

# Hot Technologies in Today's Texas

**Economist Ray Perryman often says** that Texas is good at coming up with the “next big thing” to drive economic growth. But what will be that next show-stopping innovation? Will it revolutionize the labor market and alter the demand for specific skills?

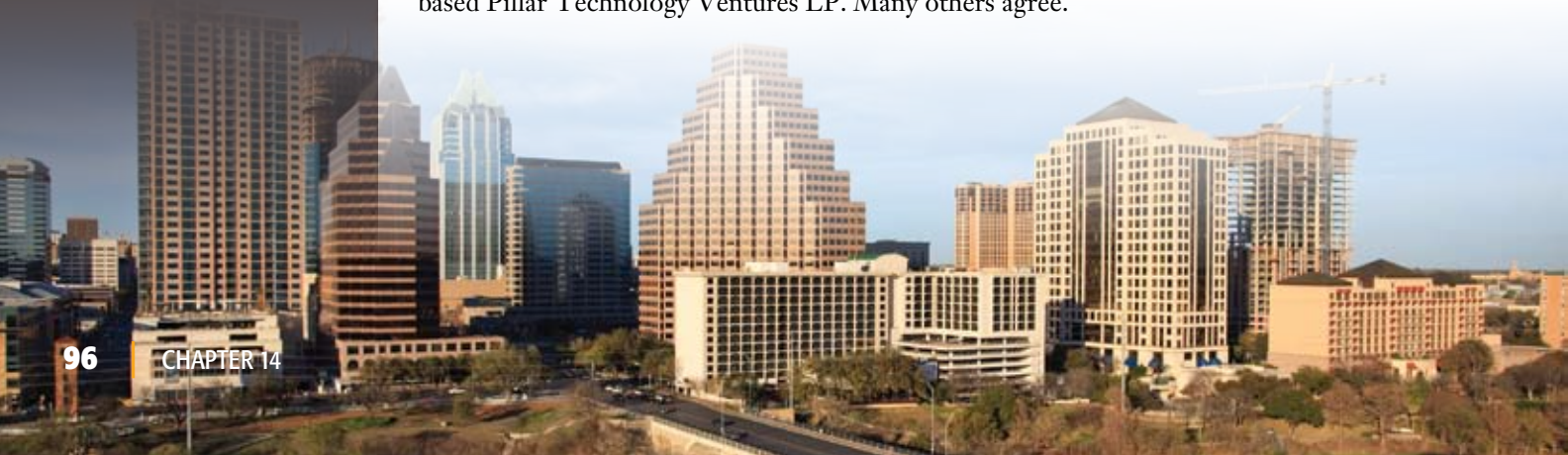
For most people, technology connotes something motorized, digitized or automated. And there is one thing electronic or computerized technologies have in common — the need for power. As electronic devices become increasingly portable and modes of transportation less reliant on oil derivatives, the technologies associated with power generation and storage will become as important to businesses and personal lives as water is to agriculture. Power generation also raises environmental concerns, causing a shift from traditional methods of electricity production, such as oil, natural gas and coal, to renewable, “green” technologies, such as solar and wind power. Waste management, nontoxic incineration, innovative packaging and recycling are also critical components of a green economy likely to affect job growth. The intersection of these, and many other diverse technologies, will contribute to the next wave of scientific discovery and economic growth.

Innovation does not necessarily mean new technology. This can refer to scientific processes, new marketing or business practices, logistical arrangements or distribution systems. But for this chapter, we focus on emerging technologies that Texas investors, public leaders and innovators looking for the “next big thing” may want to consider. “Texas needs to create a hot spot of health and technology and wealth creation,” said Jorge Vanegas, architecture professor at Texas A&M University. “The convergence of these technologies will be the real future.”

**Texas currently has a presence in six hot technologies:**

1. Batteries and energy storage
2. Robotics
3. Radio frequency identification (RFID)
4. Smart-grid technologies for power distribution
5. Cloud computing and software as a service
6. Genomics

Companies and research universities that can integrate some of these hot technologies — along with existing biotechnology, nanotechnology and renewable energy technology — will be positioned for job growth, said Robert Rough, managing director of the Dallas-based Pillar Technology Ventures LP. Many others agree.



## Batteries and Energy Storage

Storing electric energy is the Holy Grail for both the utility industry and the auto industry. Texas is home to several battery company headquarters but has not been as successful at luring the companies' production factories. For example, ActaCell Inc., a specialized lithium-ion battery maker, has its headquarters in Austin but its major employment operations in Asia.

