another strong source of jobs in the Inland Empire became a source of dislocated workers.

As a consequence of these trends, a transition to alternative economic bases is an important goal. Technology-based development and a strengthened health care sector linked to biotechnology

and biomedical instrument manufacturing are seen by area business leaders as the keys to further job and income growth in this region.

2. *Potential for Technology-Related Development*

Advanced technology manufacturing has been present in the Spokane area for many years, mostly in the form of branch plants of major corporations headquartered elsewhere. Nearly 500 companies collectively employ about 12,000 workers in advanced technology industries. More than half of the advanced technology employment is in manufacturing companies. Major corporations such as Hewlett Packard and Wang Laboratories established plants in this region many years ago, joining homegrown companies such as Itron (electric power distribution technology), Telect (telephone switching gear), and Worldwide Packets (advanced internet hardware systems). In addition, the local investor-owned utility company, Washington Water Power, began to transform itself into a diversified technology company several years back, and has re-named itself Avista Corporation. This new entity has spun off several technology subsidiaries including Avista Advantage (utility bill management services) and Avista Labs (fuel cells). Another component of the local technology strategy was created through the spin-off of a local facility by pharmaceutical giant Bayer AG. This action resulted in the creation of Hollister Stier Laboratories, a company that manufactures sterile injectable pharmaceutical products for biotechnology companies.

Table 6. Spokane Avanced Technology Employment, 1st Quarter 2002

	Units	Employment
Advanced technology manufacturing*	90	6,783
Communications services	47	1,012
Computer and data processing services	161	1,141
Medical and dental laboratories	37	1,109
Engineering & architectural services	121	1,188
Research and testing services	39	738
Total advanced technology industries	495	11,972

*Incl. Drugs, metalworking, computers and parts, electrical and electronic equip., electrical dist. equip., communications equip., misc. electrical equip. & supplies, motor vehicles, aircraft and parts, measuring instruments, and medical instruments.
Source: Washington Employment Security Department

Local leaders have been coming together in several different venues to discuss how to strengthen the technology-based industries in the Spokane area. As one noted entrepreneur in the area characterized the local situation several years ago, "it's always two steps forward, one step backward" in Spokane. Many of the larger manufacturing companies have encountered new competition abroad as globalization has proceeded, necessitating layoffs in the area. Locally-created Keytronics, an early third-party manufacturer of keyboards for personal computers, started out manufacturing their products locally but has been forced to shift production overseas. Packet Engines, a successful local startup, was sold to Agilent, and the new owners are moving most of the company out of the area. Recently, Telect has been forced to switch to an outsourcing production strategy, resulting in a major layoff after many years of building up its Spokane workforce.

3.   ***Emerging Strategies and Partnerships***

A number of separate organizations are collaborating to turn "two steps forward, one step back" into a giant leap forward to create a dynamic and sustainable technology company base in the Inland Empire. Key players include SIRTI, INTEC, the Spokane Biotechnology Association, TechNet, and Gonzaga University.

a.   Networking and Capacity Building

As a few home grown technology companies began to emerge in the late 1980s and early 1990s, a volunteer organization emerged in the Spokane area to bring the CEOs of these companies together to define common interests and create mechanisms to move projects forward. TechNet grew out of a committee established by the local Economic Development Council (EDC) to devise a recruitment strategy for technology industries. People asked to serve on this committee realized they had no interest in recruiting new companies into the area, but many reasons to continue to meet with each other.[8] The group separated from the EDC and developed a relationship with the local electric utility, then known as Washington Water Power (WWP). WWP's CEO offered them meeting space to get the group going. A program of quarterly CEO roundtables emerged, and out of that grew an interesting entrepreneurial development system. This system now includes quarterly review sessions that local startups can use to present their business models. A few venture capitalists are invited to these sessions for the purpose of critiquing the presentations. From each session, two or three companies are selected for an intensive coaching process with a team of experts assisted by MBA students from Gonzaga University's business school. The goal is to prepare these selected companies for "real" presentations to venture capital companies. This model has been expanded regionally in recent months, with a for-profit company in neighboring Post Falls, Idaho assisting startups in Idaho and western Montana with a process modeled after the Spokane effort.

b.   Supporting Startups

The Spokane Intercollegiate Research and Technology Institute (SIRTI) was created by former Speaker of the House Tom Foley, the area's longtime congressional representative, who was convinced that the lack of a top-notch research facility was a factor holding back Spokane's economic progress. Initial funding came through a federal grant, and it is now supported by state funds and fees paid by participating companies. The result is a facility that companies can use to conduct research and development projects, and a staff that can provide intensive services designed to strengthen a startup technology company so it can survive in the marketplace. Beyond use of the facilities in the commercialization of a technology, the premise of SIRTI is that startup companies often face a steep learning curve with respect to financing and management issues. Intensive assistance is offered as needed on these issues in parallel with any technology development

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[8] TechNet founders suggest that networking and collaboration are "unnatural acts" for many technology company founders, yet their need to partner around workforce development and the opportunity to create new business opportunities through networking with their peers requires a venue for collaboration.

assistance a company requires. About five companies at a time are undergoing the intensive assistance process at SIRTI, while the staff are simultaneously looking for the next set of client companies at universities, in local business organizations, and at the national laboratory in Richland, WA. In effect, SIRTI combines a research and development program, conducted in partnership with companies, with classic incubator functions. In addition, SIRTI's building often provides a venue for other groups to hold meetings, focus groups, and other gatherings.

TechNet and SIRTI are inspired in part by the success of local entrepreneurs who created a number of successful technology companies, including Avista and its progeny, Telect, Itron, Keytronics, Packet Engines, and Worldwide Packets. Bernard Daines, the founder of Packet Engines, sold this company to Agilent; he and several former key employees have since founded new companies, including Daines' enterprise World Wide Packets. There is enough success with entrepreneurial strategies in the Spokane area to give encouragement to the next generation of entrepreneurs, plus a growing pool of technology-based wealth that can be re-invested locally in the next round of startups. In this context, the TechNet/Gonzaga and SIRTI programs seem well crafted to aid the entrepreneurial development process.

c.   Guiding Education

The Inland Technology Education Consortium (INTEC) is a private not-for-profit organization formed to foster technology-based development by convening and facilitating relationships among technology businesses, educators, and government to create a skilled regional workforce for technology industries. The organization conducted a survey of Spokane area technology companies to determine key workforce skill needs. They have developed separate programs for two existing technology clusters: information technology (software development and internet companies) and biotechnology (contract manufacturers of pharmaceutical products developed by biotechnology companies, clinical trials of biotechnology products, and informatics[9] systems). Over time a new cluster may be added in energy technology, especially alternative electric power generation technologies and power system management.

INTEC is funded by a major grant from the state of Washington, a second grant from Spokane County, and project funds from the U.S. Department of Labor. INTEC has a budget of $1.2 million that is used to assess industry skill needs and create appropriate education programs to be delivered by the local community colleges and school districts. An IT Academy has been created in partnership with a high school, but located in a re-developed downtown building that also provides incubator space for startup companies. Another academy may be created around biotechnology. At present, INTEC is working with the local education community to create a "bioprocess technician"

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[9] Informatics refers to patient databases linked across multiple health care providers using web technology so that patients provide personal and financial data only once; health care professionals can add information to the patient's record and send it to a specialist in an other facility or a rehabilitation center when a hospitalized patient is released, etc. In the Spokane area, two major hospital groups and associated groups of physicians, rehabilitation facilities and nursing homes have created an informatics system on a non-profit collaborative basis.

program through which displaced workers identified by the local Workforce Development Council can be retrained to work in the two contract pharmaceutical manufacturing companies in the area which manufacture biotechnology products for third parties.

INTEC is the newest technology-oriented organization in the area, and therefore is free of the somewhat contentious history of some of the older organizations. As a consequence, INTEC is regarded as "everybody's" technology organization and is playing a key role in facilitating collaboration among some of the others. This new spirit of collaboration may be a powerful force moving the area ahead.

d.   Other Initiatives

While biotechnology is a quite small sector in Spokane and is hampered by the absence of a medical school in the region, there are several reasons to think that biotechnology and related sectors may become more important. Washington State University's Center for Reproductive Technology generates many ideas that have commercial potential, for example. Located just 55 miles north of WSU, Spokane may be a natural place to build a company based on technologies coming out of this biotechnology research program. There are several biomedical product companies in the area, and two contract manufacturers of biotechnology products, while the local health care industry is hosting over 300 clinical trials of new pharmaceutical products. The Spokane Biotechnology Association was created to give some focus and direction to these separate activities, and to market Spokane and its environs, including northern Idaho, as a region for these types of companies. The association is eagerly promoting WaFAST, a project of the Washington Technology Center to make more firms aware of the opportunities for use of federal Small Business Innovation Research (SBIR) grants as a way of obtaining funds for development projects.[10] Several major biotechnology and biomedical product companies in the Seattle area used a series of SBIRs to fund product development, providing an important supplement or alternative to venture capital investments.

