Economic Development Planning, Summary 9

Title: Economic Development Via Science and Technology: How Can Arizona Improve Its Standing?

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Summary: Those states that do the best jobs in developing and exporting science and technology will have more prosperous economies. Arizona ranks just above average when it comes to technology. To move up will require such things as an educated workforce, greater investment in Tier I research universities, lasting and enthusiastic leadership that recognizes the economic value of science and technology, and better mechanisms to transfer ideas into the marketplace.

Sector: Science, technology and economic development

Geographic impact: Arizona.
**Key actors:** Intel, Raytheon, Science Foundation Arizona, Phoenix Biomedical Campus, TGen, Honeywell, Boeing, General Dynamics, business community, Arizona Commerce Authority, First Solar, Arizona State University, University of Arizona, Northern Arizona University, and other institutions of higher education, Greater Phoenix Economic Council, Flagstaff Forty, Southern Arizona Leadership Council, Arizona Board of Regents, Arizona Technology Council, and Southern Arizona Technology Council.

**Major challenges:** Arizona must back its commitment to science and technology with sustained funding for research, find new sources of venture capital, establish more special programs for high technology, and encourage more students to pursue studies in science, technology, engineering and mathematics.

**Progress to date:** In 2002, the Milken Institute ranked Arizona 18th in science and technology. In 2012, the state ranked 15th. A small measure of progress, perhaps, but Arizona can point to some big wins in the funding and development of science and technology. At the same time, the state has incurred setbacks.

One of the bright developments has been in the area of research funding at the public universities. An Arizona State University newly committed to research has tripled its annual research expenditures since 2003 to about $365 million, while the University of Arizona ranked a formidable 19th among institutions in research and development expenditures with $650 million in 2012.

In 2006, it was great promise and fanfare that three business groups - Greater Phoenix Leadership, Southern Arizona Leadership Council and Flagstaff Forty - formed Science Foundation Arizona to fund and promote medical, scientific and engineering research programs and infrastructure. Stardust Charitable Group pledged $100 million to SFA.

In 2007, the Legislature pledged that it would match the contribution with $100 million over four years, but lawmakers stopped funding in 2009 because of the budget crisis, creating much ill feeling and leaving some organizations counting on the funding in dire straits. In 2010, SFA got some help when Gov. Jan Brewer approved $10 million in federal stimulus funds for the organization.

Despite lost opportunities because of reduced funding, SFA remains a major funding and intellectual force in the areas of science and
technology. In 2013, a six-year review was released showing that SFA grants have helped create 1,865 jobs and 24 technology companies. According to the Battelle Technology Partnership Practice study, the SFA grants have generated nearly $300 million in industry-matching and non-state research funding. The study also highlighted continuing challenges in the state’s efforts to build and strengthen science and technology. These include a shortage of venture capital, the slow growth of technology employment and students falling short in middle-school math and science.

A slice of funds from Proposition 301, a 20-year, 0.6-cent sales tax that voters passed in 2000, is annually allocated among the three public universities under the Technology and Research Initiative Fund to support new research and programs, and attract valued researchers. Business incubators and accelerators are flourishing around the state.

**Major implications:** When the study was published in 2003, it was observed that Arizona had not made much progress over the past two decades in science and technology, but that the state had a solid core of high-tech companies and universities committed to research on which to build on. Aerospace and defense remain key industries (Raytheon, Boeing and Honeywell, among others) and the semiconductor industry, led by Intel, is a major employer and innovator. The state has become a leader in solar technologies. Healthcare is growing by leaps and bounds and significant emphasis has been placed on developing the bioscience sector. Leadership and commitment to being a leader in science and technology remain key factors if Arizona is to be competitive with such high-flying neighbors as California, Colorado, Utah and Washington.

**Opportunities for alignment:** The formation of Science Foundation Arizona and efforts to fund it through matching public and private dollars represented a major milestone in the business community and state lawmakers working together to advance the state’s economy. Unfortunately, as noted, the Legislature bowed out as the recession deepened, but SFA remains active in many areas with a strong track record of backing successful research initiatives. Both ASU and UA have expanded their areas of expertise, attracting more research funding from government, non-profit groups and the private sector. Key areas of opportunity include aerospace and aviation, biomedical, defense, healthcare technologies, renewable energy, education, and information technology.
Background: With varying degrees of success, Arizona and the other 49 states are competing in the new economy, seeking to develop and export technology with the aim of keeping and creating high-paying jobs. There are many routes for states to pursue in generating wealth though science and technology innovation, but three key ways are: states must invest in and create environments supportive of technology research and development; they must prepare a capable tech workforce; and they should foster a quality of life attractive to high-tech companies and individuals.

According to The State Technology and Science Index: Comparing and Contrasting California from the Milken Institute in 2002, Arizona ranked 18th in science and technology. (The state ranked 15th in 2012.) While above average, Arizona’s 2002 ranking compares unfavorably to four of the state’s major competitors in the West: Colorado, California, Washington and Utah ranked second, third, sixth and ninth, respectively. To better understand how these four states achieved their positions, the report provides brief case studies of each, how Arizona compares and what Arizona can do to ignite a high-tech fire.