In 2008, several companies that make or research battery technology formed a consortium called the National Alliance for Advanced Transportation Batteries (NaatBatt). Lured by incentives, the consortium chose to locate its research, development and production operations in Kentucky rather than Texas. This loss highlights the limited success of Texas in the battery field. Yet Texas isn't out of the game.

EESor Inc., based in the Austin suburb of Cedar Park, claims to have made an Electrical Energy Storage Unit, or EESU, that can be charged at a much faster rate than current technology allows and can power an average-sized automobile for roughly 300 to 500 miles on a single charge — the equivalent of the drive from Dallas to Houston and back. By comparison, the new Chevrolet Volt electric car can go 40 miles per charge. If EESor's advanced capacitor technology works and if it becomes commercially accepted, then EESor may become the definition of disruptive technology — or unexpected innovations — and Texas will be a big beneficiary. "This is game-changing technology," said Tom Weir, vice president of EESor. "We believe 2010 will be a big year for us, and we plan to stay in Texas and grow in Texas."

Weir stresses that EESor is making electrical energy storage units that are more like capacitors than traditional

batteries. A battery is simply a container of chemicals that interact to store electricity, whereas a capacitor involves layers of metal that store an electrical charge. This different approach to discharging portable energy could make the small Cedar Park company a poster child for disruptive technology.

EESor has raised more than \$8 million in venture capital funding since 2003. The firm currently employs 11 people in 8,000 square feet of space in an industrial park. If the company's product catches on, however, that payroll number could grow quickly. Until now, the company has primarily hired employees with Master's and Doctoral degrees in electronics and engineering. Going forward, Weir said the company will primarily need workers with "normal" engineering degrees and extensive product development experience.

## Robotics

In the early 1970s, the United States boasted more than 100 major companies that made industrial robots. Then the Japanese entered the field and took it over. Now, the robotics field in the United States is filled with boutique companies that make specialized robots for niche industries. For example, Hanson Robotics in Richardson makes robots that appear in science fiction movies, and Solex Robotics in Houston creates robots that roll into hazardous job sites, such as volatile oil fields and chemical tanks, to inspect the sites and perform maintenance.

Some believe that Texas — with its existing software development and advanced manufacturing companies — could provide the bridge from current niche robotics to robots of the future, which could perform manual tasks for consumers and businesses. "Robotics is going to be huge," said Peter Stone, a professor of artificial intelligence at the

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— Chetan Kapoor, Agile Planet

University of Texas. “Many of the same people who will be good at working in robotics are the people who are now good at software programming.”

Though his theory may seem like something out of a science fiction novel, Stone believes that robots will soon be used in kitchens for household tasks and that automobiles will become robot vehicles on autopilot moving occupants to preprogrammed destinations. “Robots as automobiles offer real advantages. There will be no more drunk driving, and the elderly will be able to drive,” said Stone, who has helped develop a working robot car at the J. J. Pickle Research Campus of the University of Texas at Austin.

The money behind such seemingly fantastic ideas is real. Federal funding from the U.S. Department of Defense, the National Science Foundation and NASA has pushed forward robotics research at Rice University, the University of Texas and Texas A&M. Clusters of robotics companies and university researchers also have sprung up and are gathering critical mass in Boston, San Jose, Pittsburgh and Detroit, regional clusters that have obtained support from the National Science Foundation and the U.S. Department of Defense.

The lack of critical mass of robotics research and robotics companies in Texas concerns many. “Texas will get food and process automation robotics,” said Chetan Kapoor, CEO of the Austin-based robotics company Agile Planet. “Will Texas be a place for leading-edge robotics? That’s going to be hard because we don’t have critical mass. We could have critical mass, but we don’t. The most important thing is political support for this growing field.”

## Radio Frequency Identification (RFID)

RFID technology was expected to change the world in 2003, when retail giant Wal-Mart announced that all of its major consumer products suppliers would need to have RFID tags on all of their products. This move led to a new global vision: tiny radio frequency microchips on all consumer and industrial products, and RFID sensors in all warehouses and stores. This way, companies would know the location of all of its products at all times. But the world hasn’t changed — yet.

Like Wal-Mart, retailer Target and consumer products giant Procter and Gamble, have been testing RFID technology in distribution centers. But the presence of moisture or certain metals confounds RFID sensors. In addition, companies are challenged to manufacture extremely durable RFID microchips for only pennies.