Washington Water Power, now known as the Avista Corporation, has been a key force in stimulating technology-based development in Spokane. WWP's former CEO, Wendell Satre, is frequently mentioned by leaders in Spokane as a source of ideas, a provider of meeting space, and an investor in organizations and companies. In addition, Avista has provided a loaned executive, Kim Pearman-Gillman, who has been a key force in some of the newer initiatives and attempts to build collaboration among the several organizations promoting technology-based development in the area. Pearman-Gillman served as the first CEO for INTEC and helped secure major state and local funding. She also worked in the Spokane mayor's office and created a collaboration plan for further initiatives among the technology organizations in the area. She stresses that to move the area ahead, measurable progress must be made towards clear goals.

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[10] See WaFAST Federal Funding for Small Businesses at wafast.org/index.html (March 2002).

Interestingly, the collaborative regional technology plan is only emerging after a number of separate, sometimes disconnected, and sometimes competing initiatives were launched by separate organizations with overlapping leadership. This pattern is typical of the other communities we have visited. Technology-development does not start with a grand vision, it starts in bits and pieces, and clearly in Spokane, in fits and starts. An emerging cluster must be carefully nurtured lest "two steps forward/one step back" turn into a full scale retreat. As the initiatives mature, it may make sense to link and integrate them through the type of strategic planning now getting underway in Spokane.

4.   Summary and Comments

Spokane is the one place outside of Seattle in Washington state that has made a clear commitment to an entrepreneurial approach to technology-based development. No other area of the state outside the Puget Sound has tried to create a self-replicating cluster of entrepreneurs, and no other area has built as strong a system for nurturing entrepreneurs. As Oregon's Joe Cortright has observed, technology clusters are like forests that must be nurtured.[11] Spokane has clearly learned this lesson, and its system for nurturing entrepreneurs in technology clusters may be worth studying and emulating. Key elements of Spokane's entrepreneurial development system include multiple forms of support for startups, including research and development and intensive coaching, creation of institutions for networking among entrepreneurs, and encouragement for spin-offs that stay in the area.

C.   Tacoma: "The Most Wired City"

1.   Current Economic Base

Tacoma is located 30 miles south of Seattle in a striking setting on a peninsula projecting into Puget Sound, with views of 14,280 foot Mt. Rainer, the Cascade Mountains, and the Olympic Mountains as well as the Sound itself and nearby islands. The city's motto is "City of Destiny," and while it is the third largest city and the second largest contiguous urbanized area in the state, it has developed less rapidly than its northern neighbor Seattle. Unemployment is higher, and per capita income lower, than in the Seattle area.

The competition between these two cities goes back many decades to decisions about where to terminate east/west railroads. The Great Northern Railroad chose Seattle, while Union Pacific terminated in Tacoma after turning north in Portland. The competition continues today through new "knights," the ports of Seattle and Tacoma, which have vigorously competed for steamship companies in the container shipping trade that links Asian manufacturers to U.S. and Canadian markets. Tacoma has also built up an impressive industrial area on the tidal flats to the east of downtown, providing a home for a pulp mill, several solid wood products businesses, a luxury yacht builder, and a variety of other manufacturing, warehousing, and distribution companies.

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[11] Cortright, Joseph and Heike Mayer. "Ecology of the Silicon Forest." Report by Impresa Consulting for Institute for Metropolitan Studies, Portland State University, April 2000.

Tacoma is also home to the Frank Russell Company, a financial services company managing billions of dollars of private pension fund and other major assets for corporations in the United States, Europe, and Japan. This company was built by the grandson of its founder on the base of a small regional stock brokerage. The most notable technology company in the area 15 years ago was Sagem Morpho, with a technology for automated fingerprint systems that was becoming very attractive to a number of users even before the events of September 11. The firm, which has French origins, is located in Tacoma because its first substantial contracts were with the Tacoma and Pierce County police departments.

Local economic leaders are pursuing a technology development strategy due to the difficulty of expanding a heavy industry base given international competition, environmental restrictions, and labor supply issues.

Table 7. Tacoma Economic Profile

	Population, 2000	Unemployment rate	Per capita income, 1999
Pierce County	700,820	2000: 5.3% 2003: 8.0%	$25,289
Tacoma	193,556		

Sources: Washington state, Employment Security Department and Office of Financial Management

2. **_Potential for Technology-Related Development_**

While Tacoma residents tend to think of the area as primarily blue collar and manufacturing oriented, there is a considerable base of advanced technology employment in Pierce County— nearly 8,000 workers in the first quarter of 2002. Over 4,000 of these workers are in advanced technology manufacturing sectors, including a Boeing plant and a variety of smaller manufacturing firms. Engineering and architectural services, communications services, and computer and data processing services are also substantial sectors.

Table 8. Tacoma Advanced Technology Employment, 1st Quarter 2002

	Units	Employment
Advanced technology manufacturing*	79	4,063
Communications services	49	906
Computer and data processing services	151	868
Medical and dental laboratories	38	221
Engineering and architectural services	130	1,449
Research and testing services	46	463
Total advanced technology industries	493	7,970

*Includes chemicals, plastics, drugs, metalworking machinery, computer and office equip., electrical equip., communications equip., electronic components, motor vehicles, aircraft, search and navigation equip., measuring instruments, and medical instruments.
Source: Washington Employment Security Department

Despite these successes, Tacoma has not developed as rapidly as the Seattle/Bellevue/ Redmond area in the last decade precisely because it has not attracted a core of rapidly growing technology companies identified with the "New Economy." Tacoma did not have a major research institution or university until very recently. In addition, the city's downtown was not an attractive setting, with failed urban development projects creating gaping, block-sized holes, a crumbling warehouse district on the south edge of the central business district, and little new development in the business district other than the office tower built by the Frank Russell Company.

3.   *Emerging Strategies and Partnerships*

Tacoma leaders are trying to diversify the local employment base away from industrial uses with extensive blue collar employment and towards service and high tech. By cleaning up and re-building Tacoma's waterfront, the city is attempting to emphasize many of the same urban and natural amenities that have helped Seattle become a vibrant home for technology industries. In addition, an IT infrastructure initiative and an accompanying "Most Wired City" marketing campaign, and a new university branch campus are part of the strategy. This broad-based effort requires many partners, including the city and the city-owned electric utility, the state, and numerous private companies.

a.   Creating a More Attractive Downtown

In the late 1990s, local public and private leaders realized that the downtown waterfront was an eyesore the limited developer interest in redeveloping adjacent properties, and that the lack of a public university in the city inhibited technology-based development. A number of new initiatives resulted from city and county level strategic planning processes.

These local leaders persuaded the governor and legislature to establish a branch campus of the University of Washington in Tacoma, using redevelopment of older warehouse properties to get an urban development benefit as well as bringing new higher education programs into the community. In 2001, Gov. Locke announced a new investment on this campus, creating a Technology Institute that will add to the state's capacity to prepare a workforce for rapidly growing technology companies. By putting the institute in Tacoma rather in the core of the technology cluster 30 to 45 miles north in the Seattle/Bellevue area, the governor hoped to spur technology development in Tacoma. Significant private support for the facilities has emerged, indicating that this strategy has considerable merit.

In addition, a combination of state funding and local initiatives resulted in a number of additional investments that are transforming the waterfront of downtown Tacoma. A Washington State History Museum has been created across the street from the UW branch campus. Along the Thea Foss waterway at the front edge of downtown, a disused petroleum tank farm, old multi-story brick factories, and other crumbling facilities are being torn down to permit redevelopment of the area. A glass art museum featuring Tacoma-born artist Dale Chihuly, a new building for the Tacoma

Art Museum, a marina, and a "glass bridge" providing a pedestrian pathway between the waterfront, the cultural facilities, and downtown have significantly improved the area.

a.   Broadband Capacity

Complementing these public investments, several additional efforts are underway to make Tacoma a more attractive location for technology companies. The first and in many ways most exciting move was made by the city-owned electric utility, Tacoma Power. A combination of capital investment funds that had been building up on the utility's balance sheet, and a corporate merger that left talented technical staff of a cable company looking for new employment, came together in Tacoma's Click! network. A three-year study process was launched in 1992 when the U.S. Congress started to seriously discuss the deregulation of electric power. Tacoma Power's leadership wanted to be ahead of the game in defining a strategy for the new deregulated environment. Examination of other deregulated industries such as the airlines and banking suggested three themes associated with success in the new environment:

- A focus on what customers really want;
- Re-engineered, flattened organizations that could communicate well with their customers; and
- Built-in connectivity that enabled communication with customers.

