Opportunities essential for drawing 'knowledge workers'

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If Phoenix decides to swap innovation for growth as its core economic driver, finding people with the ideas and thinking skills that lead to new discoveries will be as important as cheap land and affordable homes have been for the past 60 years.

"Knowledge worker" is the term applied across industries for people who create, research, develop and invent. Knowledge economies ride on their work as ideas are turned into new products and services.

Knowledge workers may be scientists, engineers, designers, architects, high-level managers, artists or business entrepreneurs. Competition for creative people in these fields is substantial. Cities that want to develop knowledge economies need to attract them with both career and lifestyle opportunities.

In this second part of the Arizona Indicators series, *The Republic* looks at what attracts knowledge workers to an area and how Phoenix rates.

Compared with similar cities in the United States, metropolitan Phoenix is short on knowledge workers.

Data from the U.S. Bureau of Labor Statistics show knowledge workers constitute about 10.5 percent of the metropolitan Phoenix workforce, compared with 16.1 percent in Raleigh, N.C., 17.6 percent in Austin and 13.8 percent in Denver.

Phoenix also could do a better job of producing and attracting knowledge workers.

In 2005, for example, Arizona had 473 people graduate with doctorates in science or engineering compared with California's 3,600, Texas' 1,781 and North Carolina's 863.

From 1999-2000, knowledge workers constituted about 8 percent of the people who moved to Arizona. During the same period, about 30 percent of the people who moved to Texas and 14 percent of the people who moved to Georgia were considered knowledge workers.

Economist Richard Florida says knowledge workers are drawn to what he calls the three T's: technology, talent and tolerance.

Florida and others who study the dynamics of successful knowledge economies say knowledge workers are attracted to communities that offer:

• **Technology infrastructure.** Good networks of wireless and broadband Internet access are important to knowledge workers and the companies that have the jobs those workers want.

• **Innovation clusters.** "Innovation clusters" are networks of university researchers, private companies and public ventures focused on a shared field of study or

development. Being clustered in one area allows for collaboration and makes it easier to turn ideas into products or services.

• **Peers.** A sizable population of knowledge workers makes it easy to network professionally and socially.

• **Quality of life.** A good mix of social and recreation opportunities, including arts and culture, lively urban cores, diverse cultures and lifestyles, and access to outdoor recreation.

Cities in competition for knowledge workers try to cultivate these qualities. The Valley has not been as aggressive as other cities in developing programs specifically to attract knowledge workers.

Austin, for example, spent years developing itself as a hub for high-tech innovation. Then the dot-com bubble burst in the late 1990s, threatening that economic foundation. The Austin Chamber of Commerce responded with a $12 million campaign promoting Austin's job and lifestyle opportunities as "The Human Capital" to hang on to the people who made the economy work.

Denver went after knowledge workers years ago with a light-rail system and arts tax. In January 2006, Denver Mayor John Hickenlooper created the Task Force on Creative Spaces to examine land use, legislative policies and other tools to cultivate spaces in the city where knowledge workers would be able to work and live.

These kinds of efforts are based on the belief that where knowledge workers gather in significant numbers, the economic benefits extend to all parts of the community.

"These workers usually have higher wages, which contributes to better local schools and more tax to the state," said Perry Wong, an economist with the Milken Institute. "It has huge consequences down the road."

Knowledge workers can be found in many kinds of roles and professions. But there are common themes and characteristics.

Knowledge workers generally have college or post-graduate degrees. They may work as mathematicians, scientists, architects, designers, business managers, artists or engineers. They all play a role in developing new products or better ways to do things. Their work is about invention and innovation.

In the United States, people categorized as knowledge workers account for about one-third of the workforce and generate around half of all wages. They earn nearly twice the wages of people who work in service or manufacturing sectors. Their work tends to drive a regional economy across many fields and sectors.

Because their skills are highly sought and portable, they can be picky about where they live. Often young (24-35), they are willing and able to move to places that provide good jobs, but they're also looking for cities that can cater to nearly every aspect of their lifestyles.

In return, knowledge workers provide the spark that drives an economy. And the larger, more diverse the pool of knowledge workers, the more resilient the economy.

Up-and-coming companies built on innovation are born in or move to places with good populations of educated workers.

Of the 500 fastest growing U.S. companies, not one is based in Arizona. Texas has 45, Washington 14 and Colorado 11.

Arizona has strengths and weaknesses in attracting and retaining knowledge workers.

Technology and innovation

Phoenix is a young "big" city, which has made it easier to add the latest wireless and cable technology as the region grows. Rural areas still lag, but Phoenix rates well when it comes to being wired.

Recently the Washington, D.C.-based Information Technology and Innovation Foundation ranked Arizona's broadband infrastructure 12th in the nation in its 2007 State New Economy Index.