“RFID hasn’t hit its growth spurt yet,” said Pedro Reyes, professor of operations management at Baylor University. Reyes sees progress being made toward RFID microchips that are more powerful and simultaneously less costly. “There was a lot of excitement about RFID a few years ago that faded as problems came up. We haven’t hit critical mass yet in this field. But RFID will be big in a few years.”

Texas Instruments remains the dominant player in RFID technology. “Texas is right in the middle of the RFID world,” Reyes said. “Arkansas is the center of the retail RFID world because of Wal-Mart, but Richardson could become the Silicon Valley of RFID.”





However, advancements are needed to make RFID tags more durable and less expensive, which are conflicting goals, said John Priest, industrial engineering professor at the University of Texas at Arlington. “It’s such a trade-off,” Priest said. “I still think somebody is going to come up with a cheap and small battery that will solve all the problems of RFID.”

So far, there is not an acceptable return on investment for RFID, particularly for retail companies. Some industry insiders say the focus on consumer retail products is misplaced. The real future for RFID growth will be in tracking larger, more expensive items.

“RFID isn’t worth it to track a truckload of candy bars or socks, but it becomes a different story if you’re tracking hazardous chemicals or computers or cars,” said Adam Crossno, CEO of OnAsset Intelligence Inc. of Irving. His company attaches small cell phones loaded with tracking software and GPS capabilities to valuable packages, allowing the packages to “call” their owners with updates on their movements.

Crossno said the Dallas-Fort Worth area is already a hotbed for the telecom and microchip industries, so it made sense for his 23-employee company to locate inside that metro area. Despite sudden competition from new firms in China, OnAsset could capitalize and grow as distribution centers become more automated and increase demand for both RFID and real-time location system companies, Crossno said.

Crossno is not the only one who sees the long-term potential for RFID in Texas. “RFID is a good option for Texas, particularly the Dallas area. There’s huge telecommunications and software bandwidth already here,” said Robert Rough, Dallas venture capitalist at Pillar Technology Ventures.

## **Smart Grid Technologies for Power Distribution**

Americans are demanding more electricity, but they don’t want more transmission lines — at least not overhead

or in their backyards. The solution to this dilemma could come from computer sensors and upgrades to the electric distribution system. This “smart grid” could run from the power plants to homes and offices to direct the flow of electricity with modern efficiency. And enhanced monitoring of electricity consumption could help consumers moderate their consumption and help utilities better meet demand. “The smart grid is layering an Internet and computer network onto the dumb, one-way electric system that is our existing grid,” said Karl Rábago, vice president of distributed energy services at Austin Energy.

Many industry observers point out that Texas is the ideal place for new smart grid technology companies. Texas has the nation’s only self-contained electric grid linking multiple power plants with multiple utilities. Some Texas utilities are rolling out smart meters to residential homes, which can deliver constant information to residents about their electricity consumption. “We could be the world’s first smart grid here in Texas,” said Robert Hebner, an electromechanics professor at the University of Texas at Austin. However, he points out that smart meters are not manufactured in Texas and that smart grid technology companies are starting to pop up outside of Texas. “We have some of the capabilities, but we don’t have any of the [smart grid product] manufacturing, and we don’t have a critical mass of leadership pushing for a smart grid.”