Application of these principles to the electric utility's operations suggested some problems. For example, while there were a number of sub-stations, when one failed, technicians had to be sent out to diagnose the problem before a repair crew could load up the appropriate supplies and drive out to fix it. Improved broadband connectivity could eliminate this problem through smart real-time instrumentation that could alert an emergency center as to the nature of the problem, allowing quick dispatch of an appropriately equipped repair crew. At the same time, however, the two telephone companies operating within the utility's service territory were having trouble keeping up with customer requests for broadband connectivity and even basic dialtone access at new sites. These issues led to development of the idea of the electric utility establishing its own broadband fiber optic system that would permit rapid response in emergencies and eventually allow the installation of smart meters using web technology that could make reading of customer meters continuous and essentially costless. With that idea in place, the concept of selling access to the system to business and residential customers was easily added. Roughly eight years ago, the decision was made to go ahead with a major capital project using funds from sales of surplus power during high water years.[12]

Additional capacities were added to the system as the concept continued to evolve. After cable TV provider TCI bought a competitor, Viacom, in 1996, a high level group of staff left Viacom to join Tacoma Power to market the new capacities of the fiber optic system to businesses and

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[12] Tacoma's power supply comes principally from hydroelectric systems. These systems are operated on the basis of firm power estimates from low water years, and the surplus is sold to other utilities in high water years. Tacoma does not count on any revenues from surplus sales in its operating budget, so the surpluses accumulate in an account that by city statute must be used only for capital projects of the utility.

residents. These key managers ended up leading the broadband business unit at Tacoma's utility organization. By early 1999, the utility was rolling out broadband services to businesses, available within 15to 30 days, at a time when the telephone companies were unable to respond in less than several months. High speed internet access via cable modem was added for residential customers by the end of 1999, with three independent, private Internet Service Providers (ISPs) marketing these services. Finally, a closed institutional network was added for other public agencies, including city fire and police departments, parks, and schools.

As this comprehensive broadband system went into service in 2001, the City's economic development department launched a campaign to market Tacoma nationally as "the most wired city in America.[13]"

c. Upgrading Higher Education

The University of Washington's branch campus in Tacoma is a key ingredient in re-developing the south end of downtown. In addition, it plays a new role in the city's technology strategy. Starting in 1998, the WSA began a campaign to convince the governor and legislature that universities in the state were not educating enough computer science and engineering students to sustain the state's software and internet industries. Based on a survey conducted by one of the authors for WSA,[14] the association began touting statistics such as "7,000 vacant seats in the software industry" and "over 60,000 new jobs are possible," along with data on the inadequate capacity of the universities to make even a small dent in the projected demand with their graduates. Gov. Locke himself began to use these numbers in 1999 to make a case to the legislature for increased funding. At the same time, Tacoma area leaders were beginning to promote Tacoma as a new and attractive location for high tech companies, especially software and internet-based companies.

These two phenomena were joined in a proposal from the governor's office to create a special institute within the Tacoma branch campus that would focus on the needs of the IT companies. By donating $4 million in funds to build the necessary facilities, several private companies have endorsed this strategy of combining a regional development goal with an action aimed at addressing a major workforce need. Meanwhile, Gov. Locke has set goals for the new institute with the phrase "1,000 undergraduates within 10 years," a goal that could turn into 2,000 to 3,000 full- and part-time students in the 2 year program on the Tacoma campus, with upwards of 200 faculty members. As a starting point, the IT Institute will graduate 35 to 40 students in 2002 and will double in size in 2003. In building the Institute, the university has added several interesting features to make the regional development goal more concrete. A diversity coordinator and extra lab assistants have been hired to support students from a wide variety of backgrounds, and the

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[13] http://www.ci.tacoma.wa.us/econdev/News/040400%20DJC.htm (September 2003).
[14] Paul Sommers, "Washington State Software Industry Workforce Challenges," (Seattle: Northwest Policy Center, 1998).

university is working on articulation agreements with local community colleges to ease the pathway from a two-year institution to a university program.[15]

The institute's director came from an Ohio university that was created as a jointly operated branch of Ohio State and Miami University of Ohio in the 1960s. Wright State University grew out of this collaboration and was initially designed to serve further education needs of military personnel at Wright-Patterson Air Force Base. By offering undergraduate computer science education to military personnel and anyone else in the area, this small branch operation began to create a talent pool of engineering and computer science graduates. Over time, companies began to locate nearby to do business with the Air Force and to take advantage of the locally-created talent pool. This example provides a model for realizing the economic development goals of the UW-Tacoma Institute. While the program director is attempting to hire faculty to get the program running, he is also thinking about how to build relationships with high tech companies in the area already, how to place students into local internships, how to encourage entrepreneurship among the students, and other strategies that will foster development of a software industry in the Tacoma area. The institute is more than an example of "if you build it, they will come." In the planning stages, the director is explicitly interested in incorporating economic development goals as well as educational outcomes in the scope of the program.

d.   **Marketing Initiatives**

Broadband access and improved technology education are basic underpinnings for technology based economic development; marketing is needed to make firms aware of the advantages they can realize from a location in this area. The city and a county-wide economic development agency have become key players in marketing the Tacoma area as a site for technology companies.

The city of Tacoma's Economic Development Department became a partner in the effort to take advantage of new broadband capacity in Tacoma through its "Most Wired City" marketing campaign. The director of the department realized that the path-breaking work of the electric utility was providing a new tool that her department could use in marketing the city as a location for new business. A significant advertising budget was approved and high tech companies around the nation soon heard about the options available in Tacoma. By fall of 2000, during an annual economic outlook conference in Pierce County, the chamber of commerce could point to over 100 technology-based companies operating in Pierce County, and the conference organizers put a panel of high tech entrepreneurs in front of 500 local business and public sectors leaders, extolling the virtues of Tacoma:

- relatively affordable, close-in real estate and good schools that made it attractive to the workforce these companies wanted to recruit;

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[15] UW-Tacoma is an upper division only program, so the IT Institute's collaboration with community colleges may become a model for other programs on the UW-Tacoma campus.

- available space downtown;
- convenient access to SeaTac International Airport, and of course;
- great connectivity.

The leader of one company recently relocated from San Francisco indicated that all of these features of Tacoma were important to her company's relocation decision, and that her only regret was a shortage of good lunch spots in downtown, a problem that local entrepreneurs could easily fix. While the dot-com meltdown of 2001 and the ensuing recession have put a damper on the local enthusiasm, Tacoma continues to move ahead in creating a technology-based future through new investments and implementation of additional strategic elements.

Countywide responsibility for economic development resides in the Economic Development Board (EDB) of Tacoma and Pierce County. The EDB has developed a very precise strategy built on an understanding of the way major site selection consultants operate in advising major corporations about branch site options. An analysis is underway to identify major technology companies who need to have a presence in the Pacific Northwest in the long term, but who are now primarily housed in Silicon Valley or other major high tech centers. Once a short list of likely prospects is identified, local business and public sector leaders will be queried about personal or business contacts inside those companies, after which visits will be arranged using these contacts. This strategy is based on the advice of site selection consultants, who indicate that businesses put particular places on a short list for a branch operation after some senior executive indicates an interest in an area. The personal approach the EDB is developing is designed to both identify logical candidates and to find a pathway into these companies to establish that high level personal interest in Tacoma. When it comes time to make a pitch to these companies, however, the two assets that the EDB's executive director relies on are the Click! network and the UW-Tacoma IT Institute. "We have the infrastructure and talent pool you need" is the essence of the message to be communicated once the spark of interest in the area is planted. In addition, the entire strategy is based on an obvious business need for a presence in the Northwest, but is not predicated on the idea of moving the entire company.

e.   **Networking**

The chamber of commerce adds a networking component to the picture through quarterly meetings of technology company leaders, and publication of a newsletter to the members of this "technology consortium." In addition, the chamber staff assist consortium members in finding capital, developing plans for infrastructure, defining workforce needs, and developing relationships between technology firms and the brick and mortar companies in the area who may become important customers for software and internet technology developers.[16] Other organizations are now establishing venues for networking among technology companies in the Tacoma area, including a

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[16] Ann Markusen's recent paper on "High Tech and I-Tech" suggests the importance of building bridges between New Economy and Old Economy companies; Tacoma may be headed down exactly the right path in this respect. See A. Markusen, et al., "High-Tech and I-Tech: How Metros Rank and Specialize," (University of Minnesota, 2001).

WSA[17] chapter, a for-profit company called Tacoma Network, and a venture capital group called Tacoma Venture.

4. Summary and Comments

The combination of all of these efforts to improve downtown infrastructure and quality of live, enhance communication among technology firms and with key public and private sector partners, and upgrade higher education indicates that a rich cluster-like environment is being created that could foster further cluster development. The Seattle area has benefited from such a milieu, and Saxenian's work in Silicon Valley and Boston suggests the importance of these networking venues in creating viable and dynamic technology clusters.[18] However, deliberate creation of a good business climate, training of students, and provision of infrastructure does not guarantee that the cluster will in fact flourish. Like Bellingham, Tacoma's entrepreneurial development capacity seems weak and the need for it is under-appreciated. The area continues to rely mostly on promotional and recruiting efforts to bring new companies to the area. Whether the improved livability of Tacoma's downtown, its infrastructure, and increased supply of college graduates can transform the local economy is not clear at this point. The existing technology cluster is quite small and has not spawned any spin-offs from prior successes in the manner now common in Seattle and beginning to happen in Spokane.