Last year *Forbes* magazine ranked Phoenix seventh (tied with San Diego and Tampa) among the "Most Wired" cities in the United States, based on access to broadband and wireless. Leading the list were Atlanta, Orlando, Seattle, San Francisco, Raleigh, N.C., and Miami.

Access to Arizona State University played a role in Google's choice to open an office in Tempe, but Tempe's push for a citywide wireless network was also a big factor.

Innovation clusters

Innovation clusters basically blend the idea people with the money and manufacturing needed to turn their ideas into products. Such clusters offer the jobs, working environments and career opportunities that attract knowledge workers.

In 2004, economists at the Milken Institute ranked Arizona 17th in technology innovation in the State Science and Technology Index. California ranked second, Colorado third and Washington sixth. Massachusetts was first.

Phoenix has just started building its first such clusters, while other cities such as San Diego, Philadelphia, Austin and Raleigh-Durham, N.C., have spent decades and millions of dollars developing theirs.

Over the past seven years, the state and Phoenix have been developing an innovation cluster around the areas of biotechnology and bioscience. From 2000 to 2004, the number of bioscience jobs increased by 12 percent to about 72,000 total jobs. Membership in the Arizona BioIndustry Association, a trade group for the state's bioscientists, has gone from 60 in 2003 to more than 200 today.

A new Arizona company called the Molecular Profiling Institute is an example of how innovation clusters can work.

Dr. Robert Penny launched MPI in 2003 as a spinoff of the Phoenix-based International Genomics Consortium and the Translational Genomics Research

Institute. MPI turns research discoveries into medical tests that help diagnose and treat diseases.

Penny had been frustrated as an academic researcher, where it could take nearly a decade for a medical discovery to reach patients. He wanted to create a company that would take ideas from "the (research) bench to the bedside" much more quickly, he said.

Penny started as MPI's only employee. Now the company has almost 50 - two thirds of them with advanced degrees - and sells tens of thousands of its tests to hundreds of hospitals across the country.

MPI's work has led to partnerships with other national companies such as AmeriPath and Gen-Probe to distribute and develop tests. MPI also creates business for local companies, such as Tucson-based Ventana Medical Systems Inc., which supplies MPI with diagnostic equipment used to analyze cancers and personalize medical care for patients.

MPI illustrates a couple of things: how ideas can generate new businesses and how proximity to ideas, investment and entrepreneurs - innovation clusters - can produce results for the larger economy.

Proponents of this kind of economy in Phoenix say bioscience is a good start, but the same approach needs to be applied to other fields such as solar technology, environmental sustainability and optical sciences.

Venture capital and research and development grants are required to build innovation clusters. The investment goes into lab space, prototypes, office buildings and resources for start-up companies.

Barry Broome, president and CEO of the Greater Phoenix Economic Council, says that kind of investment is lacking in Phoenix because the area is just getting into the game. Other cities with established innovation clusters attract more investment.

Last year, about $35.8 million in venture capital was invested in Arizona. The city of Austin alone saw more than four times that amount.

"Knowledge companies don't pay for stuff," Broome said. "They're treated like kings everywhere in the United States because they're sought after. In some places they wouldn't even pay taxes . . . because they're going to show Ph.D.-caliber employees. We need to build a venture-capital system that understands that. The amount of money it is going to take to become world class in science will test the appetites of legislators in the state Capitol."

Even with the state's commitment to biotech, some companies struggle to find space to do their work.

One company, Ribomed Biotechnologies Inc., was recognized as one of the Arizona Companies to Watch by the Arizona Small Business Association. The company develops more efficient and accurate ways to detect diseases. But when the company lost its lab space in downtown Phoenix, owner Michelle Hanna made plans to move Ribomed to San Diego, where lab space is more affordable and there is more access to venture capital.

"When you have a state without a sound science- and tech-based industry," Wong said, "the smart kids of the state pack up and leave."

Increasing the number

With only 10 percent of its workforce in knowledge-worker careers, Phoenix has a way to go to build a solid base for a knowledge economy.

To boost the population of knowledge workers, other cities have invested heavily in education and attracting jobs that draw knowledge workers.

In 2006, about 27 percent of the people in Phoenix 25 and older had a bachelor's degree or higher. In Austin, Seattle and Denver, more than 35 percent had college degrees.

Arizona also graduates fewer post doctorates in science and engineering than many of its peer states.

Arizona has a strong university system in Arizona State University, Northern Arizona University and the University of Arizona. But there are problems when it comes to preparing Arizona high school students to start college.

Last year only 48 percent of Arizona's high-school students graduated with the basic requirements needed to apply for admission to a state university.

According to a 2006 survey by the College Board, more than 80 percent of the students who took the SATs in Oregon, North Carolina and Colorado enrolled in college. In Arizona, 66 percent went to college.

Arizona also struggles to keep college graduates in the state. Last fall, about two-thirds of the engineering graduate students at ASU left the state for their careers.