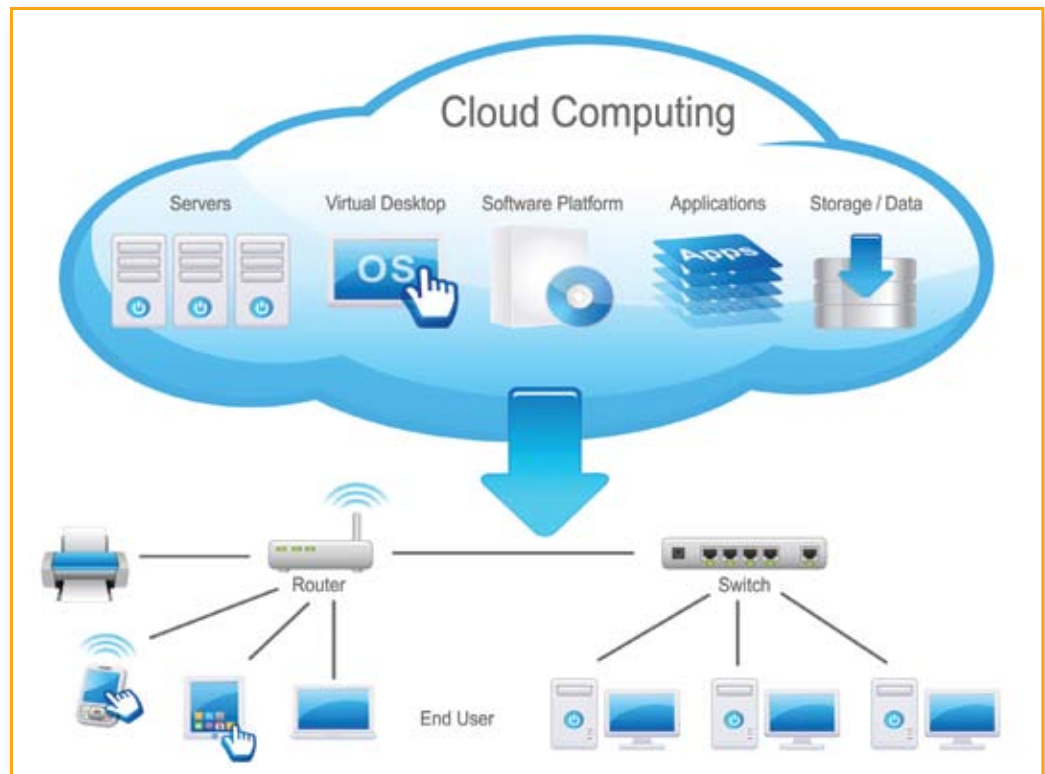
Still, he and others are optimistic that, though the Lone Star State isn’t supplying the grid equipment of the smart grid, Texas could supply the smarts. “Smart grid technology will go everywhere, and it will take a lot of people to deploy,” Hebner said. “Texas universities have some of the strongest power engineering programs in the country. We have the core people who could rebuild, repair, service and design the electric grids. That will be our advantage in Texas: people.”

Smart grid services can grow in Texas, observers say, if utilities and lawmakers push for a more efficient electric grid. And that may require the industry to adopt

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a different business model. Like most states, Texas didn’t create incentives for energy conservation when it went through deregulation. “Electric retailers only make money by selling electricity,” Rábago noted. “Screwing in a low-energy light bulb doesn’t help [the profitability] of your electric company.”

Meanwhile, Texans have balked at the idea of utility companies taking their land to build new coal-fired power plants and adding more power lines near their homes. The threat of more power plants and power lines dotting the landscape may be enough of an incentive for Texans to demand energy conservation, which is best accomplished by adding smart grid technology, Rábago said.

Texas communities that push for smart grid technology also can become a center for a new workforce of engineers and other technology-minded workers focused on designing energy efficiencies, Hebner said. “The creative class will gather somewhere in the future around smart grid technology and cloud computing. And it could happen in Texas.”

## Cloud Computing and Software as a Service

Allowing employees and companies more access to their software systems as they travel is part of the thinking behind new computing trends called cloud computing and software as a service. Texas has gained a foothold with new companies in these industries.

The Internet forms the core of the cloud computing concept. Just a worldwide network of servers hosting Web sites and software applications, the Internet is linked by network cables. The structure of the Internet allows companies that want to lower costs to rent space on a remote server for data storage and software access. Rackspace US Inc. has created data centers to address this need. Rackspace data centers are filled with thousands of servers at its headquarters, a converted shopping mall in San Antonio, and other sites. In addition to renting server space, companies can now also rent the software they use on a monthly basis, have that software stored remotely and simply access their software applications via the Internet.

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Rackspace was started as a hosting firm in 1998 by college students in San Antonio. From its beginning as a collection of a few hundred servers to store companies’ electronic files, Rackspace eventually created its own data-storage software as well as hosting software for other companies. “As the computing industry continues to evolve, companies will get rid of their own data centers and server rooms because it’s not their core competency,” said Paul Norman, director of recruiting at Rackspace.

By filling the unique needs of its customers, Rackspace is on pace to be one of the fastest-growing online hosting companies in the nation. Rackspace now includes 2,800 employees, mostly in San Antonio, as well as satellite offices in Austin, Texas; Blacksburg, Virginia; London, England; and Hong Kong. “The advantage for our business is that Texas is an inexpensive place to do business,” said Norman. “The disadvantage is that the technology hubs are not in Texas. It’s becoming increasingly difficult to find the talent we need locally.”