D. Tri-Cities: Bringing Entrepreneurs to the Technology

1. Current Economic Base

The Tri-Cities—Kennewick, Pasco, and Richland—are located on the shores of the Columbia River in Southeastern Washington. Kennewick and Richland are in Franklin County, while neighboring Pasco is just across the river in Benton County. The combined metropolitan area population is over 190,000 persons.

Richland abuts the Hanford Reservation, home to production reactors built in World War II to supply fissionable materials for the first atomic bombs. The Reservation grew into the Pacific Northwest National Laboratory, a major national laboratory managed by Battelle. Waste management activities are operated by other companies, and there is one operating commercial nuclear power reactor. Several thousand scientists and engineers work at Battelle or for one of the contractors managing various facilities and a nuclear waste cleanup program on the reservation.

Because many of well-compensated professionals live in Richland or Kennewick, per capita income is substantially higher in Benton County ($25,004 in 1999) than in Franklin County ($17,961

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[17] WSA, formerly known as the Washington Software Alliance, operates from an office in Seattle close to the core of the software/ internet cluster. However, to serve as a statewide association, WSA has created local chapters in several areas including Bellingham and Tacoma.

[18] Annalee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, (Cambridge: Harvard University Press, 1994).

in 1999). The economic base of Franklin County is built on agriculture, food processing, and related industries such as transportation. Unemployment in both of these counties is higher than in King County, and per capita income, despite the influence of the Hanford Reservation's workforce, is far lower.

Table 9: Tri-Cities Economic Profile

	Population, 2000	Unemployment rate	Per capita income, 1999
Benton County	142,475	2000: 6.4% 2003: 7.0%	$25,004
Kennewick	54,751		
Richland	38,708		
Franklin County	49,347	2000: 9.5% 2003: 7.5%	$17,961
Pasco	32,066		

Sources: Washington state, Employment Security Department and Office of Financial Management

2. *Potential for Technology-Related Development*

The Tri-Cities region includes nearly 250 advanced technology companies with aggregate employment of about 8,300. The two largest sectors are research and testing services, and engineering and architectural services. These sectors are likely to grow in response to the mounting effort to clean up radioactive wastes on the Hanford Reservation. However, there are major concerns in the region about what will happen to the area when the cleanup process is completed, or in the case of these two leading sectors, what will happen once the process design is substantially completed and only somewhat more routine operations are needed for the remainder of the cleanup. Given the difficulty of the technical issues involved, even "routine" operations will require a very sophisticated, engineering/research intensive workforce for several decades. The challenge facing the region remains, however, how to find new markets and develop new products or services using the talent pool in the area, much of which is focused on radioactive waste problems that are somewhat unique to the Hanford site.

Tridec, the local economic development organization, articulates a long run technology-based development strategy for the region as a whole. The research programs at the national laboratory yield many commercial technologies, and the national laboratory staff has been directed by Energy Department leadership to develop programs to sustain the laboratory once the current mission of nuclear waste cleanup is completed. Nearby agriculture and food processing industries can benefit from some of the technology base at the laboratory, e.g., biotechnology techniques applied to agriculture or instrumentation useful in food processing plants. Other technologies coming out of the laboratory may have applications in energy, pharmaceutical products, advanced materials, and other fields. Therefore, a technology strategy appears to make some sense for the region.

Table 10: Tri-Cities Advanced Technology Employment, 1st Quarter 2002

	Units	Employment
Advanced technology manufacturing*	25	341
Communication services	25	263
Computer and data processing services	43	884
Medical and dental laboratories	12	75
Engineering & architectural services	103	2,827
Research and testing services	38	3,891
Total advanced technology industries	246	8,281

*Includes chemicals, plastics, drugs, metalworking machinery, computer and office
equip., electrical equip., communications equip., electronic components,
motor vehicles, aircraft, search and navigation equip., measuring instruments,
and medical instruments.
Source: Washington Employment Security Department

3. *Emerging Strategies and Partnerships*

While advanced technology has been a significant feature in the Tri-Cities economy for several decades, impending changes in the level of activity financed by the federal government at Hanford are forcing local leaders to plan for a substantial transition towards privately-led development. Diversification of the local economy based on commercialization of technologies based at Hanford is a key gesture of the emerging strategy.

a. Strategic Planning

Tridec conducted a strategic planning project in 2002 to assess the strengths and weaknesses of the region and develop strategies for moving ahead. Eight CEO-level focus groups were created to examine various sectors of the economy. Identified strengths include good schools, low crime rates, and a generally high quality of life, along with the technical strengths of the major contractors at the national laboratory and the support that comes from federal agencies for commercialization programs. Weaknesses include inadequate programs in IT in the schools, and a lack of Ph.D. programs in the area. Washington State University has a facility in Richland, but provides only limited offerings at this site. IT bandwidth is also a problem. Outside the laboratory itself, the region does not have good Internet access. Local leadership is trying to get a major Internet node, or "Point of Presence" established in Richland, with smaller facilities in adjacent communities. One of the incubators in the area is housed in a building owned by Energy Northwest, the operator of the commercial nuclear power plant out on the Reservation. This building consequently is connected to NOANET, a regional public utility fiber optic network. However, legal wrangling over who can offer Internet and other services using this infrastructure has prevented use of the fiber capacity in the area.[19]

Having identified these issues, local leaders are working on solutions. Cost sharing between WSU and major Hanford contractors has resulted in bringing in a new professor at the WSU site. A

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[19] NOANET is discussed further in the profile of Wenatchee on p. 28.

WSA chapter has been formed among local IT companies to foster growth of this set of companies. An internship program has been established with the University of Idaho to bring students to the national laboratory. Hopefully after they graduate or complete advanced studies, these interns will consider employment at the national laboratory. Battelle and CH2M Hill are offering 40 hours of free technical assistance to local businesses to help them improve their operations. This program allows businesses short-term access to very high level technical expertise. In addition, a small business assistance program provides general management consulting to over 500 firms per year.

b.   Incubators

A common strategy for nurturing startups is to house them in an incubator facility so that costs can be minimized and management assistance can be provided. The Tri-Cities region has at least three incubators run by different organizations. One of these is profiled below.

The Applied Process Engineering Laboratory (APEL) is a facility located in Richland in a 90,000-square-foot former warehouse owned by Energy Northwest. The space has been converted into an office, electronics lab, and high bay manufacturing space. Battelle leases some of the space, and some is used by contractors involved in the nuclear waste cleanup effort on the Hanford Reservation. The goal is to have core tenants such as Battelle occupying 60 percent of the space, with the remainder used by startups that would ideally spend no more than three to five years in the building before moving on to other facilities. This business model ensures that the incubator facility is financially self-sustaining.

The facility typically houses eight or nine startup companies and could accommodate several more. Companies who have used this facility include a firm developing high temperature electronics products that may have applications in fuel cells, a botanical genetics company, a company developing a line of sensitive skin cosmetic products, and a firm developing radioactive "seeds" used in cancer treatment. Some of the tenants are Battelle employees on entrepreneurial leave, and most of the technologies being developed originated at Battelle. While the number of successful graduates is not yet at the level planned for, these results indicate that the general strategy of launching startups based on laboratory developed technology is working.

APEL is also meeting a broad regional need for wet lab space for biotechnology firms. This type of facility is very expensive in Seattle and Portland, and two firms, one from each of these cities, have leased lab space at APEL during part of their development process. There is no expectation that such firms will remain permanently in the Tri-Cities. One firm in Seattle did part of its development work at APEL and part in Seattle, and ultimately moved its Tri-Cities operation back to the west side of the state. Such tenants improve APEL's financial position and meet regional needs as well.

c. Diversification

Another viable technology strategy is to diversify the business base of the organizations already operating in the area. Lockheed Martin's local IT group is a good example. This division of a major defense contractor provides IT support to about 8,000 computer users at Hanford. In addition, the division is supporting 13,000 computer users at the Department of Defense, the Veterans Administration, and other federal agencies at a variety of sites around the nation, and is marketing its services to the broader public. A staff of 500 in Richland has grown to 620 in recent years as the diversification strategy has been implemented at Lockheed IT.

Battelle is also part of the diversification strategy. The company is beginning to directly invest in selected technology transfer operations. This arrangement seems to appeal more to larger established companies than to startups, but if that larger company is operating in the Tri-Cities, local economic development benefits will accrue. In addition, Battelle is creating technologies for very sophisticated analysis of the relationships among patents and public university research programs. Through these analyses, laboratory staff is identifying potential research partnerships with other laboratories in the Northwest that can be linked to regional development programs over time. It is not clear, however, whether these strategies will have local economic development benefits. Direct investments in companies licensing technology from the laboratory, and research partnerships with universities and other national laboratories, may be successful diversification strategies for Battelle at large, but not necessarily strategies that expand the local job base in the Tri-Cities.

d. Overcoming a Shortage of Entrepreneurs and Managers

One final obstacle to technology-based development is more serious, and to date no effective strategy has been devised. This obstacle is a shortage of entrepreneurs and skilled management teams in the area to create companies around technologies available at the national laboratory. Linked to this issue is the availability of venture capital. Venture capital investors want to see a strong business plan and an experienced management team before they make major investments in a startup company. The Seattle-based Alliance of Angels, early stage investors who can get a startup company going, visited the Tri-Cities, but found few deals they wanted to support given the lack of experienced management groups in the area. Unless entrepreneurs and skilled managers can be brought in, the region will have to create programs to grow their own over time, based on local people who are committed to staying in the area. This may make it difficult for the national laboratory to achieve its goal of spinning out 10 companies per year, particularly if the idea is that those 10 spinouts will remain in the Tri-Cities. As Tridec's CEO puts it, the Alliance visit revealed that the region has good technology, but "lacks the right jockeys" to turn the technology into successful companies.