"People are going to the universities and gaining some education, but then they're leaving," said Laura Brenot of the Arizona Technology Council, a non-profit technology association formed to boost the state's knowledge economy. "Most of our members have come to us to say that they are having a hard time finding tech talent and qualified talent."

The value of an educated workforce, especially in a knowledge economy, can be seen in the work at Raytech Corp. in downtown Phoenix.

Raytech started in 1995 as an industrial-design firm that helps clients turn ideas into marketable products. Raytech employees have to be highly skilled and educated, with many of them holding degrees in design, engineering and business management. Past projects range from developing more efficient solar panels for Arizona Public Services to building a better roach trap.

Raytech's work begins when a client comes in with an idea for an invention. Raytech engineers calculate the mechanics of how the invention would work. Designers make sure the product is aesthetically pleasing and practical to use. Raytech contracts a local company to build prototypes. Raytech researchers figure out whether the new product would be marketable and profitable.

Bringing smart people together is vital in order to turn ideas into tangible goods, said Raymond Zuckerman, CEO and founder of Raytech.

"No one person comes up with one of these systems (and products) overnight," Zuckerman said. "We would like to see a bigger pool of talented people."

Quality of life

Life after work is an important factor when it comes to building a good pool of knowledge workers.

Economist Richard Florida studies knowledge workers - what he calls the "Creative Class" - and says they want to live in cities that offer "a stimulating environment and amenities for every possible lifestyle." Cities with heavy concentrations of knowledge workers generally have four major quality-of-life amenities:

• Strong arts and culture.

• Easy access to lively urban cores.

• Diverse lifestyles.

• Good outdoor recreation.

In the summer of 2004, the Maricopa Regional Arts and Culture Task Force released a report that found the Valley ranked last or close to the bottom in nearly every standard used to measure the strength of a region's arts and culture sector.

Measured against nine economic competitors (Atlanta, Austin, Charlotte, N.C., Denver, Indianapolis, Portland, Ore., Salt Lake City, San Diego and Seattle), Phoenix spent the least money on arts, culture and humanities organizations. Phoenix also had the fewest number of museums, performing arts companies, and other arts and culture establishments.

Cyd West, director of research and economic partnerships for the Maricopa Partnership for Arts and Culture, said supporting arts and culture helps to create identity and name recognition for cities. It also stimulates an environment open to creativity and new ideas. Creative people and knowledge workers "need to be in an environment that supports innovation," West said. "They're voting with their feet in where they choose to live."

Urban cores connected to mass transit are also important to knowledge workers, who are 30 percent more likely to live within a 3-mile radius of the downtowns and central business districts.

The Valley's new light-rail system and related pedestrian-friendly developments springing up around the stops is a positive. Construction of single-family homes still dominates in the Valley, but the number of condos and other types of urban living are on the rise.

Mass transit and dense, lively neighborhoods give Phoenix more ways to appeal to knowledge workers, said Nancy Welch, associate director with the Morrison Institute

for Public Policy at ASU. "The more choices we have, the more opportunity we have to attract and keep the people who are going to work at the highest skill."

Phoenix also can capitalize on being a relatively diverse and open place with Arizona being one of the most culturally diverse states in the country.

Cultural diversity represents an area's openness and tolerance to new ideas and various lifestyles - important to knowledge workers who often want to socialize and learn from people with different perspectives.

Knowledge workers also want places that are physically open, with access to parks and good outdoor recreation. Given Arizona's rich outdoor settings, this is a strength the Valley can promote. "How we value our desert environment as an amenity and how we use open space to connect our community will be an asset," Welch said. "These are opportunities to engage people with each other."

The long haul

Vairavan Subramanian is an ASU student pursuing a doctorate in the School of Sustainability. The native of India recently started a company called Green Dream, and his first project is to develop a biodegradable drinking straw that would reduce landfill waste and greenhouse-gas emissions. He hopes to market the product to fast-food chains worldwide.

Subramanian, who loves the outdoors and Arizona's diversity, said his work wouldn't be possible if he wasn't in a place where he could collaborate with other smart people to innovate and solve problems.

"As an engineer, I think a certain way, but a social scientist can think in a way that is totally amazing to me," Subramanian said. "Biologists and economists are totally different. When all of us come together and put in our views, it's amazing what we're trying to produce. . . . You can come up with amazing solutions, which is the future."

Perry Wong with the Milken Institute says if Phoenix wants to move toward a knowledge economy, local leaders and residents must have a shared vision and take concerted actions to make Phoenix a place that attracts and hangs on to more people like Subramanian.

"The temptation is that if you turn a piece of land for development," Wong said, "you get an instant revenue from taxation, the budget looks better and you have construction, which will create a huge amount of jobs." Instead, Wong said, people need to look beyond the instant answers and understand that effort and investment in a knowledge economy "might not even be a huge success right away . . . but this will be good in the long haul."

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