This is a common concern among software-related companies in Texas. Rackspace needs more software programmers with Bachelor’s degrees and experience in Linux programming. But there are not enough of those graduates from Texas schools. As a result, about 40% of Rackspace’s workers are coming from out of state.

With the Internet revolution, new software companies have sprung up in recent years across the world offering customers software in a pay-as-you-go, or software-as-a-service, model. Many of these specialized software companies have popped up throughout Texas, demanding more specialized worker skills.

For example, Anthony Davis, a former software engineer for Microsoft, moved to Plano to take advantage of a lower cost of living. In 2007, he launched software-as-a-service company 2Go Software Solutions Inc. The 20-employee company specializes in on-demand mobile software for companies whose employees travel and need to track inventory, receipts or other information using their smart cell phones and laptop computers.

While Davis said that Texas currently has a strong pool of software talent that is largely underserved due to the shrinking telecom industry in the Dallas area, he is concerned that Texas schools aren’t keeping up to meet the industry’s future demand. When Davis posts a job opening, three out of four applicants are foreign engineers looking for him to sponsor their work visa to come to Texas. “I see very few people coming out of the colleges in Texas interested in this industry,” Davis said. “Anything my state can do to encourage math, computers and science in the schools would be helpful.”

And like many young entrepreneurs, Davis points out that financing is easier to obtain on the West Coast or in the Northeast than in Texas. “The weakest part of Texas is the financing environment. If I have to get financing, I have to go to California or Boston,” Davis said. “You can’t get more than \$1 million in Texas.”

Still, cloud computing and software as a service are technologies that are well suited for Texas, said Rough at Pillar Technology Ventures. “It goes back to our roots. We have a lot of companies already in the state that are involved in computing and software. It also doesn’t take much to start a software-as-a-service company.”

Rough noted that all of the new Texas software companies that pitch his

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firm are now based on the software as a service model. He also pointed out that virtualization software allows a single server to run many different applications and store more data, which is pushing forward the idea of shared computing power. “A small company may have needed five servers to operate in the past,” Rough said. “But now you can run five small companies on five servers.”

## **| Genomics**

In late 2009, Human Genome Sciences of Maryland announced initial success for a new drug to treat the tissue inflammation disease lupus. This first major sign of success marked a major milestone for joint effort between genomic research and drug discovery.

Some Texas researchers and drug developers want to replicate that kind of success here. Observers in Texas hope that the Lone Star State can leverage genomics to create cures for specialized diseases and develop genetically modified, specialized agriculture products in the next decade. “If you link genomics to pharmaceutical research, that’s the lynchpin,” said Guy Diedrich, vice chancellor of technology commercialization at Texas A&M University in College Station. “Then the next big area is agriculture genomics. It can all happen soon.”

Much of the genomic research in Texas has been performed at the Texas Medical Center in Houston, where the Texas A&M Institute for Genomic Medicine and

the Baylor College of Medicine Human Genome Sequencing Center have built up their staff of medical researchers to push forward in this field. The University of Texas at Austin and the University of Texas-Southwestern in Dallas also have created human genomic research operations. “The power of genomics is personalized medicine,” said Michael Gonzales, who is involved in genomic research at the University of Texas at Austin. “Going into the blueprint of the individual will cause all kinds of new industry.” One possible new industry involves customized drugs and customized health care for individual patients.