Battelle is trying to grow entrepreneurs from within its own workforce by offering entrepreneurial leaves of absence to staffers who want to start a company. A staff member can take a leave while remaining eligible for health benefits for a year. Partial leaves are possible if the person wants to keep involved in laboratory research as well. About 40 staff members have taken

advantage of this program over the years, and about 30 companies have been launched. Battelle suspends an intellectual property clause in the standard employment contract for staffers taking such a leave to enable them to work on technologies they developed at the laboratory. This program assists any would-be entrepreneur who steps forward and requests assistance, but the program manager cannot actively market it inside the lab since internal unit managers also want to keep their key staffers to meet their own mission goals.

In other regions facing a shortage of venture capital, local venture capital funds have been established. This strategy has been tried but has not been successful in the Tri-Cities. At least three attempts have been made set up a local fund, but none has been sustainable because of an inadequate flow of local investment opportunities. The critical problem in the Tri-Cities remains the development of the local entrepreneurial base; the venture capital problem will likely be solved through local funds or relationships to Seattle area funds once the entrepreneurial base is expanded.

4.   *Summary and Comments*

The Tri-Cities area has launched a technology-based development effort with several major actors. The national laboratory continues its federal mission-driven research programs, but is committed to a goal of spinning out commercial companies based on technology transfer programs and participation in an incubator facility. A second incubator is operated in association with a community college. Tridec recruits companies into the area and works with all parties to find entrepreneurs who may want to build a company in the area based on technologies coming out of the laboratory.

This strategy has been clearly articulated and well-supported by federally-funded programs, but it faces several major obstacles. Technologies may be successfully spun out into private companies, but the companies do not necessarily stay in the area. To gain financing, companies sometimes move to a location near venture capital sources, or they may sell the original company to a larger company that wishes to relocate the operation. While the Tri-Cities offers a high quality of life in the perception of local residents, outsiders do not always perceive that quality when they visit a region in the eastern Washington desert, several hours' drive from larger cities. Recruiting either whole companies, or entrepreneurs and management teams to run locally created companies, is a challenge.

E.   **Wenatchee: From Apples to Global Manufacturing**

1.   *Current Economic Base*

Wenatchee and East Wenatchee are two cities located in different counties—Chelan and Douglas, respectively—near the eastern edge of the Cascade mountains in central Washington. Chelan County is 90 percent forested, but its eastern edge is on the shores of the Columbia River. The land along the river is quite fertile, and adequate water is available for irrigation making the area suitable for tree fruit orchards. Douglas County lies on the eastern shore of the Columbia River; this

county is dryer and flatter and as one moves away from the orchards along the river, grain cultivation is a typical use of the land. While the Columbia River divides the two cities and counties, they are linked by bridges and an economic history built primarily on apple production. A total of 33,600 persons live in Wenatchee and East Wenatchee, a third of the total population of the two counties. High unemployment rates and relatively low per capita income are key issues local economic development organizations hope to address.

Table 11: Wenatchee Economic Profile

	Population, 2000	Unemployment rate	Per capita income, 1999
Chelan County	66,616	2000: 8.9% 2003: 6.4%	$25,483
Wenatchee	27,856		
Douglas County	32,603	2000: 7.5% 2003: 7.9%	$19,204
E. Wenatchee	5,757		

Sources: Washington state, Employment Security Department and Office of Financial Management

Commercial orchards started in this area in the 1880s and had become the mainstay of the local economy by the middle of the 20th century. A boom in the cultivation of apples in the 1980s and 1990s, followed by new international competition and weak prices, led to bankruptcy for many orchardists in central Washington. At the same time, large retail organizations establishing strong backward linkages down into food processing to guarantee quality and pricing have forced significant consolidation of the food processing industry in the last decade. These two trends came together in Wenatchee, producing hard times. In the spring of 2001, a major fruit processing plant located 40 miles north of Wenatchee slipped into receivership, threatening as many as 2,000 seasonal jobs and several dozen year-round jobs. Announcements like this have become almost routine in Wenatchee, with many empty warehouses lining the railroad tracks at the edge of town.

Chelan County, which is 90 percent forestland, was also impacted by the closure of many national forests to harvesting in the 1980s for environmental reasons, and unemployment rates exceeded 10 percent throughout much of the 1990s. The eight percent plus unemployment rates typical in the late 1990s, driven more by agricultural and food processing industry issues, were actually a rather dismal improvement from the levels five or 10 years earlier.

2.   Potential for Technology-Related Development

In a primarily agricultural region, it is not clear why technology-based development should be the strategy of choice. Wenatchee is well-removed from the major technology development centers in Washington State, and it has no university or other research institution from which commercializable technologies can emerge. However, it does have some assets that may be attractive to a narrow range of technology-based companies, including spectacular scenery, a nearby ski resort, and lakes and rivers that attract summertime and winter visitors, including a

number of Seattle-area entrepreneurs that have established second homes in the area. In addition, the county-owned electric utility operates its own hydroelectric generating facilities, guaranteeing access to low cost electric power to local companies.[20] With such severe job losses in traditional industries, there is a great interest in the potential for technology companies.

Given this context, it is not surprising to find a quite small base of advanced technology companies operating in this region. A total of 70 companies with aggregate employment of over 800 comprise the advanced technology portion of the Wenatchee economy. Several advanced technology manufacturers, including an aircraft parts manufacturer and a product development company, are the most visible technology-based companies. A handful of communications, software and data processing services, engineering companies, and testing services make up the balance of the technology base in this region.

Table 12: Wenatchee Advanced Technology Employment, 1st Quarter 2002

	Units	Employment
Advanced Technology Manufacturing*	8	344
Communication Services	11	123
Computer and Data Processing Services	17	106
Medical and Dental Laboratories	7	23
Engineering & Architectural Services	19	190
Research and Testing Services	8	42
Total Advanced Technology Industries	70	829

*Includes drugs, electronic components, aircraft and parts, and medical instruments.
Source: Washington Employment Security Department

Two companies now located in Wenatchee provide models and a base to build on, however. Boeing subcontractor Pacific Aerospace employs upwards of 400 people in Wenatchee. This company builds aerospace components for both Boeing and Airbus.   Another recent addition to the industrial scene is a small machining and product design company that produces specialty machinery products for Spielberg's DreamWorks SKG and a variety of other sophisticated customers around the globe.

Wenatchee area leaders are also exploring what connections can be made to the high tech boom in the Seattle area on the other side of the Cascade Mountains. A Seattle area technology industry leadership group has been using a retreat facility in Chelan County for annual meetings, and a number of successful high tech entrepreneurs have established second homes near ski lodges or on the shores of a large lake in Chelan County. If the attention of these high tech leaders can be gained, an interest in recreation in the area can perhaps be turned into a source of investment capital and entrepreneurial energy that could benefit Wenatchee.

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[20] The hydroelectric system was built in the Northwest after the Great Depression, and   inexpensive hydropower is still offered by county Public Utility Districts (PUDs) in central Washington. Some PUDs, including Chelan PUD, own their own dams and hydroelectric generating stations, while others rely primarily on power generated at federally-owned facilities, and marketed and distributed through the Bonneville Power Administration (BPA). The PUD system in the region plays a significant role in economic development.