Arizona
Arizona has a mixed record for high technology. The state is known for its electronics and aerospace industries, as well as optics. The high-tech effort is led by manufacturing with some pockets of research. Major high-tech employers are Honeywell, Intel, Motorola, Boeing, and Raytheon. Overall, by most measures, Arizona ranks just above average in high tech. Over the past 20 years, the state has not gained much ground in science and technology.

Over the last 50 years, Arizona’s economy has been spurred by climate and job growth. The economy has been characterized by rapid job growth, but it has been more a case of quantity than quality jobs. Various indicators of economic progress show gaps. Real per capita income has fallen behind the national average since the 1970s, from 93 percent to 85 percent in 1990s. The state’s revenue base has been limited by nine straight years of tax cuts. State spending for K-12 and higher education did not keep pace with economic growth in the 1990s.

On a bright note, passage of Proposition 301 means 20 years of funding for science and technology research at the three public universities. In the first year, the three received a total of $50 million. Arizona is known for its entrepreneurship, but long has lacked access to venture capital.
The state also has few special programs for high technology. The Arizona Technology Council has been formed to advocate for high tech in central and northern Arizona, in cooperation with the Southern Arizona Technology Council.

**Colorado**
Colorado ranked No. 2 on the Milken index with a technology community more diverse than that of many other high-tech states. Three primary factors were identified as leading to the state’s high tech success:

- Ability to attract and retain thousands of knowledge workers. Colorado’s colleges and universities produce relatively large numbers of the scientists, engineers and other graduates desired by technology companies. In 2002, the state had the highest concentration of high-tech workers in the country.
- Perceived high quality of life that appeals to high-tech companies and workers.
- Federal labs, defense and space facilities, and high levels of R&D activity at the state’s research universities. Military, climate and space facilities are clustered in Colorado.

Challenges include a drop in funding for education and passage of the Taxpayers' Bill of Rights (TABOR) that puts the brakes on state and local spending without taxpayer approval.

**California**
California ranked third in the Milken index. The state operates on a different scale than its much smaller Western counterparts, boasting Silicon Valley (described as another economic Gold Rush), such world-class universities as Stanford, UCLA and Berkeley, nearly 50 federal R&D laboratories, and a deeply rooted aerospace industry.

A history of risk taking, extensive venture capital and talented individuals have helped California and Silicon Valley flourish. A state government committed to higher education and high-tech development have played a major role in economic success. In 2000, the state announced an initiative to establish the California Institutes for Science and Innovation, committing $300 million over four years. The formation
of high-tech firms is encouraged through funding from the California Technology Investment Partnership.

**Challenges** include dealing with the effects of Proposition 13 (which limited property tax rates and increases), a drop in the mid-rankings in expenditures per capita on K-12 and higher education, and a decline in the percentage of people with high school and bachelor’s degrees, reflecting a changing population.

**Washington**
Washington placed sixth on the Milken index, with much of the credit going to two homegrown giants: Boeing and Microsoft. The two companies helped stimulate an economic boom in Seattle whose high-tech workforce numbered 193,000 in 2001. High-tech workers in Washington were the highest paid in the country in 1998, earning an average of $105,700 annually. Also playing a role in the state’s high tech development were the prowess of U.S. Sen. Henry “Scoop” Jackson and U.S. Sen. Warren Magnuson in bringing home federal funding, the University of Washington’s success in landing federal research grants, and the state’s strong financial support of K-12 education.

Challenges include middling state financial support of high-tech research, a decline in per capita spending of higher education and what business leaders warned is a growing sense of complacency in Washington about the need to invest in the state’s high tech future.

**Utah**
Utah’s No. 9 ranking in the Milken index can be attributed, in part, to a young and educated population, breakthrough technology developments, LDS leadership, a strong track record of entrepreneurship, and a university system that does extremely well in attracting research dollars ($400 million in 2000, which ranked Utah’s three research universities seventh in the country in state academic research).

Challenges include a small state revenue base with a large percentage of the budget devoted to education, leaving little flexibility to spend in other areas; a small population of 2.1 million; and few government-sponsored programs for technology business development.
Strategies to improve Arizona’s standing

Each of the four Western states competing with Arizona in high tech found their own ways to success. But there are some similarities in their stories. All benefited from large, sustained federal investments in defense and space that helped create a concentration of knowledge workers. The presence of these workers spurred a positive cycle of higher education, training and state preparation for high-tech activities. Also, the states had major research universities and traditions of university and economic development connections and technology transfers.

State tax and spending policies were not viewed as playing much of a role, if any, in high-tech development in the states. However, a certain level of public revenue is needed to support the schools and infrastructure for states to compete.

Based on the examples of the competitor states, five strategies could help Arizona improve its standing in science and technology:

- Lasting, enthusiastic leadership that recognizes the economic value of science and technology.
- The right message and strategy to convey the urgency of this issue.
- Invest in the creation and maintenance of first-tier research institutions.
- More and better mechanisms to improve the transfer of ideas into the marketplace.
- A belief that the state can be a leader in science and technology.