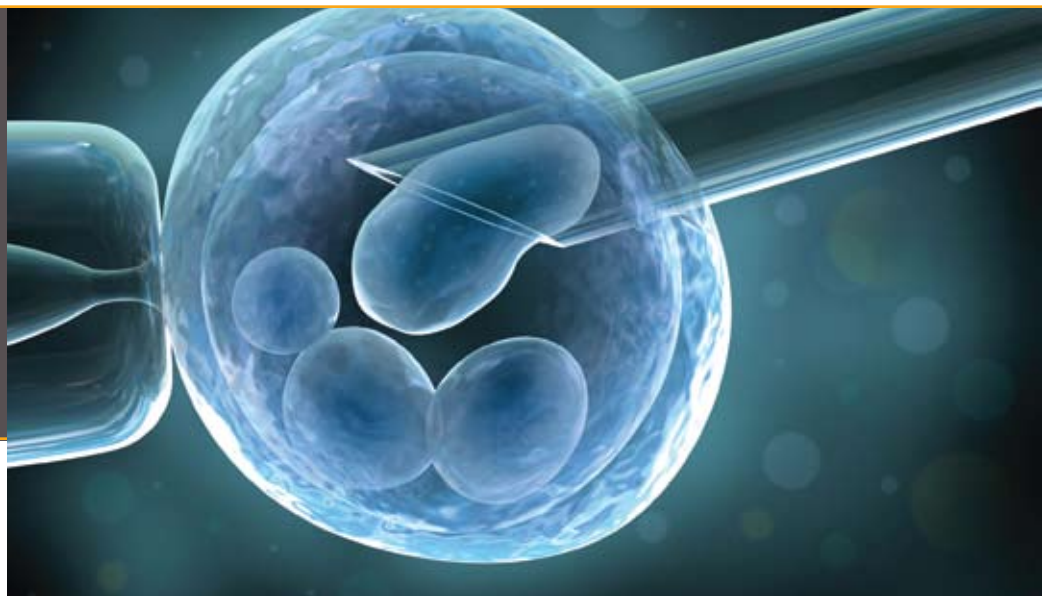
Meanwhile, Texas Tech and Texas A&M have also established labs to research the genomic makeup of plants with an eye on creating food crops that are more resistant to drought and disease. Texas A&M concentrates much research on three problem areas that will affect mankind during the next 40 years: water shortage, food shortage and disease.

All of this medical research is funded through federal grants, primarily from the National Institutes of Health. And medical breakthroughs that will be commercially viable are still years away, said Gonzales.


In Lubbock, the new Functional Genomics Center at Texas Tech University is working on using genetics to modify cotton and then move on to other conditions in plants, animals and humans. Texas Tech received additional funding from the Texas Emerging Technology Fund to create its genomics research center.

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Understanding the DNA blueprint to living creatures could turn genomics into software programming, where researchers could program organisms.

“Each step towards a better understanding of the ways that we can utilize animal genetic material to predict, prevent and treat disease is a substantial step towards a healthier America,” said Nancy Dickey, president of the Texas A&M Health Science Center.

## Closing Thoughts

Companies that can apply critical, scientific thought processes to existing problems will succeed and grow in the future. For example, Jorge Vanegas at Texas A&M points out that demand is rising for batteries and for environmentally sustainable waste management, so the businessperson who creates a safe disposal method for batteries will become rich by linking modern trends to modern problems. In the current economic climate, this may be the time for Texas to consider how to converge new technology ideas and fund new companies that can advance those new ideas.

Limited financial support for new technology companies in the Lone Star State continues to be a problem, according to Texas entrepreneurs and investors.

Venture capitalist Robert Rough argues that funding in Texas is out of balance, with funding for scientific research much more than funding for young companies that want to use that research (and more than 20 times as much money from federal and state sources than from venture capital investors). Rough points out that state employee pension plans in Ohio and Florida are making concerted efforts to invest their money into startup companies in their states. And he suggests adjusting the Emerging Technology Fund to allow for not only initial capital investment in

promising start-up companies but also later-stage funding for these companies will help Texas companies grow. “We need more small venture capital in Texas,” Rough said.

Texas also needs a diverse mixture of technology-related companies to drive new ideas. The hot technologies listed in this chapter can cross-pollinate new product ideas that will lead to new companies in new fields over the next decade. For example, the semiconductor field is influencing modern solar technology. The science of modern plastics is borrowing ideas from the nanotechnology field. New silicon-based consumer products are taking ideas from the medical device field.

“Texas is so spread out and we have so much in this state,” Rough said. “We need to bring ideas together to build the future.”

And integrating ideas, entrepreneurs, investors and high-skill workers appears to still be a challenge for this state. The Kauffman Foundation stresses that regions that can grow and launch entrepreneurs can create jobs. The Kauffman Foundation currently ranks Texas as the 13th best state for entrepreneurial activity and 18th overall on its New Economy Index of states that are best at creating the companies and jobs of the near future. “The new economy is creating profound, irreversible changes in the U.S. economic structure at a pace we would not have imagined even a decade ago,” said Robert Litan, vice president of research and policy at the Kauffman Foundation. “Innovators in the United States — and worldwide — are increasingly investing in resources to compete based on this new reality.”

Innovation, a continued entrepreneurial commitment, business-friendly climate for small business and a dedication to developing a workforce with the science and engineering skills needed to create and apply new technology can put Texas on a solid path to creating the “next big thing.”

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