3.   *Strategies and Partnerships*

Leaders from various organization in the area—including the local community college, the Chambers of Commerce, the two ports, the Greater Wenatchee Area Technology Alliance, and others—have come together in the past year to craft new collaborative strategies. Agriculture and food processing remain significant industries despite their problems, but these key sectors cannot be relied on to produce new employment prospects or higher income levels; to move the economy ahead, new industries must be established.

a.   **Broadband Access**

As leadership in the area began to understand that advanced technology, including broadband connectivity, was key to future progress in this region, an important external event presented a new opportunity. The hydroelectric system in the Northwest is owned and managed by several separate utilities, with both publicly-owned and investor-owned organizations involved. However, the key river system is the Columbia and its major tributaries, and this system has to be managed in a coordinated way to achieve multiple outputs including hydroelectric power generation, irrigation, and waterborne transportation. Consequently there is a long tradition of inter-linked contracts and treaties, with Canadian as well as U.S. entities involved. Broadband technology built around fiber optic cables provides new opportunities for the management of these complicated electric power systems. The PUDs in the region banded together with BPA to form the Northwest Open Action Network (NOANET) to link the various generating and distribution stations together to create a more efficient system. A key goal of NOANET is to enable the participating utilities to link their local systems into this broadband trunk system to gain additional operational efficiencies such as automated meter reading and eventually, real-time demand management. As the local distribution companies link the broadband system to each household and business, this telecommunication capacity can then be used for additional purposes such as Internet access, video distribution, or telephone services. Since the PUDs are not legally mandated to offer such services, they are offering third parties the opportunity to use their broadband infrastructure to offer these services to businesses and households.[21]

Thus, NOANET becomes a two-pronged economic development opportunity for Wenatchee. Businesses can be created to offer services on this network, or existing firms can take advantage of the infrastructure to complement other ways of delivering services to households and businesses. In addition, the availability of the infrastructure and expanded service offerings may convince other firms to locate in the area, and existing firms are finding it efficient to use some of the PUD's new capacity and services in lieu of internal solutions. For example, Pacific Aerospace has been running its own servers to support the company's communication needs, but they are going to get out of the "telecommunications hardware" business and use the PUD facility.

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[21] For more information about NOANET, see www.noanet.net (March 2002).

b.   Industrial Park Development

The Port of Chelan County, which is the main economic development entity in the region, is putting additional chips on the table to make the region more attractive to business, and is creating a recruitment program around the whole package. Near its own facilities at the north edge of town, the port has created an industrial park with excellent broadband connectivity. Pacific Aerospace is located in this region, and the company's president says that the connectivity offered at this site is critical to the firm's ability to operate in the Wenatchee region. Space is still available in this industrial park, and the port is actively marketing it. A new aspect of the park is a community technology center, which will provide a location for internet-based businesses requiring the most extensive broadband access. The facility will serve as a training center, with several university programs, and it will provide incubator space for startups. Electric power research and management firms, as well as software development companies are expected to find this location attractive.

The port is also putting together a new industrial park project on a former lumber mill site in a nearby smaller town. The mill burned down nearly 20 years ago, and subsequent changes in national forest management made it uneconomic to reconstruct the mill. A new technology park—located near the retreat center that Seattle-area technology users have been using—is being designed for the site to appeal to high tech companies. To make it appealing to environmentally-conscious technology entrepreneurs, the port is planning to preserve many environmental amenities on the site, including a 200 foot wide greenbelt along the scenic Wenatchee River. Excellent broadband connectivity will also be established into the site.

c.   Networking and Coalition Building

Marketing of these two industrial properties to advanced technology manufacturing and internet-based firms in sectors such as software development or e-commerce then becomes the core of the strategy. The strategy is supported by a number of organizations:

- Wenatchee Valley College, a community college with existing machining and information technology programs, and a short term worker training program that supports the recruitment efforts;
- the ports of Chelan and Douglas, who work with firms in their respective counties to find sites and access local services;
- other Chelan PUD programs, including work with the local skills consortium to bring technology content into K-12 education;
- the city of Wenatchee, whose planning office is collecting information about the local business community including the incipient technology industries; another key focus is skill development among the Hispanic population in the area.;
- the Wenatchee Chamber of Commerce, which has facilitated the development of an alliance of seven Chambers in Chelan and Douglas counties to foster economic development in the region; a Center for the New West report on Wenatchee as a "high performance community"

is a key tool in getting the regional chambers to participate in a broad regional development effort; and

- Greater Wenatchee Area Technology Alliance, a group of technology companies and educators who are discussing common interests and ways of supporting the technology center developed by the PUD.

One strategy being considered by these groups is to contact people who have left the area, and developed successful businesses in other places. These successful individuals may have family ties or a liking for the quality of life in the Wenatchee Valley, and may be interested in moving their companies to the region. This strategy seems especially attractive to local leaders because one of the two key technology firms in the area is owned by an individual who moved to Wenatchee from the Bay Area after he met a local woman who wanted to remain in Wenatchee. He realized that more and more of his business contacts worldwide were being made by telephone or over the Internet anyway, so a location in the Bay Area to facilitate personal meetings was not necessary. With good broadband access and a regional airport nearby, he can stay in contact with his customers from a new home in Wenatchee. The other major advanced technology manufacturer in Wenatchee, Pacific Aerospace, has consolidated operations from Oregon and New Jersey into its plant in Wenatchee. Both of these firms have found that it is relatively easy to recruit staff from other regions when appropriate high level skills cannot be found in Wenatchee. The local quality of life is attractive to many people who welcome the chance to leave major US cities.

Leaders of these groups stress that the cooperative strategies emerging in the area are quite new. The individual cities, counties, ports, and Chambers previously worked separately and often competed against each other. However, with the changes in agriculture and food processing layered on top of adverse developments in forestry and mill operations in the prior decade, a sense of crisis emerged, and local leadership realized they had to take a different tack. In addition, there has been some turnover in leadership ranks, and newer, younger leaders are more interested in collaborative strategies than some of the old guard. Many of these new leaders have been in the area less than 10 years and are not encumbered by old commitments or histories of conflict with other organizations. The combination of a sense of urgency and a willingness to collaborate is very attractive to businesses who want to expand in the area. Pacific Aerospace's president indicates that this combination is both rare in his experience of doing business in various communities, and very attractive to his company.

Summary and Comments

Wenatchee is an agricultural services center located in a scenic central Washington region. Given problems in the agricultural sector, the city is attempting to diversify into technology fields. However, the region does not have any major research institutions, and the existing technology "seed companies" are too few and too small to fuel a technology-led boom in the area. The area's strategy of bringing in state-of-the-art broadband capacity in a modern industrial park will enhance the competitiveness of existing companies, and courting technology entrepreneurs who happen to visit or own second homes in the area is a "can't hurt/might help" approach that may produce limited

success. This city is a clear example of the need to balance technology strategies with other approaches to economic development.

V. KEY LESSONS FROM THE FIVE COMMUNITIES

The five case studies in the previous pages demonstrate that the path to technology-based development is quite different depending on where a community starts out. In this section, an analysis of the experience of the five case study communities provides lessons and recommendations for other communities who decide to pursue technology-based development strategies.

A. There is Likely Some Role for IT in All Communities

All five of the case study communities have made a commitment to pursue technology-based development even though they are outside the major techpole in the state, and have very different current economic bases. This situation suggests that there is some role for IT in every community. However, it also may be that these communities are simply chasing the latest development fad without adequate analysis to decide if there really is a potential for substantial IT-based development in their community. A quick comparative analysis in this section explores the role of IT in these five communities. The table on the following page summarizes key community characteristics and the IT-based economic development strategies that have emerged in these five metropolitan regions.

Table 13: IT Strategies in the Five Case Study Communities

Strategies	Bellingham	Spokane	Tacoma	Tri-Cities	Wenatchee
Recruitment	X	X	X	X	X
Networking	X	X	X	X	X
Entrepreneur programs		X	X	X	
Venture fund	X	X	X		
IT education	X	X	X	X	X
IT infrastructure	X	X	X	X	X
Industrial park or campus development	X				X
Re-develop older buildings/ districts	X	X	Public sector only		X
Incubator		X		X	
Sector institutions	X	Multiple	Multiple	X	
New-old links	X			X	
Unique elements	Redundant fiber optic trunk lines; telco collaboration	Collaborative entre-preneurship program; IT Academy	Public utility created Internet access system; IT Institute	National laboratory site	Public regional fiber optic system

All five of these cities have been built around resource industries—agriculture and food processing, forestry and wood products, petroleum refining, aluminum smelting, and nuclear energy-related technologies. For a variety of reasons, these traditional industries are not seen as strong foundations for future employment growth, as discussed in the individual case studies. All five

communities are emphasizing IT-related sectors such as software development and both consumer and business-to-business e-commerce. Spokane and the Tri-Cities are also focusing on certain aspects of bioscience industries and alternative energy systems. Wenatchee is alone in explicitly pursuing advanced technology manufacturing based on its IT capacity and other factors. Why have all five of these communities chosen to focus on IT? Several reasons are possible:

1. a desire to replicate the wealth creation in Seattle
2. a belief that further growth of IT is likely
3. a perception that the siting requirements for IT companies will be more diverse in the next phase of IT development, and
4. a concern that the benefits of IT be made available to current industries in these areas.

The first potential reason is a probably not a wise basis for a decision to pursue IT companies. The fabulous fortunes created by leading IT companies such as Microsoft and Amazon may never be replicated in any location as the IT industries mature and more normal profit rates emerge in a world of stronger competition among suppliers of IT products. However, the other three rationales seem to be quite reasonable. These rationales suggest that there is at least some modest role for IT in every city, a role that economic development officials should include in their strategies even if it is not the centerpiece or primary target for economic development in some areas.

The responses of these five cities to the IT development puzzle are somewhat different than those chosen by other metro areas around the country. For example, in the Atlanta area, public-private partnerships among research institutions, economic development organizations, and private industry are being created to enhance the competitiveness of existing industries such as freight movement based on applications of advanced IT. In Michigan, advanced IT is integral to an effort to re-invent the state's most visible product, automobiles, incorporating new energy technologies and "drive by wire" technology. These two examples of larger regional or statewide strategies stand in contrast to the stand-alone strategies of the five case study communities. As noted at the beginning of the paper, Washington state is not in a position to play a strong role in development strategy. This is a key weakness of the local strategies—they lack a strong statewide partner.

Ann Markusen, a University of Minnesota professor, argues that economic development strategies based on narrow definitions of high tech miss a key point: many industries, including services, are very IT-intensive and the application of IT in these sectors may create significant competitive advantages.[22] Similarly, Battelle's Walt Plosila cautions urban leaders to focus on enhancing the competitiveness of existing industries using advanced IT and other new technologies,[23] while Harvard's Michael Porter advises leaders to work on improved competitiveness for all industries, not just those that are currently fashionable.[24] The five Washington state case study communities may be missing important opportunities by failing to examine possible

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[22] Markusen, et. al. "High-Tech and I-Tech: How Metros Rank and Specialize."
[23] Remarks at a Council for Urban Economic Development training session in Phoenix, AZ, January 2000.
[24] Presentation at the Council on Competitiveness "Clusters of Innovation" conference in Washington, D.C., December 2001.

applications for advanced IT in existing older industries. One firm in Bellingham is pursuing a locally "contrarian" strategy of developing software applications, hardware and other technology solutions for agriculture equipment dealers, and in Spokane, efforts are underway to foster an electric power management systems cluster, using both new hardware and software. These somewhat rare efforts to link the new and old economies are more consistent with the advice from Markusen, Plosilla, Porter and others than the mainstream strategies in these areas.

IT is for everyone in the sense that these new technologies are going to be key factors in the competitiveness of many industries, and software firms with a local market focus can be essential in ensuring that all sectors can take advantage of emerging technologies. However, small cities all over the United States need to be realistic about what is possible. A new Microsoft or IBM is unlikely to blossom in a small city without a major university, a large and technically sophisticated workforce, local venture capital, and other specialized business services that support technology development. In addition, there will be somewhat rare opportunities to encourage a local entrepreneur or former resident to create or re-locate a software development or e-commerce firm into a smaller city. Small cities' marketing and recruitment programs are focused on identifying these opportunities; however, they are likely to be infrequent.

B.   Broadband Access Can Meet Multiple Local Needs

High quality, reliable broadband internet access is a necessary component to IT development, and several of the communities have taken steps to provide or strengthen this capacity. In at least two of the study cities (Tacoma and Wenatchee), the way broadband access is being provided is novel and worth considering by cities who have not yet secured high quality broadband access. A third case, Bellingham, suggests a "best practice" of community-led negotiations with existing telecommunications providers that led to substantially enhanced service. Establishing good broadband capacity in a region is a necessary but insufficient first step. Once this capacity is in place, the question is what can be done with that capacity to create real economic development benefits.

An important lesson from these case studies is that broadband capacity is often installed to meet some need other than just providing higher speed or more reliable Internet access. In Tacoma and Wenatchee, internal needs of electric utilities drove the initial planning, and a wide range of services to businesses and residential customers was added on top of a system initially designed to improve emergency responses or cut utility operating costs. In Bellingham and Tacoma, poor responses to new service requests by major telephone companies served as a stimulus to local leaders to establish new competitive services or negotiate with the telephone companies to improve all services including dialtone and Internet access. Only in Spokane was fiber optic capacity installed as a deliberate economic development strategy to induce further growth of IT based companies. Spokane has the largest technology industry employment base of the five case study communities, and it may be that a substantial industrial base is necessary before a community can lead off with a broadband initiative solely for economic development purposes. Spokane is also unique in having a very strong investor-owned utility headquartered in the city; the situation of this

company vis á vis regional broadband needs and telecommunications companies is very different from the municipal and county-owned utilities serving three of the remaining four communities.

The key point seems to be that broadband can meet multiple needs. If a local utility, local government, school system, or health care system has not modernized its telecommunication infrastructure, there may be an opportunity for creative local leaders to develop a system that meets their needs, while at the same time providing broader connectivity for businesses and residents.

## C.	Seed Companies Can Provide a Foundation for Local IT Growth

In each of these five communities, some form of technology-based development had taken root in the community prior to the establishment of broadband connectivity, and current strategies are built around the technology industry "seeds." In the Northwest, the concept of a seed tree is well known; seed trees left behind on a logged plot help to generate the next generation of trees naturally adapted to the site. The five case study communities are relying "seed companies" to spark local technology industry development in an analogous manner. Seed companies that have adapted to economic life in a city outside the major techpole are good examples of what is possible for companies that may consider such a site. In Wenatchee, the smallest of the five case study communities, a single aerospace manufacturer and an innovative product development company are already operating in the area. In Bellingham and Spokane, a handful of IT firms are in place, and in Spokane, the electronics and computer parts manufacturing industries have a long history in the area. Broadband connectivity enhances the competitiveness of these seed companies and provides a platform on which additional development strategies can be built. In Tacoma, an advanced technology manufacturer/software developer of French origin deliberately chose the community prior to construction of the broadband system in order to be close to its first two major customers, and the grandson of a stockbroker turned a small brokerage firm into a financial management services powerhouse.

## D.	Creative Linkages With Research Institutions Can Be a Key to Technology Development

Three of the five communities are building strategies in part around the capacity of local research institutions. In Spokane, one of the major hospitals has established a heart research institute, and links have been nurtured with Washington State University, whose campus is 55 miles away. However, this city and that university appear to need each other; WSU is the nearest university for Spokane, and Spokane is the nearest sizeable city for a research university that requires an urban based setting for some of its programs. In addition, the Spokane Industrial Research and Technology Institute provides a home for advanced applied research and development programs. In Tacoma, the University of Washington has a limited presence on a branch campus, but a new IT Institute provides a developing platform for both teaching and research in IT. And in the Tri-Cities, a major national laboratory gives the region unique strengths in research activities, and WSU has a small branch campus in the area.

Many leading thinkers on technology-based development counsel communities to build strong linkages to research institutions as part of local strategies, and several of these communities seem to be taking this advice to heart. Wenatchee is challenged in this area due to its small size and the limited capacity at the local community college, the only institution of higher education in the area. Bellingham is attempting to take advantage of the opportunity to engage the scholars at Western Washington University, a teaching oriented campus, with local economic development issues; however, this initiative is at the very beginning stages and a strong local linkage remains to be forged with this university.

Research institutions are key to many aspects of technology development; they provide new technologies around which companies can be built; they supply sophisticated labor to the local market, and they can be an important problem-solving resource for companies stymied by some technical problem. The case studies make it clear that smaller cities have to be quite creative in establishing research institution linkages; branch campuses have been created in three of the five case study communities, and a fourth is trying to build links to an existing campus not oriented in this direction.

E.   Recruiting Outside Companies Should be Part of Any Local Strategy

All of the case study communities employ recruitment strategies. In Bellingham and Wenatchee, the primary focus is on Seattle area companies who may wish to find a lower operating cost environment with a high quality of life. In Tacoma, a two-pronged strategy has emerged, partly focused on the Seattle area and partly built around the Click! network/Most Wired City campaign and a focused attempt to bring in branch plants of major established IT companies who want a presence in the Northwest region. In Spokane and the Tri-Cities, the recruiting effort is national in scope. In Spokane, a locally-based "serial entrepreneur" provides a model many communities are considering – recruiting alumni from local schools who have gone on to other regions to establish their careers. Bernard Daines, founder of Packet Engines and Worldwide Packets, is a local boy made good in Silicon Valley, where he became a successful developer of Ethernet technologies. Having acquired some capital from his success in Silicon Valley, he at some point decided to move back to his home town and draw in engineering talent as required from the Valley in order to build the two companies he has founded in the Spokane area. Two leaders of INTEC in Spokane also gained experience in Silicon Valley before emerging as leaders of this technology education consortium.

Many communities are deliberately examining old high school yearbooks and local college alumni lists looking for former residents who have become successful in technology fields. A deliberate program of finding and contacting such individuals may occasionally result in finding the entrepreneurial seed to start a local company, or an existing company that may consider moving into an area.

**F.   Networking Organizations Can Help Foster Growth of Existing
          Technology Companies**

In addition to the recruitment of expanding or cost conscious companies from other places, these case study communities are putting considerable effort into fostering growth of existing and startup technology companies already located in their communities. A variety of strategies are used to nurture development of the local technology companies. All five communities have established some sort of technology company association. Three of these local groups have affiliated with a statewide software industry association. In two areas, separate networking groups have emerged with a focus on bringing in venture capital. These organizations provide an opportunity for entrepreneurs and key executives of young technology companies to exchange notes on problems and strategies, key resources, and market opportunities. This is a common approach in other regions, made popular by Anna Lee Saxenian's seminal piece comparing Route 128 to Silicon Valley. She attributes the Valley's quick recovery from an early 1990s crisis in the computer industry, and its subsequent spectacular growth, to the breadth and depth of networking that exists in that area.[25] The original MIT Enterprise Forum in Cambridge has been emulated by MIT graduates in many other areas. Atlanta's *TechLinks* magazine and website, and Seattle's Pacific Northwest PC User Group are additional examples of efforts to create networking venues in major urban areas. This study shows the same strategy in place in smaller urban areas, with one or more examples in each of the five case study communities.

G.   Real Estate Can Be a Strategic Component

In addition to recruitment of new firms, strong research and education, and facilitation of networks and entrepreneurship, the remaining component of the case study communities' technology-based development efforts involves real estate development. In four of these communities, an effort has been mounted to create a physical environment attractive to technology-based development. These efforts have taken several different forms:

- Tacoma is redeveloping its waterfront to improve the general attractiveness of its downtown, using a university branch campus and other major public investments to seed a new round of development in the area.
- Spokane has rehabilitated older industrial structures to meet the needs of technology companies, and has provided high capacity broadband access in these buildings.
- Bellingham leaders have redeveloped some older buildings in the downtown area and created a new technology campus development on the edge of the city in an area more appealing to suburban-oriented companies.
- Wenatchee has created in in-town industrial park and a rural campus environment is possible as part of a planned mill site redevelopment.

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[25] Saxenian, Regional Advantage: Culture And Competition In Silicon Valley And Route 128.

In each of these examples, an effort has been made to shape one or more local real estate development efforts to meet the unique needs of IT-based companies. At the same time, these developments are meeting broader community needs to enhance the physical infrastructure and overall quality of life in the community. In this way technology-based development become integrated into broader community development goals.

H.   Comparative Advantage Still Matters

Most of the communities in this study have focused their technology development efforts on already existing, if very nascent, technology "mini" seed-sectors or clusters:

- Bellingham   software and telecommunications;
- Spokane   health sciences and energy;
- Wenatchee   advanced technology manufacturing; and
- Tri-Cities   federal laboratory-spawned engineering and research services in chemistry, materials, bioscience, and energy.

None of these four communities tried to create completely new technology industries entirely from scratch, an approach to economic development that has rarely shown encouraging results. Tacoma may be the exception that proves this rule; it has created extensive infrastructure to support future technology development but there is little evidence yet as to whether such development will take place. Not only are the other four communities pursuing a niche within the IT field to distinguish themselves from many other communities pursuing technology development, they are developing niches related to existing strengths in their economy. These findings suggest that the old-fashioned idea of pursuing comparative advantage, adding strength to already strong industries, is still relevant.

I.   Successful Communities Use Multi-Faceted Approaches to Economic Development

All five communities in this study, to varying degrees, appear to use a rich and comprehensive mix of economic development strategies. These include the traditional recruitment of outside firms; providing support services to local business (including technical assistance to existing firms), and strategic facilitation and partnership-building for their nascent technology seed-clusters. Harvey Goldstein and Michael Luger[26] suggest that targeted selection of high-tech development strategies (recruitment, modernization, incubation, and stimulation of innovation) should be contingent on the particular region's conditions and development objectives. However, they also note that there is little evidence of any such rational connection between such theory and practice; rather, communities tend to select their approaches on a fairly *ad hoc* basis. It may simply be, however, that these communities are making such selections in a fashion that is actually based

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[26] Harvey Goldstein and Michael Luger, "Theory and Practice in High-Tech Development." In Bingham, Richard and Mier, Robert. eds., *Theories of Local Economic Development* (Newbury Park: Sage Publications, 1993).

on the internal, intuitive logic provided by considerable knowledge of local conditions, and that these strategic mixes are therefore good fits for many of these places.

VI. CONCLUSION: WHAT IS THE CONNECTION OF STATE POLICY TO LOCAL EFFORTS?

As noted at the outset of this report, technology-led development is a key state goal, motivated by the disparity in economic conditions between the Seattle area and the rest of the state. Gov. Locke's technology advisor has proposed an eight-step list of tools for supporting development of technology throughout the state. These include:

- strengthening research institutions;
- building a skilled workforce;
- educating children well;
- expanding telecommunications infrastructure;
- encouraging technology transfer, entrepreneurship, and new business creation;
- developing digital government; and
- creating strategic partnerships among business, government, education, and non profits; and communicating the technology development agenda to key audiences.

During the course of this case study, we asked community members about the importance of these factors in their local development strategies. Some of the state policy elements proved to be less important to them than others. For example, digital government was not considered to be a particularly valuable tool as yet for developing successful technology sectors.

The presence of research institutions *per se* did not appear to be a necessary condition for technology development, since several of these communities had managed to participate in such development without locally-based institutions, and most of the existing seed companies did not spin out from university research programs.[27] Research facilities may be a co-existing feature of communities with technology sectors but not necessarily a creator of them. They seem to provide an important supporting role, however, in these communities. Richard Florida argues that a diverse urban environment is conducive to high tech development,[28] and universities may be a cultural force producing this diverse social environment where creative people can come together to create new companies in rapidly developing fields such as information technology. In this sense, there may be an indirect connection between the presence of research institutions and successful technology-based development efforts. Major research universities or institutes are also a source of well-educated workers who may gravitate to new technology companies, and entrepreneurs often choose to locate near such labor sources. However, as these case studies demonstrate, this type of development can get started without direct connections to a local research institution.

There was considerable skepticism among interviewees about the role of public policy in encouraging entrepreneurship, technology transfer, and business and e-commerce development. There are some traditional programs provided by government, such as small business development

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[27] Bellingham provides a counter-example, but this company was based on technology developed in the neighboring Canadian province, not at an in-state university.

[28] Florida, Richard L., *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life.* (New York, NY: Basic Books, 2002).

advice. These programs are seen as useful only for typical small businesses, and the organizations providing this type of assistance rarely have expertise in advanced technology fields. To be useful to technology businesses, a program would have to recruit staff with expertise in technology fields, spin off and commercialization processes, the development of business models, and acquiring seed and venture capital. Our respondents in technology companies reported that they typically find expertise in these fields only in the private sector.

The other items on the Washington Technology Advisor's policy list, however, were all seen as important public tools for bolstering technology development. Given the experiences of these communities, there are clearly areas where judicious application of intelligent public policy in support of these factors can provide useful support in local technology development efforts. In addition, we found widespread agreement with the proposition that the most successful role for government seems to be in facilitating the development of already existing, nascent seed-clusters, rather than direct attempts to create such clusters.

We also suggest that state and local governments can provide their traditional resources in more effective ways:

- Expand, update, and integrate the education/training systems with the business community.

  Education and workforce development are seen by most people as key functions of government. However, technology development has created a much expanded set of requirements, some quite new, in the education and training communities. These new requirements include increasing public access to technology and to the schools, ensuring that instructors and administrators stay current on the kinds of technology skills students and workers need, continuing to develop online distance education and alternative class hours for training, and achieving full scale integration between the education/training and business communities. Washington's education and training institutions are all still in relatively early stages of implementing such strategies, and continue to require considerable energy and commitment from policy makers to keep them moving down this path.

- Identify infrastructure and service gaps and bring resources and partners together that can help fill the gaps.

  Government and key private partners can help identify specific gaps and bring together interested partners to address those gaps. For example, the EDC and its partners in Bellingham successfully brought telecommunications providers to the same table, convinced them to share their existing cable line maps, and was thus able to fill in line gaps where necessary, creating a fairly sophisticated and complete broadband capacity. Similar assistance can be provided in other key areas, such as finding and bringing together possible seed and venture capital sources. Helping to facilitate the development of collaborative, strategic partnerships is a role a number of public agencies have played successfully in these communities.

The provision of infrastructure or support for infrastructure development continues to be an appropriate role for public agencies. In addition to physical infrastructure, this can also include finding and connecting businesses with necessary support services—e.g., legal, accounting, and banking services where there is expertise in serving technology oriented businesses whose needs may be different from more traditional industries. Again, this is a form of identifying and connecting partners as a facilitator rather than acting as a direct service provider.

- Provide state leadership and outreach on the promotion of technology sector development in key communities.

The business leaders in the five communities included in this study felt strongly that state government at present provides virtually no assistance in communicating the state's desire to develop technology sectors locally, regionally, nationally or internationally. This is a role that, they feel, other states play far more effectively, and a role that could provide critical help in Washington.

- Track outcomes and the interaction between state and local level policy

These five communities are at relatively early stages in their attempts to develop technology clusters. It would be particularly valuable to be able to follow up in a few years and evaluate how effective their attempts have been. In addition, benchmarking their success against communities in other states pursuing similar goals would be very useful in judging the efficacy of alternative strategic approaches, differences in the state-level policy environment, and the effectiveness of regional collaboration among communities. For example, TechLinks in Atlanta is an interesting attempt to link the core "techpole" of Georgia to smaller communities pursuing technology development strategies. In Washington state, several statewide industry associations and the Governor's Technology Advisor are attempting to build analogous linkages. The success of these linkage strategies would be worth studying in a separate research project going well beyond the scope of this effort.